FHWA-NY-EIS-04-01-D

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
CROSS HARBOR FREIGHT MOVEMENT PROJECT
in
Kings, Queens, Richmond Counties, New York and
Hudson, Union, Middlesex, Essex Counties, New Jersey

PREPARED BY:

UNITED STATES DEPARTMENT OF TRANSPORTATION (USDOT)

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FEDERAL RAILROAD ADMINISTRATION (FRA)

AND

NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION (NYCEDC)

Submitted pursuant to the National Environmental Policy Act of 1969, §42 U.S.C. 4332 (2)(c) (and where applicable, 49 U.S.C. 303) by the U.S. Department of Transportation Federal Highway Administration and Federal Railroad Administration.

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Cross Harbor Freight Movement Project
Draft Environmental Impact Statement

Abstract

The New York City Economic Development Corporation (NYCEDC), in cooperation with the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA), have completed a Draft Environmental Impact Statement (DEIS) for the Cross Harbor Freight Movement Project. Evaluated as part of the project are alternatives proposed to improve the movement of goods throughout northern New Jersey and southern New York. NYCEDC is the study sponsor, and FHWA and FRA serve as joint lead agencies for the preparation of the DEIS under the regulations of the National Environmental Policy Act (NEPA).

The alternatives considered in the DEIS include a No Action Alternative, a Transportation Systems Management (TSM) Alternative, which would include the more efficient management of the current transportation infrastructure; the Expanded Float Operations Alternative, which would include enhanced and expanded capacity for the railcar float system across New York Harbor between Greenville Yard in Jersey City, New Jersey, and 65th Street Yard in Brooklyn, New York; and the Rail Freight Tunnel Alternative (Tunnel Alternative), which would include construction of a rail freight tunnel under New York Harbor. For the Tunnel Alternative, two tunnel routes were evaluated: (1) between the Staten Island Railroad in Staten Island, NY, and South Brooklyn, NY, (the "Staten Island alignment") and (2) between Greenville Yard in Jersey City, NJ, and South Brooklyn, NY (the "New Jersey alignment"). In addition, two implementation scenarios are evaluated for each route: a single tunnel system ("Single Tunnel System") and a double tunnel system ("Double Tunnel System"). The Tunnel Alternative would also include improvements to rail infrastructure such as increasing clearances along the Bay Ridge Branch and Montauk Branch of the Long Island Rail Road and/or the Staten Island Railroad and the expansion of an existing rail yard in West Maspeth, Queens. The New Jersey Alignment of the Tunnel Alternative has been identified in the DEIS as the Preferred Alternative.

Considered in the analyses and impact assessments in the DEIS are the benefits of an improved freight transportation system in the region and the potential effects on railway and highway systems, land use, visual character, natural resources, water quality, air quality, noise and vibration, energy, contaminated materials, cultural resources, and environmental justice. Conceptual mitigation measures to reduce anticipated localized impacts are discussed in the document. Also considered in the DEIS is the financial feasibility and cost-effectiveness of each alternative.

Comments on this Draft EIS are due by July 16, 2004 and should be sent to:

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CROSS HARBOR FREIGHT MOVEMENT PROJECT

a project of New York City Economic Development Corporation

Draft
Environmental Impact Statement

United States Department of Transportation
Federal Highway Administration
Federal Railroad Administration

APRIL 2004

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A. PROJECT PURPOSE AND NEED

INTRODUCTION

The New York City Economic Development Corporation (NYCEDC), in cooperation with the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA), propose to improve the movement of goods throughout northern New Jersey and southern New York. NYCEDC is the study sponsor, and FHWA and FRA serve as joint lead agencies for the preparation of the Environmental Impact Statement (EIS) under the regulations of the National Environmental Policy Act (NEPA).

The metropolitan tri-state region, including portions of southern New York, northern New Jersey, and southwestern Connecticut, is facing a major urban freight mobility challenge. The region's economic prosperity is a key driver of the U.S. economy, and fuels a tremendous demand for goods movement.[1] For the past fifty years, however, the freight transportation system east of the Hudson River has not kept pace with this growth in goods movement. While the East-of-Hudson region has invested heavily in improved public transportation and passenger roadway facilities, the freight system has failed to evolve with changing freight patterns and technology. Instead, the concentration of port, rail and air freight facilities needed to sustain the region's economic link to the rest of the world has developed largely in the West-of-Hudson region. The only direct connection from this freight hub to the heavily populated region east of the Hudson River is via truck. The result is a freight transportation system that:

- Relies on trucks to move almost 80 percent of all goods;
- Suffers from chronic roadway congestion throughout most of the day;
- Imposes additional costs and unreliability on regional businesses and consumers;
- Causes detrimental impacts to local communities in the form of truck trips diverted through local streets; and
- Is potentially vulnerable to major disruptions and provides limited redundancy at a few key links, such as the George Washington and Verrazano-Narrows Bridges, which together handle 30,000 truck crossings each day.

Forecasts indicate that the demand for goods movement in the metropolitan region will grow roughly 70 percent above existing levels by 2025, to nearly one billion tons per year, due to increased economic activity and changing logistics patterns (Reebie Associates, TRANSEARCH database, DRI-WEFA). Without a significant improvement in the current freight system, this

[1] In 2000, 582.2 million tons ($1.44 trillion) of goods moved into, out of, or through the 30-county tri-state metropolitan region.

rapid growth will overwhelm current capacity and degrade the region's economic competitiveness and quality of life. The freight system needs to be substantially upgraded to prevent congestion from constraining the region's economic growth.

PROBLEM IDENTIFICATION

The existing East-of-Hudson rail freight network is an underused asset. Currently, only 1.76 percent of the total tonnage that flows into the East-of-Hudson region travels by rail. If certain constraints are overcome, the rail freight infrastructure could accommodate a tremendous volume of goods movement into the region at a lower cost and with fewer adverse impacts on local communities than an equivalent flow of trucks.

The major rail gateways into New York City carry heavy passenger rail traffic; however, there are two key freight corridors in the heart of the region that are currently underused, and could provide substantial capacity to expand the rail freight system—the Bay Ridge Branch in Brooklyn and Queens and the Montauk Branch in Queens. The Cross Harbor Freight Movement Project includes an analysis of rail alternatives to address the current regional goods mobility problem and enhance the capacity, reduce congestion and costs, and improve reliability and strategic redundancy of the freight system. The project focuses specifically on investments that enable robust rail service in the East-of-Hudson region; namely, improvements to the two key East-of-Hudson rail lines discussed above, rail yards and other supporting facilities, and an improved connection to the national freight rail network in northern New Jersey. These improvements would provide much-needed relief to the region's congested and vulnerable roadways, enhance the competitive position of regional businesses, improve neighborhood quality of life, and allow the region to capture the expected level of growth and benefits.

KEY CHARACTERISTICS OF PROJECT STUDY AREAS

The project addresses conditions and impacts in two main study areas (see Figures S-1 and S-2). The first is a broad, 30-county region surrounding New York City. Within the 30-county region is an 11-county area ("project area") where freight movement problems have been identified, and where the project alternatives would be located. These regions are subdivided into East-of-Hudson counties and West-of-Hudson counties. The East-of-Hudson portion of this project area includes the five counties that comprise New York City, plus Nassau and Suffolk counties on Long Island. The West-of-Hudson portion of the project area comprises four northern New Jersey counties: Hudson, Essex, Union and Middlesex. In addition to the two main study areas, subsets of them are used within this EIS to describe locations where project alternatives would have the potential for direct impacts.

FREIGHT SERVICE AND TRANSPORT PROBLEMS

Although large volumes of goods are moved daily through the 30-county region and the project area, freight hauling operates on a vast but often congested, inefficient, and physically limited system. Each freight movement system—highway, rail, water, and air—faces limitations on operations, access, and routes, as well as physical constraints. A detailed analysis was performed to determine the characteristics of current and future freight movement in the 30-county region.

In 2000, 582 million tons of consumer goods, fuel, food, building materials, and other domestic freight valued at $1.44 trillion moved through the region. Most freight travels in trucks—79 percent measured by weight and 92 percent measured by estimated value. According to the latest

national revenue and volume statistics from the Association of American Railroads (AAR) and American Trucking Associations (ATA), freight transport by rail is on the average 2.7 cents per ton-mile versus 5.0 cents per ton-mile for trucks. The projected growth in goods movement cannot be absorbed by the region's freight transport system without detrimental effects on the region's highway system, its economy, and its environment, as discussed below.

HIGHWAY SYSTEM

Trucks hauling freight in the project study areas share an extensive highway and roadway system with passenger cars, buses, and other non-freight vehicles. In the face of a forecasted dramatic increase in the movement of freight by truck, this highway system is inadequate. In the project area, all traffic going to and from New York City and Long Island or New England must funnel through a limited number of bridges and tunnels. The George Washington Bridge, which carries an average of 276,000 vehicles per day, is the only crossing that is part of the National Highway Network—the designated system of highways for 53-foot trailers. Thus, it is the only option for 53-foot trailers west of the Hudson River bound for Long Island and New England. Tractor-trailer trucks can cross the Arthur Kill to Staten Island and the Verrazano-Narrows Bridge to Brooklyn, but this route is inferior, because it entails negotiating narrow, substandard lanes on either the Outerbridge Crossing or Goethals Bridge to get to Staten Island. When the trucks arrive in Brooklyn, the Gowanus Expressway, which connects to the Verrazano-Narrows Bridge, is severely congested and cannot accommodate 53-foot trailers. Continuing farther north, the Brooklyn/Queens Expressway has height limitations which force the largest trucks to use local streets.

Adding substantial capacity to the river crossings would not alone solve the problem. The major land routes for large trucks leading to and from the river crossings in New Jersey and New York are also continually congested. As discussed below, an increase in trucks would also pose serious consequences for the region's economy, its air quality and fuel consumption, and its safety.

RAILWAY SYSTEMS

If the bridges and tunnels leading to the area east of the Hudson River constrain the capacity of the highway system to carry freight now and in the future, consider that there is virtually no rail crossing at all. There is a rail bridge at Selkirk, New York, but it is 140 miles to the north of the project area. There are some railcar float operations between New Jersey and Brooklyn, but the capacity of that system is currently very limited. In addition, like the highway system, the rail system was put in place before containerization and doublestack technology were developed. Portions of the system also suffer from the dominance of passenger traffic on shared tracks and the limited number and size of rail yards. The region's complex rail freight infrastructure is constrained by the availability of track and yards for modern rail service and by the clearance available to freight cars. The height under which a railcar can safely pass "clearance requirement" differs based on the type of rail car. Intermodal transport—which is an efficient method of shipping goods by rail—generally requires higher vertical clearance—17 feet, 6 inches to allow passage of trailer-on-flatcars (TOFC) and up to 22 feet, 6 inches to allow for modern doublestack containers and tri-level auto carriers. While the majority of rail lines west of the Hudson have full doublestack clearances, many rail lines east of the Hudson River often do not even meet the clearance heights required for TOFC service and so are limited to bulk transport. This shipping method requires that packaged freight be individually transferred from a railcar to a local delivery truck, box-by-box, or that liquid and bulk commodities be pumped out.

It is a considerably less efficient way to move the types of commodities that could be more easily moved by intermodal transport. Also, except for the Bay Ridge Branch of the LIRR, the East-of-Hudson freight lines share tracks with existing passenger service. In addition, the East-of-Hudson region lacks adequate rail yard capacity.

WATERBORNE TRANSPORT

Waterborne transit can move a substantial amount of cargo—containers, liquids, raw materials, bulk—long distances at a relatively low cost per ton. The Port of New York and New Jersey (PONYNJ) has a long history as a leading point of entry to the United States for goods and materials from around the world. Water transport is most effective at moving non-time sensitive bulk commodities around the New York region, such as petroleum, where the emphasis is on low cost. Even a reinvigorated float system would be unattractive to the growing intermodal market segment which requires reliable and time sensitive freight movement due to the need to transfer cargo between rail and water on each side of the harbor. Like access to rail terminals, trucks taking cargo from many of the port facilities must navigate narrow, often busy local streets. Once these trucks get to the expressways, they face the same deficiencies and constraints that plague the all-truck freight trips.

AIR TRANSPORT

Although air cargo makes up a small percentage of all freight moving through the 30-county region and project area, its value is particularly high and the goods are usually urgently needed. Air transport serves a small but important niche role in the movement of lightweight, high value, time sensitive goods for which shippers are willing to pay a high price. It is best exemplified by the overnight delivery services such as Federal Express and its competitors. In the future, air freight will continue to be a niche player in the movement of regional freight and critical to the region's financial and service sectors, but unable to move large volumes of key consumption products such as food, lumber, clay and concrete.

PROJECT GOALS

Recognizing the compelling need for an improved freight transportation system in the region, NYCEDC undertook the Cross Harbor Freight Movement Major Investment Study (MIS), as described below. Project goals were developed during and subsequent to the MIS process with input from steering and advisory committees established to guide the MIS and EIS processes (see Chapter 21, "Public Process and Participation" for information on these committees). These goals reflect the need for more reliable and efficient goods movement, reduction in dependence on trucks for diversion of trucks to other less polluting transport systems, promotion of economic development with improved freight transport, and for strategic system redundancy. The project goals and their related objectives are as follows:

GOAL 1: IMPROVE THE MOVEMENT OF GOODS INTO, OUT OF, AND THROUGH THE REGION

- OBJECTIVE 1A: Develop structural and nonstructural project alternatives that alleviate the shortcomings of the present network.
- OBJECTIVE 1B: Reduce overall travel time for shippers and receivers.

GOAL 2: CREATE A MORE MODALLY BALANCED GOODS MOVEMENT SYSTEM IN THE REGION

- OBJECTIVE 2A: Develop freight movement alternatives that encourage the use of existing transportation corridors with excess capacity.
- OBJECTIVE 2B: Support rail and marine alternatives as a means of diverting traffic from congested highways.
- OBJECTIVE 2C: Foster reliability of freight movement across the Hudson River.

GOAL 3: IMPROVE ENVIRONMENTAL QUALITY IN THE REGION BY DIVERTING FREIGHT MOVEMENTS TO LESS POLLUTING MODES OF TRANSPORTATION

- OBJECTIVE 3A: Develop project alternatives that result in an overall improvement in air quality, traffic congestion and infrastructure wear.
- OBJECTIVE 3B: Identify potential environmental impacts and mitigation associated with the project alternatives.

GOAL 4: PROMOTE ECONOMIC DEVELOPMENT IN THE REGION THROUGH A MORE EFFICIENT GOODS MOVEMENT SYSTEM

- OBJECTIVE 4A: Determine the freight movement needs of commercial and industrial interests through outreach and industry involvement.
- OBJECTIVE 4B: Ensure that the project alternatives can meet both present and future commercial transportation needs.
- OBJECTIVE 4C: Reduce the transportation cost to businesses and consumers by alleviating wasteful congestion and creating competitive transportation alternatives.

GOAL 5: PROVIDE STRATEGIC SYSTEM REDUNDANCY TO THE REGION'S VITAL HUDSON RIVER CROSSINGS

This goal was added to the project after the events of September 11, 2001. It is intended to assure that in the event of an attack or other catastrophe, the freight system will have enough redundancy so that essential goods and commodities can continue to move into, through, and out of the entire region, including those areas east of the Hudson River.

Given the considerable problems facing an essential service in the region—movement of goods to and from the region's core—NYCEDC initiated the Cross Harbor Freight Movement MIS in 1998. The overarching goal of the MIS, which was completed in the spring of 2000, was to develop a project specific strategy for improving the region's movement of goods across the New York Harbor. Fifteen alternatives involving highway, rail, water, and air systems, were screened in a three-tiered process with a strong public participation component. Nine of the alternatives were discarded upon completion of the first-level screen either because they faced insurmountable barriers to implementation or because they were not full "stand alone" proposals and therefore did not fully address the identified problems. Two alternatives were dismissed upon the completion of the second and third tier of the screening analysis, leaving four alternatives, including the No Action Alternative, for the most detailed MIS analysis and

ultimately for consideration in the DEIS. (See Chapter 2, "Project Alternatives," for descriptions of the screening process and results.)

B. PROJECT ALTERNATIVES

The basic project alternatives for the Cross Harbor Freight Movement Project were identified as part of the Major Investment Study (MIS). This was done in a comprehensive planning process with considerable input from the project's steering and advisory committees and the public. During this process, 15 strategies involving highway, rail, water, and air transportation systems were screened and evaluated against project goals and objectives. Ultimately, three alternatives were recommended for more detailed assessment in the EIS: the No Action Alternative, the Expanded Float Operations Alternative, and the Rail Freight Tunnel Alternative, which includes two alignment options—(1) between Jersey City, New Jersey, and Brooklyn, New York, and; (2) between Staten Island and Brooklyn, New York. A Transportation Systems Management (TSM) Alternative, which maximizes the efficiency of the present freight system through low-cost investments, was later added for evaluation in the EIS. As described in Chapter 1, "Project Purpose and Need," and confirmed in the MIS, alternatives that address an improved rail freight system between areas west and east of the Hudson River would best meet the goals of improving goods movement in the region, reducing dependency on trucking and increasing reliance on other less polluting transportation systems, promoting economic development, and achieving strategic transportation system redundancy.

During the EIS process, the recommended alternatives were further refined. Numerous implementation strategies were developed and evaluated based on engineering, transportation planning, environmental, and economic assessments. (See "Alternatives Considered and Discarded" in Chapter 2 for a description of alternative strategies evaluated during the EIS process, but ultimately eliminated.) Based on these analyses, the following four alternatives are assessed in this EIS:

- No Action Alternative
- Transportation Systems Management (TSM) Alternative
- Expanded Float Operations Alternative
- Rail Freight Tunnel Alternative (Tunnel Alternative)

NO ACTION ALTERNATIVE

The No Action Alternative includes rail infrastructure that currently exists or that has been committed to within regional transportation plans, capital plans, or that is otherwise likely to be implemented through public or private investment by the future analysis years for the EIS—2010 and 2025. In addition to rail projects, related planned highway and port projects are included in the No Action Alternative. The No Action Alternative project list was developed through close coordination with numerous transportation planning agencies and a review of these agencies' capital and transportation improvement plans. This list of projects included in the No Action Alternative is presented in Chapter 2, "Project Alternatives."

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative would include measures to manage more effectively the existing transportation infrastructure to accommodate freight demand without major capital expenditures.

It would emphasize operating improvements and strategic upgrades to critical bottlenecks along the existing freight rail system and could include the following elements:

- Increased efficiency in float operations between Greenville Yard, Jersey City, NJ, and 65th Street Yard, Brooklyn, NY, including improved scheduling coordination between the float operator, rail operators, and customers;
- Improved rail freight movement along the Hudson Line through better coordination of rail operators using the line, and upgraded signaling, allowing one additional round trip rail freight train to travel the line per day during the mid-day "commuter lull";
- Rehabilitation of two existing float bridges at Greenville Yard;
- Upgrading yard trackage at 65th Street Yard to better serve float operations;
- Upgrades to the Bay Ridge Branch and Montauk Branch.

The alternative would provide an easily implementable, short-term response to the growing need for improved cross harbor rail capacity. However, due to capacity limitations of the rail car float system and East-of-Hudson rail infrastructure, it would divert only approximately 69,000 tons per year of freight from truck to rail. Capital costs are estimated at $31 million and operational costs are estimated at $2.4 million per year.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

The Expanded Float Operations Alternative would include enhanced and expanded capacity for the railcar float system across New York Harbor between Greenville Yard and 65th Street Yard. This alternative could include the following elements:

- Increased efficiency in float operations between Greenville Yard, Jersey City, NJ and 65th Street Yard, Brooklyn, NY, including more frequent and scheduled float operations and improved schedule coordination between float operators, and the bulk rail operations providing connecting service on either side of the harbor;
- Improved rail freight movement along the Hudson Line through better coordination of rail operators using the line, and upgraded signaling;
- Rehabilitation or new construction of four float bridges at Greenville Yard;
- Construction of two additional float bridges at 65th Street Yard and upgrading yard trackage at 65th Street Yard to better serve float operations;
- Expansion of a rail yard in West Maspeth, Queens;
- Upgrades to the Bay Ridge Branch and Montauk Branch.

This alternative would require the operation of three barges. Additional trains would be generated by the increased float operations. In New Jersey, there would be an additional daily roundtrip train along the Greenville Branch between Oak Island Yard and Greenville Yard, and two new daily round trip trains that would shuttle between northern New Jersey rail yards and Greenville Yard. East of the Hudson River, there would be an additional daily roundtrip train along the Bay Ridge Branch between 65th Street Yard and Fresh Pond Yard, Hudson Line, and the Fremont Secondary between Oak Point Yard and Fresh Pond Yard as a result of improvements along the Hudson Line. This alternative would divert an estimated 459,000 tons per year of freight from truck to rail per year. Capital costs for the Expanded Float Operations

Alternative are estimated at $80 million. Operational costs are estimated at $18 million per year. Because the cost of providing scheduled service would likely not be competitive to attractive rail traffic, public sector funding would be required to make this alternative viable.

RAIL FREIGHT TUNNEL ALTERNATIVE

The Rail Freight Tunnel Alternative (Tunnel Alternative) would establish a direct rail freight connection between the East- and West-of-Hudson regions through the construction of a rail freight tunnel under New York Harbor. Two tunnel alignments have been evaluated in the DEIS: (1) between Greenville Yard, Jersey City, NJ and the Bay Ridge Branch, Brooklyn, NY (the "New Jersey alignment"); and (2) between the Staten Island Railroad, Staten Island, NY, and the Bay Ridge Branch, Brooklyn, NY (the "Staten Island alignment").

Both of these alignments would involve the initial construction of a tunnel under the New York Harbor. The tunnel would be designed to accommodate the potential future construction of a second parallel tunnel. Demand forecasts show that sufficient demand will exist in the project design year of 2025 to support construction of a second tunnel. Since the Tunnel Alternative could eventually be expanded to include a second tunnel and its associated upland improvements, this DEIS presents the elements and potential impacts of both the one- and two-tunnel systems. This DEIS evaluates the two potential implementation scenarios for the Tunnel Alternative as follows:

- Single Tunnel System—The Single Tunnel System would include the construction of a single rail freight tunnel across the New York Harbor, using either the New Jersey alignment or the Staten Island alignment. The Single Tunnel System would also comprise new rail yard capacity in West Maspeth, improvements at existing yards and rail lines, and construction of additional tracks and increased clearance heights. The tunnel would be expected to be completed between 2011 and 2015. The Single Tunnel System could remain as a permanent, stand-alone tunnel, or as the initial phase of a two tunnel system.
- Double Tunnel System—Under this scenario, the Single Tunnel System would be implemented as described above. It assumes that once the single-track tunnel is operational, additional demand exists to construct a second parallel tunnel. The Double Tunnel System would also comprise the further expansion of West Maspeth Yard and the installation of rail track in certain locations where not previously required in the Single Tunnel System. Whether the Double Tunnel System would be implemented immediately or as an expansion of the Single Tunnel System, the Double Tunnel System would be operational by the analysis year of 2025.

Under the New Jersey alignment of the Single Tunnel System, approximately 28 trains (i.e., 14 roundtrip trains) would use the tunnel each day. These 28 daily trains would transport on average 13.3 million annual tons of freight in 2025. Under the Staten Island tunnel alignment, approximately 24 trains (i.e., 12 roundtrip trains) would use the tunnel each day, carrying an average of 12.7 million annual tons of goods.[1] Under either alignment of the Double Tunnel System, approximately 64 trains per day, carrying on average up to 19 million tons of goods, would travel through the tunnel each day.

[1] As explained in Chapter 8, "Transportation," the total diversion of the Staten Island tunnel alignment of the Single Tunnel System is somewhat less than the New Jersey alignment because of routing constraints and potential wait times en route to the one-track Staten Island tunnel portal.

SINGLE TUNNEL SYSTEM

Tunnel Alignment and Construction

Either tunnel alignment would consist of a single-track tunnel with provision to add a second bored tube across the harbor in the future. Some parts of the tunnel as well as the concrete cut-and-cover sections would be sized to allow installation of a second track when the additional bored tube is added. The tunnel would be constructed using primarily bored tunnel technology. For the Staten Island alignment, a tunnel boring machine (TBM) would be used to drill through rock in Staten Island and/or through compacted soil underneath the harbor and in Brooklyn. A portion of the New Jersey tunnel alignment would be constructed using immersed tube tunnel technology.

Associated Rail Infrastructure Improvements

The antiquated East-of-Hudson rail freight infrastructure would need to be substantially upgraded to service modern trains that would use the tunnel. In some cases, construction of additional mainline rail tracks will be required. Such new tracks will be constructed near and parallel to the existing tracks and within the existing rail right-of-way. Rail infrastructure improvements common to both tunnel alignments would include:

- An expanded rail yard in West Maspeth (108 acres);
- Rehabilitation of existing mainline track and re-establishment of second mainline track along the Bay Ridge Branch between the Brooklyn tunnel portal area and Fresh Pond Yard, with clearances increased to 22 feet, 6 inches along the line;
- Two new rail sidings to parallel the Bay Ridge Branch from East 43rd to East 98th Streets (i.e., "New Lots") within the existing rail right-of-way. These rail sidings are train tracks that will parallel the mainline tracks, and will be used for freight operations and as a waiting area for westbound tunnel traffic;
- Improvements to two existing mainline tracks along the length of the Montauk Branch of the LIRR between Fresh Pond Yard and the rail yard in West Maspeth, with clearances increased to 22 feet, 6 inches along the line;
- Improvements to 65th Street Yard; and
- Improvements to Fresh Pond Yard.

The Staten Island tunnel alignment would require the following additional rail infrastructure improvements:

- A second span of the Arthur Kill Lift Bridge;
- Rehabilitation of existing mainline track and construction of second mainline track from the Arthur Kill Lift Bridge to the east end of Arlington Yard;
- One new mainline track and rehabilitation of existing mainline track along the Staten Island Railroad from the east end of Arlington Yard to the tunnel portal area, with clearances increased to 22 feet, 6 inches;
- 30,000 feet of new sidings along the Chemical Coast Line at its connection to the Staten Island Railroad.

The New Jersey tunnel alignment would require the following additional rail infrastructure improvement:

- Improvements to two existing mainline tracks from the Lehigh Valley Drawbridge to the tunnel portal in Greenville Yard;
- Construction of a second Waverly Loop connecting the P&H Line to the Greenville Branch. The first Waverly Loop would be constructed as part of previously planned New Jersey rail improvements and is included in the No Action Alternative.

In addition to the rail infrastructure that would have already been improved under the Single Tunnel System, the following would be required for the Double Tunnel System:

- Further expansion of the rail yard in West Maspeth (160 acres) and construction of a container storage structure;
- Under the New Jersey alignment, construction of a direct connection between the National Docks Secondary and the tunnel portal area.

Costs

Capital costs for the Single Tunnel System are estimated at $4.77 billion for the New Jersey tunnel alignment and $4.68 billion for the Staten Island tunnel alignment. The New Jersey alignment is slightly more expensive due to the need to initially construct a two-track segment, using immersed tube tunnel construction, so as not to preclude the potential construction of a second tunnel in the future. Operational costs for either tunnel alignment are estimated at $30 million.

Capital costs for the Double Tunnel System are estimated at $7.35 billion for the New Jersey tunnel alignment and $7.66 billion for the Staten Island tunnel alignment. Operational costs for the second tunnel are estimated at $30 million per year. Total capital costs include costs of construction, engineering and management, and property acquisitions required for the project. (A detailed discussion of property acquisitions required for this alternative is provided in Chapter 4, "Economic Conditions and Impacts").

C. PREFERRED ALTERNATIVE

A recommendation of a Preferred Alternative for the Cross Harbor Freight Movement Project is presented in this section. The selection of a Preferred Alternative is based upon a comparison of the project alternatives in relation to several factors, including: the goals and objectives identified in Chapter 1, "Project Purpose and Need," economic benefits, construction elements, community input, and environmental impacts.

GOAL 1: IMPROVE THE MOVEMENT OF GOODS INTO, OUT OF, AND THROUGH THE REGION

OBJECTIVE 1A: Develop structural and nonstructural alternatives that alleviate the shortcomings of the present network.

OBJECTIVE 1B: Reduce overall travel time for shippers and receivers.

The project alternatives include both structural alternatives (the various tunnel alignments and systems) and non-structural alternatives (those which are primarily operational in nature such as the TSM and Expanded Float Operations Alternatives). Objective 1B can be measured by two

criteria: the dollar value of benefits accruing to transportation system users because of reductions in congestion, and the dollar value of benefits accruing to regional communities due to reductions in externalities which result from congestion, such as accidents, highway wear and tear, and air pollution. These benefits stem directly from the diversion of freight movement from truck to rail, and the resulting reduction in highway truck volumes, as described in Goal 2 below. The annual benefits for each alternative in the year 2025 (in 2002 dollars) are shown below aggregated for the two criteria. The benefits are presented for the Metropolitan New York region (including the counties of southwestern Connecticut and northern New Jersey), and for the United States as a whole.

- The *TSM Alternative* would have an insignificant and essentially unmeasurable impact due to the small diversion that it achieves from truck to rail (see Goal 2 below).
- The *Expanded Float Operations Alternative* would achieve annual user benefits of $1.7 million for the Metropolitan New York region, and $3.3 million for the U.S. as a whole.
- The *Tunnel Alternative* would achieve a range of freight diversion and user benefits, as follows:
  - The *Staten Island alignment of the Single Tunnel System* would achieve annual user benefits of $14.3 million for the Metropolitan New York region, and $65.7 million for the U.S. as a whole.
  - The *Staten Island alignment of the Double Tunnel System* would achieve annual user benefits of $44.5 million for the Metropolitan New York region, and $134.7 million for the U.S. as a whole.
  - The *New Jersey alignment of the Single Tunnel System* would achieve annual user benefits of $15.1 million for the Metropolitan New York region, and $69.8 million for the U.S. as a whole.
  - The *New Jersey alignment of the Double Tunnel System* would achieve annual user benefits of $44.6 million for the Metro New York region, and $143.4 million for the U.S. as a whole.

GOAL 2: CREATE A MORE MODALLY BALANCED GOODS MOVEMENT SYSTEM IN THE REGION

OBJECTIVE 2A: Develop freight alternatives that encourage the use of existing transportation corridors with excess capacity.

OBJECTIVE 2B: Support rail and marine alternatives as a means of diverting traffic from congested highways.

OBJECTIVE 2C: Foster reliability of freight movement across the Hudson River.

All three objectives were addressed through the development of alternatives that use rail and marine corridors as a means of diverting traffic from congested highways. In accomplishing this diversion from truck to rail and marine transport, system reliability is improved by reducing congestion on the regional highway system and offering shippers and receivers more options for goods movement. The region is an archipelago with an extensive and underutilized series of corridors for moving goods by waterborne transportation. The region's freight rail infrastructure is vastly under-utilized compared to historic norms, particularly those parts crucial to this project

(the Bay Ridge and Montauk (west) branches of the Long Island Rail Road), which are essentially unused by passenger trains.

The achievement of these objectives can be measured in two ways: (1) by the extent to which each project alternative is forecast to divert freight shipments in the future (2025) from truck to rail; and (2) the reduction of truck volumes in key freight corridors. As discussed in Chapter 8, "Transportation," the region is extraordinarily dependent on seven Hudson River bridge and tunnel crossings to receive goods shipped by truck from most of North America. Of these seven crossings, the George Washington and Verrazano-Narrows bridges are the most important to the region for cross-Hudson goods movements. The degree to which each project alternative is forecast to reduce the volume of freight-carrying trucks ("commodity" trucks) on these and other crossings in 2025 was measured. Commodity trucks are generally the largest (up to 53 feet in length) tractor-trailers and can have the equivalent impact of 3 passenger car equivalents in their relative impact on traffic operations. The annual modal diversion (in year 2025 tons) and the impact of this diversion in reducing 24-hour commodity truck volumes in 2025 is forecast to be as follows for each project alternative:

- The *TSM Alternative* would divert 69,000 tons, which is too small to have a measurable impact on truck volumes in any specific screenline.
- The *Expanded Float Operations Alternative* would divert 459,000 tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 23,100 trips, or less than one percent of total commodity truck volume.
- The *Tunnel Alternative* would result in the following diversions:
  - *Staten Island alignment of the Single Tunnel System* would divert 8.8 million tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 460,500 annual trips, or six percent of total commodity truck volume.
  - The *Staten Island alignment of the Double Tunnel System* would divert 12.9 million tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 798,600 annual trips, or ten percent of total commodity truck volume.
  - The *New Jersey alignment of the Single Tunnel System* would divert 9.5 million tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 521,100 annual trips, or seven percent of total commodity truck volume.
  - The *New Jersey alignment of the Double Tunnel System* would divert 14.9 million tons, resulting in a reduction of commodity truck volumes on the Hudson River crossings of 880,200 annual trips, or eleven percent of total commodity truck volume.

GOAL 3: IMPROVE ENVIRONMENTAL QUALITY IN THE REGION BY DIVERTING FREIGHT MOVEMENTS TO LESS POLLUTING MODES OF TRANSPORTATION

OBJECTIVE 3A: Develop preferred alternatives that result in an overall improvement in air quality, traffic congestion and infrastructure wear.

OBJECTIVE 3B: Identify potential environmental impacts and mitigation associated with the final alternatives.

The annual modal diversions presented under Goal 2 would result in positive impacts on regional transportation, which can be quantified in vehicle miles traveled (VMT) and vehicle

hours traveled (VHT). VMT and VHT estimates can subsequently be used to determine regional air quality improvements. The project alternatives would, however, cause various environmental impacts. Some of these impacts would require mitigation, while other impacts would remain unmitigable. These environmental quality improvements and impacts would include the following:

- The *TSM Alternative* would divert a minor quantity of freight from truck to rail; therefore resulting in negligible air quality and traffic congestion improvements. This alternative would create few adverse environmental impacts.
- The *Expanded Float Operations Alternative* would have an insignificant impact on regional commodity truck VMT and VHT – 0.1 and 0.2 percent, respectively. This alternative would create few adverse environmental impacts. As presented in Chapter 9, "Air Quality," this alternative would result in regional air pollutant emission reductions for VOCs, CO, and CO_2.
- The *Tunnel Alternative* would result in the following*:*
  - The *Staten Island alignment of the Single Tunnel System* would result in a 2.7 percent reduction in VMT and VHT and regional emissions reductions for VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NOx emissions would increase. This alternative would have the potential to cause adverse unmitigable noise, visual, and neighborhood character impacts along the elevated portions of Segment 2 of the Staten Island Railroad. Expansion of West Maspeth Yard would include displacement of 25 to 29 businesses. Visual impacts would potentially result from the ventilation shaft at the 69th Street pier. Significant noise impacts would occur along six rail segments. Up to five acres of tidal wetland would potentially be disturbed from the construction of the second span of the Arthur Kill Lift Bridge.
  - The *Staten Island alignment of the Double Tunnel System* would result in a forecast VMT reduction of 3.8 percent and a VHT reduction of 4.4 percent, and regional emissions reductions for VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NOx emissions would increase. When compared to interim guidance criterion, $PM_{2.5}$ emissions along the Bay Ridge Branch under the Double Tunnel System would result in potentially unmitigable significant adverse impacts. This alternative would have the potential to cause unmitigable adverse noise, visual, and neighborhood character impacts along the elevated portions of Segment 2 of the Staten Island Railroad. Visual impacts would potentially result from the ventilation shaft at the 69th Street pier. Adverse noise and neighborhood character impacts would result along Segment 3 of the Bay Ridge Branch. Expansion of West Maspeth Yard would include displacement of 44 to 52 businesses, and filling eight to nine acres of open water. Significant noise impacts would occur along ten rail segments. Up to five acres of tidal wetland would potentially be disturbed from the construction of the second span of the Arthur Kill Lift Bridge.
  - The *New Jersey alignment of the Single Tunnel System* would reduce commodity truck VMT and VHT by about 3.0 percent and reduce regional emissions of VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NOx emissions would increase. Expansion of West

Maspeth Yard would include displacement of 25 to 29 businesses. Significant noise impacts would occur along four rail segments.

- The *New Jersey alignment of the Double Tunnel System* would result in a VMT reduction of 4.5 percent and a VHT reduction of 4.9 percent and regional emissions reductions for VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NOx emissions would increase. When compared to interim guidance criterion, $PM_{2.5}$ emissions along the Bay Ridge Branch under the Double Tunnel System would result in potentially unmitigable significant adverse impacts. Significant noise and neighborhood character impacts would result along Segment 3 of the Bay Ridge Branch. Expansion of West Maspeth Yard would include displacement of 44 to 52 businesses, and filling eight to nine acres of open water. Significant noise impacts would occur along eight rail segments.

GOAL 4: PROMOTE ECONOMIC DEVELOPMENT IN THE REGION THROUGH A MORE EFFICIENT GOODS MOVEMENT SYSTEM

OBJECTIVE 4A: Determine the needs of commercial and industrial interests through outreach and industry involvement.

OBJECTIVE 4B: Ensure that the final alternatives can meet both present and future commercial needs.

OBJECTIVE 4C: Reduce the transportation cost to businesses and consumers by alleviating wasteful congestion and creating competitive transportation alternatives.

Objective 4A was met through an extensive public outreach process which began during the Major Investment Study (MIS) and continued through the EIS, including regular meetings of a broad-based stakeholders' advisory committee, and individual meetings with interested parties. In addition, during the MIS, an outreach effort was specifically directed at the regional shipping community. This involved interviews with some 60 interests, and the formal shipper preference survey (267 respondents) which was used as the basis for truck to rail diversion estimation in both the MIS and EIS.

Objectives 4B and 4C can be measured in four ways: (1) the direct improvement in the efficiency of business related transportation and resulting cost savings; (2) the multiplier effects throughout the economy which results from savings in freight-related transportation costs; (3) the creation of new jobs resulting from this increased economic activity; and (4) the freight support activities which would be retained and generated in the vicinity of the new rail infrastructure, resulting in further job creation. These benefits are distinct from the general travel efficiency benefits shown in Goal 1. The forecasts of these annual impacts are presented below for each project alternative for the year 2025 (in 2002 dollars and number of jobs) for the Metropolitan New York region and for the U.S. as a whole where applicable.

- The *TSM Alternative* would have an insignificant and essentially unmeasurable impact due to the small diversion which it achieves from truck to rail (see Goal 2 above).
- The *Expanded Float Operations Alternative* would achieve annual benefits in business travel efficiency of $1.2 million for the Metropolitan New York region, and $2.3 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $8 million in the region, and $10 million in the U.S. as a whole, and the creation of 107 new jobs in the region. The new freight infrastructure associated with this

alternative is not large enough to result in the retention or creation of new freight related jobs along the project alignment, aside from those jobs directly associated with the operation of the float.

- The *Tunnel Alternative* would achieve the following:
  - The *Staten Island alignment of the Single Tunnel System* would achieve annual benefits in business travel efficiency of $10.4 million for the Metropolitan New York region, and $22.2 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $820 million in the region, and $170 million in the U.S. as a whole, and the creation of 15,530 new jobs in the region. (Benefits for the U.S. as a whole are smaller than regional benefits due to the resulting transfer of some economic activity from elsewhere in the U.S. to the region.) Of these jobs, this alternative would result in the retention or generation of 8,100 freight related jobs along the project alignment.
  - The *Staten Island alignment of the Double Tunnel System* would achieve annual benefits in business travel efficiency of $27.7 million for the Metropolitan New York region, and $77 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $1,400 million in the region, and $380 million in the U.S. as a whole, and the creation of 26,120 new jobs in the region. In addition, this alternative would result in the retention or generation of 13,400 freight related jobs along the project alignment.
  - The *New Jersey alignment of the Single Tunnel System* would achieve annual benefits in business travel efficiency of $15 million for the Metropolitan New York region, and $34.6 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $890 million in the region, and $205 million in the U.S. as a whole, and the creation of 16,900 new jobs in the region. In addition, this alternative would result in the retention or generation of 8,640 freight related jobs along the project alignment.
  - The *New Jersey alignment of the Double Tunnel System* would achieve annual benefits in business travel efficiency of $41.5 million for the Metropolitan New York region, and $110 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $1,600 million in the region, and $490 million in the U.S. as a whole, and the creation of 29,890 new jobs in the region. In addition, this alternative would result in the retention or generation of 15,200 freight related jobs along the project alignment.

GOAL 5: PROVIDE STRATEGIC SYSTEM REDUNDANCY TO THE REGION'S VITAL HUDSON RIVER CROSSINGS

The provision of transportation system redundancy became more imperative for the region subsequent to the events of September 2001. It was recognized that if any of the major Hudson River crossings were impaired or unusable for an extended duration, the flow of goods that the East of Hudson region consumes on a daily basis would be significantly restricted. Without the flow of goods to and from the East of Hudson region, the economic vitality of the City and the region would be severely challenged. The northeast region may also be adversely affected if the George Washington Bridge were unusable as the bridge is an important link on the I-95 corridor for goods movement. Each of the alternatives provides some level of system redundancy,

however, the Tunnel Alternative would provide the greatest benefits in terms of capacity, safety/security, and operational efficiency.

CONCLUSION

With respect to all goals, the TSM Alternative would produce minimal or unmeasurable benefits due to the small diversion from truck to rail that it achieves. The Tunnel Alternative would produce far greater benefits than the Expanded Float Operations Alternative due to the ability of the tunnel to attract a much larger diversion of freight from truck to rail. This results from the more efficient operation (in time, cost and reliability) of direct rail service in comparison to transfers between landside rail and float. As shown in the analyses presented in this Draft EIS, the Tunnel Alternative is preferable to both the TSM Alternative and the Expanded Float Operations Alternative with respect to the project goals and objectives.

The New Jersey alignment of the Tunnel Alternative would achieve greater benefits than the Staten Island alignment. The more direct routing to the western portal of the New Jersey alignment would result in more diversion of freight from truck to rail, which would subsequently yield greater user benefits and travel efficiencies than the Staten Island alignment. In addition, the New Jersey alignment has limited adverse environmental and neighborhood character impacts in comparison to the Staten Island alignment.

As previously described, the New Jersey alignment could be constructed as a Single Tunnel System or Double Tunnel System. The Double Tunnel System would produce greater benefits than the Single Tunnel System due to operational constraints in the Single Tunnel System, which reduce the diversion of intermodal traffic. While the Double Tunnel System would generate the largest benefits in many respects, it would also result in additional adverse environmental impacts, more business displacements, and would require additional capital expenditures.

The New Jersey alignment of the Tunnel Alternative has been identified by NYCEDC as the Preferred Alternative. The decision of whether a Single or Double Tunnel System should be recommended will be explored further during the period between the Draft EIS and the Final EIS. For the purposes of this Draft EIS, the benefits and impacts of all alternatives are analyzed and discussed. It is anticipated that the Final EIS will present a comparison of the following alternatives: No Action Alternative, the TSM Alternative, the New Jersey alignment of the Single Tunnel System, and the New Jersey alignment of the Double Tunnel System.

D. ENVIRONMENTAL IMPACTS OF THE PROJECT ALTERNATIVES

Summarized in this section are the findings of the environmental analyses performed in this Draft EIS. Analyses were performed to determine the potential for adverse and/or beneficial impacts in the following categories: land use, neighborhood character, and social conditions; economic conditions; visual and aesthetic considerations; historic resources; archeological resources; transportation; air quality; noise and vibration; energy; contaminated materials; water resources; wetland and terrestrial resources; coastal zone management; construction impacts; environmental justice; and financial analysis. Table S-1 provides a summary of the potential impacts for the TSM, Expanded Float Operations, and Tunnel Alternatives. Where the potential for adverse impacts have been identified and mitigation measures are feasible, such measures are discussed in detail in the respective chapters of this Draft EIS.

Table S-1

Summary of Environmental Impacts (By Project Alternative)

	TSM Alternative	Expanded Float Operations	Single Tunnel System – New Jersey Alignment	Double Tunnel System – New Jersey Alignment	Single Tunnel System – Staten Island Alignment	Double Tunnel System – Staten Island Alignment
Land Use	No adverse impacts	No adverse impacts	No significant impact on neighborhood character.	Adverse impact on neighborhood character in Segment 3 of Bay Ridge Branch and Queens Portion of Bay Ridge Branch, due to widespread noise impacts. Mitigation proposed.	Adverse impact on neighborhood character in the elevated portions of Northern Staten Island Segment 2, due to widespread noise impacts. Mitigation not feasible.	Adverse impact on neighborhood character in the elevated portions of Northern Staten Island Segment 2 (mitigation not feasible). Adverse impacts on neighborhood character on Segment 3 of Bay Ridge Branch and Queens portion of Bay Ridge Branch, due to widespread noise impacts (mitigation proposed).
Economics	Negligible economic impacts/benefits.	Travel efficiencies and cost savings of $4.3 M for US. 107 new jobs in Metro region. $8M increase in personal income in Metro region.	Travel efficiencies and cost savings of $50.5M for US. 16,900 new jobs in Metro region. $890M increase in personal income in Metro region. Displacement of 25-29 businesses for expanded West Maspeth Yard.	Travel efficiencies and cost savings of $159.8M for US. 29,890 new jobs in Metro region. $1.6B increase in personal income in Metro region. Displacement of 44-52 businesses for expanded West Maspeth Yard.	Travel efficiencies and cost savings of $37.9M for US. 15,530 new jobs in Metro region. $820M increase in personal income in Metro region. Displacement of 25-29 businesses for expanded West Maspeth Yard.	Travel efficiencies and cost savings of $126.5M for US. 26,120 new jobs in Metro region. $1.4B increase in personal income in Metro region. Displacement of 44-52 businesses for expanded West Maspeth Yard.
Visual	No change in visual character.	No change in visual character.	Adverse visual impact from increased rail traffic along Greenville Branch. Mitigation proposed.	Adverse visual impact from increased rail traffic along Greenville Branch. Potential for adverse visual impact from storage structure at W. Maspeth Yard, depending on height and design. Mitigation proposed.	Adverse visual impact from increased rail traffic along elevated portion of Staten Island Segment 2 (mitigation proposed). Vent shaft in Stated Island Segment 4 study area and Bay Ridge Branch Segment 1 at 69th Street Pier would have adverse effects on views from public walkways and piers and waterfront views (unmitigable).	Adverse visual impacts from increased rail traffic along elevated portion of Staten Island Segment 2 (mitigation proposed). Vent shaft in Staten Island Segment 4 study area and Bay Ridge Branch Segment 1 at 69th Street Pier would have adverse effects on views from public walkways and piers and waterfront views (unmitigable). Potential for adverse visual impact from storage structure at W. Maspeth Yard, depending on height and design.
Historic	Adverse impacts on historic Greenville Yard Transfer Bridge System. Mitigation proposed.	Adverse impacts on historic Greenville Yard Transfer Bridge System. Mitigation proposed.	Adverse impacts on historic Greenville Yard Transfer Bridge System. Potential for adverse impacts on historic resources along Bay Ridge Branch. Mitigation proposed.	Adverse impacts on historic Greenville Yard Transfer Bridge System. Potential for adverse impacts on historic resources along Bay Ridge Branch. Mitigation proposed.	Potential for adverse impacts on historic resources within Northern SI Segments 3 & 4. Potential for adverse impacts on historic resources along Bay Ridge Branch. Mitigation proposed.	Potential for adverse impacts on historic resources within Northern SI Segments 3 & 4. Potential for adverse impacts on historic resources along Bay Ridge Branch. Mitigation proposed.

Table S-1 (cont'd)
Summary of Environmental Impacts (By Project Alternative)

	TSM Alternative	Expanded Float Operations	Single Tunnel System – New Jersey Alignment	Double Tunnel System – New Jersey Alignment	Single Tunnel System – Staten Island Alignment	Double Tunnel System – Staten Island Alignment
Archae-ological	Potential adverse effects on shipwreck sites from Greenville Yards float bridge rehab. Mitigation proposed.	Potential adverse effects on shipwreck sites from Greenville Yards float bridge rehab. Mitigation proposed.	Potential adverse effects on NJSR and NR listed Morris Canal and potential shipwreck sites. Potential adverse effects on resources in West Maspeth Yard. Mitigation proposed.	Potential adverse effects on NJSR and NR listed Morris Canal and potential shipwreck sites. Potential adverse effects on resources in West Maspeth Yard. Mitigation proposed.	Potential adverse effects on Arthur Kill Lift Bridge Area, Northern Staten Island Segment 3 and Segment 4. Potential adverse effects on resources in West Maspeth Yard. Mitigation proposed.	Potential adverse effects on Arthur Kill Lift Bridge Area, Northern Staten Island Segment 3 and Segment 4. Potential adverse effects on resources in West Maspeth Yard. Mitigation proposed.
Transpor-tation	Minor diversion of freight from truck to rail in Year 2025 (69,000 annual tons). No adverse local traffic impacts.	Minimal effect on regional commodity truck VMT/VHT of 0.1 and 0.2 percent respectively. Diversion of 459,000 tons from truck to rail in 2025. No adverse local traffic impacts.	Diversion of 9.4M tons from truck to rail in 2025. Annual reduction in vehicle miles traveled (VMT) of 3%. Significant local traffic impacts at 8 intersections in West Maspeth and 1 intersection near 65th Street Yard (mitigation proposed).	Diversion of 14.9M tons from truck to rail in 2025. Annual reduction in vehicle miles traveled (VMT) of 4.5%. Significant local traffic impacts at 9 intersections in West Maspeth and 1 intersection near 65th Street Yard (mitigation proposed).	Diversion of 8.8M tons from truck to rail in 2025. Annual reduction in vehicle miles traveled (VMT) of 2.7%. Significant local traffic impacts at 8 intersections in West Maspeth and 1 intersection near 65th Street Yard (mitigation proposed).	Diversion of 12.9 tons from truck to rail in 2025. Annual reduction in vehicle miles traveled (VMT) of 3.8%. Significant local traffic impacts at 9 intersections in West Maspeth and 1 intersection near 65th Street Yard (mitigation proposed).
Air Quality	No beneficial or adverse impacts.	No beneficial or adverse impacts.	Reduction in VOC, CO, and CO_2 emissions in Metro region and increase in regional NOx emissions. Adverse PM2.5 impacts near New Lots sidings along Bay Ridge Branch and at Brooklyn Portal. Adverse NO2 and PM2.5 impacts at Fresh Pond Yard. Potential mitigation measures proposed. No adverse impacts from truck activity near yards.	Reduction in VOC, CO, and CO_2 emissions in Metro region and increase in regional NOx emissions. Adverse PM2.5 impacts along several rail segments and at West Maspeth Yard. Potential NAAQS violations of NO2 and PM2.5 at East New York Tunnel (Bay Ridge Branch Segment 4). Adverse NO2 and PM2.5 impacts at Fresh Pond Yard. Potential mitigation measures proposed. No adverse impacts from truck activity near yards.	Reduction in VOC, CO, and CO_2 emissions in Metro region and increase in regional NOx emissions. Adverse PM2.5 impact near New Lots sidings along Bay Ridge Branch and at Brooklyn Portal. Adverse NO2 and PM2.5 impacts at Fresh Pond Yard. Potential mitigation measures proposed. No adverse impacts from truck activity near yards.	Reduction in VOC, CO, and CO_2 emissions in Metro region and increase in regional NOx emissions. Adverse PM2.5 impacts along several rail segments and at West Maspeth Yard. Potential NAAQS violations of NO2 and PM2.5 at East New York Tunnel (Bay Ridge Branch Segment 4). Adverse NO2 and PM2.5 impacts at Fresh Pond Yard. Potential mitigation measures proposed. No adverse impacts from truck activity near yards.

Table S-1 (cont'd)
Summary of Environmental Impacts (By Project Alternative)

	TSM Alternative	Expanded Float Operations	Single Tunnel System – New Jersey Alignment	Double Tunnel System – New Jersey Alignment	Single Tunnel System – Staten Island Alignment	Double Tunnel System – Staten Island Alignment
Noise and Vibration	No adverse noise or vibration impacts.	No adverse noise or vibration impacts.	Residents along 7 segments impacted; 2 segments severely impacted. Mitigation proposed where feasible. Adverse vibration/ground-borne noise impacts along some rail segments.	Residents along 3 segments impacted; 8 segments severely impacted. Mitigation proposed where feasible. Adverse vibration/ground-borne noise impacts along some rail segments.	Residents along 7 segments impacted; 4 segments severely impacted. Mitigation proposed where feasible. Adverse vibration/ground-borne noise impacts along some rail segments.	Residents along 3 segments impacted; 10 segments severely impacted. Mitigation proposed where feasible. Adverse vibration/ground-borne noise impacts along some rail segments.
Energy	Negligible energy savings.	Annual energy savings of 14 billion BTUs in Metro area.	Annual energy savings of 641 billion BTUs in Metro area.	Annual energy savings of 1.5 trillion BTUs in Metro area.	Annual energy savings of 561 billion BTUs in Metro area.	Annual energy savings of 1.4 trillion BTUs in Metro area.
Contaminated Materials	Possible contaminated soil removal, dewatering, asbestos and lead-paint abatement and assessment. Mitigation proposed.	Possible contaminated soil removal, dewatering, asbestos and lead-paint abatement and assessment. Mitigation proposed.	Possible contaminated soil removal, dewatering, asbestos and lead-paint abatement and assessment. Substantial excavation and dewatering for tunnel construction. Contaminated materials expected at Phelps Dodge and other acquisition sites in West Maspeth and in Greenville Yards. Mitigation proposed.	Possible contaminated soil removal, dewatering, asbestos and lead-paint abatement and assessment. Substantial excavation and dewatering for tunnel construction. Contaminated materials expected at Phelps Dodge and other acquisition sites in West Maspeth and in Greenville Yards. Mitigation proposed.	Possible contaminated soil removal, dewatering, asbestos and lead-paint abatement and assessment. Substantial excavation and dewatering for tunnel construction. Serpentinite asbestos possible in Staten Island Segment 4.Contaminated materials expected at Phelps Dodge and other acquisition sites in West Maspeth. Mitigation proposed.	Possible contaminated soil removal, dewatering, asbestos and lead-paint abatement and assessment. Substantial excavation and dewatering for tunnel construction. Serpentinite asbestos possible in Staten Island Segment 4.Contaminated materials expected at Phelps Dodge and other acquisition sites in West Maspeth. Mitigation proposed.
Water Resources	No signficant adverse impacts.	No significant adverse impacts.	Potential effects on water quality and aquatic resources through in-water construction activities, in-water filling, and upland construction and operational activities (e.g., Brooklyn shoreline, Newtown Creek shoreline). Mitigation proposed.	Potential effects on water quality and aquatic resources through in-water construction activities, in-water filling, and upland construction and operational activities (e.g., Brooklyn shoreline, Newtown Creek shoreline). Adverse impacts from filling 8-9 acres of subtidal habitat in Maspeth Creek and Newtown Creek. Mitigation proposed.	Potential effects on water quality and aquatic resources through in-water construction activities, in-water filling, and upland construction and operational activities (e.g., Brooklyn shoreline, Newtown Creek shoreline, Arthur Kill and Kill Van Kull shorelines), including second span of Arthur Kill Lift Bridge. Mitigation proposed.	Potential effects on water quality and aquatic resources through in-water construction activities, in-water filling, and upland construction and operational activities (e.g., Brooklyn shoreline, Newtown Creek shoreline, Arthur Kill and Kill Van Kull shorelines), including second span of Arthur Kill Lift Bridge. Adverse impacts from filling 8-9 acres of subtidal habitat in Maspeth Creek and Newtown Creek. Mitigation proposed.

Table S-1 (cont'd)
Summary of Environmental Impacts (By Project Alternative)

	TSM Alternative	Expanded Float Operations	Single Tunnel System – New Jersey Alignment	Double Tunnel System – New Jersey Alignment	Single Tunnel System – Staten Island Alignment	Double Tunnel System – Staten Island Alignment
Wetlands and Terrestrial Resources	No signficant adverse impacts. Phragmites patches at 65th Street Yard may require delineation.	No significant adverse impacts. Phragmites patches at 65th Street Yard and West Maspeth Yard may require delineation.	Phragmites patches at 65th Street Yard and West Maspeth Yard may require delineation. Adverse impact on least tern nesting activity in NJ. Mitigation proposed.	Phragmites patches at 65th Street Yard and West Maspeth Yard may require delineation. Adverse impact on least tern nesting activity in NJ. Adverse impacts from filling 8-9 acres of Maspeth Creek and Newtown Creek. Mitigation proposed.	Phragmites patches at 65th Street Yard and West Maspeth Yard may require delineation. Loss of small (0.5 ac) subtidal habitat in NJ and Staten Island for second span of Arthur Kill Lift Bridge, plus 5 acres of tidal wetland in Staten Island. Mitigation proposed.	Phragmites patches at 65th Street Yard and West Maspeth Yard may require delineation. Loss of small (0.5 ac) subtidal habitat in NJ and Staten Island for second span of Arthur Kill Lift Bridge, plus 5 acres of tidal wetland in Staten Island. Adverse impacts from filling 8-9 acres of Maspeth Creek and Newtown Creek. Mitigation proposed.
Coastal Zone Management	Alternative is consistent with policies	Alternative is consistent with policies	Tunnel Alternative is not consistent or requires mitigation to be consistent with specific aspects of certain policies. The tunnel itself and its ancillary facilities such as the ventilation facilities are not specifically water-dependent uses. Construction of overall beneficial project does require in-water activities that would result in some adverse impacts to natural environment. Mitigation proposed.	Tunnel Alternative is not consistent or requires mitigation to be consistent with specific aspects of certain policies. The tunnel itself and its ancillary facilities such as the ventilation facilities are not specifically water-dependent uses. Construction of overall beneficial project does require in-water activities that would result in some adverse impacts to natural environment. Mitigation proposed.	Tunnel Alternative is not consistent or requires mitigation to be consistent with specific aspects of certain policies. The tunnel itself and its ancillary facilities such as the ventilation facilities are not specifically water-dependent uses. Construction of overall beneficial project does require in-water activities that would result in some adverse impacts to natural environment, including loss of 5 acres of wetlands for second span of Arthur Kill Lift Bridge. Mitigation proposed.	Tunnel Alternative is not consistent or requires mitigation to be consistent with specific aspects of certain policies. The tunnel itself and its ancillary facilities such as the ventilation facilities are not specifically water-dependent uses. Construction of overall beneficial project does require in-water activities that would result in some adverse impacts to natural environment, including loss of 5 acres of wetlands for second span of Arthur Kill Lift Bridge and open water filling at West Maspeth.Mitigation proposed.

Table S-1 (cont'd)
Summary of Environmental Impacts (By Project Alternative)

	TSM Alternative	Expanded Float Operations	Single Tunnel System – New Jersey Alignment	Double Tunnel System – New Jersey Alignment	Single Tunnel System – Staten Island Alignment	Double Tunnel System – Staten Island Alignment
Construction	No adverse impacts.	No adverse impacts.	Possible adverse impacts (air, noise, traffic) in areas where construction activities would continue over a long term, including cut and cover sections, shaft sites, and Maspeth Yard. Mitigation proposed where feasible.	Possible adverse impacts (air, noise, traffic) in areas where construction activities would continue over a long term, including cut and cover sections, shaft sites, and Maspeth Yard. Mitigation proposed where feasible.	Possible adverse impacts (air, noise, traffic) in areas where construction activities would continue over a long term, including cut and cover sections, shaft sites, and Maspeth Yard. Mitigation proposed where feasible.	Possible adverse impacts (air, noise, traffic) in areas where construction activities would continue over a long term, including cut and cover sections, shaft sites, and Maspeth Yard. Mitigation proposed where feasible.
Environmental Justice	No disproportionate adverse impacts.	No disproportionate adverse impacts.	No disproportionate adverse impacts.	No disproportionate adverse impacts.	Potential for disproportionate adverse impacts after mitigation. Further site-specific analysis required.	Potential for disproportionate adverse impacts after mitigation. Further site-specific analysis required.
Financial Analysis	Negligible benefit-cost ratio.	Benefit-cost ratio for Metro NY Region=0.29; for U.S.=0.27.	Benefit-cost ratio for Metro NY Region=1.9; for U.S.=0.7	Benefit-cost ratio for Metro NY Region=2.2; for U.S.=1.0	Benefit-cost ratio for Metro NY Region=1.8; for U.S.=0.6	Benefit-cost ratio for Metro NY Region=1.9; for U.S.=0.8



Figure S-1

Context Map

CROSS HARBOR FREIGHT MOVEMENT PROJECT

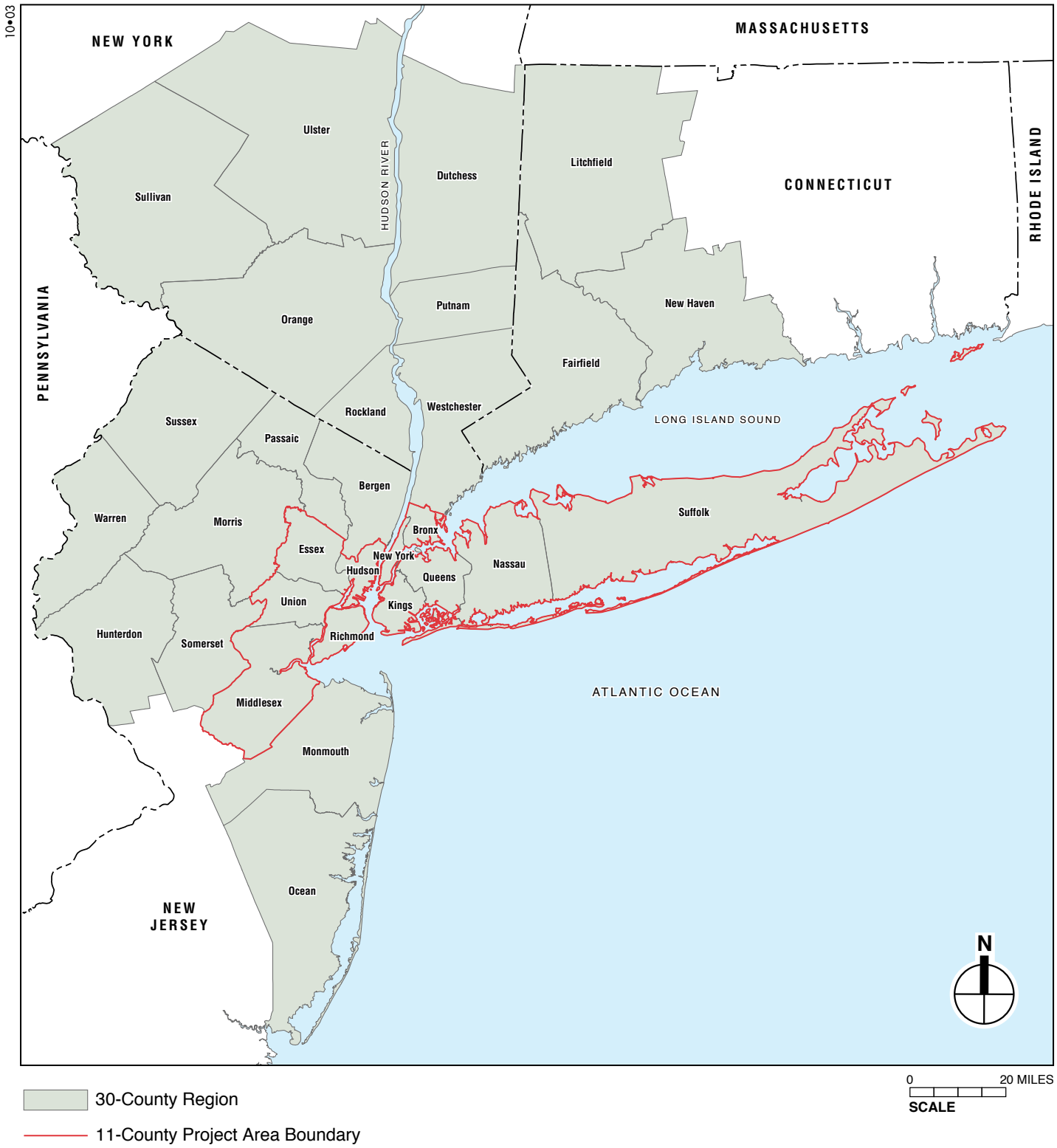


Figure S-2
Cross Harbor Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 1: Project Purpose and Need

A. INTRODUCTION

The New York City Economic Development Corporation (NYCEDC), in cooperation with the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA), propose to improve the movement of goods throughout northern New Jersey and southern New York. NYCEDC is the study sponsor, and FHWA and FRA serve as joint lead agencies for the preparation of the Environmental Impact Statement (EIS) under the regulations of the National Environmental Policy Act (NEPA).

The metropolitan tri-state region, including portions of southern New York, northern New Jersey, and southwestern Connecticut, is facing a major urban freight mobility challenge. The region's economic prosperity is a key driver of the U.S. economy, and fuels a tremendous demand for goods movement.[*] For the past fifty years, however, the freight transportation system east of the Hudson River has not kept pace with this growth in goods movement. While the East-of-Hudson region has invested heavily in improved public transportation and passenger roadway facilities, the rail freight system has failed to evolve with changing freight patterns and technology. Instead, the concentration of port, rail and air freight facilities needed to sustain the region's economic link to the rest of the world has developed largely in the West-of-Hudson region; and the only direct connection from this freight hub to the heavily populated region east of the Hudson River is via truck. The result is a freight transportation system that:

- Relies on trucks to move almost 80 percent of all goods;
- Suffers from chronic roadway congestion throughout most of the day;
- Imposes additional costs and unreliability on regional businesses and consumers;
- Causes significant detrimental impacts to local communities in the form of truck trips diverted through local streets; and
- Is potentially vulnerable to major disruptions and provides limited redundancy at a few key links, such as the George Washington and Verrazano-Narrows Bridges, which together handle 30,000 truck crossings each day.

This already untenable situation is expected to deteriorate even further. Forecasts indicate that the demand for goods movement in the metropolitan region will grow roughly 70 percent above existing levels by 2025, to nearly one billion tons per year, due to increased economic activity and changing logistics patterns (Reebie Associates, TRANSEARCH database, DRI-WEFA). Without a significant improvement in the current freight system, this rapid growth will

[*] In 2000, 582.2 million tons ($1.44 trillion) of goods moved into, out of, or through the 30-county tri-state metropolitan region. This represents 4 percent of the total goods moved throughout the U.S. measured by tonnage, and 18 percent measured by value.

overwhelm current capacity and degrade the region's economic competitiveness and quality of life. The freight system needs to be substantially upgraded to prevent congestion from constraining the region's economic growth.

B. PROBLEM IDENTIFICATION

OVERVIEW

The East-of-Hudson rail freight network is an underused asset. Currently, only 1.76 percent of the total freight tonnage that flows into the East-of-Hudson region travels by rail, because the rail freight system suffers from three critical constraints:

1. Extensive passenger rail service on the Hudson Line that limits the windows of operation for freight trains;

2. Lack of a direct, convenient, and reliable Hudson River freight rail crossing, causing freight trains bound for the East-of-Hudson region to take a circuitous route; and

3. Inadequate vertical and horizontal clearances on East-of-Hudson rail lines that prevent the use of modern rail freight equipment.

If these constraints are overcome, the rail freight infrastructure could accommodate a tremendous volume of goods movement into the region at a lower cost and with fewer adverse impacts on local communities than an equivalent flow of trucks. Thus, investment in rail freight infrastructure could play a major role in helping the region accommodate the expected growth in freight volumes. Reducing the region's dependence on a few Hudson River truck crossings would also make the freight system more resistant to major system disruptions.

The major rail gateways into New York City carry heavy passenger rail traffic; however, there are two key corridors in the heart of the region that are currently underused, and could provide significant capacity to expand the rail freight system:

- The *Bay Ridge Branch* is an underutilized freight-only rail line through Brooklyn and Queens that was once a major rail freight corridor during the heyday of rail float operations across the harbor in the 1920s. It once carried 600,000 railcars per year, but now only carries approximately 1,600 carloads per year.
- The *Montauk Branch* west of Jamaica, Queens is an increasingly underutilized two-track rail line with minimal passenger service[†]. It runs through the center of the largest remaining concentration of industrial land use in New York City.

The project includes an analysis of rail alternatives to address the current regional goods mobility problem and enhance the capacity, reduce congestion and costs, and improve reliability and strategic redundancy of the freight system. This project focuses specifically on investments that enable robust rail service in the East-of-Hudson region; namely, improvements to the two key East-of-Hudson rail lines discussed above, rail yards and other supporting facilities, and an improved connection to the national freight rail network in northern New Jersey. These

[†] The Long Island Rail Road removed all stations from this branch during the 1980's and 1990's, and now uses this line only to reposition one or two out-of-service trains per day during the peak commuter periods.

improvements will provide much-needed relief to the region's congested and vulnerable roadways, enhance the competitive position of regional businesses, improve neighborhood quality of life, and allow the region to capture the expected level of growth and benefits.

KEY CHARACTERISTICS OF PROJECT STUDY AREAS

The project addresses conditions and impacts in two main study areas (see Figure 1-1). The first is a broad, 30-county region surrounding New York City. Within the 30-county region is an 11-county area ("project area") where freight movement problems have been identified, and where the project alternatives would be located. These regions are subdivided into East-of-Hudson counties and West-of-Hudson counties. The East-of-Hudson portion of this project area includes the five counties that comprise New York City, plus Nassau and Suffolk counties on Long Island. The West-of-Hudson portion of the project area comprises four northern New Jersey counties: Hudson, Essex, Union and Middlesex. In addition to the two main study areas, subsets of them are used within this EIS to describe locations where project alternatives would have the potential for direct impacts. "Study areas" were determined for each site where potential operational or construction activities may occur under the project alternatives. Finally, certain of the larger study areas were further subdivided into "segments" that capture more precisely the nature of a site.

30-COUNTY REGION

The 30-county region covers an area of approximately 12,412 square miles of land at the juncture of southern New England and the mid-Atlantic states. Even though many urban centers have grown in other parts of the country, the 30-county region is still the most populated region in the United States, with some 21 million residents, according to the 2000 U.S. Census of Population.

The economic importance of this 30-county region is evidenced by the personal income of its residents, the value of wholesale merchandise sold, and the revenue of warehousing/storage establishments. In 1999, the personal income of its residents amounted to approximately $774 billion, nearly 10 percent of the personal income of all residents of the United States. Reflecting the region's economic importance and role in commodity flow, the total value in 1997 of the wholesale merchandise sold in it exceeded $480 billion, 11.8 percent of the nation's total (U.S. Census Bureau, 1997 Census of Wholesale Trade, March 2000). In 1997 the revenue of establishments engaged in warehousing and storage of goods in the New York-Northern New Jersey-Long Island, NY-NJ-CT Consolidated Metropolitan Statistical Area (CMSA) totaled $1.1 billion, 10.1 percent of the nation's total (U. S. Census Bureau, 1997 Census of Transportation and Warehousing, January 2000).

PROJECT AREA

The project area contains the urban core of the region, and is considerably denser than the surrounding region. The project area contains nearly 13.4 million people and more than 5 million jobs (private employment); these represent 4.8 and 4.9 percent, respectively, of the nation's population and private employment, on 0.05 percent of its land.

The area of densest population, employment, and economic activity in the United States is physically cut off from the nation's mainland on three islands—Manhattan, Long Island and Staten Island—and a peninsula (the Bronx). Underscoring the project area's national economic importance are such statistics as this: even though the area represents approximately 4.8 percent

of the nation's population, in 1997 the total value of the wholesale merchandise sold in it equaled $297 billion, or 7.3 percent of the nation's total.

FREIGHT SERVICE AND TRANSPORT PROBLEMS

Although large volumes of goods are moved daily through the 30-county region and the project area, freight hauling operates on a vast but often congested, inefficient, and physically limited system. Each freight movement system—highway, rail, water, and air—faces limitations on operations, access, and routes, as well as physical constraints. In the face of anticipated population and economic growth as well as an even greater increase in the rate of consumption, and thus a large increase in demand for goods, the region's system is inadequate, as discussed below for each transport component.

FREIGHT TRANSPORTATION CHARACTERISTICS AND DEMAND

A detailed analysis was performed to determine the characteristics of current and future freight movement in the 30-county region. The Reebie Associates TRANSEARCH database for the year 2000 was used as the national conditions for freight forecasts. Reebie compiles the TRANSEARCH database from a combination of publicly available goods movement sources as well as direct reporting from shippers and carriers across the country. The database tracks goods movement information by point of origin, destination, commodity category, and mode of shipment. It includes all North American flows including domestic, Canadian, and Mexican. It is augmented by dollar values calculated from a regional selection of the 1993 National Commodity Flow Survey (CFS) produced by the United States Department of Transportation (USDOT). Future freight flows were projected for the year 2025 by Global Insight.[‡]

The commodity flow analysis used a zonal structure that divided North America into 52 zones—30 zones representing the regional counties and 22 external zones composed of groups of states or counties which share common freight distribution characteristics for trade with the region. Commodities were disaggregated into 43 categories based on Standard Transportation Commodity Codes (STCC) which are closely related to Standard Industrial Commodity Codes (SICC) that are used in reporting economic output and employment. Commodity flows were further disaggregated into the four major transport modes—truck, rail, water, and air. This analysis provided an extensive understanding of commodity flow in the region by origin and destination, commodity type, and mode. The commodity flow analysis served as the base for forecasting freight diversion resulting from the project alternatives. (More detail on the commodity flow analysis is provided in Appendix 2B).

The 2025 forecast is based on anticipated growth in employment/output by market sector. The economic forecast was produced in December 2001, and accounts for the anticipated impacts of the September 11, 2001 terrorist attacks on the regional and national economies. The attacks were forecast to have a pronounced impact on regional economic growth in the near term, but it was forecast that in the long-term the region would return to pre-September 11th growth rates. Forecasted mode splits were generated by growing current commodity groups (accounting for varying economic growth rates by industry sector), but independent of existing or future capacity limitations on the transportation system. The latter was addressed by the transportation impact analysis in this document.

[‡] Global Insight is an economic forecasting firm located in Waltham Massachusetts, formerly known as DRI-WEFA.

In 2000, 582 million tons of consumer goods, fuel, food, building materials, and other domestic freight valued at $1.44 trillion moved through the region (see Figure 1-2).[§] The top commodities by weight and value are shown in Figure 1-3. The types of commodities moved inbound and outbound are generally similar. However, the petroleum and warehousing/distribution categories play a larger role in outbound movements highlighting the region's role as a distribution center to other North American markets, as well as a consuming region. Figure 1-3 shows the distribution of origins and destinations for cargo traveling inbound to and outbound from the region. The region's largest single trading partner is the region itself (intraregional flows) with a total freight exchange of 165 million tons. Other major partners include northern New York State (96 million tons) and the Midwest (51 million tons). The region ships and receives a wide variety of products, both inbound and outbound, across the entire nation.

Freight in the 30-county region moves in four systems: highway, railroad, water, and air. Most freight travels in trucks—79 percent measured by weight and 92 percent measured by estimated value. Waterborne freight movement is next highest by weight (15 percent), but much lower by estimated value of freight (2 percent). Rail freight accounts for 6 percent by weight and 5 percent by estimated value. Air transport carries 0.2 percent of the region's freight tonnage; however, the estimated value of these shipments is 0.6 percent: high value goods move by air.

Within the region, the distinction between transport choices is clear. Within the 30-county region, both sides of the river show a similar reliance on trucks. However, rail transportation in the East-of-Hudson subregion accounts for less than 2 percent of freight tonnage and only 0.6 percent by value. By contrast, the West-of-the-Hudson subregion, which is connected to the national rail infrastructure, has a rail share of 9 percent by weight and 10 percent by value. According to the latest national revenue and volume statistics from the American Association of Railroads (AAR) and American Trucking Association (ATA), freight transport by rail is on the average 2.7 cents per ton-mile versus 5.0 cents per ton-mile for trucks.

Without any change to the system, truck tonnage is expected to increase from 79 to 85 percent of the total movement, rail tonnage would decrease from 6 to 5 percent, waterborne freight would decrease from 15 to 9 percent, and air transport would increase from 0.15 to 0.20 percent. These forecasts, which do not consider capacity constraints, represent estimated demand for each type of transport. Applying the percentages to the total tonnage is more telling: demand for trucking will increase by 83 percent, from 460 million to 841 million tons; demand for rail will also increase, by 45 percent, from 32 million to 46 million tons; demand for waterborne freight transport will increase slightly, by 6 percent, from 87 to 92 million tons; and demand for air transport will increase by 127 percent from 0.87 million to 1.98 million tons.

These substantial increases cannot be absorbed by the region's freight transport system without significant detrimental effects on the region's highway system, its economy, and its environment, as discussed below.

HIGHWAY SYSTEM

Trucks hauling freight in the project study areas share an extensive highway and roadway system with passenger cars, buses, and other non-freight vehicles (see Figure 1-4). These include

[§] 2000 TRANSEARCH dataset, compiled by Reebie Associates from a combination of publicly available goods movement sources as well as direct reporting from shippers and carriers across the country. Forecasts are developed by DRI-WEFA.

several east-west and north-south interstate highways and a number of other national, state and local arteries.

In the face of a forecast dramatic increase in the movement of freight by truck, this highway system is inadequate. Although a number of major highways, arterials, and access roads serve some parts of the 30-county region reasonably well and may continue to do so, the situation in the project area is much more problematic, due primarily to the limited number and capacity of river crossings. In much of the region, when the major highways are overly congested, long-haul trucks can use alternate routes or local roads. This is not an ideal condition, but it keeps freight and other traffic moving. In the project area, however, all traffic going to and from New York City and Long Island or New England must funnel through a limited number of bridges and tunnels (see Figure 1-5). If these facilities are backed up, there is no alternative local artery or street. The trucks must sit there. And currently these facilities are congested throughout most of the day and into the night. Waits of up to 45 minutes to get into the Lincoln and Holland tunnels or over the George Washington Bridge are common. The bridge, which carries an average of 276,000 vehicles per day, is the only crossing that is part of the National Highway Network—the designated system of highways for 53-foot trailers. Thus, it is the only option for 53-foot trailers west of the Hudson River bound for Long Island and New England. Tractor-trailer trucks can cross the Arthur Kill to Staten Island and the Verrazano-Narrows Bridge to Brooklyn, but this route is inferior, because it entails negotiating narrow, substandard lanes on either the Outerbridge Crossing or Goethals Bridge to get to Staten Island. Ultimately, when the trucks arrive in Brooklyn, the Gowanus Expressway, which connects to the Verrazano-Narrows Bridge, is severely congested and cannot accommodate 53-foot trailers. Continuing farther north, the Brooklyn/Queens Expressway has height limitations which force the largest trucks to use local streets. The various tunnel crossings have restrictions on vehicle height, weight, and cargo (hazardous prohibited), which effectively preclude their use by long-haul freight carriers.

Adding substantial capacity to the river crossings would not alone solve the problem. Some additional capacity, such as at the Goethals Bridge, has been proposed. However, to meet the demand for moving freight on trucks as well as the underlying growth in passenger car movement, the capacity of the river crossings would have to be increased substantially. Were this to happen, however, the problem would not be solved. The major land routes for large trucks leading to and from the river crossings in New Jersey and New York are also continually congested. Without the current bridge and tunnel bottlenecks, which meter traffic flows onto the area's roadways, the highways themselves could not accommodate the traffic increase. All of the expressways are located in densely developed areas, so that expansion would be very difficult. In addition, the increase in capacity would possibly attract commuters and other travelers from public transportation into cars, which would compete with trucks for available space and create a number of other serious, adverse environmental and socioeconomic impacts.

In addition, many of the older collector routes and local routes in the region's roadway infrastructure were constructed well before the advent of the modern tractor-trailer truck. In most cases, roadway geometry (such as overhead clearance, lane width, and turning radii) cannot accommodate the requirements for safe operation of a large trailer truck. The problem is particularly acute where long-haul trucks must use the local street network to carry freight between a terminal (rail, port, air, or truck) and the appropriate expressway. This deficiency is already limiting the throughput capacity of the region's freight airports, ports and intermodal terminals; with more trucks, the condition would only deteriorate further. In addition, Manhattan, where there are no truck-accessible expressways (other than the one-mile segment of Route I-95 that connects the George Washington Bridge to the Cross Bronx Expressway) and where

the region's densest development and most important economic centers are located, cannot accommodate a substantially higher load of truck traffic on its local street network.

From a transportation vantage point, the use of highways to accommodate the growth in commodities shipped and transshipped in the region is not feasible, particularly at the region's center. As discussed below, an increase in trucks would also pose serious consequences for the region's economy, its air quality and fuel consumption, and its safety.

RAILWAY SYSTEMS

If the bridges and tunnels leading to the area east of the Hudson River constrain the capacity of the highway system to carry freight now and in the future, consider that there is virtually no rail crossing at all. There is a rail bridge at Selkirk, New York, but it is 140 miles to the north of the project area. There are some railcar float operations between New Jersey and Brooklyn, but the capacity of that system is currently very limited. In addition, like the highway system, the rail system was put in place before containerization and doublestack technology were developed. As a result, there are insufficient overhead or lateral clearances to accommodate the larger loads, as well as lower than usual weight limits. Portions of the system also suffer from the dominance of passenger traffic on shared tracks and the limited number and size of rail yards. The additional time, cost, and other service constraints of either of these rail crossing options greatly decreases the attractiveness of rail shipment to all but a few users, and limits the region's ability to accommodate increasing freight volumes by a choice of modes.

More specifically, the region's complex rail freight infrastructure is constrained by the availability of track and yards for modern rail service and by the clearance available to freight cars (see on Figure 1-6). The height under which a railcar can safely pass ("clearance requirement") differs based on the type of rail car. Intermodal transport—which is an efficient method of shipping goods by rail—generally requires higher vertical clearance—17 feet, 6 inches to allow passage of trailer-on-flatcars (TOFC) and up to 22 feet, 6 inches to allow for modern doublestack containers and tri-level auto carriers.[*] While the majority of rail lines west of the Hudson have full doublestack clearances, many rail lines east of the Hudson River often do not even meet the clearance heights required for TOFC service and so are limited to bulk transport (see Figure 1-7). This shipping method requires that packaged freight be individually transferred from a railcar to a local delivery truck, box-by-box, or that liquid and bulk commodities be pumped out. It is a considerably less efficient way to move the types of commodities that could be more easily moved by intermodal transport. Also, except for the Bay Ridge Branch of the Long Island Rail Road (LIRR), the East-of-Hudson freight lines share tracks with existing passenger service. Raised station platforms and electrified third rails do not allow sufficient width for doublestack cars. Only bulk boxcars can currently be transported along many of these rail lines.

In addition, the East-of-Hudson region lacks adequate rail yard capacity. Freight is transferred in West-of-Hudson yards from rail to truck for distribution to New Jersey, New York City, Long Island, and areas north of the city (although rail yards east of the Hudson River serve locations east of the river almost exclusively). Conversely, goods from these areas are trucked to study area rail yards for shipment throughout the country. Some 13 major rail freight yards and intermodal terminals cover approximately 1,250 acres in northern New Jersey. Eight of these handle container freight on approximately 600 acres. In 1996 they handled 1.15 million

[*] 20 feet, 6 inches for the containers, plus 2 feet for potential future electrification.

intermodal containers (2,170 containers or trailers per acre), compared to 246,000 carloads at the five bulk terminals (364 carloads per acre). In contrast, only the Harlem River Yard (which comprises 28 acres) has been upgraded for intermodal transport.

WATERBORNE TRANSPORT

Waterborne transit can move a substantial amount of cargo—containers, liquids, raw materials, bulk—long distances at a relatively low cost per ton. The Port of New York and New Jersey (PONYNJ) has a long history as a leading point of entry to the United States for goods and materials from around the world. Water transport is most effective at moving non-time sensitive bulk commodities around the New York region, such as petroleum, where the emphasis is on low cost. At one time, water transport played a key role in floating cargo across the harbor from the New Jersey railheads. But even in the 1920s, the inefficiency of this system was widely recognized, leading to the formation of the Port Authority of New York and New Jersey (PANYNJ) for the purpose of constructing a rail tunnel to replace the water transport system. Since then, the harbor float system has declined precipitously to where it serves only a fraction of regional freight movement. Even a reinvigorated float system would be unattractive to the growing intermodal market segment which requires reliable and time-sensitive freight movement due to the need to transfer cargo between rail and water on each side of the harbor.

Today, a number of port facilities of varying sizes handle domestic and international bulk and container cargo in PONYNJ. As shown on Figure 1-8, most of the container terminals are located in New Jersey, where land and access to rail lines and expressways are available. Existing container terminal capacity is 3.5 million 20-foot equivalent units (TEUs).[**] Although the majority of port capacity is located west of the Hudson River, 20 percent of PONYNJ containers have a destination that is east of the Hudson River. Almost all freight traveling from northern New Jersey ports to a destination east of the Hudson River moves by truck, across the George Washington or Verrazano-Narrows Bridge. Freight destined for points west of the Hudson River can move either by rail or truck.

To meet an anticipated more-than-doubling of demand, the agencies responsible for planning, maintaining and/or expanding the port are undertaking comprehensive plans for improvements in the harbor, including deepening the channels to accommodate the larger ships now in service, expanding and introducing new intermodal terminals, and preparing a comprehensive port improvement plan, to guide the upgrading over the coming years. (See below, under "Planning Context" for the list of specific projects.)

While these actions will help to correct deficiencies in the harbor and on land in the port facility, the land-side connections to these facilities are highly constrained. Like access to rail terminals, trucks taking cargo from many of the port facilities must navigate narrow, often busy local streets. Once these trucks get to the expressways, they face the same deficiencies and constraints that plague the all-truck freight trips.

AIR TRANSPORT

Although air cargo makes up a small percentage of all freight moving through the 30-county region and project area, its value is particularly high and the goods are usually urgently needed.

[**] One TEU equals the volume occupied by a container that is 20 feet long (i.e., a single 40-foot container is two TEUs).

Air transport serves a small but important niche role in the movement of lightweight, high value, time-sensitive goods for which shippers are willing to pay a high price. It is best exemplified by the overnight delivery services such as Federal Express and its competitors. In the future, air freight will continue to be a niche player in the movement of regional freight and critical to the region's financial and service sectors, but unable to move large volumes of key consumption products such as food, lumber, clay, and concrete.

The region contains a number of airports, as shown on Figure 1-9, including three major airports—John F. Kennedy International Airport, LaGuardia Airport, and Newark Airport. Of these, JFK and Newark Airports handle sizable quantities of freight. LaGuardia handles only limited mail and cargo service in the baggage compartments of passenger planes. LaGuardia is not suited to handle major freight movements due to land and airside capacity constraints. Stewart Airport, on the west side of the Hudson River near Newburgh, New York, has been expanding its services, including freight service. Teterboro Airport serves couriers destined for the country's network of Federal Reserve banks and its main clearing-house in Philadelphia. It is also the hub for many small package cargo shipments and the primary receiving point for hearts and other human organs used for lifesaving transplant operations performed at medical centers throughout the region. While air transport is a part of the regional freight network, air freight carriers do not typically transport the type of freight frequently moved by truck.

JFK Airport is the major air freight facility in the metropolitan area, and handled 1.86 million tons of air cargo in 2000 (the latest year for which full data are available from the PANYNJ. As discussed in the New York Metropolitan Transportation Council (NYMTC) Regional Freight Plan's Task 4 report, the efficiency of federal inspection services at JFK are a regional asset; these services are so well respected that international cargo arriving at Newark Airport is often transported to JFK to clear customs. However, the competing needs for land area at the airport reduce the facility's ability to provide the most convenient layout for loading, conveying, and storing freight. Also, freight movement is subject to the same delays as passenger travel, both from airfield congestion and limited aircraft parking areas. Newark Airport is also a major air freight facility, handling 1.07 million tons of air cargo in 2000. As noted above, LaGuardia Airport is not suited to accept and transport air freight in any volume (it carried 20,195 tons in all of 2000), and its main vehicular access is the Grand Central Parkway, which allows only passenger vehicles. Trucks must approach the airport from local streets; use of large tractor-trailers is all but impossible given the access and configuration of the airport roadways. Stewart Airport accommodates passenger flights, but does not have a sizable freight operation.

Air freight operations at JFK are also restricted by access constraints. Although direct expressway access is available, it is limited to the Van Wyck Expressway, which is heavily congested at most times of the day. Since air cargoes are time-sensitive, the access delays can be serious. Some shippers actually use helicopters to avoid the uncertainty of road travel to and from the airport. Newark Airport is better situated in terms of regional highway access; it has direct access to I-78 with good connections to the New Jersey Turnpike (I-95), as well as direct access to U.S. Routes 1 and 9 and U.S. Route 22. Stewart Airport has direct access to I-84 and Route 17. Still, any trucks traveling between these airports and locations east of the Hudson River must pass through the same bottlenecks and pay tolls to cross the water.

SECURITY ISSUES

When the events of September 11, 2001 prompted the closing of the City's bridges and tunnels, it became clear that the region's reliance on trucking and just a few river crossings, with no

redundancy or flexibility, made the region and its center city vulnerable to disruption of goods movement. In the event that it became necessary to move military equipment and personnel across the river and harbor, there would be inadequate means to do so.

C. PROJECT GOALS

Recognizing the compelling need for an improved freight transportation system in the region, NYCEDC undertook the Cross Harbor Freight Movement Major Investment Study (MIS), as described below. Project goals were developed during and subsequent to the MIS process with input from steering and advisory committees established to guide the MIS and EIS processes (see Chapter 21, "Public Process" for information on these committees). These goals reflect the need for more reliable and efficient goods movement, reduction in dependence on trucks for diversion of trucks to other less polluting transport systems, promotion of economic development with improved freight transport, and for strategic system redundancy. As discussed in Chapter 2, "Project Alternatives," 15 alternatives were evaluated to determine their potential to satisfy the project goals during the MIS process. The project goals and their related objectives are as follows:

GOAL 1: IMPROVE THE MOVEMENT OF GOODS INTO, OUT OF, AND THROUGH THE REGION

- OBJECTIVE 1A: Develop structural and nonstructural project alternatives that alleviate the shortcomings of the present network.
- OBJECTIVE 1B: Reduce overall travel time for shippers and receivers.

GOAL 2: CREATE A MORE MODALLY BALANCED GOODS MOVEMENT SYSTEM IN THE REGION

- OBJECTIVE 2A: Develop freight movement alternatives that encourage the use of existing transportation corridors with excess capacity.
- OBJECTIVE 2B: Support rail and marine alternatives as a means of diverting traffic from congested highways.
- OBJECTIVE 2C: Foster reliability of freight movement across the Hudson River.

GOAL 3: IMPROVE ENVIRONMENTAL QUALITY IN THE REGION BY DIVERTING FREIGHT MOVEMENTS TO LESS POLLUTING MODES OF TRANSPORTATION

- OBJECTIVE 3A: Develop project alternatives that result in an overall improvement in air quality, traffic congestion and infrastructure wear.
- OBJECTIVE 3B: Identify potential environmental impacts and mitigation associated with the project alternatives.

GOAL 4: PROMOTE ECONOMIC DEVELOPMENT IN THE REGION THROUGH A MORE EFFICIENT GOODS MOVEMENT SYSTEM

- OBJECTIVE 4A: Determine the freight movement needs of commercial and industrial interests through outreach and industry involvement.

- OBJECTIVE 4B: Ensure that the project alternatives can meet both present and future commercial transportation needs.
- OBJECTIVE 4C: Reduce the transportation cost to businesses and consumers by alleviating wasteful congestion and creating competitive transportation alternatives.

GOAL 5: PROVIDE STRATEGIC SYSTEM REDUNDANCY TO THE REGION'S VITAL HUDSON RIVER CROSSINGS

This goal was added to the project after the events of September 11, 2001. It is intended to assure that in the event of an attack or other catastrophe, the freight system will have enough redundancy so that essential goods and commodities can continue to move into, through, and out of the entire region, including those areas east of the Hudson River.

D. PROJECT BACKGROUND, PRIOR STUDIES AND CURRENT PLANNING CONTEXT

PLANNING BACKGROUND

CROSS HARBOR FREIGHT MOVEMENT MAJOR INVESTMENT STUDY (MIS)

Given the considerable problems facing an essential service in the region—movement of goods to and from the region's core—NYCEDC initiated the Cross Harbor Freight Movement MIS in 1998. The overarching goal of the MIS, which was completed in the spring of 2000, was to develop a project specific strategy for improving the region's movement of goods across the New York Harbor. Some 15 alternatives involving highway, rail, water, and air systems were screened in a three-tiered process with a public participation component. Nine of the alternatives were discarded upon completion of the first-level screen either because they faced insurmountable barriers to implementation or because they were not full "stand alone" proposals and therefore did not fully address the identified problems. Two alternatives were dismissed upon the completion of the second and third tier of the screening analysis, leaving four alternatives, including the No Action Alternative, for the most detailed MIS analysis and ultimately for consideration in the DEIS. (See Chapter 2, "Project Alternatives," for descriptions of the screening process and results.)

PRIOR STUDIES

The idea of a cross-harbor freight tunnel has a long history. An 1893 plan by the Pennsylvania Railroad included a new double-track line extending from Houtenville (near Rahway), New Jersey, across the Arthur Kill by bridge or tunnel, through Staten Island, and under "the Narrows" to Brooklyn via a tunnel terminating at a LIRR connection. Similarly, in 1903 the Pennsylvania Railroad unveiled a complex plan of terminal expansion and rail connections via a "cross harbor" tunnel between Jersey City and Brooklyn to address waterway congestion in the Port district. A cross-harbor tunnel was included in the PANYNJ's first Comprehensive Plan, published in 1922. The project foundered amidst disagreements among, then, a dozen different freight railroads controlling the waterfront rail yards, including the Pennsylvania Railroad, which had recently invested in the development of a railcar float operation from Greenville in New Jersey to Brooklyn in New York. At the same time, New York City advocated keeping the tunnel within city limits and building it under the Narrows between Brooklyn and Staten Island. About a year later, New York City dug shafts in both Brooklyn and Staten Island for a joint

passenger-freight rail tunnel, but in 1925, after much controversy, the New York State legislature passed the Nicoll Hofstadter Bill, which prohibited the city from building a freight tunnel, in part because it conflicted with the PANYNJ's Comprehensive Plan.

A study in 1941 re-explored a cross-harbor tunnel as a defense initiative to connect Brooklyn directly to locations west of the Hudson River. Planners and freight railroads on both sides of the Hudson River have conducted numerous studies since then, exploring improvements to the inefficient railcar float system and the construction and operation of a rail freight tunnel. By the 1990s, considerable advances in tunneling technology, increasingly severe roadway congestion, and freight industry conditions led NYCEDC and the New York City Department of City Planning (NYCDCP) to reexamine the issue once more. The resulting *Intermodal Goods Movement Study* concluded that rail freight improvements, including the development of a rail freight tunnel under New York Harbor, had potentially favorable public benefits. The Cross Harbor Freight Movement MIS confirmed that conclusion.

CURRENT REGIONAL PLANNING CONTEXT

There are numerous on-going efforts to improve the region's transportation network. These efforts include planning to improve highway, rail, and port infrastructure. Many of these initiatives would affect or be affected by the development of the Cross Harbor Freight Movement project. Initiatives include:

HIGHWAY INFRASTRUCTURE INITIATIVES

- PANYNJ is proposing to build a second bridge next to the existing Goethals Bridge and upgrade the existing bridge to current engineering standards.
- New Jersey Department of Transportation (NJDOT) is undertaking Portway, a multi-phase transportation improvement program to improve access to and between the Newark/Elizabeth air/seaport complex, intermodal rail facilities, trucking and warehousing/transfer facilities and the regional surface transportation system. The project is intended to relieve congestion and improve access for trucks. Phase I, budgeted at $850 million, consists of 11 NJDOT projects and two PANYNJ projects that would collectively create an 8-mile roadway from Ports Newark and Elizabeth to Croxton Yard. Three of the Phase I projects are currently in construction: roadway improvements to Doremus Avenue over Oak Island Yard, redesign of Charlotte and Tonnelle Circles in Jersey City, and construction of the McLester Street Flyover to Expressrail Yard. Three projects are in the planning stage: Doremus Avenue Roadway, Route 1 and 9 St. Pauls Avenue Bridge, and Route 7 Wittpenn Bridge Replacement. Seven projects are undergoing feasibility assessment, including a new NJ Turnpike freight-only interchange. Later phases could allow for an extension of Portway to the north to Little Ferry Terminal, to the east to the Global Marine Terminal and a potential future terminal at Military Ocean Terminal at Bayonne (MOTBY), and to the south to industrial areas in Union County.
- NYSDOT has completed the Staten Island Expressway MIS, which included an evaluation of an array of transportation improvements such as HOV lanes, toll-paying SOV lanes, light rail in the median, access ramps, and added tunnel lanes. Based on the MIS findings, the alternatives recommended for further study include: (1) Travel Demand Management; (2) Transportation System Management; and (3) Special Use Lanes/Bus Transitways.

- NYSDOT is studying alternatives to reconstruct the Gowanus Expressway including construction of a Gowanus tunnel, a no-build alternative requiring $15-25 million/year in expenditures for repairs; a major rehabilitation; and a relief viaduct involving the construction of a structure over the expressway to aid traffic flow during reconstruction which would later be used as a bus/HOV lane.
- NYMTC/NYSDOT is conducting the South Brooklyn Transportation Investment Study. The study area includes South Brooklyn-south of the Long Island Expressway, east of I-278, and west of the Nassau County line. The area includes truck routes to the Verrazano-Narrows Bridge. The study will develop multi-modal transportation improvement alternatives to optimize the movement of people and goods through the area.
- NYSDOT is conducting the Bronx Arterial Needs MIS, a study that will focus on improving the Cross Bronx Expressway (I-95) and the Major Deegan Expressway (I-87).
- NYSDOT is proposing the Reconstruction of the Bruckner/Sheridan Expressway Interchange. This project is being undertaken to address the operational, geometric, and safety issues related to the existing bottleneck situation at the interchange of the Bruckner Expressway (I-278) and the Sheridan Expressway (I-895). The project is also intended to improve trucking access between the regional highway system and industrial uses on the Hunts Point Peninsula, including the Hunts Point Food Distribution Center.
- NYCDOT, NYSDOT, Metropolitan Transportation Authority (MTA) and PANYNJ are developing the *Bronx and Manhattan ITS and ITS Early Deployment Plan* for the New York City Metropolitan Area to assess computerized technology to better coordinate traffic flows.
- NYCDOT is conducting a truck route study, *Freight Vehicle Operations and Needs Assessment and Design,* to develop solutions to inefficient routing, and promote efficient goods movement.
- NYCDCP recently conducted the *Off Peak Delivery Study* to evaluate options for encouraging vehicles to use off-peak travel periods. The study recommended toll incentives using E-ZPass discounts, allowing commercial vans on parkways during off peak periods, wider E-ZPass lanes for faster movement of commercial vehicles, coordinating repair and maintenance work with truck deliveries, and in-vehicle parking devices to charge only for time parked at meters.

RAIL FREIGHT INFRASTRUCTURE INITIATIVES

- NYSDOT is studying the development of a potential new bulk and intermodal rail yard at the Pilgrim State Psychiatric Hospital site in Deer Park Long Island and associated improvements including increased clearance heights along the LIRR Main Line. An EIS for this project is being prepared.
- NYSDOT has completed its project to increase clearance heights on the Hudson Line to 17 feet, 6 inches to accommodate TOFC rail transport.
- PANYNJ is expanding the Howland Hook Marine Terminal, which would include improvements to the existing site and the development of the adjacent Port Ivory site into an intermodal rail yard. These improvements are expected to be complete in 2005.
- PANYNJ will be building a northbound connection between the Staten Island Railroad and the Chemical Coast Line in New Jersey. This project is expected to be complete in 2005.

- PANYNJ is expanding its Expressrail facility at Port Elizabeth and improving on-dock rail at Port Newark.
- NYCEDC and PANYNJ will be reactivating the Staten Island Railroad upon completion of the Staten Island Railroad-Chemical Coast Line connection. NYCEDC will also be adding capacity to Arlington Yard, adding track and extending the Travis Branch to the Fresh Kills Transfer Facility, currently under construction.
- NYCEDC will be upgrading tracks at the south Brooklyn waterfront along 1st Avenue between 39th and 51st Streets to serve port facilities along the Brooklyn waterfront.
- NJDOT, PANYNJ, and the freight railroads have developed a two-phase New Jersey State Rail Plan for upgrading freight lines. Financial assistance will be provided to the railroads for acquisitions, rehabilitations, and rail facility construction that meet certain criteria. Currently, funding is approved for the first phase.
- LIRR is initiating planning to increase the capacity of its mainline between Jamaica and Hicksville from two to three tracks. The third track would be useful for more flexible movement of freight between Fresh Pond Yard and points east.
- Metro-North, together with Amtrak, CSX, and CP, is performing an operations study to improve coordination of rail users along the Hudson line.
- Northeast Freight Service and Investment Study (also referred to as the NASTO Freight Study), sponsored by NYSDOT and Maine DOT.
- Mid-Atlantic Rail Operations Study, sponsored by CSX, NS, Amtrak, I-95 Corridor Coalition, and the Departments of Transportation of the following states: Pennsylvania, New Jersey, Maryland, Delaware, and Virginia.
- Multi-Client Port Access Study, sponsored by I-95 Corridor Coalition.
- Container and Truck Trailer Security Study, sponsored by I-95 Corridor Coalition.
- Study of Truck Freight Crossing the Canada-U.S. Border, sponsored by the Eastern Border Transportation Coalition.

PORT INFRASTRUCTURE INITIATIVES

- U.S. Army Corps of Engineers (USACOE), U.S. Environmental Protection Agency (USEPA), PANYNJ, NJDOT, NYSDOT, ESDC, and NYCEDC have begun work on a regional Comprehensive Port Improvement Plan (CPIP) to develop a long-term strategy for the PONYNJ.
- USACOE is undertaking a number of navigation channel deepening programs in New York Harbor to provide up to 45-foot depth (and possibly up to 50-foot depth) in selected channels. The PONYNJ's navigation channels are currently between 35 and 40 feet in depth.
- NYCEDC will be developing an intermodal rail facility at the South Brooklyn Marine Terminal.
- NYCEDC is redeveloping the South Brooklyn Marine Terminal for maritime use.
- PANYNJ will be expanding the Howland Hook Marine Terminal east of Port Ivory.

- PANYNJ and terminal operators are undertaking modernization of the Port Newark and Port Elizabeth facilities.
- The City of Bayonne is considering developing a portion of the former Military Ocean Terminal at Bayonne for port development.

REGIONAL PLANS

Regional Transportation Plan: Mobility for the Millennium

NYMTC, in cooperation with state and local transportation agencies, is responsible for the development of a financially constrained Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) for the Metropolitan Region. The RTP, *Mobility for the Millennium, A Transportation Plan for the New York Region*, most recently updated in 1999, identifies issues and sets goals and objectives to guide transportation decision-making in the context of funding constraints and other limitations on the degree of transportation improvement that can be expected. The plan presents a vision of goals and strategies for the region's transportation system by 2020. The plan includes the following goals and actions that are relevant to this project:

- Freight Transportation: Minimize the cost and improve the reliability of freight movement in the region. Objectives related to this goal include encouraging multi-modal shipment of freight and expanded alternatives for trucks and all other commercial vehicles, improve physical infrastructure between shipping and receiving points, and remove burdensome government regulations and restrictions. The plan considers options for improved trans-Hudson rail freight access and calls for county or municipal efforts to designate or refine truck routing systems.
- Infrastructure: Achieve and maintain a state of good repair on the transportation system. Objectives related to this goal include bringing transportation infrastructure to a state of good repair and maintaining the system on a normal replacement cycle.
- Land Use and Transportation: Develop integrated land use and transportation solutions for the short-, medium-, and long-term future. This includes taking into account how new development will affect the transportation system, and how that system should improve access to major activity centers.
- Airport Access: Address problems of vehicular access to the region's airports for freight as well as passengers. Apply "intelligent transportation systems" (ITS) technologies and congestion management to improve service levels on the Van Wyck Expressway. Consider access to Stewart Airport as part of a Major Investment Study for I-84.
- Improve regional environmental quality, balance environmental quality with the region's mobility and economic activity, and conform to the State Implementation Plan and Clean Air Act Amendments. A particularly relevant objective related to this goal is to minimize growth in vehicular traffic (vehicle miles traveled), thus reducing air pollution from cars, buses, and trucks (mobile source emissions).
- Identify public and private funding resources to implement the long-range plan. This goal, through its objectives, fosters increasing operating efficiencies in transportation systems, minimizes the time needed to implement projects, and develops new privatization efforts and innovative financing techniques.

- Continue to monitor the performance of the long-range plan, adding measures and projects, as necessary to achieve the goals of the plan.

The RTP is currently being updated to reflect a 2025 planning horizon. The next RTP should be completed in 2004.

NYMTC Regional Freight Plan

NYMTC is developing a Regional Freight Plan to address congestion and constraints on the region's freight distribution network. The plan is evaluating rail and highway transport and will make recommendations for infrastructure and operational improvements for goods delivery in the 30-county region.

New York State Air Quality Implementation Program

Under the Clean Air Act Amendments (CAAA) of 1977 and 1990, areas of the country that fail to meet National Ambient Air Quality Standards (NAAQS) must prepare air quality plans demonstrating how standards will be attained. These plans, known as the State Implementation Plans (SIPs), set forth procedures and control measures to maintain air quality in areas in attainment with the NAAQS and to achieve NAAQS in areas that are not in attainment with the standards. Manhattan (New York County) is a non-attainment area for particulate matter with an aerodynamic diameter of 10 micrometers in diameter or less (PM_{10}). EPA has recently redesignated New York City from non-attainment to attainment for CO.

In 1997, USEPA promulgated standards for "fine particles" with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$), but those standards have yet to be implemented. Implementation requires that each state develop an EPA-approved monitoring plan to gather three calendar years of data. The three years of data are then analyzed to determine which areas within the state are in attainment and which are not in attainment for even smaller particulate matter, $PM_{2.5}$. The states thereafter have three years to develop regulations to control $PM_{2.5}$ emissions and their precursors in non-attainment areas, and these regulations must then be approved by EPA for incorporation into the SIP. Once attainment areas are delineated, the states must revise their SIPs under the Clean Air Act.

EPA's final transportation conformity rule, dated August 15, 1997, requires NYMTC, the Federal Transit Authority (FTA), and the Federal Highway Administration (FHWA) to make conformity determinations on metropolitan long-range transportation plans, TIPs, and transportation projects with respect to the SIP before they are adopted or approved. The long-range transportation plan is the official intermodal metropolitan transportation plan for an area and generally has a 20-year planning horizon. The TIP is a staged, multiyear, intermodal program of transportation projects, which are consistent with the long-range transportation plan.

The conformity regulations require that, to demonstrate conformity, transportation programs must contribute to annual emission reductions and provide for the implementation of transportation control measures, consistent with SIP requirements. Project-level conformity to the SIP is determined by demonstrating conformity to a plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and supporting the expeditious attainment of the standards.

The conformity requirements require that a currently conforming TIP exist in order for any transportation project to be approved but also limit the conformity status of a TIP and Long Range Transportation Plan (LRTP) to a maximum of three years for nonattainment and

maintenance areas. Thus the conformity determination for the RTP, approved in September 1999, was set to lapse in October 2002. However, due to the World Trade Center disaster on September 11, 2001, and the resultant loss of NYMTC's files containing regional transportation and air quality data, combined with the major changes to the downtown mass transit system, the conformity requirements for the New York City metropolitan area have been temporarily waived until September 30, 2005, pursuant to Public Law 107-230 enacted October 1, 2002.

Transportation Improvement Program (TIP)

NYMTC, in cooperation with state and local transportation agencies, is responsible for the development of a financially constrained Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) for the New York Metropolitan Region. The TIP addresses and coordinates specific transportation projects in accordance with regional transportation goals. It is updated every two years, and must be found to conform to the SIP. The current TIP, which includes the study for the Cross Harbor Freight Movement Project, specifies $50 billion in projects to be funded through 2004. The status of the current TIP is currently in flux following the events of September 11, 2001. NYMTC has applied to the U.S. Department of Transportation for an indefinite extension of the current TIP. Its request has not yet been acted upon.

Long Island Transportation Plan, 2000 (LITP 2000)

The LITP 2000 represents a regional, long-range planning initiative that was conceived in order to address the severe traffic congestion that presently exists on Long Island. The NYSDOT, in conjunction with other key government agencies, businesses, and community leaders, are in the process of finalizing the plan that, if implemented, would improve the movement of people and goods throughout Long Island. The LITP 2000 will offer an array of recommendations, some to be implemented in the short term and others over the next 20 to 30 years. Although the majority of the transportation strategies currently considered focus on the automobile, ways to improve the movement of freight related cargo are also under review. Specific freight movement recommendations in the latest material available on the LITP 2000 include the development of a rail yard at the former Pilgrim State Psychiatric Hospital site and work on clearance to enable rail access to Long Island in keeping with the downstate rail clearance program. In addition, the selective road widening initiative portion of the plan could have a positive impact on truck traffic, by increasing overall roadway capacity.

E. CONCLUSION

It is estimated that 582 million tons of freight moved through the Metropolitan region in 2000. According to forecasts, by the year 2025 the volume of regional freight movement is estimated to grow to 989 million tons, an increase of 70 percent. This is a greater rate of increase than most other measures of growth, including population, employment, and personal income. The reasons are that increasing economic prosperity and the general increase in trade needed to support it (both within the U.S. and internationally) will result in a disproportionate increase in freight movement. This trend has been evident for decades as the growth in truck traffic (the predominant form of regional freight movement) increases more rapidly than other measures—both in the region and nationally. Contrary to the belief that the transition to a post-industrial service-based economy would decrease freight movement, the increasing prosperity, and high levels of trade generated by the new economy actually increase freight movement. Many items which used to be made or grown in the region—from food products to clothing—are now largely

imported. New or expanded vehicular bridges are highly unlikely given the cost and the region's non-compliance with federal air quality standards. It appears that only rail freight options offer a realistic prospect for adding sufficient capacity to move into the region the large quantities of consumer products required to sustain its economic vitality and enhance the region's connections to the national Freight Transportation Infrastructure. ✷

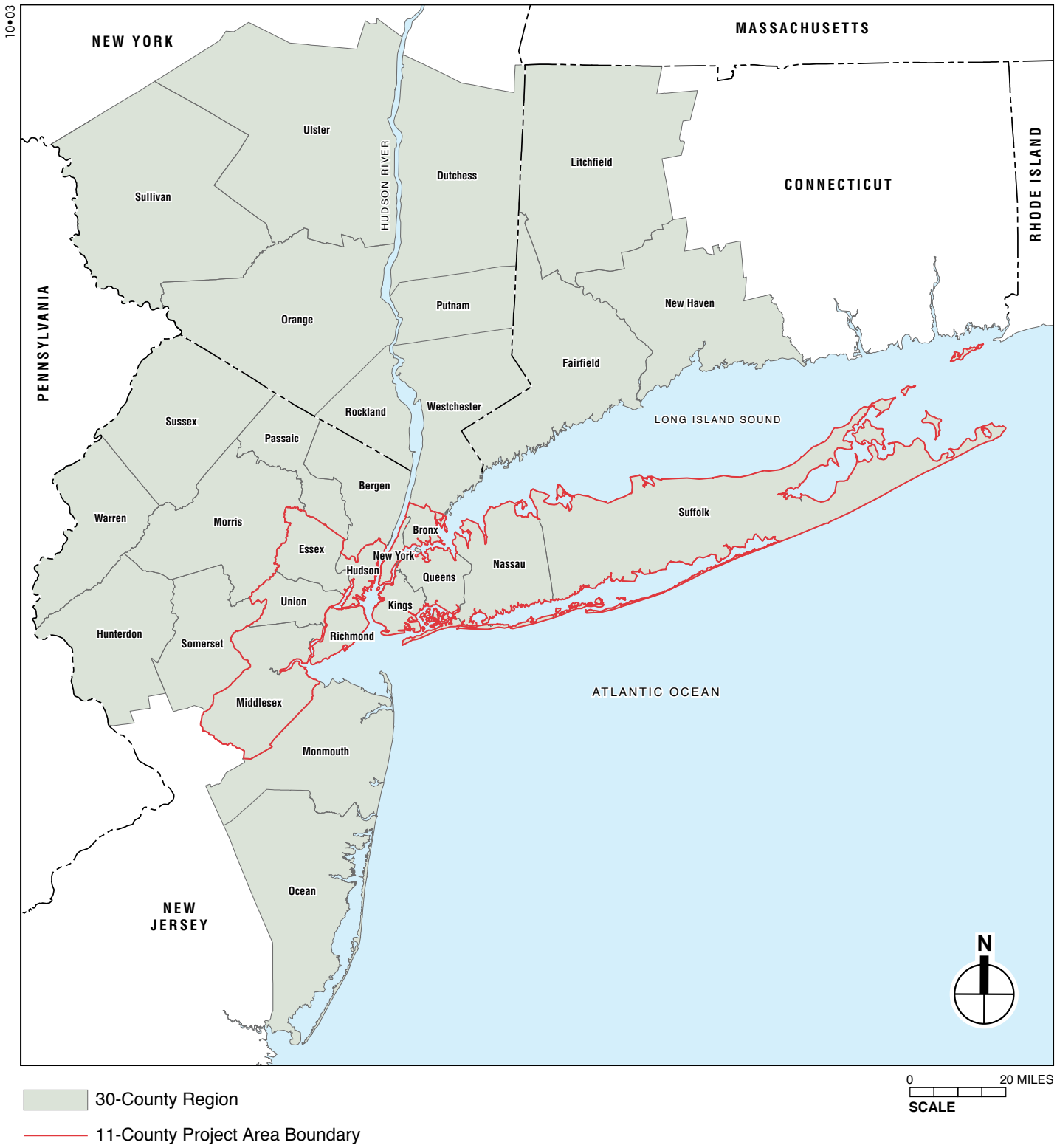
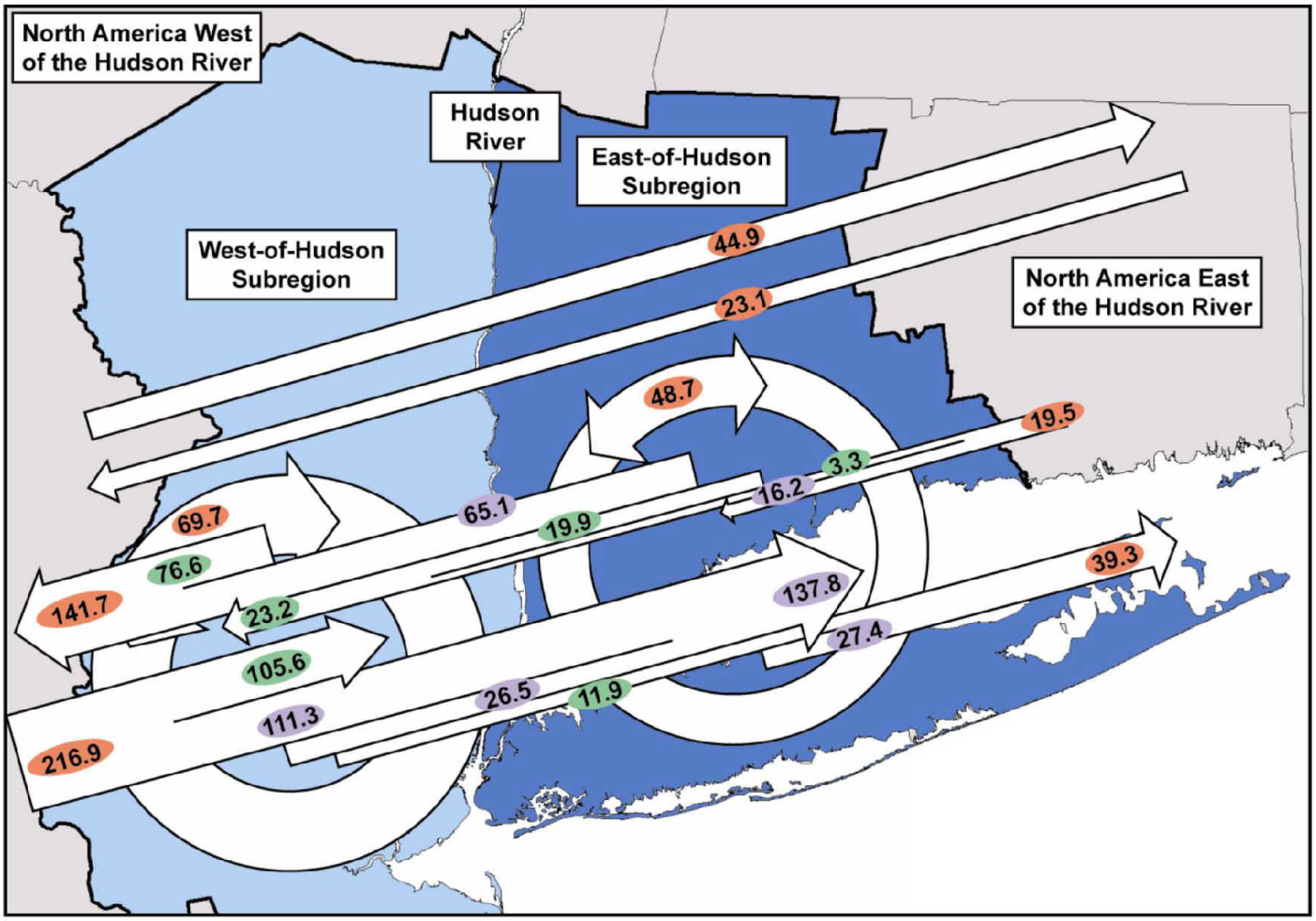


Figure 1-1

Cross Harbor Study Areas

CROSS HARBOR FREIGHT MOVEMENT PROJECT

10•03



Shipments to/from East-of-Hudson Subregion

Shipments to/from West-of-Hudson Subregion

Total Shipments

Millions of Tons

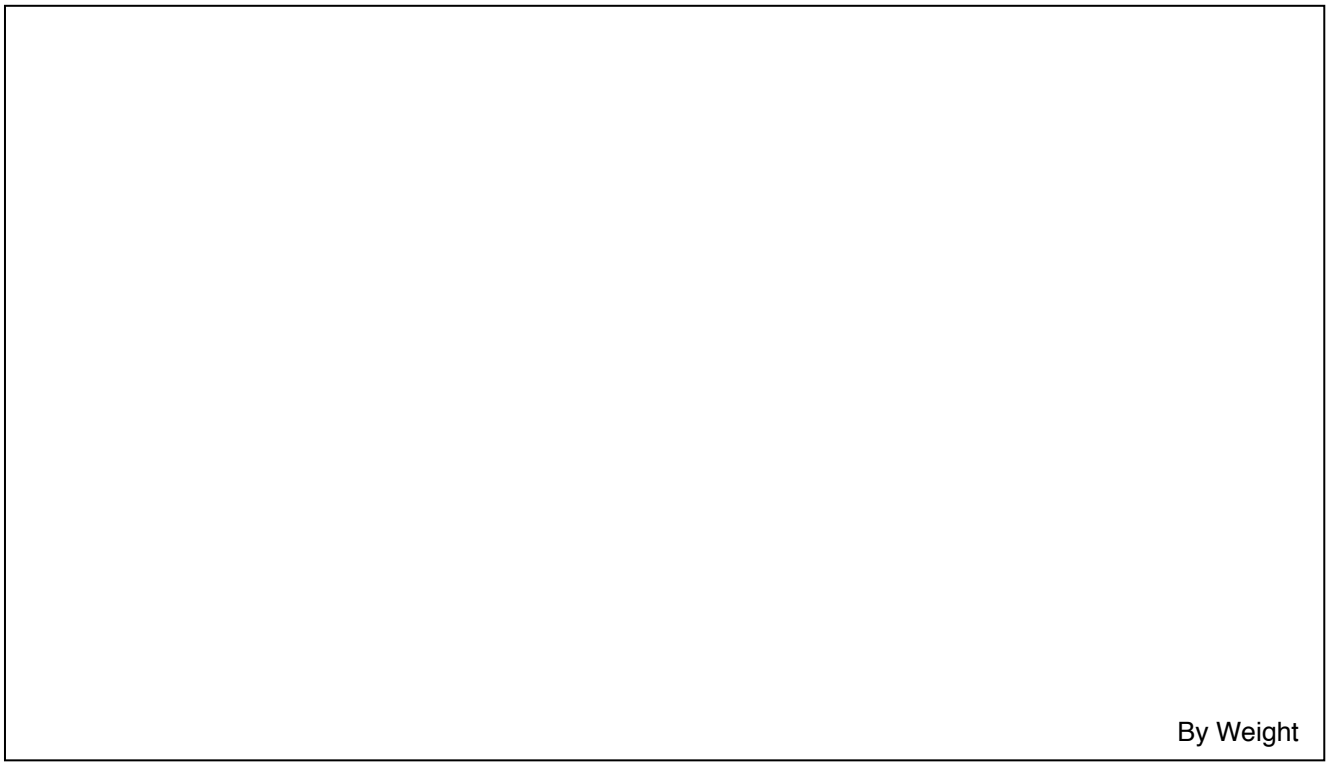
Source: Draft Commodity Flow Analysis, April 2002

Figure 1-2

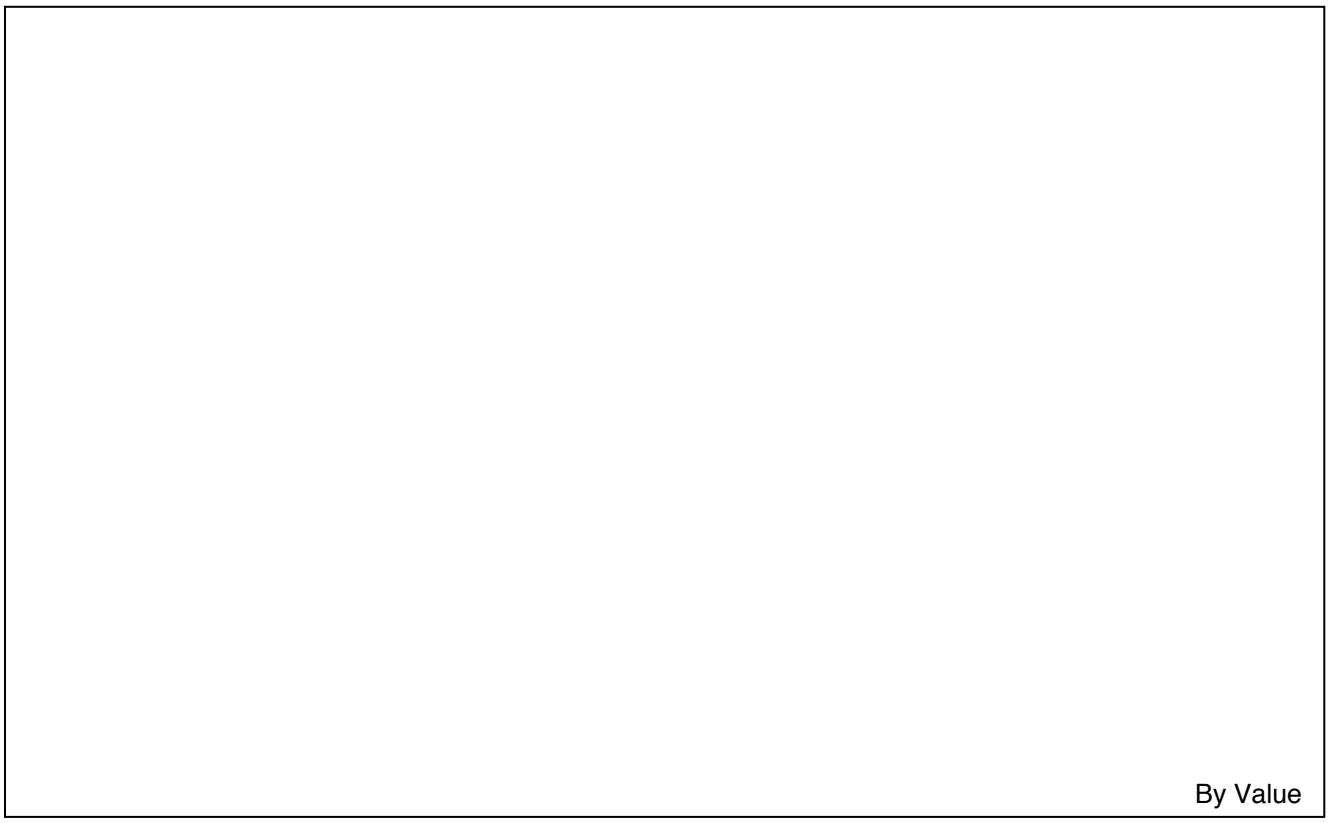
30-County Region Commodity Flows, 2000

CROSS HARBOR FREIGHT MOVEMENT PROJECT

10•03



By Weight



By Value

Figure 1-3
Top Commodities Moved in the
Cross-Harbor Study Region

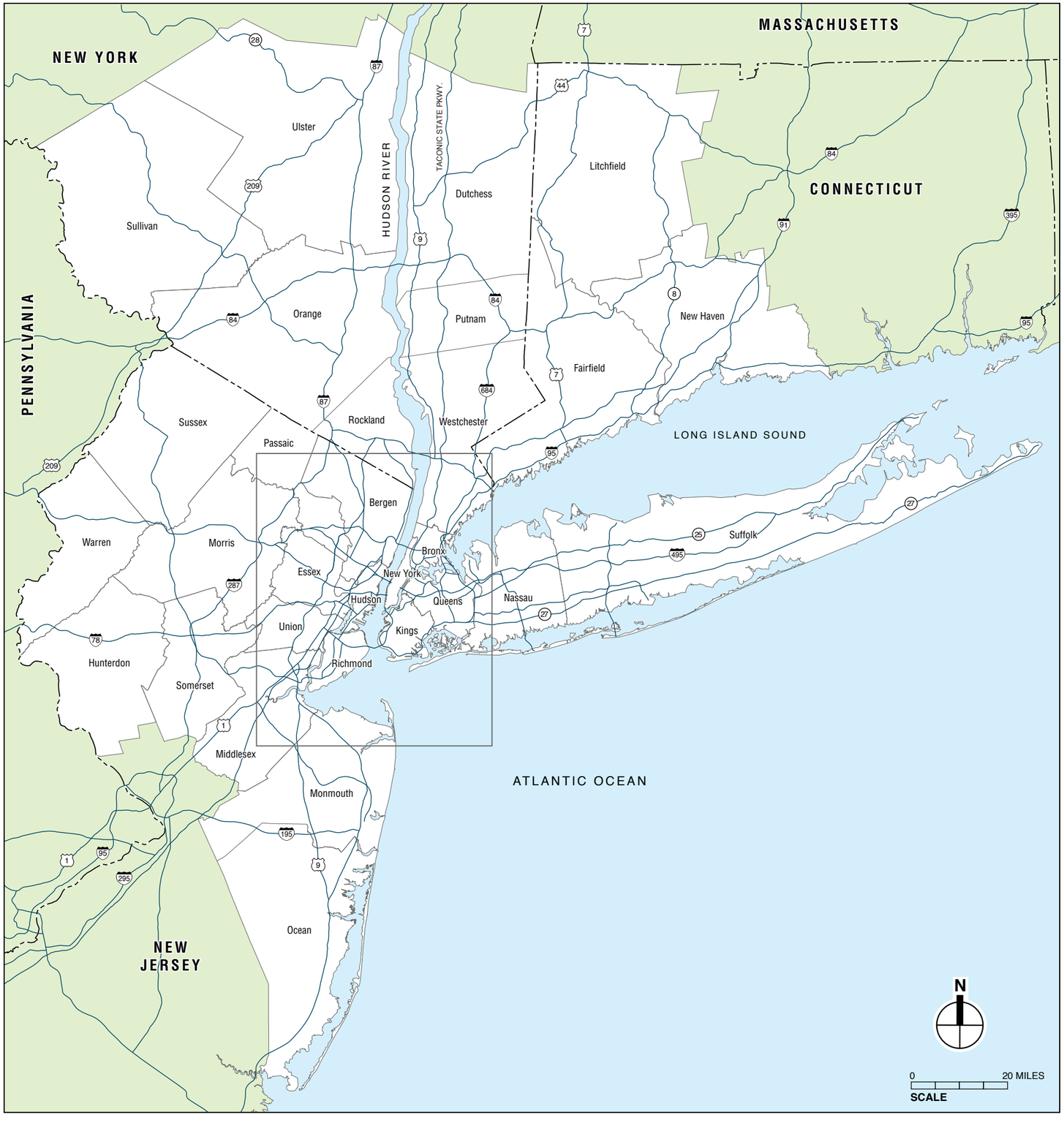




Figure 1-4
Regional Highway System
CROSS HARBOR FREIGHT MOVEMENT PROJECT

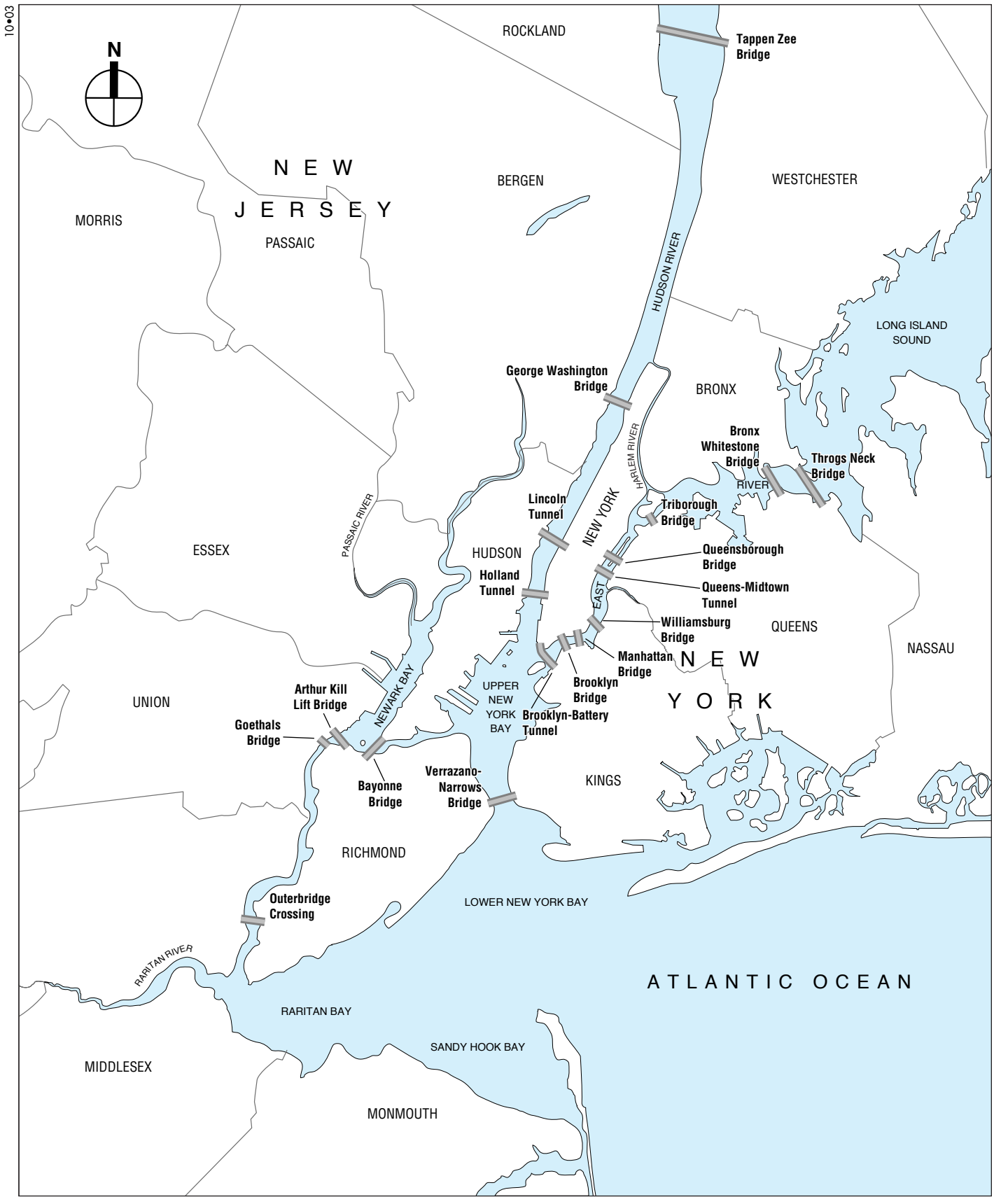


Figure 1-5

Major Bridge and Tunnel Crossings

CROSS HARBOR FREIGHT MOVEMENT PROJECT

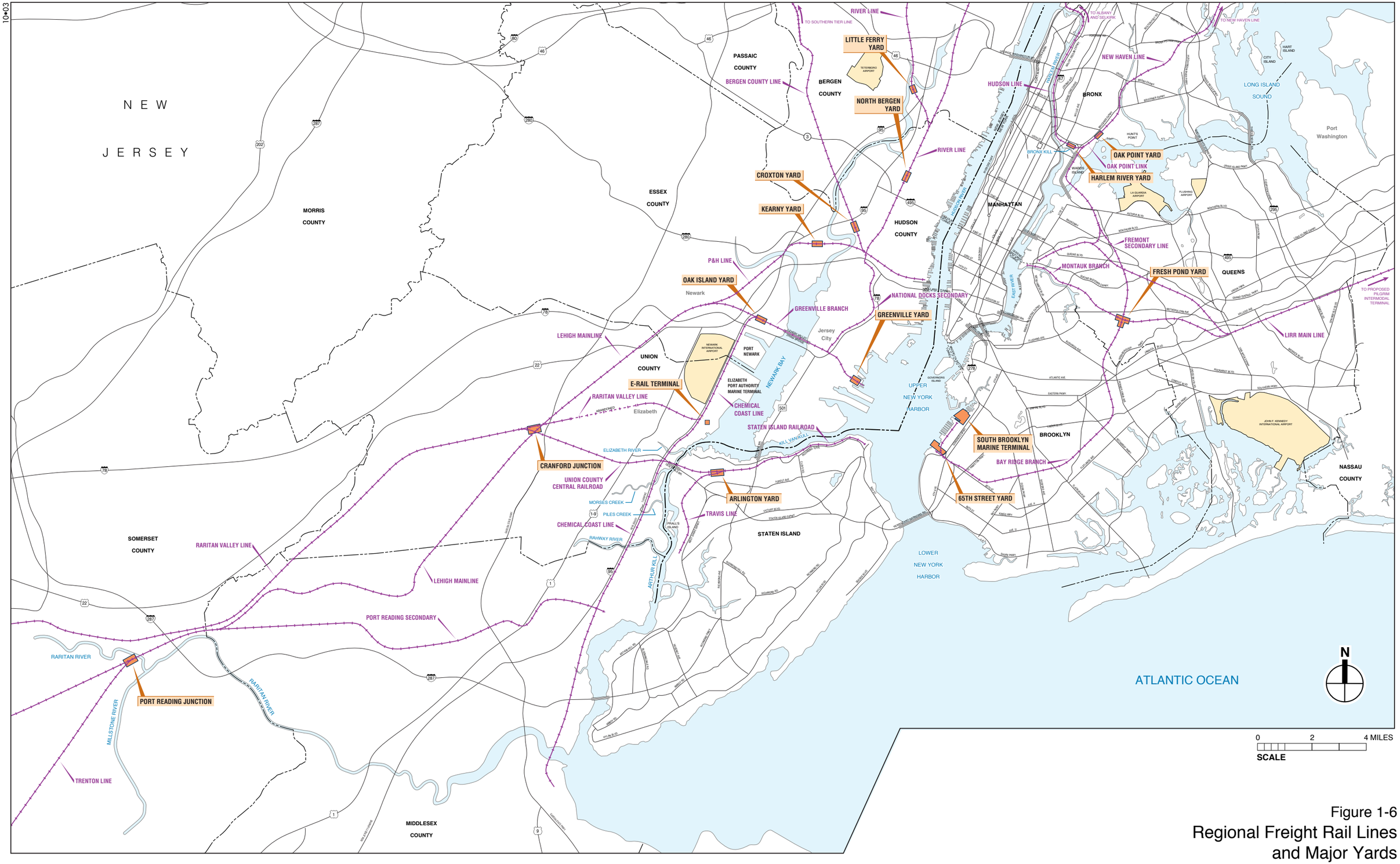
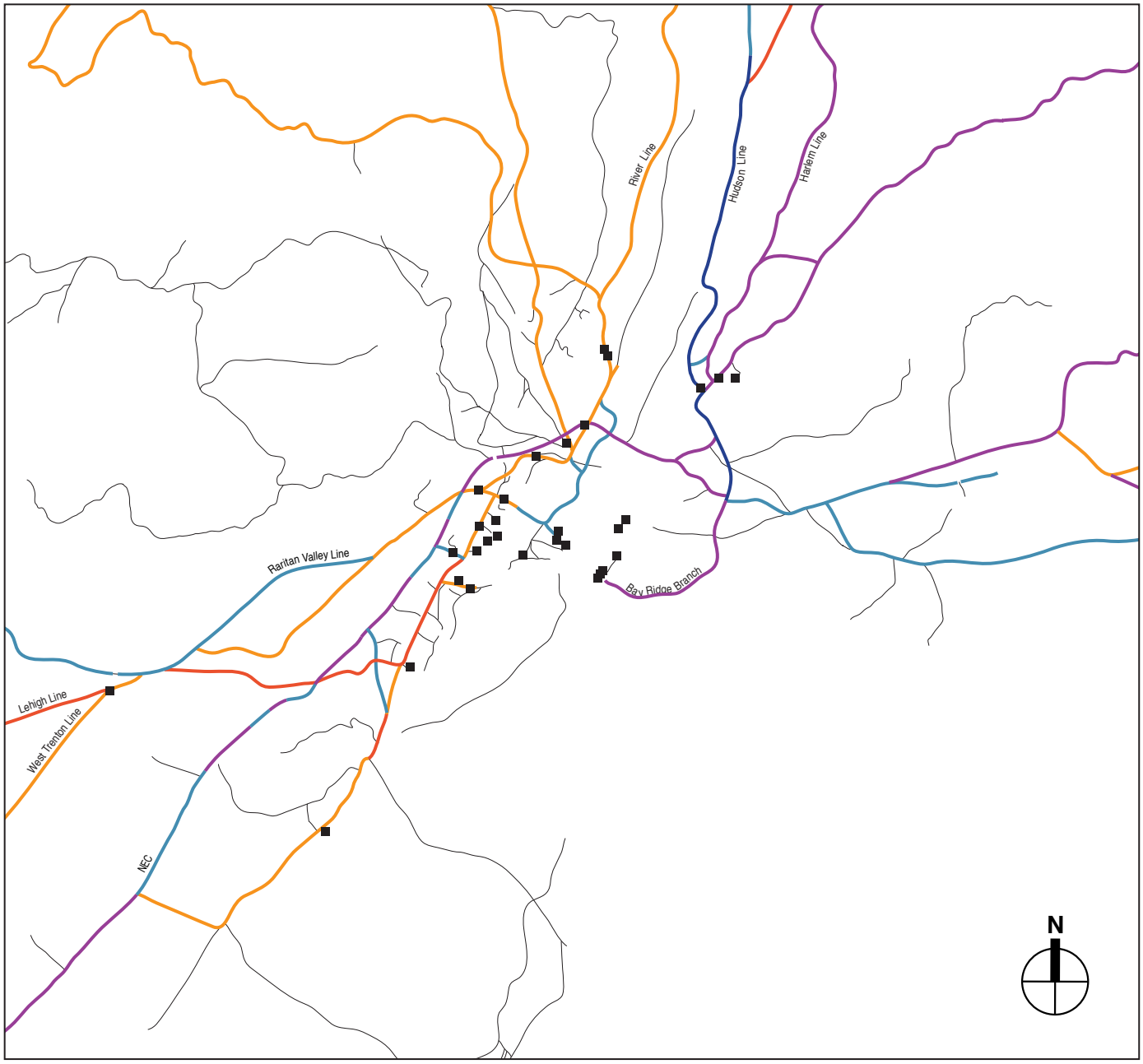


Figure 1-6

Regional Freight Rail Lines and Major Yards

CROSS HARBOR FREIGHT MOVEMENT PROJECT



- Intermodal Terminal and Yard
- Carload-Freight (less than 17'-6")
- TOFC (17'-6")
- TOFC (17'-6") Pending
- Doublestack (20'-6")
- Doublestack (20'-6") Pending
- Regional Rail Network

SOURCE: Cross Harbor Freight Movement Project

Figure 1-7
Regional Map of Tallest
Allowable Rail Car Types by Route
CROSS HARBOR FREIGHT MOVEMENT PROJECT

10•03

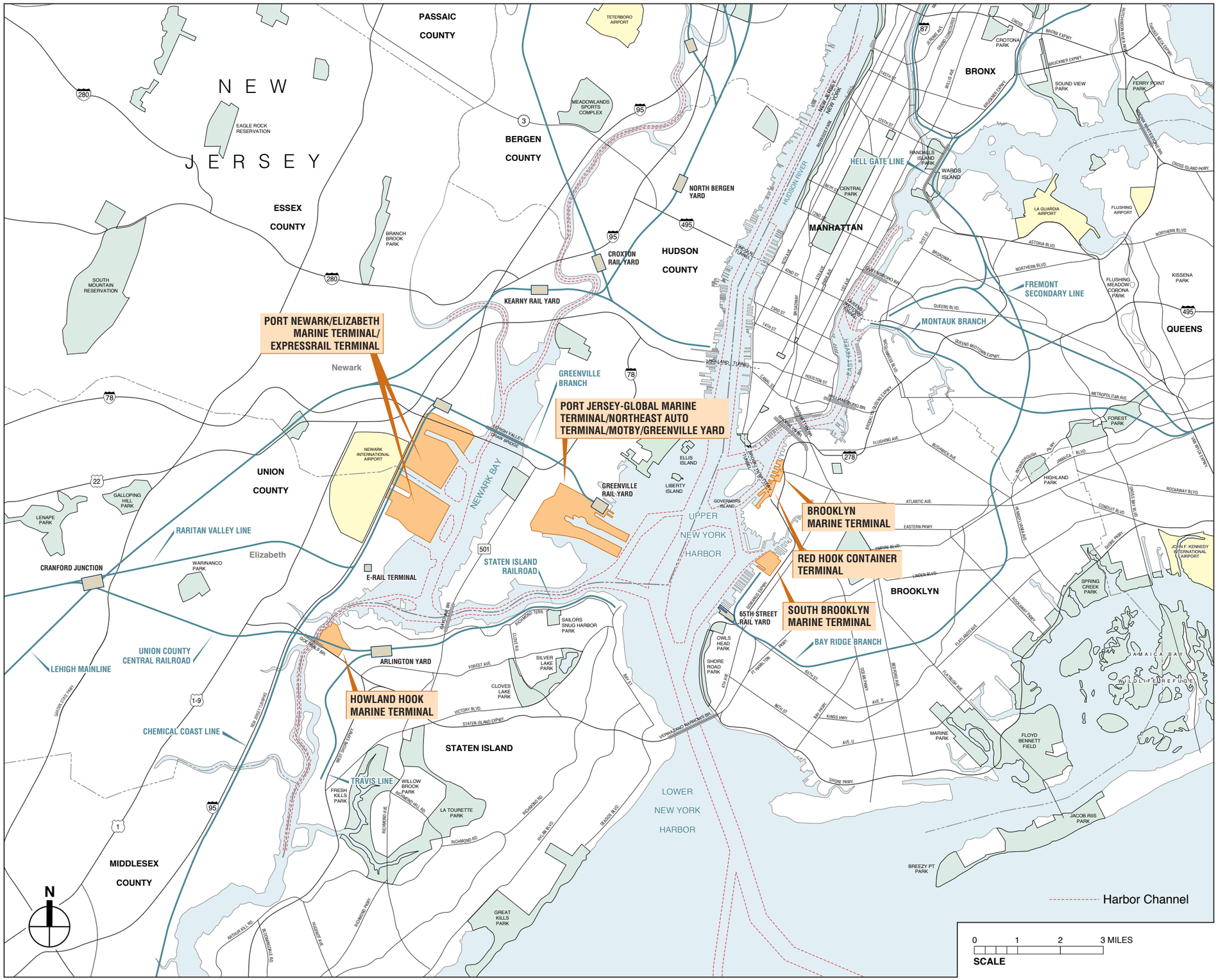


Figure 1-8
Port Facilities of Port of New York and New Jersey

CROSS HARBOR FREIGHT MOVEMENT PROJECT

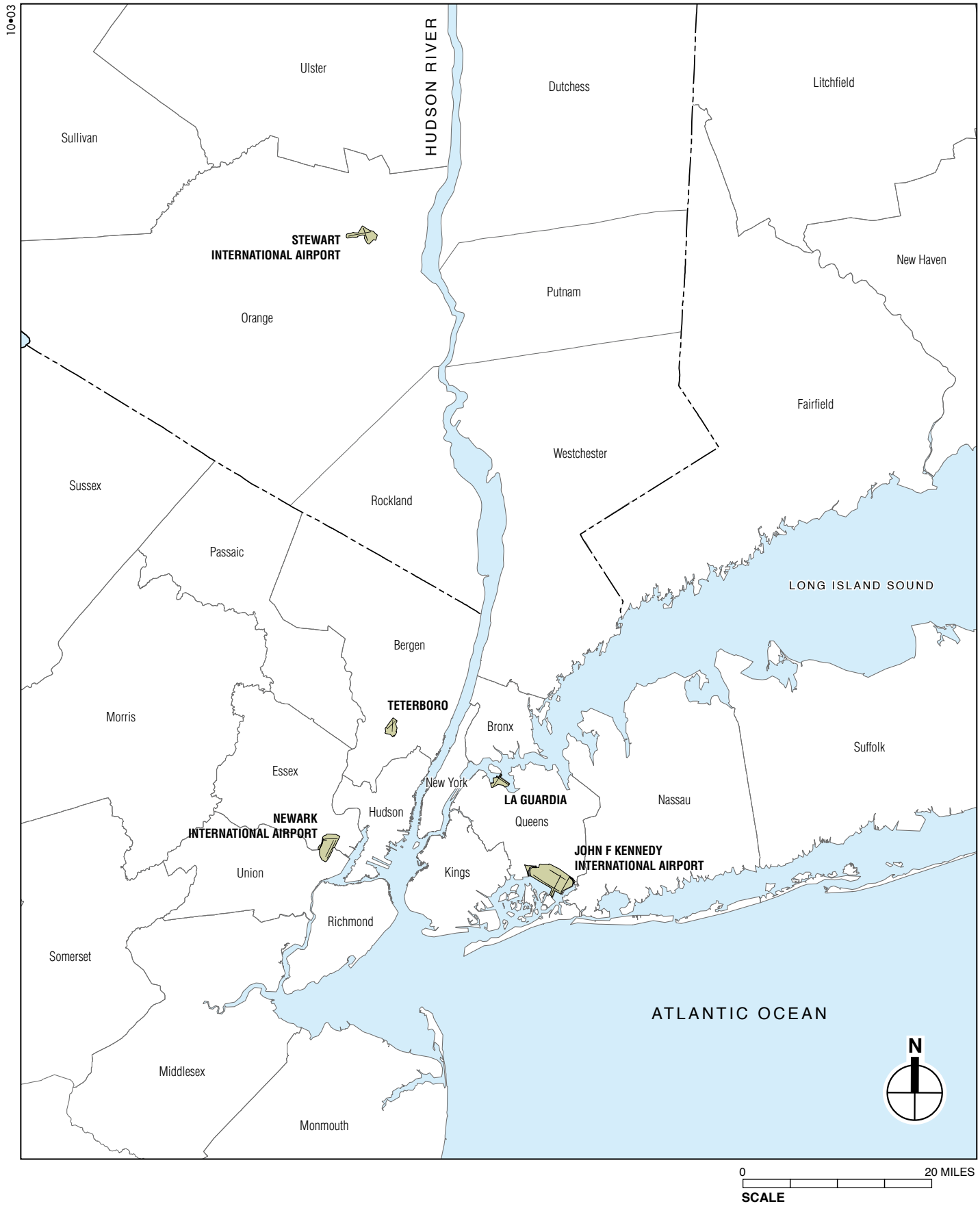


Figure 1-9
Regional Airports

CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 2: Project Alternatives

A. INTRODUCTION

The basic project alternatives for the Cross Harbor Freight Movement Project were identified as part of the Major Investment Study (MIS). This was done in a comprehensive planning process with considerable input from the project's steering and advisory committees and the public. During this process, 15 strategies involving highway, rail, water, and air transportation systems were screened and evaluated against project goals and objectives. Ultimately, three alternatives were recommended for more detailed assessment in the Environmental Impact Statement (EIS): the No Action Alternative, the Expanded Float Operations Alternative, and the Rail Freight Tunnel Alternative, which includes two alignment options—between Jersey City, New Jersey, and Brooklyn, New York, and between Staten Island and Brooklyn, New York. A Transportation Systems Management (TSM) Alternative, which maximizes the efficiency of the present freight system through low-cost investments, was later added for evaluation in the EIS. (Section H of this chapter, "Alternatives Considered and Discarded" contains a summary of the alternatives evaluated as part of the MIS.) As described in Chapter 1, "Project Purpose and Need," and confirmed in the MIS, alternatives that address an improved rail freight system between areas west and east of the Hudson River would best meet the goals of improving goods movement in the region, reducing dependence on trucking and increasing reliance on other less polluting transportation systems, promoting economic development, and achieving strategic transportation system redundancy.

During the EIS process, the recommended alternatives were further refined. Numerous implementation strategies were developed and evaluated based on engineering, transportation planning, environmental, and economic assessments. (See "Alternatives Considered and Discarded" below for a description of alternative strategies evaluated during the EIS process, but ultimately eliminated.) Based on these analyses, the following four alternatives are assessed in this EIS:

- *No Action Alternative*: The No Action Alternative includes rail, highway, and port infrastructure that currently exists or that has been committed to, or is otherwise likely to be implemented through public or private investment within the project's analysis horizon.
- *Transportation Systems Management (TSM) Alternative*: This alternative would include the more efficient management of the current transportation infrastructure (see Figure 2-1). The alternative would emphasize operating improvements such as more efficient float operations between Greenville Yard in Jersey City, New Jersey and 65th Street Yard in Brooklyn, New York and better coordination of passenger and rail freight operations along the Metro-North Railroad's Hudson Line. It would also provide strategic upgrades to the existing rail freight infrastructure such as low-cost capital improvements along the Bay Ridge Branch and Montauk Branch of the Long Island Rail Road (LIRR).

- *Expanded Float Operations Alternative:* This alternative would include enhanced and expanded capacity for the railcar float system across New York Harbor between Greenville Yard in Jersey City, and 65th Street Yard in Brooklyn. This alternative would also include low-cost capital improvements along the Bay Ridge Branch and Montauk Branch of the LIRR and possible construction of an expanded rail yard in West Maspeth (see Figure 2-2).
- *Rail Freight Tunnel Alternative (Tunnel Alternative)*: This alternative would include construction of a rail freight tunnel under New York Harbor. Two tunnel routes were evaluated: (1) between the Staten Island Railroad in Staten Island, NY, and the Bay Ridge Branch in Brooklyn, NY, (the "Staten Island alignment") and (2) between Greenville Yard in Jersey City, NJ, and the Bay Ridge Branch in Brooklyn, NY (the "New Jersey alignment"). In addition, two implementation scenarios are evaluated for each route: a single tunnel system ("Single Tunnel System") and a double tunnel system ("Double Tunnel System"). The Single Tunnel System would be built so as not to preclude expansion to the Double Tunnel System. The Tunnel Alternative would also include improvements to rail infrastructure such as increasing clearance heights along the Bay Ridge Branch and Montauk Branch of the Long Island Rail Road and/or the Staten Island Railroad and the expansion of an existing rail yard in West Maspeth, Queens (see Figures 2-3 and 2-4).

Capital and operational improvements would be needed for each alternative. Substantial upgrades and increased capacity of the existing East-of-Hudson rail freight system would be needed to accommodate modern rail freight trains. Improved operations would also be required, including continued and enhanced coordination among passenger and freight operators, shippers, and customers.

Assessed in the EIS are the impacts for two future years, 2010 and 2025. The year 2025 was selected as the long term planning horizon for all project alternatives. It is also consistent with planning horizons being used for other independent regional rail infrastructure planning efforts. For 2010, the TSM Alternative, Expanded Float Operations Alternative, and No Action Alternative are considered since these alternatives could be constructed and operational prior to the year 2010. For the long-term 2025 scenario, the continuation of these alternatives and the Tunnel Alternative is assessed. The rail freight tunnel could be operational by between 2011 and 2015.

B. PROJECT BACKGROUND

The region's rail freight transportation network is characterized by a complex system of railroads, rail lines, rail yards, and track and yard ownership and rights. Infrastructure conditions and rail operations differ east and west of the Hudson River. To develop the project alternatives, the existing rail network was reviewed and evaluated to identify infrastructure and operational needs and to maximize project consistency with the current existing network.

The primary regional freight railroads are as follows:

- Norfolk Southern (NS), a Class I Railroad,[1] provides service on routes between northern New Jersey and Chicago (via Buffalo or Harrisburg), and points south including Charlotte and Atlanta.

[1] A Class I Railroad is a railroad with an operating revenue in excess of $261.9 million.

- CSX Transportation (CSX), also a Class I Railroad, provides service between northern New Jersey and Chicago (via Selkirk, New York), and points south including Philadelphia and Miami, and the East-of-Hudson region (via Selkirk, New York). CSX leases rights to serve freight customers on Metro-North passenger tracks in New York and southern Connecticut. It owns the tracks beyond Metro-North stations in New York that continue north along the Hudson River to Selkirk and Albany.
- Canadian Pacific (CP), also a Class I Railroad, provides service from Canada and New England to northern New Jersey and New York City. CP has trackage rights to interchange with CSX at Oak Point Yard in the Bronx, deliver to customers at Harlem River Yard in the Bronx, and to interchange with New York and Atlantic (NY&A) at Fresh Pond Yard in Queens.
- Providence & Worcester (P&W) provides service to/from Connecticut and Fresh Pond, Queens, on the New Haven Line.
- New York & Atlantic Railway (NY&A) provides freight service along the Long Island Rail Road (LIRR) including the Bay Ridge Branch and the Montauk Branch in New York City and other LIRR lines to Long Island.
- New York Cross Harbor Railroad (NYCHRR) provides rail float service between Greenville Yard in Jersey City, New Jersey, and the First Avenue rail yard in Brooklyn.
- Amtrak provides limited mail, parcel and express service in conjunction with its passenger service on the Northeast Corridor.

A more detailed description is presented in Chapter 8, "Transportation."

FREIGHT ROUTES TO THE REGION

Numerous areas in Hudson, Essex, Union and Middlesex Counties in New Jersey and Staten Island, Brooklyn, Queens, and the Bronx in New York could be affected by the project. These areas are in the vicinity of rail yards, rail lines, and other project sites that could be impacted by construction and/or operational activities associated with the project alternatives. Existing conditions at each of these project sites is discussed in Chapter 3, "Land Use, Neighborhood Character, and Social Conditions."

C. NO ACTION ALTERNATIVE

OVERVIEW

The No Action Alternative includes rail infrastructure that currently exists or that has been committed to within regional transportation plans, capital plans, or that is otherwise likely to be implemented through public or private investment by the future analysis years for the EIS—2010 and 2025. In addition to rail projects, related planned highway and port projects are included in the No Action Alternative. The projects included in the No Action Alternative are independent initiatives that may complement the project alternatives, but are not dependent on them. The No Action Alternative project list was developed through close coordination with numerous transportation planning agencies and a review of these agencies' capital and transportation improvement plans.

Ongoing rail, highway and port proposals in the project area may affect or be affected by the implementation of the Cross Harbor Freight Movement Project. Projects that are currently not well defined, but may be implemented by the 2025 analysis year, are evaluated in a more qualitative manner as part of the assessment of cumulative impacts. (Please refer to Chapter 18, "Secondary and Cumulative Impacts," for a complete list of these projects and an assessment of potential cumulative effects.)

The No Action Alternative includes the following rail, highway, and port projects listed by geographic area. The list includes, for each project, the project sponsor and the EIS future analysis year by which the project will be implemented.

NEW JERSEY

Rail Projects

- Construction of a connection between the Staten Island Railroad and the Chemical Coast Line in New Jersey (southbound and northbound). Project sponsor: Port Authority of New York and New Jersey (PANYNJ). EIS Analysis Year: 2010 for the northbound connection, 2025 for the southbound connection.
- Implementation of a number of rail infrastructure projects under the New Jersey State Rail Plan. Those most directly related to the project include a Port Jersey rail connection to the Global Marine Terminal and the Military Ocean Terminal at Bayonne (MOTBY), and improvements to Oak Island Yard as described under Oak Island Yard below. Project Sponsor: New Jersey Department of Transportation (NJDOT), PANYNJ, and private rail operators. EIS Analysis Year: 2010.
- Implementation of a number of rail infrastructure projects on New Jersey rail lines. Those most directly related to the project include construction of a second mainline track between North Bergen Yard and Kearny Yard; additional signals along the P&H Line; the Waverly Loop connecting the P&H Line to the Greenville Branch; a second bypass track south of Oak Island Yard; a second track and TCS along the Chemical Coast Line between Elizabeth-port and Oak Island Yard; a connection between the Trenton Line and Port Reading Secondary; a second track (10.7 miles) along the Lehigh Mainline between Bound Brook and Potter; upgrading track, and adding sidings and TCS along the Port Reading Secondary; and adding a second track along the Chemical Coast Line between the Port Reading Secondary and Bayway Yard. It should be noted that while these projects are anticipated as part of the No Action Alternative, some may be required for the Tunnel Alternative. These projects are categorized into two phases; funding currently exists for the first phase only. Additional Project Sponsor: PANYNJ, NJDOT, Conrail Shared Assets Operations (CSAO), and private rail operators. EIS Analysis Year: 2010.

Highway Projects

- Implementation of Portway, a multi-phase transportation improvement program to improve access to and between the Newark/Elizabeth air/seaport complex, intermodal rail facilities, trucking and warehousing/transfer facilities, and the regional surface transportation system. The project is intended to relieve congestion and improve access for trucks in this area. Phase I consists of 11 NJDOT and two PANYNJ sponsored projects that would collectively create an eight-mile exclusive roadway from Ports Newark and Elizabeth to Croxton Yard. Among the Phase I projects are roadway improvements to Doremus Avenue over Oak Island

Yard; redesign of Charlotte and Tonnelle traffic circles in Jersey City; and construction of the McLester Street flyover to Expressrail Yard. Later phases could allow for an extension of Portway to the north to Little Ferry Terminal, to the east to the Global Marine Terminal and a potential future terminal at MOTBY, and to the south to industrial areas in Union County. Project Sponsor: NJDOT. EIS Analysis Year: 2010 for Phase I; 2025 for later phases.

Port Projects

- Development of a portion of the former MOTBY for port development. Project sponsor: City of Bayonne. EIS Analysis Year: 2010.
- Expansion of the Global Marine Terminal. Project sponsor: OOCL, which is a private shipping company. EIS Analysis Year: 2010.

STATEN ISLAND, NY

Rail Projects

- Reactivation of the Staten Island Railroad including reconstruction of Arlington Yard, track improvements between Arlington Yard and the Arthur Kill Lift Bridge, and extension of the Travis Branch. Project sponsor: New York City Economic Development Corporation (NYCEDC). EIS Analysis Year: 2010.

Highway Projects

- Twinning of the Goethals Bridge by constructing a second bridge adjacent to the existing Goethals Bridge and upgrading the existing bridge to current engineering standards; and short-term improvements proposed to reduce congestion on the existing span and on the Staten Island Expressway. At the time of the analysis, it was presumed that the capacity of the Goethals Bridge would be expanded in the future. Since this action would potentially improve the competitiveness of trucking in relation to the Tunnel Alternative, it was thought prudent to include it in the analysis to provide the most conservative estimate of tunnel demand. While there are no immediate plans or funding available to move forward with this project, there remains a reasonable likelihood that it will be completed by the Tunnel Alternative's design year of 2025. Project sponsor: PANYNJ. EIS Analysis Year: 2025.

Port Projects

- Expansion of Howland Hook Marine Terminal involving improvements to the existing site and the development of the adjacent Port Ivory site into an intermodal rail terminal. Project sponsor: PANYNJ. EIS Analysis Year: 2010.

BROOKLYN, NY

Rail Projects

- Upgrading of tracks along 1st Avenue between 39th and 51st Streets in Sunset Park to serve intermodal and port facilities along the Brooklyn waterfront. Project sponsor: NYCEDC. EIS Analysis Year: 2010.

- Expanding the IRT Nostrand Avenue subway beyond Flatbush Terminal along the north side of the Bay Ridge Branch right-of-way for approximately 1,200 feet. Project Sponsor: New York City Transit (NYCT). EIS Analysis Year: 2010.

Port Projects

- Development of intermodal rail facilities including on-dock rail yards and other short term improvements at the South Brooklyn Marine Terminal. Project sponsor: NYCEDC. EIS Analysis Year: 2010.
- Redevelopment of South Brooklyn Marine Terminal for maritime use. Project sponsor: NYCEDC. EIS Analysis Year: 2010.

QUEENS, NY

Rail Projects

- Increasing clearance heights to 17 feet, 6 inches to accommodate trailers on flat cars (TOFC) on the Fremont Secondary. Project sponsor: NYSDOT. EIS Analysis Year: 2010.

Other

- Construction of the Review Avenue Transfer Station that would transport municipal solid waste by barge or rail via the Montauk Branch. Project sponsor: Private entity. EIS Analysis Year: 2010.

BRONX, NY

Rail Projects

- Increasing clearance heights to 17 feet, 6 inches to accommodate TOFC along the Hudson Line between Selkirk, New York and the Bronx. Project sponsor: Private entity. EIS Analysis Year: 2010.

Other

- Potential expansion of municipal solid waste facilities at Harlem River Yard and/or at American Marine Rail adjacent to Oak Point Yard that would transport municipal solid waste by barge or rail via the Hudson Line. Project sponsor: Private entities. EIS Analysis Year: 2010**.**

Highway Projects

- Implementation of a dedicated truck route along Edgewater Road. The truck route is planned and will be more fully defined as part of NYSDOT's Bruckner-Sheridan Expressway project. Project sponsor: NYSDOT. EIS Analysis Year: 2010.

LONG ISLAND, NY

Rail Projects

- Construction of a new rail freight yard at the former Pilgrim State Psychiatric Hospital site in Islip, NY, and associated improvements along the Long Island Rail Road (LIRR) Main Line. Project sponsor: NYSDOT. EIS Analysis Year: 2010.

UPPER NEW YORK HARBOR

- Deepening of navigational channels in the Port of New York and New Jersey (PONYNJ) to provide up to 50-foot depth in selected channels. Project sponsor: The U.S. Army Corps of Engineers (USACOE). EIS Analysis Year: 2010 assumes 45 feet for Newark Bay and Kill Van Kull and 41 feet for Arthur Kill and Port Jersey; 2025 assumes 50 feet for these channels as well as for Anchorage, Bay Ridge and Ambrose Channels (to 53 feet).
- Enhancement of the railcar float system. Project sponsor: PANYNJ. EIS Analysis Year: 2010.

REGIONAL PROJECTS

Highway Projects

- Implementation of the Regional Transportation Plan (RTP), Transportation Improvement Program (TIP), and Congestion Management System (CMS) for the New York Metropolitan Region. Project sponsor: New York Metropolitan Transportation Council (NYMTC) members. EIS Analysis Year: 2010.
- Implementation of the RTP, TIP, and CMS for northern New Jersey. Project sponsor: New Jersey Transportation Planning Authority (NJTPA) members, EIS analysis year: 2010.

OPERATIONS

The No Action Alternative infrastructure improvements and projected increases in goods movement in the region would generate additional rail traffic both east and west of the Hudson River. Some of the increased demand is expected to be accommodated on existing trains. Table 2-1 summarizes the train traffic for the project rail lines under Existing Conditions and the No Action Alternative.

IMPROVEMENTS AND OPERATIONS AT PROJECT SITES

The following section describes improvements and operations at project sites under the No Action Alternative based on the list of No Action projects above.

NEW JERSEY

Greenville Yard

The Greenville Yard will continue to serve as the New Jersey marine terminal for cross harbor float operations. No capital improvements are planned. With new float facilities at 65th Street Yard, the facility would serve one barge and one train per day.

Oak Island Yard

The Oak Island Yard will continue to serve as a classification yard. CP is proposing to improve its intermodal facility at Oak Island Yard by constructing a food facility, a paved transfer area, and 2,000 feet of new trackage, and rehabilitating 8,000 feet of track. A second bypass track will be constructed south of the yard. There will be truck access improvements under Portway on Doremus Avenue which runs through the yard. The yard would continue to serve 20 trains per day under the No Action Alternative, as under existing conditions.

Table 2-1
Rail Traffic Under Existing Conditions and No Action Alternative-2025

Rail Line	Existing Traffic (passbys/day)	No Action Traffic (passbys/day)
Lehigh Mainline	94	106
Northeast Corridor	324	326
River Line	34	36
Southern Tier	114	114
Chemical Coast Line	11	16
P&H Line	27	31
National Docks Secondary	10	8
Greenville Branch (Oak Island Yard to National Docks)	16	14
Staten Island Railroad (Arlington Yard to Arthur Kill Lift Bridge)	0	4
Bay Ridge Branch	2	2
Montauk Branch West (Fresh Pond Yard to Maspeth Yard)	6	6
Fremont Secondary	6	6

Greenville Branch

The Waverly Loop to connect the P&H Line to the Greenville Branch will be constructed. The number of trains traveling between the National Docks Secondary and the Chemical Coast Line will decrease to 14 trains per day.

P&H Line

A second track will be constructed between North Bergen Yard and Kearny Yard in the rail line right-of-way. The number of trains traveling the line under the No Action Alternative is projected to increase to 31 trains per day from 27 trains under existing conditions.

Chemical Coast Line

The northbound Chemical Coast Line connection to the Staten Island Railroad will be constructed under 2010 conditions and the southbound connection under 2025 conditions. These connections will offer Staten Island access to the national freight rail network and major rail terminals along the Chemical Coast Line (including Oak Island Yard). A second track will be constructed along the Chemical Coast Line between the Port Reading Secondary and Bayway Yard (just south of the Staten Island Railroad) and between Elizabethport and Oak Island Yard. The number of trains traveling the line under the No Action Alternative is projected to increase to 14 to 18 trains per day (for different portions of the rail line) from 10 to 12 trains under existing conditions.

NEW YORK

Staten Island

Arlington Yard. The currently inactive Arlington Yard will be developed into an intermodal facility as part of the Staten Island Railroad Reactivation Project. The yard will serve as a bulk and intermodal facility that will receive and deliver freight. The yard will serve Staten Island businesses, the Howland Hook Marine Terminal, and the NYC Department of Sanitation's Waste Transfer Facility. The yard will be developed in two phases: 2010 and 2025.

Howland Hook Marine Terminal. Howland Hook Marine Terminal will be an expanded facility under 2010 and 2025 conditions. The proposed expansion includes improvements to the existing site and the adjacent Port Ivory site. Improvements to the existing site include a new 500-foot wharf extension, two new cranes and site reconfiguration. At the Port Ivory site, an 80- to 100-acre intermodal rail yard will be developed. The new rail will contain 6 to 10 tracks, container storage parking spaces, gantry cranes, side loaders and yard tractors. The area of the site north of Richmond Terrace will include a pier and container staging area. In the area south of Richmond Terrace, the existing buildings along the west side of Western Avenue may be demolished. Howland Hook Marine Terminal will generate on average, two roundtrip trains per day with increased numbers that would peak during ship arrivals and departures

Staten Island Railroad. The Staten Island Railroad will be reactivated as part of the Staten Island Railroad Reactivation Project under 2010 and 2025 conditions. The line will provide doublestack service. East of Arlington Yard and Harbor Road, the rail line will continue to be inactive. Approximately two roundtrip trains will travel the line each day.

Brooklyn

65th Street Yard. 65th Street Yard will serve as a marine terminal for cross harbor float operations to Greenville Yard, NJ. The yard will offer improved service with its two recently constructed float bridges. Truck access improvements are in the design phase and will be constructed in 2003. When activated, the facility would serve one barge and one train per day.

South Brooklyn Marine Terminal (SBMT)/1st Avenue Rail Line. The SBMT will undergo two phases of development under the No Action Alternative. In the short term, intermodal facilities, including an on-dock rail yard and other improvements, will be developed at the site. The second phase will involve the redevelopment of the site for maritime use. In addition, the tracks adjacent to the terminal along First Avenue between 39th and 65th Streets will be upgraded to serve intermodal and port facilities along the Brooklyn waterfront. These projects will occur under both 2010 and 2025 No Action Alternative conditions.

Bay Ridge Branch. No capital improvements are expected along this rail line under the No Action Alternative. The number of trains traveling the line under the No Action Alternative is projected to remain at two trains per day.

Queens

Montauk Branch of the LIRR. With the introduction of a new LIRR terminal at Grand Central Station under the East Side Access Project, LIRR ridership will be reduced along this branch and the line will continue to serve as the west end terminal for diesel trains. At the new Review Avenue Transfer Station, solid waste is expected to be transported primarily by barge; however, since the site is accessible to the Montauk Branch, solid waste could be transported via the rail

line at approximately one roundtrip train each day. The number of trains traveling the line under the No Action Alternative is projected to remain at six trains per day.

Fremont Secondary. The Fremont Secondary is a short portion of the rail route that extends from Selkirk to the new Pilgrim State Yard. The northern end of the Fremont Secondary is Oak Point Link in the Bronx and the southern end is at Fresh Pond Yard in Queens. The route will be cleared for TOFC service under 2010 and 2025 conditions. In addition to removing TOFC clearance restrictions, weight limitations along the Hell Gate Bridge must also be addressed to handle 286,000-pound rail freight traffic. CSX is negotiating with Amtrak on capital improvements to fortify the bridge and provide additional monies for expenses caused by higher wear and tear. The number of trains traveling the line under the No Action Alternative is projected to remain at six trains per day.

Bronx

Harlem River Yard. The rail lines serving this facility have been cleared for TOFC service and the 28-acre rail yard will operate as an intermodal facility under 2010 and 2025 conditions. Depending on the outcome of NYCDOS's ongoing update of its SWMP, Harlem River Yard may also be the location of an expanded municipal solid waste facility that uses rail and barge. The number of trains received at the yard under the No Action Alternative is projected to remain at four to six trains per day. This includes approximately one roundtrip train serving the solid waste facility.

Oak Point Yard. The Oak Point Yard will continue to serve as a classification yard. No known capital improvements are planned. The number of trains received at the yard under the No Action Alternative is projected to remain at six trains per day.

D. TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

OVERVIEW

The TSM Alternative would include measures to manage more effectively the existing transportation infrastructure to accommodate freight demand without major capital expenditures. The alternative, which would emphasize operating improvements and strategic upgrades to critical bottlenecks along the existing freight rail system, could include the following elements:

- Increased efficiency in float operations between Greenville Yard, Jersey City, NJ, and 65th Street Yard, Brooklyn, NY, including improved scheduling coordination between the float operator, rail operators, and customers;
- Improved rail freight movement along the Hudson Line through better coordination of rail operators using the line and upgraded signaling, allowing one additional round trip rail freight train to travel the line per day, during the mid-day "commuter lull,"[1]

[1] The addition of a single mid-day train could reasonably be accomplished without significant rescheduling of existing Metro-North or Amtrak schedules, and with minimal infrastructure investment along the right-of-way. An additional train scheduled half a day apart from the existing services is also expected to provide greater incremental benefit, because it would reduce the travel time and travel time variability for New York bound cars more than an additional train in the overnight passenger lull. Other evaluations currently underway by both NYSDOT and MTA Metro-North have identified potential

- Rehabilitation of two existing float bridges at Greenville Yard;
- Upgrading yard trackage at 65th Street Yard to better serve float operations;
- Upgrading the single operating track along the Bay Ridge Branch of the LIRR, including replacement of tracks, railroad ties, and ballast in certain locations, to allow higher service speeds;
- Minor adjustments to clearance heights to accommodate TOFC service (17 feet, 6 inches) along the Bay Ridge Branch and Montauk Branch of the LIRR; and
- Signal improvements on the Montauk Branch to permit bi-directional operation on existing tracks.

This alternative would build on and enhance a number of No Action Alternative projects that will be undertaken by NYSDOT and other agencies including the removal of TOFC clearance restrictions along the Hudson Line. Although most goods shipped by rail to East-of-Hudson would continue to travel via the Selkirk route, there would be improved rail freight service to major parts of New York City and Long Island.

The alternative would provide an easily implementable, short-term response to the growing need for improved cross harbor rail capacity. However, due to capacity limitations of the rail car float system and East-of-Hudson rail infrastructure, it would divert only 69,000 tons per year of freight from truck to rail.

OPERATIONS

Under this alternative, trains would arrive to Fresh Pond Yard from two directions: from the south via the 65th Street Yard float operation and from the north via the Selkirk route. The freight would then be interchanged at Fresh Pond Yard for local delivery to locations in Queens, Brooklyn and Long Island. Freight arriving from the float operation may also be stored and transferred to truck at 65th Street Yard. The improvements under the TSM Alternative may generate an additional round trip train on the Hudson Line and Fremont Secondary to Fresh Pond Yard. This would be the result of enhanced communication between passenger service and freight service that would allow an additional "window" for freight operations outside the normal freight windows in the nighttime hours. Improved scheduling would also be implemented for the railcar float operation and would include better connections between the float and train arrivals and departures. Other minimal increases in rail freight would be accommodated on existing trains.

COSTS

Capital costs are $31 million and operational costs are estimated at $2.4 million per year.

capacity for up to four additional round trip trains per day, mostly during the overnight period. For the purposes of the Cross Harbor EIS analysis, however, a single additional mid-day train is assumed. This issue may be explored further in the FEIS, once the NYSDOT and MTA Metro-North work is completed.

IMPROVEMENTS AND OPERATIONS AT PROJECT SITES

The following section describes improvements and operations at project sites under the TSM Alternative.

NEW JERSEY

Greenville Yard

Greenville Yard would serve as the New Jersey marine terminal for the Cross Harbor float operation between Greenville Yard and 65th Street Yard. Two Greenville float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new track work. Construction could be completed within two years and would therefore be constructed and operational under both 2010 and 2025 conditions. The facility would serve one barge and one train per day as under the No Action Alternative.

NEW YORK

Hudson Line

Operational improvements on the Hudson Line would be implemented under the TSM Alternative. These improvements would allow for tighter spacing of trains, which, in conjunction with coordinated scheduling, would result in additional opportunity for freight trains.

Brooklyn

65th Street Yard. Under the TSM Alternative, 65th Street Yard would be expanded. Many of the existing tracks would be removed and approximately 12 new tracks would be installed including four tracks for storage and switching and eight tracks for loading and unloading. The facility would serve one barge and one train per day as under the No Action Alternative.

Bay Ridge Branch of the LIRR. Tracks along the rail line would be upgraded through the replacement of tracks, railroad ties, and ballast in certain locations to allow for higher service speeds. In addition, there would be a minor (less than an inch) adjustment to the clearance at Flatbush Avenue. No additional trains are projected for this line.

Queens

Fresh Pond Yard. No capital improvements are proposed for this site under the TSM Alternative. The yard would serve as the site for a minimal amount of additional rail interchanges from the additional train traveling from the Hudson Line.

Montauk Branch of the LIRR. Minor improvements that would be made to the Montauk Branch include adjusting clearance heights at five overhead clearances to provide for TOFC service and signal improvements to permit bi-directional operation on existing tracks. The clearance work would involve localized excavation at the clearances of less than 1.5 feet.

Bronx

Harlem River Yard/Oak Point Yard. No capital improvements are proposed for these sites under the TSM Alternative. However, potential operational improvements along the Hudson Line may generate an additional train that would stop at one or both of these yards.

E. EXPANDED FLOAT OPERATIONS ALTERNATIVE

OVERVIEW

The Expanded Float Operations Alternative would include enhanced and expanded capacity for the railcar float system across New York Harbor between Greenville Yard and 65th Street Yard. This alternative could include the following elements:

- Increased efficiency in float operations between Greenville Yard, Jersey City, NJ and 65th Street Yard, Brooklyn, NY, including frequent and scheduled float operations and improved schedule coordination between float operators, and the bulk rail operations providing connecting service on either side of the harbor. The current operation is not scheduled service.
- Improved rail freight movement along the Hudson Line through better coordination of rail operators using the line, and upgraded signaling;
- Rehabilitation or new construction of four float bridges at Greenville Yard;
- Construction of two additional float bridges at 65th Street Yard and upgrading yard trackage at 65th Street Yard to better serve float operations;
- Construction of a possible expanded bulk rail yard in West Maspeth;
- Upgrading of tracks along the Bay Ridge Branch of the LIRR, including replacement of tracks, railroad ties, and ballast in certain locations, to allow higher service speeds;
- Minor adjustments to clearance heights to accommodate TOFC service (17 feet, 6 inches) along the Bay Ridge Branch and Montauk Branch of the LIRR between Fresh Pond Yard and the expanded rail yard in West Maspeth; and
- Signal improvements on the Montauk Branch to permit bi-directional operation on existing tracks.

The Expanded Float Operations Alternative would divert an estimated 460,000 tons per year of freight from truck to rail.

OPERATIONS

The Expanded Float Operations Alternative would generate additional rail traffic between the East-of-Hudson and West-of-Hudson regions facilitated by improved float service, new rail yard capacity, and upgraded rail lines. Under scheduled float service, barges would leave on a regular schedule regardless of whether they were fully loaded. Scheduled service, with greater reliability and shorter travel time, would be more attractive to shippers.

Under this alternative, three barges would be in operation. There would be one trip in each direction each hour over 16 hours on weekdays and 8 hours on weekend days. Each barge would be capable of handling at least twenty 70-foot long freight cars. While one barge is crossing the harbor, one additional barge would be unloaded and loaded at each terminal. Each harbor crossing would take only 30 minutes. The barge operations would require a rail crew at each terminal, in contrast to the current operation that required a single rail crew to be transported across the harbor with each trip. Currently, the existing float service crosses the harbor once per day or less.

Additional trains would be generated by the increased float operations. In New Jersey, there would be an additional daily roundtrip train along the Greenville Branch between Oak Island Yard and Greenville Yard, and two new daily round trip trains (one per day on weekends) that would shuttle between northern New Jersey rail yards and Greenville Yard. These trains would travel along the National Docks Secondary, P&H Line, Chemical Coast Line and Greenville Branch.

East of the Hudson River, there would be an additional daily roundtrip train along the Bay Ridge Branch between 65th Street Yard and Fresh Pond Yard. An additional train would also be generated along the Hudson Line and along the Fremont Secondary between Oak Point Yard and Fresh Pond Yard as a result of improvements along the Hudson Line including enhanced communication between passenger service and freight service, allowing for an additional "window" for freight operations outside the normal freight hours. Freight arriving at Fresh Pond Yard would then be interchanged for local delivery to the West Maspeth Yard and other location in Queens, Brooklyn and Long Island. This freight is expected to be handled on existing trains leaving Fresh Pond Yard. Freight arriving from the float operation may also be stored and transferred to truck at 65th Street Yard.

COSTS

Capital costs for the Expanded Float Operations Alternative are estimated at $80 million. Total capital costs include costs of construction, engineering and management, and property acquisitions required for the project.

Operational costs are estimated at $18 million per year. It is not likely that the cost of providing scheduled service for this scheduled hourly service (for 16 round trips per day) would be borne by the market. It is also unlikely that shippers would use the float if the price for the service reflects the full operational costs. Therefore, public sector funding may be required to make this Expanded Float service alternative viable (see Chapter 21, "Financial Analysis").

IMPROVEMENTS AND OPERATIONS AT PROJECT SITES

The following section describes improvements and operations at project sites under the Expanded Float Operations Alternative.

NEW JERSEY

Greenville Yard

Four Greenville float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new track work. Construction could be completed within two years and would therefore be constructed and operational under both 2010 and 2025 conditions.

A significant difference between this alternative and the TSM Alternative is scheduled service which would increase reliability and demand for the float operations. Under this alternative, up to 16 round trip railcar float trips per day (eight per day on weekends) would be floated across the harbor in 2010 and 2025 conditions, up from a single daily round trip under the No Action Alternative.

NEW YORK

Brooklyn

65th Street Yard. Two additional float bridges would be added to 65th Street Yard to accommodate increased traffic from scheduled service. Many of the existing tracks would be removed and approximately 12 new tracks would be installed, including four tracks for storage and switching and eight tracks for loading and unloading. Construction could be completed within two years and would therefore be constructed and operational under both 2010 and 2025 conditions.

Expanded float service would increase the number of railcar floats handled by this facility to approximately 16 round trip railcar float trips per day (eight per day on weekends) in 2010 and 2025, up from a single daily round trip under the No Action Alternative.

Bay Ridge Branch of the LIRR. Tracks along the rail line would be upgraded through the replacement of tracks, railroad ties, and ballast in certain locations to allow for higher service speeds. In addition, there would be a minor (less than one inch) adjustment to the clearance at Flatbush Avenue. More frequent barging could increase rail traffic along this line by an additional round trip train per day, to two daily round trip trains up from a single daily round trip train under the No Action Alternative.

Queens

West Maspeth Yard. An expanded rail yard would be developed in West Maspeth, Queens, capable of handling both bulk and trailer on flat car (TOFC)/container on flat car (COFC) intermodal freight. The yard would serve as a central New York City location for the transfer of freight between truck and rail.

The yard would be built on the existing West Maspeth Yard site and the vacant former Phelps Dodge refinery site (see Figure 2-5). The yard would contain two tracks for storage and two to three for unloading, yielding a capacity of 90 cars, assuming cars would remain at the site an average of three days. Construction of the yard could be completed within two years and would be operational under both 2010 and 2025 conditions. The facility would be expected to serve approximately one train per day.

Fresh Pond Yard. No capital improvements are proposed for this site under the Expanded Float Operations Alternative. The yard would serve as the site for a minimal amount of additional interchanges from improved float service, the expanded West Maspeth Yard, and improvements along the Hudson Line.

Montauk Branch of the LIRR. Minor improvements that would be made to the Montauk Branch include adjusting clearance heights at five overhead clearances and signal improvements to permit bi-directional operation on existing tracks. The clearance work would involve localized excavation at the clearances of less than 1.5 feet. Freight enroute to the West Maspeth Yard would be accommodated on the existing daily round trip train from Fresh Pond Yard.

Bronx

Harlem River Yard/Oak Point Yard. No capital improvements are proposed for these sites under the Expanded Float Operations Alternative. However, potential operational improvements along the Hudson Line may generate an additional train that would stop at one or both of these yards.

F. RAIL FREIGHT TUNNEL ALTERNATIVE

The Rail Freight Tunnel Alternative (Tunnel Alternative) would establish a direct rail freight connection between the East- and West-of-Hudson regions through the construction of a rail freight tunnel under New York Harbor. Two tunnel alignments have been evaluated in the EIS: (1) between Greenville Yard, Jersey City, NJ and the Bay Ridge Branch, Brooklyn, NY (the "New Jersey alignment"); and (2) between the Staten Island Railroad, Staten Island, NY, and the Bay Ridge Branch, Brooklyn, NY (the "Staten Island alignment").

Both of these alignments would involve the initial construction of a tunnel under the New York Harbor. The tunnel would be designed to accommodate the potential future construction of a second parallel tunnel. Demand forecasts show that sufficient demand will exist in the project design year of 2025 to support construction of a second tunnel. Since the Tunnel Alternative could eventually be expanded to include a second tunnel and its associated upland improvements, this EIS presents the elements and potential impacts of both the one- and two-tunnel systems. This EIS evaluates the two potential implementation scenarios for the Tunnel Alternative as follows:

- Single Tunnel System—The Single Tunnel System would include the construction of a single rail freight tunnel across the New York Harbor, using either the New Jersey alignment or the Staten Island alignment. The Single Tunnel System would also comprise new rail yard capacity, improvements at existing yards and rail lines, and construction of additional tracks and increased clearance heights. The tunnel would be expected to be completed between 2011 and 2015. The Single Tunnel System could remain as a permanent, stand-alone tunnel, or as the initial phase of a two tunnel system.
- Double Tunnel System—Under this scenario, the Single Tunnel System would be implemented as described above. It assumes that once the single-track tunnel is operational, additional demand exists to construct a second parallel tunnel. The Double Tunnel System would also comprise the expansion of West Maspeth Yard and the installation of rail track in certain locations where not previously required in the Single Tunnel System. Whether the Double Tunnel System would b implemented immediately or as an expansion of the Single Tunnel System, the Double Tunnel System would be operational by the analysis year of 2025.

This section and subsequent chapters of this EIS have been structured to present a full assessment of the Single Tunnel System, followed by a supplemental assessment of any additional elements and/or impacts that would be generated if the Double Tunnel System were implemented. If the Single Tunnel System is constructed and subsequently expanded to the Double Tunnel System, it is anticipated that additional approvals and analyses would be required. In either case, potential impacts are based on 2025 demand forecasts.

SINGLE TUNNEL SYSTEM

Under the New Jersey alignment of the Single Tunnel System, approximately 28 trains (i.e., 14 round-trip trains), would use the tunnel each day. These 28 daily trains would transport on average 13.3 million annual tons of freight in 2025. Under the Staten Island alignment, approximately 24 trains (i.e., 12 round-trip trains) would use the tunnel each day, carrying an

average of 12.7 million annual tons of goods[1]. As described above under "Freight Routes to the Region," rail freight would enter the region via one of several well-used rail lines–the Lehigh Mainline, Chemical Coast Line, Northeast Corridor, River Line or Southern Tier. From these main lines, trains would stop at existing intermodal and classification rail yards in New Jersey where cars remaining in New Jersey would be cut-off from cars destined for East-of-Hudson, or dedicated East-of-Hudson bound trains would continue through the tunnel.

Under the New Jersey tunnel alignment, eastbound trains would continue from the main lines and rail yards along secondary routes to the tunnel. Secondary routes include the Greenville Branch, Chemical Coast Line, P&H Line. Under the Staten Island tunnel alignment, eastbound trains would travel from the main lines and yards via the Chemical Coast Line (southbound or northbound), across the Arthur Kill Lift Bridge and continue along the Staten Island Railroad in northern Staten Island to the tunnel at Alaska Street. (For more detailed route information, see Chapter 8, "Transportation.")

Trains would exit either tunnel alignment along the Bay Ridge Branch between 12th and 13th Avenues in Brooklyn. Trains would continue along the Bay Ridge Branch to Fresh Pond Yard and then on to one of several rail yards, where freight would be transferred to trucks for delivery to customers (see Figure 2-6). Ultimate destinations would depend on the type of train.

- *Intermodal trains* (trains carrying containerized freight) destined for the expanded rail yard in West Maspeth, Queens ("West Maspeth Yard"), would continue without stopping through Fresh Pond's West Yard and along the Montauk Branch to the new yard.
- *Manifest or bulk trains* (trains carrying bulk, liquid, or individually packaged freight) would likely include cars destined for multiple East-of-Hudson yards including Harlem River Yard and Oak Point Yard in the Bronx, the new Pilgrim Yard in Long Island, or 65th Street Yard in Brooklyn. From the tunnel portal, trains would continue north on the Bay Ridge Branch to Fresh Pond Yard. At Fresh Pond Yard, cars destined for Brooklyn, Queens and Long Island would be uncoupled and the train would continue north with cars destined for the Bronx yards via the Fremont Secondary. Trains destined for Brooklyn, Queens and Long Island would be classified at Fresh Pond Yard. Cars destined for Pilgrim Yard in Long Island would be delivered via the Montauk Branch and LIRR Mainline, and cars destined for 65th Street Yard would return south via the Bay Ridge Branch. Cars could also be delivered directly to businesses with rail sidings along the Bay Ridge Branch, Montauk Branch and Bushwick Branch. (For more detailed route information, see Chapter 8, "Transportation.")

THE TUNNEL AND RELATED INFRASTRUCTURE IMPROVEMENTS

The Single Tunnel System would require significant capital improvements including the construction of a one-track tunnel, new yard capacity, and improvements at existing yards and rail lines to accommodate modern train service. These construction efforts are summarized below and detailed in Chapter 16, "Construction and Construction Impacts."

[1] As explained in Chapter 8, "Transportation," fewer trains would utilize the Staten Island alignment under the Single Tunnel System due to routing constraints and potential wait times en route to the one-track Staten Island tunnel.

Tunnel Alignment and Construction

Either tunnel alignment would consist of a single-track tunnel with provision to add a second bored tube across the harbor in the future. Some parts of the tunnel as well as the concrete cut and cover sections would be sized to allow installation of a second track when the additional bored tube is added.

Bored Tunnel

The tunnel would be constructed using primarily bored tunnel technology. For the Staten Island alignment, a tunnel boring machine (TBM) would be used to drill through rock in Staten Island and/or through compacted soil underneath the harbor and in Brooklyn. A portion of the New Jersey tunnel alignment would be constructed using immersed tube tunnel technology. An immersed tube tunnel would be required in the Harbor between the shoreline at Greenville Yard and the tip of the Global Marine Terminal/NEAT pier. A "mixed face" condition (a mixture of rock and soft harbor soils) exists in this area, precluding the use of a TBM. An immersed tube tunnel is constructed by digging a submerged trench, laying pre-fabricated tunnel sections, and covering the sections. The immersed tube sections would be sealed to one another and to the bored tunnel section at the tip of the Global Marine Terminal/NEAT pier. The selection of this tunneling approach was based on an evaluation of geological conditions; ventilation needs for the tunnel; water quality, aquatic, and community impacts; construction requirements, and cost. (For other tunneling options that were evaluated, see "Alternatives Considered and Discarded," below.) The immersed tube elements would be sized to allow two tracks in this section of the tunnel. Unlike the bored portion of the tunnel, it is not feasible to add a second tube to an already constructed immersed tube.

The tunnel would be constructed at a depth that would provide necessary clearance for potential future navigational traffic. Based on trends in the shipping industry and discussions with PANYNJ and USACOE, future generations of ships may require navigational channels of up to 60 feet. The top of the bored tunnel portions would be at least 20 feet below this potential harbor depth and the top of the immersed tube portion would be at least five feet below the potential harbor depth.

Upland Tunnel Segments

The landside portion of the tunnel alignments would be built using a combination of construction methods, including bored, cut and cover, and open cut construction. In general, bored tunnels require an undisturbed overhead depth of one tunnel diameter to maintain the stability of the ground above. The landside tunnel sections in Brooklyn and Staten Island would be bored between the shoreline and the point the required overhead depth is no longer available, or 66 feet deep. From this point, the tunnel would be built of cut and cover construction to the portal location (at a depth of 35 feet, the approximate diameter of the tunnel), and then of open cut construction, to the point at which it meets existing grade. Cut and cover construction requires excavating to the required depth and covering after construction is completed. Open cut construction remains as an uncovered, below-grade excavation. The cut and cover section would be 100 feet wide closest to the bored tunnel location and narrow to 40 feet wide at the portal, while the open cut section would be 40 feet wide along its entire length. This would provide the required width if a second bored tube was added in the future. See Figures 2-7 through 2-9 for the bored, cut and cover and open cut portions of the tunnels. (Chapter 16, "Construction and Construction Impacts" provides additional information on tunneling construction methods, shaft sites and other construction information.)

The landside portion of the New Jersey tunnel alignment in Greenville would differ in that it would be built of cut and cover and open cut construction only. From an area just east of the New Jersey Turnpike Extension, tunnel construction would begin as an open cut adjacent to the Greenville Branch. When a depth of 35 feet below existing grade is reached just west of Greenville Yard, the tunnel would be constructed using cut and cover construction through Greenville Yard to the shoreline where it would be connected to the immersed tube section.

The landside portion of the tunnel alignment in Staten Island would be built of open cut construction starting at Alaska Street and ending at Bement Avenue (the location of the tunnel portal). From this point to Davis Avenue, the tunnel would be built of cut and cover construction. From Davis Avenue southeast to the shoreline at Pier 2, the tunnel would be bored.

In Brooklyn, the landside portion of the New Jersey tunnel alignment would begin near the shoreline at 65th Street Yard. It would continue under the Bay Ridge Branch to a location between 8th and 9th Avenues. From this point the tunnel would be built of cut and cover construction to approximately 10th Avenue (the tunnel portal location). It would continue in an open cut to a location between 12th and 13th Avenues along the Bay Ridge Branch right-of-way.

The landside portion of the Staten Island tunnel alignment in Brooklyn would begin at the shoreline near the 69th Street pier. The tunnel would be bored from this location, under Owl's Head Park, parts of the Bay Ridge community, and the Bay Ridge Branch to a location between 8th and 9th Avenues. From this point the tunnel would be identical to the New Jersey tunnel alignment; it would be built of cut and cover construction to approximately 10th Avenue (the tunnel portal location) and would continue in an open cut to a location between 12th and 13th Avenues along the Bay Ridge Branch right-of-way.

Tunnel Design

The length of the tunnel and portal locations are determined to a large extent by grade; the more gradual the grade, the longer the tunnel. Freight trains are long and heavy, and require additional horsepower (hp) to ascend an incline. Additional horsepower translates into higher emissions and greater ventilation requirements. To optimize tunnel length, energy requirements and ventilation requirements, the tunnel would be designed at a grade not to exceed two percent.

The exterior tunnel diameter would be approximately 33 feet, and the interior would provide 22 feet, 6 inches of clearance above the tracks; adequate clearance to accommodate doublestack service and overhead electric catenaries for potential future electrification. Although freight trains currently operate nationwide on diesel fuel, it is possible that electric freight trains may become more commonly used in the future.

A conceptual operating strategy based on specific level of service characteristics was developed for the Tunnel Alternative (Chapter 8, "Transportation," presents details of the methodology). This assumed operating strategy, along with projections of competing truck operating characteristics in 2025, served as input to the demand forecast. Once a demand estimate for the tunnel was derived, the forecast freight flow through the tunnel was compared to the assumed operating strategy for confirmation. Once the operating strategy was validated, additional details were developed. Based on this analysis, the tunnel was designed to accommodate a train with a maximum overall length of 12,800 feet and a maximum gross weight of 15,000 tons. Typical trains would be considerably shorter—3,000 feet, on average.

A primary factor affecting tunnel capacity is ventilation requirements. Exhaust and heat generated by diesel locomotives must be adequately ventilated from the tunnel before another

train can travel through it. Ventilation shafts for the tunnel would be built on either side of the harbor or on land, near the shoreline. Limited options were available for siting the ventilation shafts. Criteria for vent shaft location included: avoidance of impacts to marine and shipping traffic; minimizing the length of the segment to be vented (i.e., placing vent closer to shoreline results in smaller segment); and placing the vent shaft directly above tunnel alignment. For the New Jersey tunnel alignment, ventilation shafts would be built adjacent to the northeast tip of the Global Marine Terminal/NEAT pier in New Jersey and at 65th Street Yard in Brooklyn. The pier site in New Jersey was selected to reduce the overall length of the tunnel between shorelines and thereby its ventilation requirements. For the Staten Island tunnel alignment, ventilation shafts would be built off Pier 2 in Staten Island and off the 69th Street pier in Brooklyn. The visible portion of each ventilation shaft would be approximately 50 to 60 feet high. The ventilation structures would include air and noise pollution control systems as described in Chapter 9, "Air Quality," and Chapter 10, "Noise and Vibration."

The tunnel would be capable of accommodating emergency passenger trains under temporary conditions, since it will be constructed using standard track gauge and standard clearances. Utilities and telecommunication equipment such as electrical transmission lines and fiber optic cable may be put in place during construction of the tunnel. This piggybacking could provide substantial cost savings over typical methods for laying utilities beneath the harbor and generate revenues to partially offset tunnel operating costs.

Associated Rail Infrastructure Improvements

The antiquated East-of-Hudson rail freight infrastructure would need to be significantly upgraded to service modern trains that would use the tunnel. In some cases, construction of additional mainline rail tracks will be required. Such new tracks will be constructed near and parallel to the existing tracks and within the existing rail right-of-way. An example of a new mainline track location is provided in Figures 2-10 and 2-11. The complete alignment is provided in the engineering appendix. Rail infrastructure improvements common to both tunnel alignments would include:

- An expanded rail yard in West Maspeth;
- Rehabilitation of existing mainline track and re-establishment of second mainline track along the Bay Ridge Branch between the Brooklyn tunnel portal area and Fresh Pond Yard, with clearances increased to 22 feet, 6 inches along the line;
- Two new rail sidings to parallel the Bay Ridge Branch from East 43rd to East 98th Streets (i.e., "New Lots") within the existing rail right-of-way. These rail sidings are train tracks that will parallel the mainline tracks, and will be used for freight operations and as a waiting area for westbound tunnel traffic;
- Improvements to two existing mainline tracks along the length of the Montauk Branch of the LIRR between Fresh Pond Yard and West Maspeth Yard, with clearances increased to 22 feet, 6 inches along the line;
- Improvements to 65th Street Yard; and
- Improvements to Fresh Pond Yard.

The Staten Island tunnel alignment would require the following additional rail infrastructure improvements:

- A second span of the Arthur Kill Lift Bridge;
- Rehabilitation of existing mainline track and construction of second mainline track from the Arthur Kill Lift Bridge to the east end of Arlington Yard;
- One new mainline track and rehabilitation of existing mainline track along the Staten Island Railroad from the east end of Arlington Yard to the tunnel portal area, with clearances increased to 22 feet, 6 inches;
- 30,000 feet of new sidings along the Chemical Coast Line at its connection to the Staten Island Railroad.

The New Jersey tunnel alignment would require the following additional rail infrastructure improvement:

- Improvements to two existing mainline tracks from the Lehigh Valley Drawbridge to the tunnel portal in Greenville Yard.
- Construction of a second Waverly Loop connecting the P&H Line to the Greenville Branch. As discussed above under the No Action Alternative, the first Waverly Loop would be constructed as part of previously planned New Jersey rail improvements.

OPERATIONS

Under the New Jersey tunnel alignment, approximately 28 trains (14 round trip trains) would use the tunnel each day (see Table 2-2) in 2025. Under the Staten Island tunnel alignment, approximately 24 trains (12 round trip trains) would use the tunnel each day. These trains would be intermodal, manifest (bulk), and mixed trains of various sizes. As described in Chapter 1, intermodal transport allows transfer of a container from rail to truck, but requires higher vertical clearances. Manifest, or bulk transport, requires the transfer of packaged freight or liquid or bulk goods from the rail car to a truck. A mixed train may consist of both intermodal containers and manifest rail cars.

Table 2-2
Projected Tunnel Traffic
Single Tunnel System
(By Train Type)

Train Type	Estimated Traffic (passbys/day)	
	New Jersey Alignment	Staten Island Alignment
Intermodal	12	10
Manifest	14	12
Mixed	2	2
Total	28	24

The tunnel and associated infrastructure improvements would generate additional rail traffic both east and west of the Hudson River. Table 2-3 summarizes the train traffic for each affected rail line under each potential tunnel alignment and compares it to the No Action Alternative.

Table 2-3
Projected Rail Traffic Under the Single Tunnel System, 2025

Rail Line	No Action Traffic (passbys/day)	Staten Island Tunnel Alignment Traffic (passbys/day)		New Jersey Tunnel Alignment Traffic (passbys/day)	
		Additional	Total	Additional	Total
Lehigh Mainline	106	6	112	6	112
Northeast Corridor	326	0	326	0	326
River Line	36	4	40	4	40
Southern Tier	114	0	114	0	114
Chemical Coast Line (Port Reading to SI Railroad)	18	6	24	2	20
Chemical Coast Line (SI Railroad to E-Rail)	16	18	34	2	18
Chemical Coast Line (E-Rail to Greenville Branch)	14	18	32	2	16
P&H Line	31	2	33	12	43
National Docks Secondary (Seg 1: NYSW)	32	4	36	6	38
National Docks Secondary (Seg 2: Croxton to Greenville)	8	8	16	0	8
Greenville Branch (Oak Island to Tunnel)	14	6	20	28	42
Staten Island Railroad (Arthur Kill Lift Bridge to Arlington Yard)	4	24	34	NA	NA
Staten Island Railroad (Arlington Yard to Tunnel)	0	24	24	NA	NA
Bay Ridge Branch (Seg 1-3: 65th St Yard to New Lots)	2	30	32	34	36
Bay Ridge Branch (Seg 4: New Lots to Fresh Pond Yard)	2	48	50	52	54
Montauk Branch West (Fresh Pond Yard to Maspeth Yard)	6	16	22	18	24
Montauk Branch West (Maspeth Yard to end)	2	2	4	2	4
Bushwick Branch	2	2	4	2	4
Montauk Branch East (Fresh Pond Yard to Jamaica)	6	8	14	8	14
Fremont Secondary (Seg 1&2: Fresh Pond to Hell Gate Merge)	6	2	8	4	10
Fremont Secondary/Amtrak Hell Gate	38	2	40	4	42

Note: "NA" – these rail lines will not be used as part of the New Jersey tunnel alignment.

COSTS

As outlined in Table 2-4, capital costs for the Single Tunnel System are estimated at $4.77 billion for the New Jersey tunnel alignment and $4.68 billion for the Staten Island tunnel alignment. The New Jersey alignment is slightly more expensive due to the need to initially construct a two-track segment, using immersed tube tunnel construction, so as not to preclude the potential construction of a second tunnel in the future. Total capital costs include costs of construction, engineering and management, and property acquisitions required for the project. (A detailed discussion of property acquisitions required for this alternative is provided in Chapter 4, "Economic Conditions and Impacts.")

Table 2-4
Capital Cost Estimates: Single Tunnel System

Component	New Jersey Tunnel Alignment Cost (in millions of dollars)	Staten Island Tunnel Alignment Cost (in millions of dollars)**
Tunnel Construction and associated costs	1,406	1,120
Right-of-way Construction	800	1,060
Yard Construction	70	67
Contingency (25%)	569	562
Owners, Management, and Administrative Costs	1,358	1,343
Escalation	530	523
Total Capital Costs*	4,773	4,675

Note:
* Capital construction cost includes escalation to midpoint of construction, and are reported in year-of-expenditure dollars.
** Includes replacement of FTA transit assistance grant issued to NYCDOT for acquiring and preserving railroad right-of-way along the northern shore of Staten Island.

Operational costs for either tunnel alignment are estimated at $30 million.

IMPROVEMENTS AND OPERATIONS AT PROJECT SITES

The following section describes improvements and operations at project sites under the Single Tunnel System. The increased levels of train traffic that would be incurred by the rail lines are shown in Table 2-3.

New Jersey

In New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur Kill Lift Bridge and additional sidings along the Chemical Coast Line in New Jersey.

<u>*Greenville Yard*</u>. The cut and cover portion of the tunnel would be located within Greenville Yard and would not be visible post-construction. Trains would pass directly through Greenville Yard without stopping.

<u>*Greenville Branch*</u>. The open cut portion of the tunnel would be built along the portion of the Greenville Branch west of Greenville Yard and east of the New Jersey Turnpike Extension.

As discussed under the No Action Alternative, it is presumed that the Waverly Loop, connecting the P&H Line to the Greenville Branch would be constructed. As part of the Single Tunnel System, a second Waverly Loop would be constructed to facilitate the additional traffic along these rail lines.

The Lehigh Valley Drawbridge would also see these increased traffic levels. The bridge, which is lifted fairly infrequently to provide ship passage, is not expected to present a significant bottleneck to through traffic. Under the New Jersey tunnel alignment, a second track would be constructed from the Lehigh Valley Drawbridge to the Greenville tunnel portal.

Oak Island Yard. Oak Island Yard would experience increased traffic as a result of the tunnel. Under either tunnel alignment, the yard would serve as the major classification facility for westbound bulk trains leaving the tunnel. Approximately seven bulk trains per day traveling from various East of Hudson destinations–Long Island, Brooklyn, Queens, the Bronx, and points further north would arrive at Oak Island Yard and be classified according to railroad and destination. From here, trains would continue to their respective destinations. Mainline tracks passing through Oak Island Yard would also see an increase in train traffic from the six additional or rerouted roundtrip trains that would pass through the yard to access the New Jersey tunnel (two additional intermodal trains for the Staten Island alignment).

Chemical Coast Line. Under the Staten Island tunnel alignment, 30,000 feet of sidings would be required along this line near its planned connection to the Staten Island Railroad. These sidings would accommodate trains waiting to cross the Arthur Kill Lift Bridge while it is lifted to allow passage of maritime traffic.

New York

Staten Island

Arthur Kill Lift Bridge/Arlington Yard. A second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track. Two mainline tracks would continue through the east end of Arlington Yard.

Staten Island Railroad/Potential Tunnel Alignment. The Staten Island Railroad would be rehabilitated between Arlington Yard and the tunnel at Alaska Street. Two new mainline tracks would be constructed from the east end of Arlington Yard to the tunnel portal area. Eleven clearances along this line, between South Avenue and John Street, would need to be increased to 22 feet, 6 inches. These increased clearances would be obtained by underpinning work at individual clearances and the excavation of a trench 40 feet wide and a final depth of five feet along the right-of-way. At the pedestrian bridge at John Street, the superstructure would be raised to increase the clearance height.

The landside portion of the tunnel alignment in Staten Island would begin along the Staten Island Railroad right-of-way at Alaska Street. From here to Bement Avenue (the location of the tunnel portal), the tunnel would be in an open cut. Continuing along the right-of-way to Davis Avenue, the tunnel would be built of cut and cover construction. From Davis Avenue southeast to the shoreline at Pier 2, the tunnel would be bored.

Brooklyn

65th Street Yard. 65th Street Yard would serve as a rail yard. Under the New Jersey tunnel alignment, the tunnel ventilation shaft would also be located on this site. Improvements that would be required for the bulk yard include laying up to 19 new tracks and removing existing tracks. The ventilation shaft would be approximately 230 feet by 150 feet and 50 to 60 feet tall. Approximately four daily round trip trains would use the site in 2025, up from a single daily round trip train per day under the No Action Alternative.

Bay Ridge Branch of the LIRR. The Bay Ridge Branch would need to be upgraded to accommodate modern doublestack trains. This would include increasing 47 clearances along the line. From the tunnel portal area to Fresh Pond Yard, 33 clearances would be increased for two mainline tracks to be constructed with clearances of 22 feet, 6 inches. Increased heights in this section would be obtained through underpinning work at individual clearances and the excavation of trenches 40 feet wide and to a final depth of 5 feet. Between 2nd Avenue and 12th Avenue, 10 clearances would be increased approximately 3 feet. Major rehabilitation of the structures at the Brooklyn Manhattan Transit (BMT) Overpass, 8th Avenue, 11th Avenue, and Fort Hamilton Parkway would be necessary to allow tunnel construction. The East New York Tunnel would also be reconstructed to accommodate two tracks at the proposed clearance heights.

Two sidings of up to 10,000 feet in length each would be placed on either side of the two main line tracks at a location between East 43rd to East 98th Streets (i.e., "New Lots") along the Bay Ridge Branch. These sidings would allow trains to pull off the mainline track to await use of the tunnel, for other operational reasons, or to cut off cars for delivery to yards north of Fresh Pond. In addition, trains may cut off cars at various sidings along the Bay Ridge Branch for direct delivery to end users such as industrial and commercial businesses. An additional 18 trains would be run between the New Lots sidings and Fresh Pond Yard under either alignment.

Queens

West Maspeth Yard. Under the Tunnel Alternative, significant additional East-of-Hudson intermodal yard capacity would be needed. Under the Single Tunnel System, the existing rail yard in West Maspeth, Queens, would be expanded to a 108-acre intermodal rail yard (see Figure 2-12). Introducing significant added rail service to the West Maspeth Intermodal Yard will require expansion of the existing West Maspeth industrial site. The intermodal yard will require new infrastructure, including maintenance facilities, additional rail lines, and other related services. To accommodate this expansion, some existing businesses will need to be relocated. Vacant land in the area will also be utilized. A detailed discussion of the required land acquisition is provided in Chapter 4, "Economic Conditions and Impacts." The yard would serve as a loading and unloading site for interchange between rail and trucks. The facility would be expected to serve approximately 14 daily trains (7 arrivals and 7 departures) in 2025.

The yard would contain ten rail tracks for storage and unloading. A new bridge would be constructed over Newtown Creek at 59th Road as part of the access plan to the site. The proposed bridge would be a two-lane movable bridge. Although the bridge has not yet been fully designed, it is expected to span the width of the creek and should not require in-water piers. A second bridge along Grand Avenue would need to be replaced and widened. Maspeth Avenue would be closed south of Rust Street to avoid interference and address safety concerns. The main gate area would be located along the southern edge of the site.

Prior to constructing the West Maspeth Intermodal Yard, a smaller rail yard could be built on the site as described above under the Expanded Float Operations Alternative. The smaller yard, consisting of the current West Maspeth Yard and former Phelps Dodge refinery site, could serve as an initial step in developing additional rail capacity east of the Hudson River and would be expanded to the full yard with the completion of the Single Tunnel System.

Fresh Pond Yard. Substantial increases in train traffic would be expected at Fresh Pond Yard, requiring many more interchanges than are currently handled today. Approximately 20 trains currently use the yard and would continue to use it under the No Action Alternative. Under the Tunnel Alternative, approximately 16 additional trains would stop at the rail yard for interchanges and classification.

The intermodal trains traveling to and from the expanded West Maspeth Yard would run between the Bay Ridge Branch and the Montauk Branch without stopping via two through-tracks that would be reconstructed in the West Yard area. These tracks are currently used for freight and passenger operations. One track would be dedicated to the freight operation and the other would be a joint use track, as it is today. In addition, heights would be increased at two overhead clearances in the yard to allow for doublestack service: the Fremont Secondary and the BMT Overpass (M line train). The clearance work would require underpinning, excavation of a trench and reconstruction of the overpasses.

Montauk Branch of the LIRR (between Fresh Pond Yard and the West Maspeth Yard). This line would serve the expanded West Maspeth Yard. One mainline track and one freight track would be replaced along the length of this portion of the line. Clearance heights would be increased to 22 feet, 6 inches at five clearances along the line. Providing these clearances would involve underpinning work at individual clearances and the excavation of a trench within the right-of-way of approximately five feet deep and 40 feet wide between Fresh Pond Yard and the Welbuilt Stove Overbuild near Flushing Avenue. Two bridges, at Fresh Pond Road and the BMT Overpass would need to be reconstructed.

Bronx

Harlem River Yard/Oak Point Yard. No capital improvements are proposed for these sites under the Tunnel Alternative. However, the tunnel would likely generate some additional traffic; approximately two additional trains would stop at Oak Point Yard, and Harlem River Yard and its waste transfer facility may receive some additional trains.

DOUBLE TUNNEL SYSTEM

The Double Tunnel System would result in a significant increase in train trips throughout the study areas. Under either tunnel alignment, approximately 64 trains (i.e., 32 round-trip trains), carrying on average up to 19 million tons of goods, would travel the tunnel each day.[1] The rail freight would enter the region as described above under the Single Tunnel System. In addition to the intermodal and manifest trains previously described, the Double Tunnel System would be expected to receive "through" trains, which are trains passing through the region en route between points west of the Hudson River and the northeast. These through trains would continue

[1] While the number of trains traversing the tunnel would more than double, the tonnage of freight moved does not double. This is due to the fact that most of the additional trains attracted to the Double Tunnel System would be intermodal trains, which are lighter in weight than bulk or manifest trains.

from the portal along the Bay Ridge Branch and Fremont Secondary to connect with northbound and eastbound rail lines in the Bronx.

THE TUNNEL AND RELATED INFRASTRUCTURE IMPROVEMENTS

The Double Tunnel System would require additional capital improvements beyond those presented under the Single Tunnel System, including the completion of a second harbor crossing, the expansion of West Maspeth Yard, and, under the New Jersey alignment, the installation of a direct connection to the National Docks Secondary. These construction efforts are summarized below and detailed in Chapter 16, "Construction and Construction Impacts."

Tunnel Alignment and Construction

As discussed above, the construction of either tunnel alignment under the Single Tunnel System would include some parts already sized for a second track. Neither alignment would preclude the boring of a second tube across the harbor. The second tube of the tunnel under the Double Tunnel System would be constructed in the same manner as the first tunnel constructed under the Single Tunnel System. Under the New Jersey alignment, the TBM would be launched eastward from the already completed ventilation structure in the 65th Street Yard. The machine would be extracted at the Brooklyn portal and returned to 65th Street to bore the tunnel westward under the harbor. The TBM would be removed at the ventilation structure off of Greenville, New Jersey. Under the Staten Island alignment, the tunneling would commence from the cut and cover sections on both sides of the harbor. Both TBMs (rock on Staten Island and soft-ground from Brooklyn) would be removed at the ventilation structure at Pier 2 off of Staten Island. The landside portions of the open cut and cut and cover sections would have already been constructed with sufficient width to accommodate the installation of the second track.

The second tunnel would be designed to accommodate a train with a maximum overall length of 12,800 feet and a maximum gross weight of 15,000 tons, as in the Single Tunnel System. The actual number and lengths of trains using the tunnel would be determined by the future demand for rail freight service between the East-of-Hudson and West-of-Hudson regions.

Associated Rail Infrastructure Improvements

In addition to the rail infrastructure that would have already been improved under the Single Tunnel System, the following would be required for the Double Tunnel System:

- The expansion of the existing rail yard in West Maspeth, and the development of a storage structure;
- Under the New Jersey alignment, construction of a direct connection between the National Docks Secondary and the tunnel portal area.

OPERATIONS

Under the Double Tunnel System, approximately 64 trains (32 roundtrip trains) would use the tunnel each day in 2025 (see Table 2-5). These trains would be intermodal, manifest, mixed, and through trains of various sizes. "Through" trains are trains that would use the tunnel but whose origins and destinations would be outside the 30-county region.

Table 2-5
Projected Tunnel Traffic
Double Tunnel System (By Train Type)

Train Type	Estimated Traffic (passbys/day)
Intermodal	34
Manifest	16
Through	6
Other	8
Total	64

As discussed above, sufficient demand is forecast to support construction of the Double Tunnel System. The Single Tunnel System will not attract the full latent demand potential of rail freight service in the region. In particular, it will attract less intermodal freight than the Double Tunnel System due to operational constraints that may deter shippers of "just-in-time" delivery cargo typical of the intermodal market. Additional train service will be required to meet the forecast demand levels of the Double Tunnel System. The resulting increase in levels of train traffic along various rail lines are shown in Table 2-6.

COSTS

As shown in Table 2-7, the total cumulative capital costs for the Double Tunnel System are estimated at $7.35 billion for the New Jersey tunnel alignment and $7.66 billion for the Staten Island tunnel alignment. The Staten Island alignment is more expensive due primarily to the extensive work required on the Chemical Coast Line and the second span of the Arthur Kill Lift Bridge. Total capital costs include costs of construction, engineering and management, and property acquisitions required for the project. (Property acquisitions are discussed further in Chapter 4, "Economic Conditions and Impacts"). Operational costs for the second tunnel are estimated at $30 million per year.

IMPROVEMENTS AND OPERATIONS AT PROJECT SITES

The following section describes additional improvements and operations at project sites under the Double Tunnel System. Additional construction or improvements beyond those required for the Single Tunnel System are discussed below.

New Jersey

Greenville Branch. For the portion of the Greenville Branch between the Lehigh Mainline and the tunnel, there would be increased levels of rail traffic induced by the second tunnel. Under the New Jersey alignment, just west of the tunnel, a connection would be built to the National Docks

Table 2-6
Projected Rail Traffic Under the Double Tunnel System, 2025

Rail Line	No Action Traffic (passbys/day)	Staten Island Tunnel Alignment Traffic (passbys/day)		New Jersey Tunnel Alignment Traffic (passbys/day)	
		Additional	Total	Additional	Total
Lehigh Mainline	106	12	118	12	118
Northeast Corridor	326	6	332	6	332
River Line	36	4	40	4	40
Southern Tier	114	2	116	2	116
Chemical Coast Line (Port Reading to SI Railroad)	18	2	20	-2	16
Chemical Coast Line (SI Railroad to E-Rail)	16	44	60	-2	14
Chemical Coast Line (E-Rail to Greenville Branch)	14	44	58	12	26
P&H Line	31	8	39	6	37
National Docks Secondary	8	16	24	18	26
Greenville Branch (Oak Island to Tunnel)	14	22	36	46	60
Staten Island Railroad (Arlington Yard to Tunnel)	0	64	64	NA	NA
Bay Ridge Branch	2	70	72	70	72
Montauk Branch West (Fresh Pond Yard to Maspeth Yard)	6	42	48	42	48
Fremont Secondary (Seg 1&2: Fresh Pond to Hell Gate Merge)	6	2	8	4	10
Fremont Secondary/Amtrak Hell Gate	38	2	40	4	42
Note: "NA" – these rail lines will not be used as part of the New Jersey tunnel alignment.					

Secondary. The connection would require approximately 700 feet of new rail track between the cut and cover portion of the Greenville Branch and the existing National Docks Secondary. For the New Jersey tunnel alignment.

Oak Island Yard. Oak Island Yard would experience increased traffic as a result of the second tunnel. Mainline tracks passing through Oak Island Yard would also see an increase on train traffic beyond that of the Single Tunnel System from six additional or rerouted roundtrip trains that would pass through the yard to access the New Jersey tunnel. Eleven additional intermodal trains would pass through Oak Island Yard for the Staten Island alignment.

New York

Queens

West Maspeth Yard. Under the Double Tunnel System, significant additional East-of-Hudson intermodal capacity would be needed. As with the Single Tunnel System, introducing additional rail service to West Maspeth Yard will require expansion and additional land acquisitions. A

Table 2-7
Capital Cost Estimates:
Double Tunnel System

Component	New Jersey Tunnel Alignment Cost (in millions of dollars)	Staten Island Tunnel Alignment Cost (in millions of dollars)**
Tunnel Construction and associated costs	1,898	1,840
Right-of-way Construction	897	1,144
Yard Construction	866	850
Contingency (25%)	914	957
Owners, Management, and Administrative Costs	1,953	2,027
Escalation	822	840
Total Capital Costs*	7,350	7,658

Notes:
* Capital construction cost includes escalation to midpoint of construction, and are reported in year-of-expenditure dollars.
** Includes replacement of FTA transit assistance grant issued to NYCDOT for acquiring and preserving railroad right-of-way along the northern shore of Staten Island.

detailed discussion of this land acquisition is provided in Chapter 4, "Economic Conditions and Impacts." The expanded yard would be required to accommodate the increased intermodal traffic, which would be attracted to the Double Tunnel System. Additional paved acreage would be required for container handling, additional rail tracks with vehicular access, supporting mechanical equipment, and container storage. Additional rail yard capacity would be needed beyond that constructed under the Single Tunnel System. The intermodal rail yard at West Maspeth would be expanded to serve approximately 34 daily trains (17 arrivals and 17 departures) in 2025.

The expanded 160-acre yard would contain storage and unloading areas and additional rail tracks (see Figure 2-13). A multilevel open-air storage facility would be required to temporarily store intermodal containers. The storage structure would be built in the center of the site. The storage structure has not yet been designed, but based on preliminary conceptual plans, the building is estimated to have a footprint of 1,300 feet long by 1,600 feet wide. The height of the building may range from 130 to 220 feet tall, depending upon the footprint and design. Construction of the expanded West Maspeth Yard would require acquisition of additional properties and filling of Maspeth Creek and a portion of Newtown Creek (eight to nine acres of filling). Maspeth Avenue would remain closed south of Rust Street, and a second gate would be located near 48th Street.

Fresh Pond Yard. Increases in train traffic would be expected at Fresh Pond Yard. Under the Double Tunnel System, approximately 34 intermodal trains would pass through the yard on their way to West Maspeth Yard; 18 trains would pass through en route to or from the Fremont Secondary; and 20 trains would stop at the yard for interchanges and classification.

Bronx

Harlem River Yard/Oak Point Yard. The second tunnel would likely generate some additional traffic; approximately six additional trains would stop at Oak Point Yard and Harlem River Yard.

SUMMARY OF PROJECT ALTERNATIVES

Table 2-8 provides a summary of the construction elements for all the project build alternatives.

G. POTENTIAL PERMITS AND OTHER APPROVALS REQUIRED

Each of the project alternatives would require federal, state, and local permits and approvals. Table 2-9 lists potential discretionary permits required for the major construction and operational activities associated with each of the project alternatives. Many of these permits, their regulatory context and their applicability to the project are further described in subsequent chapters.

This EIS is being prepared in accordance with the Council of Environmental Quality's regulations implementing the National Environmental Policy Act (NEPA) of 1969, which requires federal agencies to consider the environmental impacts of actions they may undertake.

It is also being prepared in accordance with other applicable federal, state and local environmental review regulations and guidelines. These may include:

- At the federal level:
  - Federal Highway Administration (FHWA) Guidance for Preparing and Processing Environmental and Section 4(f) Documents, October 30, 1987
  - Federal Railroad Administration (FRA) Procedures for Considering Environmental Impacts, May 18, 1999
- At the state level:
  - New York State Environmental Quality Review Act (SEQRA) and its implementing regulations (6 NYCRR, Part 617)
  - New Jersey Executive Order 215–Environmental Assessment
  - NYSDOT Environmental Procedures Manual
- At the local level:
  - New York City Environmental Quality Review (CEQR) (Executive Order No. 91 of 1977, as amended)
  - Other applicable local environmental review regulations and guidelines.

Other specific agency guidance is discussed in relevant technical chapters of this EIS.

Table 2-8
Description of Project Build Alternatives

	TSM Alternative	Expanded Float Operations	Tunnel Alternative			
			Single Tunnel System		Double Tunnel System	
			New Jersey	Staten Island	New Jersey	Staten Island
Overview	More effective management of existing transportation infrastructure to accommodate increased freight demand without major capital expenditures	Enhanced and expanded capacity for railcar float system between Greenville Yard, NJ and 65th Street Yard, Brooklyn	Construction of single-track rail freight tunnel from Greenville Yard, NJ to 65th Street Yard, Brooklyn. Approximately 12 round-trip trains would use the tunnel each day.	Construction of single-track rail freight tunnel from Staten Island Railroad to 65th Street Yard, Brooklyn. Approximately 12 round-trip trains would use the tunnel each day.	Construction of two-track rail freight tunnel from Greenville Yard, NJ to 65th Street Yard, Brooklyn. Approximately 32 round-trip trains would use the tunnel each day.	Construction of two-track rail freight tunnel from Staten Island Railroad to 65th Street Yard, Brooklyn. Approximately 32 round-trip trains would use the tunnel each day.
Main Elements	Improved efficiency and schedule coordination for rail float operations.	Improved efficiency and schedule coordination for all float operations, including more frequent operations.	Single track tunnel across upper NY Harbor from Greenville to Brooklyn	Single Track tunnel across Upper NY Harbor from Staten Island to Brooklyn	Two track tunnel across Upper NY Harbor from Greenville to Brooklyn	Two track tunnel across Upper NY Harbor from Staten Island to Brooklyn
	Better coordination and upgraded signaling along Hudson Line	Rehabilitation/ construction of four float bridges at Greenville Yard	108-acre intermodal rail yard in West Maspeth, Queens	108-acres intermodal rail yard in West Maspeth, Queens	Expanded 160-acre intermodal rail yard in West Maspeth, with storage structure	Expanded 160-acre intermodal rail yard in West Maspeth, with storage structure
	Rehabilitation of two float bridges at Greenville Yard	Upgrades and two new float bridges at 65th Street Yard	Upgrades, rehabilitation and/or installation of tracks along Bay Ridge and Montauk Branches	Upgrades, rehabilitation and/or installation of tracks along Bay Ridge and Montauk Branches and Staten Island Railroad	Upgrades, rehabilitation and/or installation of tracks along Bay Ridge and Montauk Branches	Upgrades, rehabilitation and/or installation of tracks along Bay Ridge and Montauk Branches and Staten Island Railroad
	Improvements at 65th Street Yard	Upgrading of Bay Ridge and Montauk Branches	Improvements to Fresh Pond Yard (bulk yard) and 65th Street Yard	Improvements to Fresh Pond Yard (bulk yard) and 65th Street Yard	Improvements to Fresh Pond Yard (bulk yard) and 65th Street Yard	Improvements to Fresh Pond Yard (bulk yard) and 65th Street Yard
			Second Waverly Loop connecting P&H Line with Greenville Branch	Construction of second span of Arthur Kill Lift Bridge	Second Waverly Loop connecting P&H Line with Greenville Branch	Construction of second span of Arthur Kill Lift Bridge
				New rail sidings along Chemical Coast Line in NJ	Direct connection from National Docks Secondary Tunnel portal at Greenville Yard	New Rail sidings along Chemical Coast Line in NJ
Cost						
Capital Costs	$31 million	$80 million	$4.77 billion	$4.68 billion	$7.35 billion	$7.66 billion
O&M	$2.4 million/year	$18 million/year	$30 million/year	$30 million/year	$30 million/year	$30 million/year
Diversion of Freight from Truck to Rail (2025)	69,000 tons	460,000 tons	9.5 million tons	8.8 million tons	14.9 million tons	13.0 million tons

Table 2-9
Potential Permits Required for Major Construction and Operational Activities

Alternative	Work Type	Site Location	Permitting Activity	Permitting Agencies	Permit/Approval
TSM/Expanded Float Operations	Construct/ rehabilitate float bridges	65th St. Yard (Brooklyn) Greenville Yard (NJ)	Construction in tidal wetlands	USACOE	Section 404 Permit
				NYSDEC, NJDEP	Tidal Wetlands Permit
				NJDEP	Tidal Wetlands Conveyance Permit
			Construction in freshwater wetlands	USACOE	Section 404 Permit
				NYSDEC, NJDEP	Freshwater Wetlands Permit
			Excavation and fill in navigable waters	USACOE	Section 404 Permit
				NYSDEC	Protection of Waters Permit
				NJDEP	Tidal Wetlands Permit
				NJDEP, NYSDEC	Water Quality Certificate
				NYSDOS, NJDEP	Coastal Zone Consistency Determination
				NJDEP	Waterfront Development Permit
					Stream Encroachment Permit
			Discharge to surface waters	USACOE	Section 404 Permit
				NYSDEC	Protection of Waters Permit
					SPDES Permit
					Water Quality Certificate
				NJDEP	NJPDES Permit
					Water Quality Certificate
			Construction in floodplain/coastal zone	NYSDOS, NJDEP	Coastal Zone Consistency Determination
				NYSDEC	Protection of Waters Permit
				NJDEP	Stream Encroachment Permit
					Waterfront Development/Coastal Wetlands Permit
			Construction of structures in navigable waters	USACOE	Section 10 Permit
				USCG	Section 9 Permit
				NYSDEC, NJDEP	Tidal Wetlands Permit
				NYSDEC	Protection of Waters Permit
				NJDEP	Stream Encroachment Permit
	Expand West Maspeth Yard	Existing West Maspeth Yard Former Phelps Dodge site (Queens)	Construction in freshwater wetlands	USACOE	Section 404 Permit
				NYSDEC	Freshwater Wetlands Permit
			Discharge to surface waters	USACOE	Section 404 Permit
				NYSDEC	Protection of Waters Permit
					SPDES Permit
					Water Quality Certificate
			Construction in floodplain/coastal zone	NYSDOS	Coastal Zone Consistency Determination
				NYSDEC	Protection of waters Permit

Table 2-9 (cont'd)
Potential Permits Required for Major Construction and Operational Activities

Alternative	Work Type	Site Location	Permitting Activity	Permitting Agencies	Permit/Approval
Rail Freight Tunnel Alternative	Construct Ventilation Shafts	Global Marine Terminal/NEAT Pier Pier 2 (Staten Island) 65th Street Yard (Brooklyn) 69th Street Yard (Brooklyn)	Construction in tidal wetlands	USACOE	Section 404 Permit
				NYSDEC, NJDEP	Tidal Wetlands Permit
				NJDEP	Tidal Wetlands Conveyance Permit
			Construction in freshwater wetlands	USACOE	Section 404 Permit
				NYSDEC, NJDEP	Freshwater Wetlands Permit
	Immersed Tube Tunnel	Greenville Yard to tip of Global Marine Terminal/NEAT Pier (Jersey City)	Excavation and fill in navigable waters	USACOE	Section 404 Permit
				NYSDEC	Protection of Waters Permit
	Construct Intermodal Facility and fill in Maspeth Creek (Double Tunnel System)	West Maspeth, Queens		NJDEP	Tidal Wetlands Permit
				NJDEP, NYSDEC	Water Quality Certificate
				NYSDOS, NJDEP	Coastal Zone Consistency Determination
				NJDEP	Waterfront Development Permit
					Stream Encroachment Permit
			Discharge to surface waters	USACOE	Section 404 Permit
				NYSDEC	Protection of Waters Permit
	Construct 2nd span of Arthur Kill Lift Bridge adjacent to and south of existing span	Arthur Kill to Chemical Coast Line (NJ) Arthur Kill to Arlington Yard (Staten Island)			SPDES Permit
					Water Quality Certificate
				NJDEP	NJPDES Permit
					Water Quality Certificate
			Construction in floodplain/coastal zone	NYSDOS, NJDEP	Coastal Zone Consistency Determination
				NYSDEC	Protection of Waters Permit
				NJDEP	Stream Encroachment Permit
					Waterfront Development/Coastal Wetlands Permit
			Construction of structures in navigable waters	USACOE	Section 10 Permit
				USCG	Section 9 Permit
				NYSDEC, NJDEP	Tidal Wetlands Permit
				NYSDEC	Protection of Waters Permit
				NJDEP	Stream Encroachment Permit
			Construction and operation of a stationary air source	NYSDEC, NJDEP	Air Pollution Control Permit/Registration

H. ALTERNATIVES CONSIDERED AND DISCARDED

ALTERNATIVES CONSIDERED UNDER THE MIS

STUDY OVERVIEW

During the MIS, some 15 alternatives involving highway, rail, water, and air systems were evaluated with the goal of developing a strategy for improving the region's movement of goods across the New York Harbor. The alternatives were screened in a three-tiered process including public participation. Nine of the alternatives were discarded upon completion of the first-level screen either because they faced insurmountable barriers to implementation or because they were not full "stand alone" proposals and therefore did not fully address the identified problems. Each of these is referred to as an alternative/ strategy in the discussion below. Two alternatives were dismissed upon the completion of the second and third tier of the screening analysis, leaving four alternatives including the no action alternative for the most detailed MIS analysis and ultimately for consideration in the DEIS. The section below summarizes the alternatives evaluated and the reasons for eliminating or recommending them for further review.

Summary of Alternatives

Staten Island to Brooklyn Shared Passenger and Freight Tunnel Alternative. This alternative, formulated in the public outreach process, proposed to develop a rail tunnel that would be designed to accommodate both rail freight and passenger subway service. This would be made possible by creating a tunnel connection between the MTA's Staten Island Rapid Transit (SIRT) Line on Staten Island and the New York City subway system in Brooklyn. This concept was eliminated because of the incompatibility of freight and subway service (including safety concerns, and the incompatibility of doublestack trains with the third rail used by passenger trains), and shared use of the Bay Ridge Branch, which would have limited capacity on an existing vital East-of-Hudson rail line for freight. For these reasons, this alternative had several "fatal flaws" and was eliminated after the initial screening process.

Vertical Takeoff and Landing (VTOL) Aircraft Alternative. The concept of using VTOL aircraft to ferry freight across the harbor was presented at MIS public meetings. Under this concept, a fleet of specially designed aircraft would airlift up to two 40-foot containers each between intermodal facilities on both sides of the Hudson River. In order to take off and land at highly constrained transshipment areas, this type of aircraft would need to fly vertically. This alternative was eliminated during the first screening, because the equipment is still in a conceptual stage of development. Before issues of site selection, environmental impacts and air traffic concerns could be addressed, more research and development needs to occur to address the alternative's viability.

Freight Connection to the Brooklyn Navy Yard Alternative/Strategy. A freight connection to the Brooklyn Navy Yard from the existing East-of-Hudson rail network was examined. This alternative was eliminated when it was determined that there is no feasible way to connect the two entities.

Rail Freight Connection to Red Hook Alternative/Strategy. It was determined that since the NYCEDC was considering the development of a new railcar float at this terminal, and because other types of rail connections would be infeasible, this alternative would not be analyzed further in the MIS.

Connection to Kearny Yard Alternative/Strategy. Kearny Yard, an existing intermodal rail yard located in northern New Jersey, is connected via rail lines to the sites of a potential New Jersey or Staten Island tunnel. Therefore, it was not analyzed further in the MIS.

Link to JFK International Airport for Air Cargo Movements Alternative/Strategy. This alternative could be accomplished by using trucks to transport air cargo freight arriving at John F. Kennedy International Airport to one of the proposed rail intermodal facilities in Brooklyn, Queens, and Long Island. Since this alternative addresses local freight movement, not cross harbor freight movement, it was not analyzed further as part of the MIS process.

Use of a Containment Island for Port Activities Alternative/Strategy. As part of the public process, it was suggested that a containment island be created by filling an area of the harbor or ocean to create a new land mass. Ships could dock at this island and exchange their cargo, either for transfer to smaller ships or to some mode of transportation that would be created to connect to mainland locations. This alternative was considered to address port development, not cross harbor freight movement.

"Hub Tub" Concept for Port Activities Alternative/Strategy. Similar to the containment island scenario, this proposal would utilize large floating vessels to facilitate the transshipment of marine cargo between large ships and smaller vessels which would distribute cargo along the coastline and up major navigable rivers to inland destinations. This strategy addresses port development, not cross harbor freight movement.

Rail Freight into Manhattan Alternative/Strategy. The high line south of Penn Station is currently inactive. This line could potentially be connected to the rail freight network near Penn Station in Manhattan. Once the rail line was restored, freight rail service could then be offered to the Lower West Side of Manhattan. However, since this alternative related to local freight movement, not cross harbor freight movement, it was eliminated from further study.

Jersey City to Brooklyn Combined Rail/Truck Tunnel Alternative. This alternative was suggested by several transportation agencies and in shipper interviews as a possible solution to cross harbor roadway congestion. The alternative proposed having a truck entrance that would originate close to the New Jersey Turnpike's Extension in Jersey City. In Brooklyn, the tunnel could connect to the Gowanus Expressway, or use an exclusive truck roadway that would be developed with the right-of-way of the Bay Ridge Branch. The tunnel could connect to both a potential marine terminal in Sunset Park, Brooklyn as well as the Bay Ridge Branch. Truck usage fees could help offset tunnel construction costs.

The more detailed second level screening determined that a combined rail/truck tunnel alternative would be so attractive to the trucking industry, that a large percentage of existing and future freight traffic would be diverted from rail to trucks. This alternative is not consistent with the goals of the MIS because it would result in deteriorated air quality and a continued reliance on trucking in the region. In addition, further transportation analysis determined that the New Jersey Turnpike Extension in New Jersey and the Gowanus and Van Wyck Expressways in Brooklyn do not have adequate unused capacity to handle the projected additional truck traffic. If trucks were restricted to using the tunnel at off-hours only, then vital freight operations that need to occur during this time frame would be disrupted. Under this alternative, it would be virtually impossible to balance the two modes of freight transport. Given this reality, as well as environmental and cost issues, the MIS concluded that this alternative was not realistic, and it was therefore not considered beyond the third-level screening.

Access to the Region's Core MIS, "AA" Freight Component Alternative. The Access to the Region's Core (ARC) MIS is a separate ongoing study of strategic investments to improve passenger rail transportation in the heart of the New York City metropolitan area. Members of the Cross Harbor Freight Movement Project's Steering Committee suggested that the freight component of the ARC study—known as the "AA" alternative—be evaluated as a stand alone alternative in the Cross Harbor Freight Movement MIS. This alternative proposed a new rail tunnel (for both passenger and freight cars) under the Hudson River from Hoboken to Penn Station in Manhattan. The freight portion of this alternative would also involve a new track connection from Penn Station to Amtrak's West Side Line to Oak Point Yard in the Bronx. The second-tier screening analysis raised questions about potential operational and scheduling constraints on rail freight imposed by sharing track with passenger service along the nation's most heavily used passenger corridor. Transportation analyses conducted under the second-level screening revealed that this alternative could be expected to do as well as the low capital-intensive railcar float alternative. This alternative was not advanced beyond the second tier of the screening process.

No Action Alternative. The no action alternative described in the MIS included the array of committed improvements to the regional transportation system that would be realized from 1998 (the base year for the MIS study) to 2020 (the future analysis year for the Cross Harbor Freight Movement MIS), independent of the outcome of the Cross Harbor Freight Movement Project.

Enhanced Transportation Systems Management (TSM)/Railcar Float System Alternative. This alternative began the evaluation process as three separate alternatives: transportation system management; expanded railcar float operations; and a high-speed loading and unloading float. The original TSM methods recommended for analysis in the MIS study included improved railcar float operations; expanded rail freight service east of the Hudson River; extended AMTRAK rail freight service; Intelligent Transportation Systems (ITS); and pricing strategies.

Using the TSM alternative as a base, the expanded railcar float service alternative proposed the addition of new railcar float locations. Locations for review originally included Howland Hook Marine Terminal on Staten Island and Oak Point Yard in the Bronx. A float connection at Oak Point Yard was later dropped because it became apparent that float operations were only viable along a limited number of short, direct routes and that only a destination on the south Brooklyn waterfront could serve as a viable float destination.

The third alternative involved a high-speed loading and unloading float bridge alternative that could significantly reduce cargo loading and unloading times. Specialized vessel design as well as advanced loading and unloading equipment would have to be designed at a scale that has not been successfully realized to date. The technology involved is new and experimental in nature. Thus this portion of the alternative was dropped from further review, while the TSM and expanded railcar float system options were advanced for consideration in the DEIS.

Staten Island to Brooklyn Rail Tunnel Alternative. A Staten Island/Brooklyn rail tunnel was one of the original alternatives suggested for study at the project's inception. As proposed, this cross-harbor tunnel alignment from Staten Island to Brooklyn would provide a permanent rail link between the East-of-Hudson and West-of-Hudson rail networks. Throughout the MIS analysis this tunnel alternative performed well against all planning, environmental, cost, and operational criteria. Therefore, this alternative was recommended for review in the DEIS.

Jersey City to Brooklyn Rail Tunnel Alternative. The Jersey City/Brooklyn rail tunnel would also provide a permanent rail freight link between West of Hudson and East of Hudson regions.

This tunnel would run between the Greenville Yard in Jersey City and Brooklyn. On the New Jersey side it would connect with the Greenville Branch, while, on the Brooklyn side, the tunnel would connect with the Bay Ridge Branch. A tunnel connection to the Brooklyn waterfront at Sunset Park could also be provided to support a potential container facility on the Brooklyn waterfront. Like the Staten Island tunnel alignment, this alternative performed well against environmental cost and operational criteria. Thus, this alternative was also recommended for review in the DEIS.

Maybrook Corridor. This alternative involved the reactivation of the Maybrook Corridor, formerly a double track mainline railroad right-of-way utilized exclusively for freight service. The Maybrook Corridor (also known as the "Poughkeepsie Bridge route") connected the Pennsylvania Railroad lines through Allentown and Bethlehem, PA, as well as lines coming into Philadelphia, with New England. The Poughkeepsie-Highland Railroad Bridge, which traverses the Hudson River, was formerly a double-track rail segment. A connection once existed between the bridge route and the Hudson Line. The alternative was discarded due to inconsistency with local plans, operating constraints, engineering difficulties, and right-of-way issues. Little of the infrastructure is considered recoverable, and the line would be unsuitable for heavy through freight even after restoration. Various entities (including Dutchess County, MetroNorth, and the Town of Lloyd) own portions of the rail corridor right-of-way. The Poughkeepsie-Highland Railroad Bridge Company, the current owner of the bridge, and other local groups support preservation of the bridge as a pedestrian and bicycle thoroughfare. A recently completed study by NYSDOT and the Poughkeepsie-Dutchess County Transportation Council concluded that a "rails-to-trails" program may be the most suitable use for portions of the corridor. In addition, the Maybrook Corridor alternative was considered inferior due to the following reasons: vertical clearance restrictions to Tarrytown, NY and between Tarrytown and Oak Point Yard; a long distance (approximately 40 miles) of track between Maybrook and Hopewell Junction that would need reconstruction; title and right-of-way owner issues; operational conflicts and limited freight movement windows on the Hudson Line; and challenges related to routing trains between Dutchess County and New York City.

ALTERNATIVES CONSIDERED AND DISCARDED UNDER THE EIS

OVERVIEW

The recommended alternatives of the MIS were evaluated in detail in the EIS process. These alternatives were subject to design, siting, transportation, environmental, market, and economic studies that evaluated numerous implementation options. The following summarizes some of the major options that were evaluated and the reasons they were ultimately eliminated from further consideration. Additional discussion of the evaluation of these discarded alternatives is provided in the supporting document entitled "Alternatives Development and Review."

IMMERSED TUBE CONSTRUCTION FOR ENTIRE TUNNEL LENGTH

Two construction methods were considered for the tunnel alignments: the immersed tube method and the bored method as described above under "Tunnel Alternative." An extensive sampling and testing program was undertaken to determine whether the Harbor bottom's geological conditions were suited for the tunneling technologies. Based on the results of these surveys, both technologies are viable except in the area between Greenville Yard and the northwest corner of the Global Marine Terminal/NEAT pier. The geological conditions in this area requires the use of immersed tube technology.

Ultimately, the bored tunneling technology was selected as the preferred method (except in the area off Greenville Yard under the New Jersey tunnel alignment) for a number of reasons. Immersed tube technology requires construction of a trench through dredging, resulting in considerable disturbance to the harbor bottom sediments and therefore has greater potential for adverse water quality and aquatic impacts than the bored tunnel technology which would have negligible impacts. Impacts associated with the immersed tube technology can be minimized through the use of turbidity curtains and other techniques. However, in some areas currents preclude the use of turbidity curtains. (See discussion in Chapter 13, "Water Quality and Aquatic Resources.") Disposal of the material is more difficult. The upper layers of the sediments contain contaminants that would be subject to special disposal requirements. It may be difficult to separate the more contaminated sediment from the cleaner, deeper sediments. Finally, the dredge spoils would require extensive dewatering. On the other hand, spoils from a boring operation would be clean and could potentially be marketed for reuse. The factors contribute to a considerably higher cost for this technology.

BROOKLYN WATERFRONT TUNNEL ALIGNMENT

The EIS also evaluated a direct and primary rail tunnel connection to the Brooklyn waterfront, as identified in the MIS. The alignment would provide primary access to port development along the waterfront. Under this option, either tunnel alignment would enter land near Owl's Head Park. A large underground junction would need to be built under the park. From this point, trains would have two options, to continue to either the Bay Ridge Branch or to the Brooklyn waterfront. The waterfront tunnel alignment would continue north along First Avenue to 46th Street where it would connect to the First Avenue Rail Line. The underground junction would be a major construction effort. Based on analyses conducted as part of the EIS, it was determined that a considerably less expensive and less capital-intensive option existed for access to the Brooklyn waterfront. Manifest trains with cars destined for 65th Street Yard or other locations along the Brooklyn waterfront would continue along the Bay Ridge Branch to Fresh Pond Yard where they would be classified as a dedicated Brooklyn waterfront train and continue back along the Bay Ridge Branch with a connection to the soon to be rehabilitated 1st Avenue Rail Line. Bulk cargo is generally less time sensitive than intermodal, making this a viable option. Dedicated Brooklyn waterfront trains, such as tri-level auto trains destined for the potential South Brooklyn Marine Auto Terminal could make a reverse move just east of the tunnel entrance. Since a more easily implementable and significantly less costly option was developed as part of the EIS, the waterfront tunnel alignment was dropped.

ALTERNATIVE SITES FOR INTERMODAL RAIL YARD

As part of the EIS process, several potential intermodal facility sites were considered. Eleven (11) sites in New York City and eight (8) sites on Long Island were evaluated for potential use as an intermodal rail yard. The analysis involved criteria specific to intermodal rail yards, which require greater space than other yard types due to container movement and storage and vehicular access to each rail track. Potential sites were evaluated using the following criteria:

- Sufficient acreage (50-100 acres), preferably paved;
- Direct and unimpaired rail access to the site;
- Vehicular/truck access to the Long Island Expressway within three miles; and
- Minimal conflicting surrounding uses.

An analysis of all the evaluated sites is provided in the supporting documentation of this EIS. Of the 19 sites evaluated (most of which comprise less than 20 acres), five were recommended for further evaluation based on the above criteria. These five sites included: (1) First Avenue Rail Yard, Sunset Park, Brooklyn; (2) the vacant Phelps-Dodge site, West Maspeth, Queens; (3) 65th Street Rail Yard, Bay Ridge, Brooklyn; (4) Pilgrim Hospital Complex site, Islip, Long Island; and (5) Republic Airport, East Farmingdale, Long Island.

Of these five sites, the vacant Phelps-Dodge site was determined to be most ideal due to the existing rail activities, size, surrounding industrial uses, and excellent transportation links. Intermodal rail traffic, which carries consumer goods, is time sensitive. In order to attract intermodal traffic to the tunnel, the tunnel system must be as time sensitive as possible. The most time-efficient way to move intermodal traffic in the East-of-Hudson region would be to have a single and central distribution point. This approach avoids the need for multiple train stops and reclassifications, each of which would slow down the delivery of the last products in line. The Phelps-Dodge site in West Maspeth is the best place to have this single distribution point because of its central location within the East-of-Hudson region and good access to rail freight lines and highways. Thus, the trains would be able to get to the rail yard efficiently, and the trucks delivering the goods could subsequently access highways and final markets efficiently. The alternative sites discussed above do not have West Maspeth's advantage of centrality of location within the East-of-Hudson region and rail and highway access. The alternative yard sites discussed above would not satisfy the purpose of and need for improving rail efficiency to the maximum extent possible in order to provide the greatest diversion of long haul trucks. Therefore, the Phelps-Dodge site and expansion of the existing West Maspeth rail yard was selected and is analyzed in this EIS.

ALTERNATIVE SITE PLANS FOR WEST MASPETH YARD

Numerous site plan designs were evaluated for the expanded intermodal yard in West Maspeth, Queens. The yard design was constrained by certain minimum criteria to ensure efficient operations. The rail freight operating environment is such that to attract demand, the yard would need to provide separate operating areas for the two major national railroads serving New York City. The yard would need to include track for the loading and unloading of containers to and from railcars, container storage areas, and truck loading and unloading areas. The number and length of tracks required is a function of the number and length of trains, and arrival and departure schedules. Based on these factors, a yard was designed to accommodate the estimated demand of a two-track tunnel and supporting infrastructure. The following tracks would be required for the yard: fourteen 3,100-foot-long working tracks, twenty-three 3,000-foot-long storage tracks, and three 8,000-foot-long arrival and departure (A/D) tracks to handle complete unit train lengths. The container storage area would need to provide adequate storage for inbound containers and trailers awaiting pick-up by a trucker and for outbound containers and trailers awaiting loading onto a train.

Designs evaluated extended as far north as the Pulaski Bridge and as far south as Flushing Avenue. Because the site would be located in an active industrial area and would require land acquisition and the displacement of a number of businesses, minimizing the size of the yard while maintaining an efficient operating infrastructure were the primary factors that were considered in selecting a preferred site plan. Under the Double Tunnel System, the preferred site plan would contain a reduced yard size by constructing a multi-level container storage facility. This design would limit the extent of the yard to an area between the Kosciusko Bridge to the north and a line parallel to and south of Maspeth Avenue. However, it would require the filling

of Maspeth Creek and a portion of Newtown Creek to provide eight to nine acres of additional land area. These various site plans are discussed in more detail under separate design reports. (Refer to Chapter 22, "References," for more information.)

PORT IVORY FLOAT OPERATION

The EIS examined the feasibility of developing a railcar float terminal at Port Ivory on Staten Island, from which railcars would be floated to 65th Street Yard. This operation would be in addition to the expanded Greenville Yard to 65th Street Yard float operation described above.

Subsequent to a detailed level of service analyses, the Port Ivory float operation was eliminated for the following reasons. The additional capacity resulting from having two float operations is not needed under any projection of carfloat use in the future. The Port Ivory terminal would compete with the Greenville terminal for the same traffic. As a result, no additional traffic would be diverted from truck to rail. With two float terminals, float operating costs and capital costs for tug boats and barges would double and terminal and support costs would increase by more than fifty percent. In addition, the railroads would tend to consolidate their traffic for a single carfloat and would be unlikely to perform the additional switching, classification, and running of trains needed to divide their traffic between two redundant float operations. Finally, the railroads would likely opt for the Greenville float location, which is near Oak Island Yard, over the Staten Island float location, which involves a routing along the heavily used Chemical Coast Line, and the uncertainties associated with the frequent opening of the Arthur Kill Lift Bridge for maritime traffic.

UNION COUNTY CENTRAL RAILROAD

For the Staten Island tunnel alignment, the option of accessing the Staten Island Railroad by diverting traffic from the Lehigh Mainline to the Union County Central Railroad was evaluated. The analysis indicated that rather than taking this direct route to the tunnel, the preferred route would include an initial stop in northern New Jersey to unload freight at rail yards before continuing to the tunnel. Therefore, it is expected that trains would access the Staten Island Railroad via the Chemical Coast Line.

Under the Union County Central Railroad route, trains would need to stop at Port Reading Junction where cars destined for the Staten Island tunnel would be cut off. Railroad level-of-service was found to be less favorable for the Union County Central Railroad. Time would be lost by having to create, inspect, and change crews for trains before they could depart from Port Reading Junction. In addition, the operating costs of creating new tunnel trains at Port Reading Junction with dedicated crews and locomotives would be considerably greater than running the existing trains to their current destination yards where cars remaining in New Jersey would be cut off from those destined for the tunnel and the train would continue along the Chemical Coast Line to the Staten Island Railroad. Furthermore, the Union County Central Railroad would be subject to delays and would not be as reliable as the Chemical Coast Line because there would be no ability on the single-track rail line to queue eastbound trains waiting to cross the Arthur Kill Lift Bridge during lifting operations and still allow passage of westbound trains which had previously been queued on the east side of the bridge. Lastly, trains cannot stop in northern New Jersey first and then proceed to the tunnel via the Union County Central Railroad because the rail yards are north of the Union County Central Railroad, and the connection to the Union County Central Railroad is only from the south.

I. PREFERRED ALTERNATIVE

Presented in this section is a recommendation of a Preferred Alternative for the Cross Harbor Freight Movement Project. The selection of a Preferred Alternative is based upon a comparison of the project alternatives in relation to several factors, including: the goals and objectives identified in Chapter 1, "Project Purpose and Need," economic benefits, construction elements, community input, and environmental impacts.

GOAL 1: IMPROVE THE MOVEMENT OF GOODS INTO, OUT OF, AND THROUGH THE REGION

- OBJECTIVE 1A: Develop structural and nonstructural alternatives that alleviate the shortcomings of the present network.
- OBJECTIVE 1B: Reduce overall travel time for shippers and receivers.

The project alternatives include both structural alternatives (the various tunnel alignments and systems) and non-structural alternatives (those which are primarily operational in nature such as the TSM and Expanded Float Operations Alternatives). Objective 1B can be measured by two criteria: the dollar value of benefits accruing to transportation system users because of reductions in congestion, and the dollar value of benefits accruing to regional communities due to reductions in externalities which result from congestion, such as accidents, highway wear and tear, and air pollution. These benefits stem directly from the diversion of freight movement from truck to rail, and the resulting reduction in highway truck volumes, as described in Goal 2 below. The annual benefits for each alternative in the year 2025 (in 2002 dollars) are shown below aggregated for the two criteria. The benefits are presented for the Metropolitan New York region (including the counties of southwestern Connecticut and northern New Jersey), and for the United States as a whole.

- The *TSM Alternative* would have an insignificant and essentially unmeasurable impact due to the small diversion that it achieves from truck to rail (see Goal 2 below).
- The *Expanded Float Operations Alternative* would achieve annual benefits of $1.7 million for the Metropolitan New York region, and $3.3 million for the U.S. as a whole.
- The *Tunnel Alternative* would achieve the following:
  - The *Staten Island alignment of the Single Tunnel System* would achieve annual user benefits of $14.3 million for the Metropolitan New York region, and $65.7 million for the U.S. as a whole.
  - The *New Jersey alignment of the Single Tunnel System* would achieve annual user benefits of $15.1 million for the Metropolitan New York region, and $69.8 million for the U.S. as a whole.
  - The *Staten Island alignment of the Double Tunnel System* would achieve annual user benefits of $44.5 million for the Metropolitan New York region, and $134.7 million for the U.S. as a whole.
  - The *New Jersey alignment of the Double Tunnel System* would achieve annual user benefits of $44.6 million for the Metro New York region, and $143.4 million for the U.S. as a whole.

GOAL 2: CREATE A MORE MODALLY BALANCED GOODS MOVEMENT SYSTEM IN THE REGION

- OBJECTIVE 2A: Develop freight alternatives that encourage the use of existing transportation corridors with excess capacity.
- OBJECTIVE 2B: Support rail and marine alternatives as a means of diverting traffic from congested highways.
- OBJECTIVE 2C: Foster reliability of freight movement across the Hudson River.

All three objectives were addressed through the development of alternatives that use rail and marine corridors as a means of diverting traffic from congested highways. In accomplishing this diversion from truck to rail and marine transport, system reliability is improved by reducing congestion on the regional highway system and offering shippers and receivers more options for goods movement. The region is an archipelago with an extensive and underutilized series of corridors for moving goods by waterborne transportation. The region's freight rail infrastructure is vastly under-utilized compared to historic norms, particularly those parts crucial to this project (the Bay Ridge and Montauk (west) branches of the Long Island Rail Road), which are essential unused by passenger trains.

The achievement of these objectives can be measured in two ways: (1) by the extent to which each project alternative is forecast to divert freight shipments in the future (2025) from truck to rail; and (2) the reduction of truck volumes in key freight corridors. As discussed in Chapter 8, "Transportation," the region is extraordinarily dependent on seven Hudson River bridge and tunnel crossings to receive goods shipped by truck from most of North America. Of these seven crossings, the George Washington and Verrazano-Narrows bridges are the most important to the region for cross-Hudson goods movements. The degree to which each project alternative is forecast to reduce the volume of freight-carrying trucks ("commodity" trucks) on these and other crossings in 2025 was measured. Commodity trucks are generally the largest (up to 53' feet in length) tractor-trailers and can have the equivalent impact of 3 passenger car equivalents in their relative impact on traffic operations. The annual modal diversion (in year 2025 tons) and the impact of this diversion in reducing 24-hour commodity truck volumes in 2025 is forecast to be as follows for each project alternative:

- The *TSM Alternative* would divert 69,000 tons, which is too small to have a measurable impact on truck volumes in any specific screenline.
- The *Expanded Float Operations Alternative* would divert 459,000 tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 23,100 trips, or less than one percent of total commodity truck volume.
- The *Tunnel Alternative* would in result in the following diversions:
  - The *Staten Island alignment of the Single Tunnel System* would divert 8.8 million tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 460,500 annual trips, or six percent of total commodity truck volume.
  - The *New Jersey alignment of the Single Tunnel System* would divert 9.5 million tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 521,100 annual trips, or seven percent of total commodity truck volume.

- The *Staten Island alignment of the Double Tunnel System* would divert 12.9 million tons resulting in a reduction of commodity truck volumes on the Hudson River crossings of 798,600 annual trips, or ten percent of total commodity truck volume.
- The *New Jersey alignment of the Double Tunnel System* would divert 14.9 million tons, resulting in a reduction of commodity truck volumes on the Hudson River crossings of 880,200 annual trips, or eleven percent of total commodity truck volume.

GOAL 3: IMPROVE ENVIRONMENTAL QUALITY IN THE REGION BY DIVERTING FREIGHT MOVEMENTS TO LESS POLLUTING MODES OF TRANSPORTATION

- OBJECTIVE 3A: Develop preferred alternatives that result in an overall improvement in air quality, traffic congestion and infrastructure wear.
- OBJECTIVE 3B: Identify potential environmental impacts and mitigation associated with the final alternatives.

The annual modal diversions presented under Goal 2 would result in positive impacts on regional transportation, which can be quantified in vehicle miles traveled (VMT) and vehicle hours traveled (VHT). VMT and VHT estimates can subsequently be used to determine regional air quality improvements. The project alternatives would, however, cause various environmental impacts. Some of these impacts would require mitigation, while other impacts would remain unmitigable. These environmental quality improvements and impacts would include the following:

- The *TSM Alternative* would divert a minor quantity of freight from truck to rail; therefore resulting in negligible air quality and traffic congestion improvements. This alternative would create few adverse environmental impacts.
- The *Expanded Float Operations Alternative* would have an insignificant impact on regional commodity truck VMT and VHT—0.1 and 0.2 percent, respectively. This alternative would create few adverse environmental impacts.
- The *Tunnel Alternative* would result in the following:
  - The *Staten Island alignment of the Single Tunnel System* would result in a 2.7 percent reduction in VMT and VHT, and regional emissions reductions for VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NO_x emissions would increase. This alternative would have the potential to cause significant unmitigable noise, visual, and neighborhood character impacts along the elevated portions of Segment 2 of the Staten Island Railroad. Development of West Maspeth Yard would include displacement of 25 to 29 businesses. Visual impacts would potentially result from the ventilation shaft at the 69th Street pier. Significant noise impacts would occur along six rail segments. Up to five acres of tidal wetland would potentially be disturbed from the construction of the second span of the Arthur Kill Lift Bridge.
  - The *Staten Island alignment of the Double Tunnel System* would result in a forecast VMT reduction of 3.8 percent and a VHT reduction of 4.4 percent, and regional emissions reductions for VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NO_x emissions would increase. When compared to interim guidance criterion, $PM_{2.5}$

emissions along the Bay Ridge Branch under the Double Tunnel System would result in potentially unmitigable significant adverse impacts. This alternative would have the potential to cause significant unmitigable noise, visual, and neighborhood character impacts along the elevated portions of Segment 2 of the Staten Island Railroad. Visual impacts would potentially result from the ventilation shaft at the 69th Street pier. Significant noise and neighborhood character impacts would result along Segment 3 of the Bay Ridge Branch. Development of West Maspeth Yard would include displacement of 44 to 52 businesses, and filling eight to nine acres of open water. Significant noise impacts would occur along ten rail segments. Up to five acres of tidal wetland would potentially be disturbed from the construction of the second span of the Arthur Kill Lift Bridge.

- The *New Jersey alignment of the Single Tunnel System* would reduce commodity truck VMT and VHT by about 3.0 percent and reduce regional emissions of VOCs, CO, and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NO_x emissions would increase. Development of West Maspeth Yard would include displacement of 25 to 29 businesses. Significant noise impacts would occur along four rail segments.
- The *New Jersey alignment of the Double Tunnel System* would result in a VMT reduction of 4.5 percent and a VHT reduction of 4.9 percent and regional emissions reductions for VOC, CO,and CO_2. In some areas, local air pollutant concentrations would increase due to locomotive engine emissions and regional NO_x emissions would increase. When compared to interim guidance criterion, $PM_{2.5}$ emissions along the Bay Ridge Branch under the Double Tunnel System would result in potentially unmitigable significant adverse impacts. Significant noise and neighborhood character impacts would result along Segment 3 of the Bay Ridge Branch. Development of West Maspeth Yard would include displacement of 44 to 52 businesses, and filling eight to nine acres of open water. Significant noise impacts would occur along eight rail segments

GOAL 4: PROMOTE ECONOMIC DEVELOPMENT IN THE REGION THROUGH A MORE EFFICIENT GOODS MOVEMENT SYSTEM

- OBJECTIVE 4A: Determine the needs of commercial and industrial interests through outreach and industry involvement.
- OBJECTIVE 4B: Ensure that the final alternatives can meet both present and future commercial needs.
- OBJECTIVE 4C: Reduce the transportation cost to businesses and consumers by alleviating wasteful congestion and creating competitive transportation alternatives.

Objective 4A was met through an extensive public outreach process which began during the Major Investment Study (MIS) and continued through the EIS, including regular meetings of a broad-based stakeholders' advisory committee, and individual meetings with interested parties. In addition, during the MIS, an outreach effort was specifically directed at the regional shipping community. This involved interviews with some 60 interests, and the formal shipper preference survey (267 respondents) which was used as the basis for truck to rail diversion estimation in both the MIS and EIS.

Objectives 4B and 4C can be measured in four ways: (1) the direct improvement in the efficiency of business related transportation and resulting cost savings; (2) the multiplier effects

throughout the economy which results from savings in freight-related transportation costs; (3) the creation of new jobs resulting from this increased economic activity; and (4) the freight support activities which would be retained and generated in the vicinity of the new rail infrastructure, resulting in further job creation. These benefits are distinct from the general travel efficiency benefits shown in Goal 1. The forecasts of these annual impacts are presented below for each project alternative for the year 2025 (in 2002 dollars and number of jobs) for the Metropolitan New York region and for the U.S. as a whole where applicable.

- The *TSM Alternative* would have an insignificant and essentially unmeasurable impact due to the small diversion which it achieves from truck to rail (see Goal 2 above).
- The *Expanded Float Operations Alternative* would achieve annual benefits in business travel efficiency of $1.2 million for the Metropolitan New York region, and $2.3 million for the U.S. as a whole. This improvement in travel efficiency would result in an increase in personal income of $8 million in the region, and $10 million in the U.S. as a whole, and the creation of 107 new jobs in the region (no new jobs would be created outside of the region by any alternative). The new freight infrastructure associated with this alternative is not large enough to result in the retention or creation of new freight related jobs along the project alignment, aside from those jobs directly associated with the operation of the float.
- The *Tunnel Alternative* would achieve following:
  - The *Staten Island alignment of the Single Tunnel System* would achieve annual benefits in business travel efficiency of $10.4 million for the Metropolitan New York region, and $22.2 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $820 million in the region, and $170 million in the U.S. as a whole, and the creation of 15,320 new jobs in the region. (Benefits for the U.S. as a whole are smaller than regional benefits due to the resulting transfer of some economic activity from elsewhere in the U.S. to the region.) Of these jobs, this alternative would result in the retention or generation of 8,100 freight related jobs along the project alignment.
  - The *Staten Island alignment of the Double Tunnel System* would achieve annual benefits in business travel efficiency of $27.7 million for the Metropolitan New York region, and $77 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $1,400 million in the region, and $380 million in the U.S. as a whole, and the creation of 26,120 new jobs in the region. These jobs include the retention or generation of 13,400 freight related jobs along the project alignment.
  - The *New Jersey alignment of the Single Tunnel System* would achieve annual benefits in business travel efficiency of $15 million for the Metropolitan New York region, and $34.6 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $890 million in the region, and $205 million in the U.S. as a whole, and the creation of 16,900 new jobs in the region. These jobs include the retention or generation of 8,640 freight related jobs along the project alignment.
  - The *New Jersey alignment of the Double Tunnel System* would achieve annual benefits in business travel efficiency of $41.5 million for the Metropolitan New York region, and $110 million for the U.S. as a whole. This improvement in travel efficiency would contribute to an increase in personal income of $1,600 million in the region, and $490

million in the U.S. as a whole, and the creation of 29,890 new jobs in the region. These jobs include the retention or generation of 15,200 freight related jobs along the project alignment.

GOAL 5: PROVIDE STRATEGIC SYSTEM REDUNDANCY TO THE REGION'S VITAL HUDSON RIVER CROSSINGS

The provision of transportation system redundancy became more imperative for the region subsequent to the events of September 2001. It was recognized that if any of the major Hudson River crossings were impaired or unusable for an extended duration, the flow of goods that the east of Hudson region consumes on a daily basis would be significantly restricted. Without the flow of goods to and from the east of Hudson region, the economic vitality of the City, the region and to an extent the country would be severely challenged. The northeast region may also be adversely affected if the George Washington Bridge were unusable as the bridge is an important link on the I-95 corridor for goods movement.

Each of the alternatives provides some level of system redundancy; however, the Tunnel Alternative would provide the greatest benefits in terms of capacity, safety/security, and operational efficiency.

CONCLUSION

With respect to all goals, the TSM Alternative would produce minimal or unmeasurable benefits due to the small diversion from truck to rail that it achieves. The Tunnel Alternative would produce far greater benefits than the Expanded Float Operations Alternative due to the much greater diversion of freight from truck to rail. This results from the more efficient operation (in time, cost, and reliability) of direct rail service in comparison to transfers between landside rail and float. As shown in the analyses presented in this Draft EIS, the Tunnel Alternative is preferable to both the TSM Alternative and the Expanded Float Operations Alternative with respect to the project goals and objectives.

The New Jersey alignment of the Tunnel Alternative would achieve greater benefits than the Staten Island alignment. The more direct routing to the western portal of the New Jersey alignment would result in more diversion of freight from truck to rail, which would subsequently yield greater user benefits and travel efficiencies than the Staten Island alignment. In addition, the New Jersey alignment would avoid several significant environmental and neighborhood character impacts exclusive to the Staten Island alignment.

As previously described, the New Jersey alignment could be constructed as a Single Tunnel System or Double Tunnel System. The Double Tunnel System would produce greater benefits than the Single Tunnel System due to operational constraints in the Single Tunnel System, which reduce the diversion of intermodal traffic. While the Double Tunnel System would generate the largest benefits in many respects, it would also result in additional adverse environmental impacts, more business displacements, and would require the highest capital expenditures.

The New Jersey alignment of the Tunnel Alternative has been identified by NYCEDC as the Preferred Alternative. The decision of whether a Single or Double Tunnel System should be recommended will be explored further during the period between the Draft EIS and the Final EIS. For the purposes of this Draft EIS, the benefits and impacts of all alternatives are analyzed and discussed. It is anticipated that the Final EIS will present a comparison of the No Action Alternative, the TSM Alternative, the New Jersey alignment of the Single Tunnel System, and the New Jersey alignment of the Double Tunnel System. ✷

11•03

Figure 2-1
Transportation Systems Management (TSM) Alternative

CROSS HARBOR FREIGHT MOVEMENT PROJECT

11-03

Figure 2-2
Expanded Float Operations Alternative

CROSS HARBOR FREIGHT MOVEMENT PROJECT

11•03

Figure 2-3
Rail Freight Tunnel Alternative - Staten Island Alignment

CROSS HARBOR FREIGHT MOVEMENT PROJECT

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Figure 2-4

Rail Freight Tunnel Alternative - New Jersey Alignment

CROSS HARBOR FREIGHT MOVEMENT PROJECT

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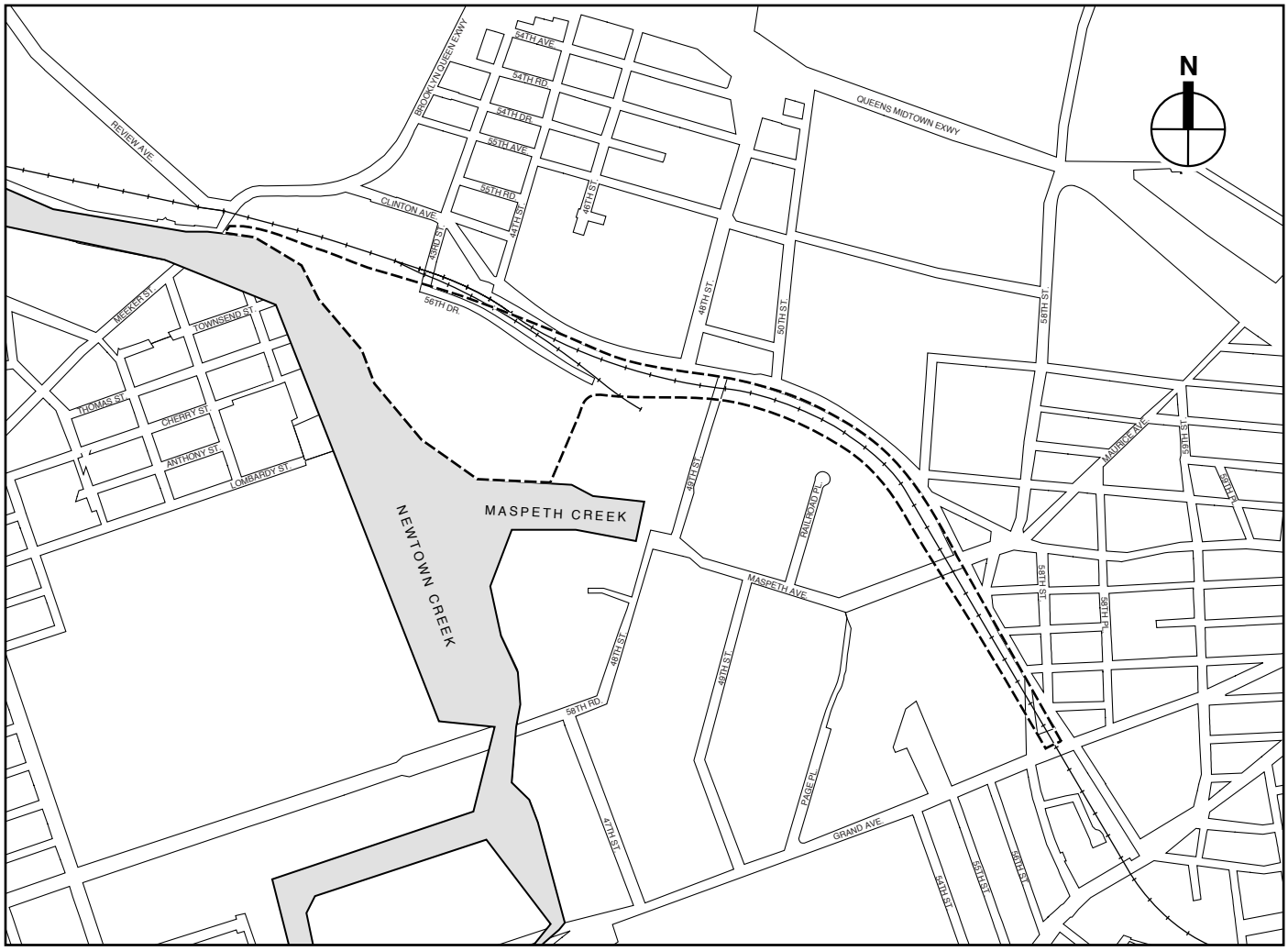


Figure 2-5

West Maspeth Yard • Expanded Float Operations Alternative

CROSS HARBOR FREIGHT MOVEMENT PROJECT

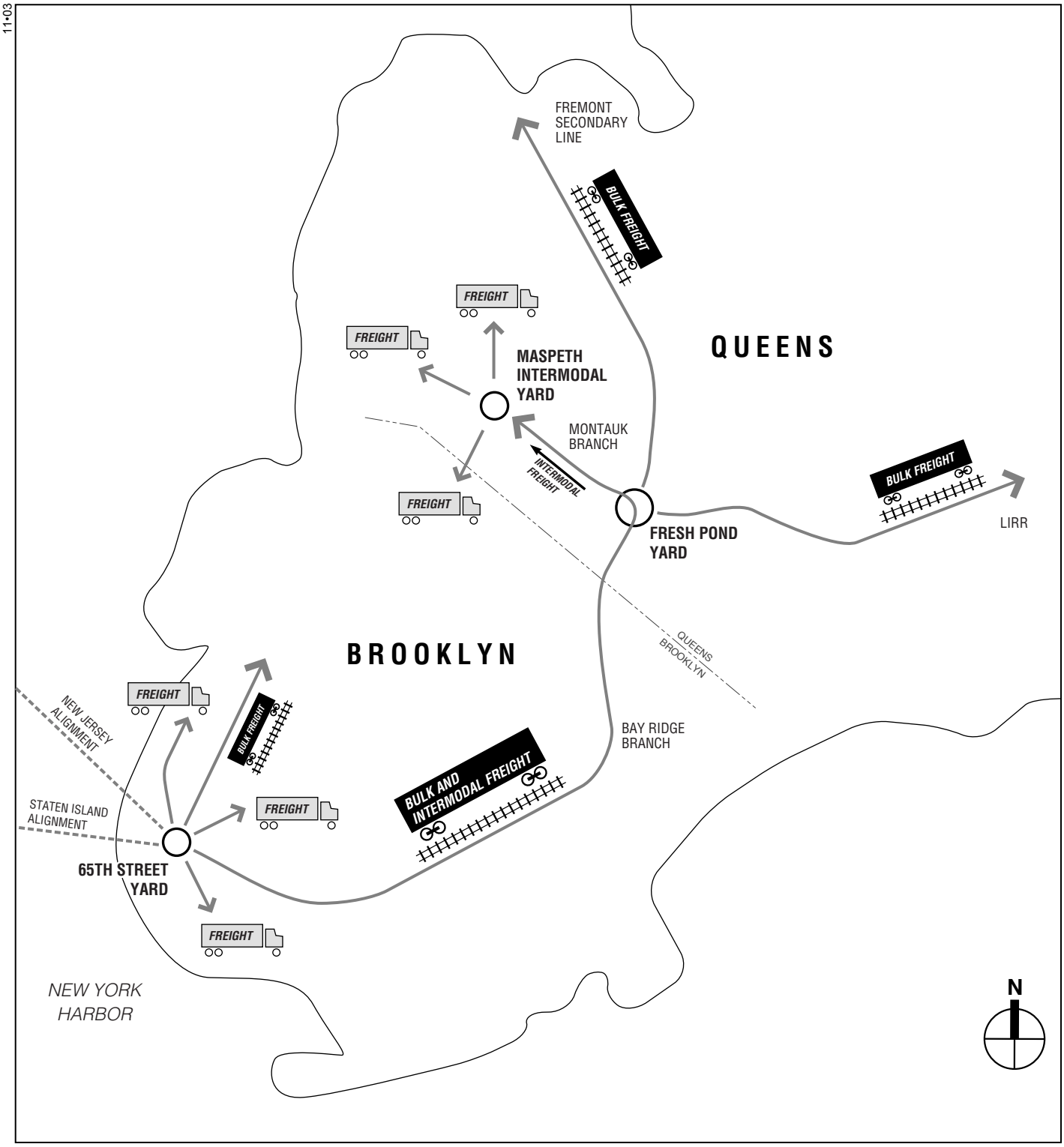


Figure 2-6
Tunnel Alternative — Freight Destinations

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 2-7

New Jersey Tunnel Alignment

CROSS HARBOR FREIGHT MOVEMENT PROJECT

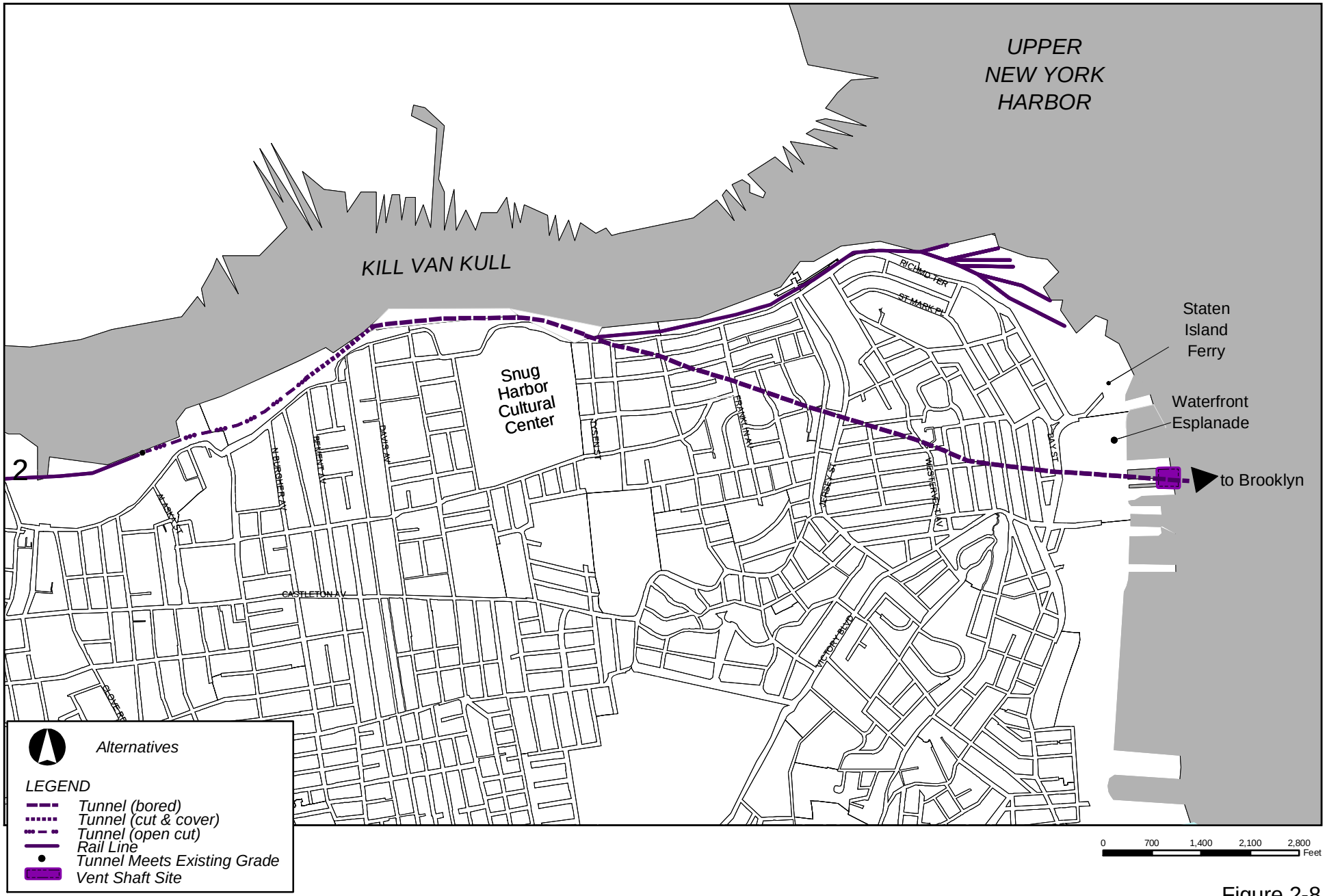


Figure 2-8
Staten Island Tunnel Alignment
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 2-9
Tunnel Alignments in Brooklyn
CROSS HARBOR FREIGHT MOVEMENT PROJECT

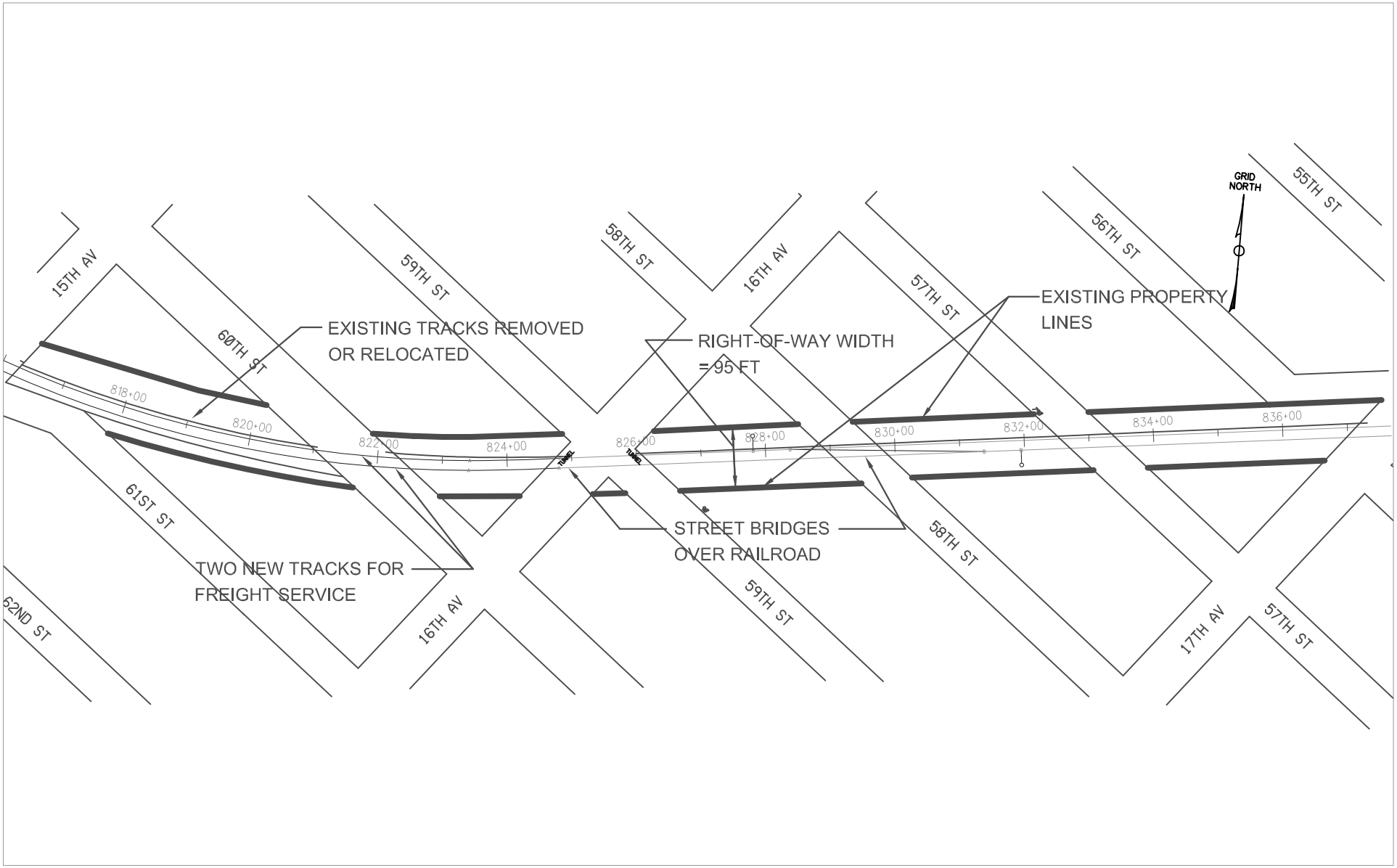


Figure 2-10
Proposed Rail Alignment- Above Grade (Typical)
CROSS HARBOR FREIGHT MOVEMENT PROJECT

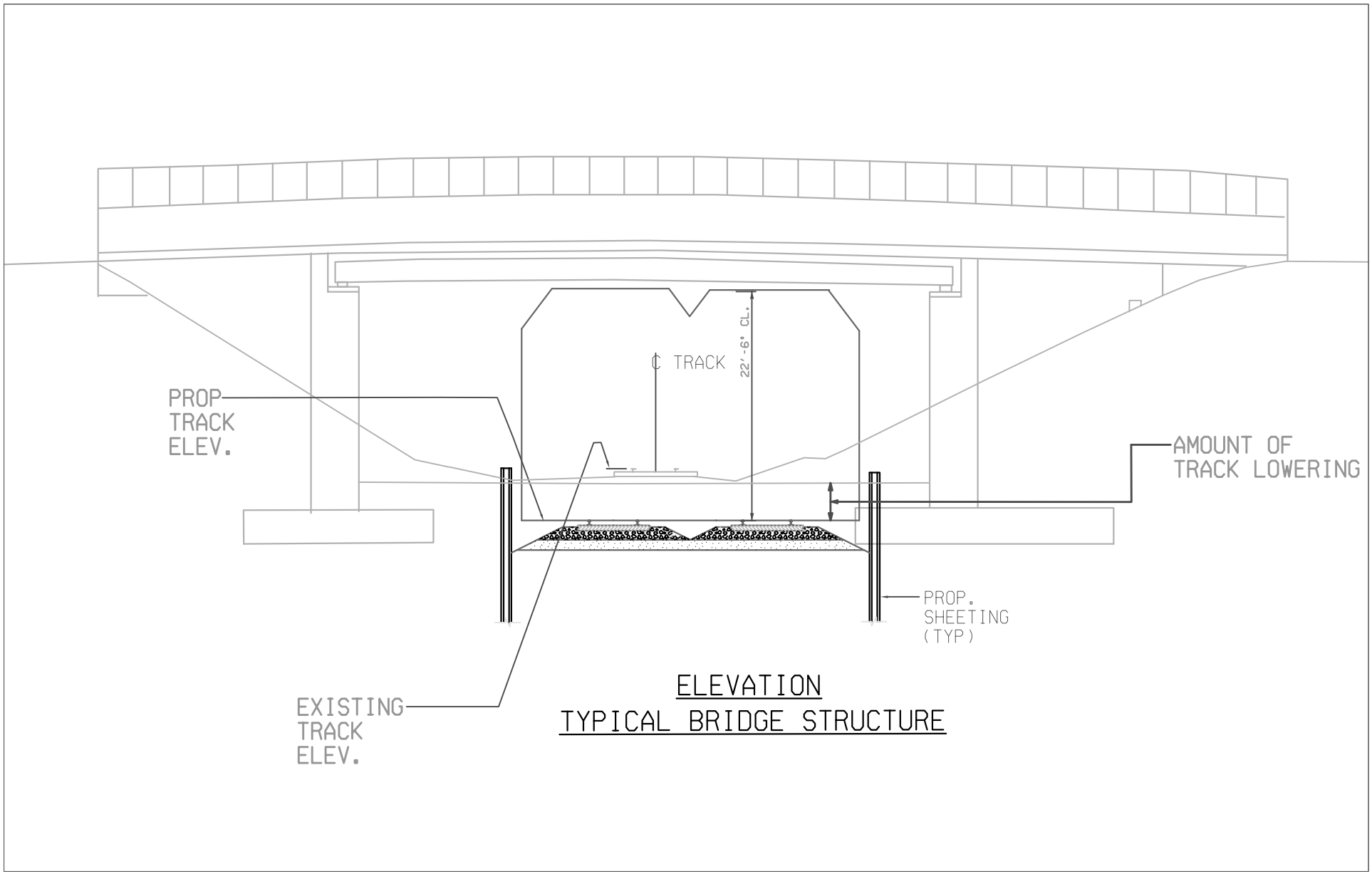


Figure 2-11
Proposed Rail Alignment - Cross Section (Typical)
CROSS HARBOR FREIGHT MOVEMENT PROJECT

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Figure 2-12

West Maspeth Yard • Single Tunnel System

CROSS HARBOR FREIGHT MOVEMENT PROJECT

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Figure 2-13

West Maspeth Yard • Double Tunnel System

CROSS HARBOR FREIGHT MOVEMENT PROJECT

A. INTRODUCTION AND METHODOLOGY

This chapter considers existing land use, neighborhood character, and social conditions for areas potentially affected by the project alternatives. These areas include portions of Hudson, Essex, Union, and Middlesex Counties in New Jersey, and Staten Island, Brooklyn, Queens, and the Bronx in New York. The analysis includes assessments of existing land use, zoning, public policy, neighborhood character, community facilities (neighborhood institutions, such as schools, libraries, hospitals, etc.), open spaces and demographic characteristics. The chapter then discusses future trends and growth expected by 2010 and 2025 for the study areas under the No Action Alternative; and identifies and addresses potential impacts on land use, zoning and public policy, neighborhood character, and social conditions associated with the project alternatives. The potential for displacement of residents or community facilities as a result of the project alternatives is also addressed.

Study areas were determined for each site where potential operational or construction activities may occur under the project alternatives. Operational and construction activities could occur at existing and new rail yards, along rail lines, and along the potential tunnel alignment. The study areas associated with these activities cover a broad geographic area and are diverse in terms of their land uses and context. (The project area, including each of the project sites, is shown on the Figure S-1 "Context Map," provided in the Executive Summary). The size of the study areas was determined after consideration of the potential for traffic, air quality, noise, and other impacts associated with project activities, so that appropriate land use information was gathered to support those analyses. The study areas for the assessment of land use, zoning and public policy, neighborhood character, and social conditions are as follows:

- *For rail lines and the bored portion of the tunnel alignments, the area within 400 feet of those activities.* In addition, a general discussion of neighborhood character within a ¼-mile of these project elements is provided to set the context for the study areas. The size of these study areas was determined based on a consideration of potential project impacts during construction and operation. All the rail lines are existing uses, and therefore no land use change would occur under the project alternatives. However, the rail lines currently have varying levels of operational activity; some are inactive or experience little activity, while others are heavily traveled. Therefore, impacts such as noise and vibration were the primary factors considered in determining study area size.

- *For the "open cut" and "cut and cover" portions of the tunnel alignments and for rail yards, the area within ¼ mile of those activities.* These larger study areas were defined for project elements where the physical effects of construction and operation would be more extensive. For example, the impacts associated with open cut and cut-and-cover construction for the tunnel would be more visible and far-reaching than those for the bored tunnel sections, which would not be visible above ground. The rail yards would have the potential to result in

off-site impacts from vehicular traffic traveling to and from the sites. For certain rail yard study areas that are crossed by major highways, boundaries were adjusted to terminate at the highways when there were no residential areas beyond this point, or if impacts would not be expected to occur in these areas (i.e., no additional project-generated traffic, or no additional noise). For example, in New Jersey, the study area for Greenville Yard and the potential tunnel alignment did not extend west of the New Jersey Turnpike.

In addition, due to the length of the study areas for several of the rail lines, the rail line study areas were divided into segments. The segment divisions were determined based on a consideration of potential project impacts, land uses, and track elevations along the rail lines. The study area for the Staten Island Railroad and tunnel alignment was divided into four segments, the study area for the Bay Ridge Branch and tunnel alignment was divided into four segments, and the study area for the Fremont Secondary was divided into three segments.

Various sources were used to prepare this chapter, including field surveys; data and reports supplied by local government agencies; interviews with representatives of government agencies and private realtors; and geographic information systems (GIS). For an additional discussion of information sources, see Appendix 7, "Land Use and Economic Conditions."

Tables defining zoning districts for both New Jersey and New York City and zoning maps for each of the study areas are provided in Appendix 7, "Land Use and Economic Conditions."

B. EXISTING CONDITIONS

NEW JERSEY STUDY AREAS

There are seven study areas located within the State of New Jersey: Oak Island Yard Study Area located in Essex County; Greenville Yard/Potential Tunnel Alignment Study Area located in Hudson County; Greenville Branch Study Area, located in Hudson County; National Docks Secondary Study Area located in Hudson and Bergen Counties; P&H Line Study Area located in Hudson and Essex Counties, Chemical Coast Line Study Area located in Essex, Union, and Middlesex Counties; and the Arthur Kill Lift Bridge Study Area located in Union County (see Figure S-1). Following is a description of the existing land use, zoning, neighborhood character, community facilities, open space and social conditions for the New Jersey study areas.

OAK ISLAND YARD STUDY AREA

The Oak Island Yard Study Area is located in the City of Newark, Essex County on Newark Bay. The study area is roughly defined as the area within ¼ mile of Oak Island Yard and generally extends from Delancey Street to the north, Newark Bay to the east, Firmenich Way to the south, and the New Jersey Turnpike/I-95 to the west. The Turnpike is not quite ¼ mile from the Oak Island Yard, but it creates a visual and physical barrier from land uses to the west. The rail yard is at grade and Doremus Avenue crosses the rail yard on a bridge.

Land Use and Neighborhood Character

As shown in Figure 3-1, land uses in the study area are uniformly industrial with active rail yards, port facilities, warehouses, distribution centers, manufacturing facilities, public utility infrastructure, and air freight businesses associated with nearby Newark Airport (located just to the southwest of the study area). The area also includes the Passaic Valley Sewerage

Commissioners Pumping Station, several large industrial buildings, a chemical manufacturing building, the Newark Industrial Center, and several parking lots.

Zoning and Public Policy

The entire Oak Island Study Area is zoned for heavy industry where commercial and industrial activities are restricted only in that they shall not be in conflict with nuisance regulations.

The City of Newark is in the process of completing a comprehensive Master Plan. Draft versions of the document available for public review indicate that City policy is to maintain heavy industrial areas, including the Oak Island Study Area, as an important economic asset of the City.

The Port Authority of New York and New Jersey (PANY/NJ) and other agencies, such as the New Jersey Department of Transportation (NJDOT) and the North Jersey Transportation Planning Authority (NJTPA), are implementing other public policy and infrastructure investments within and adjacent to the Oak Island Study Area. Most notably, the Portway and Comprehensive Port Improvement Plan (CPIP) initiatives are important long-term strategies to accommodate continued growth of cargo movement into the Port of New York and New Jersey and to improve truck and rail access (see Chapter 2, "Project Alternatives," for a description of Portway). The most direct effect for the Oak Island Yard Study Area is the current project reconstructing and widening the Doremus Avenue Bridge over the rail yard under Portway.

The eastern portion of the study area falls within the New Jersey Department of Environmental Protection's (NJDEP) Coastal Zone Management (CZM) area. The policies associated with the CZM are discussed in detail in Chapter 15, "Coastal Zone Management."

Other applicable public policy to development in the study area includes Newark's designation as a special urban area by the New Jersey State Legislature. This enables the City to receive State aid for maintaining and upgrading municipal services and to offset local property taxes. Development that would be of economic and social benefit and that serves the needs of local residents and neighborhoods is encouraged.

Community Facilities, Open Space, and Population Characteristics

There are no community facilities or designated open space resources located within the Oak Island Yard Study Area. In addition, no residents live within the Oak Island Yard Study Area.

GREENVILLE YARD/POTENTIAL TUNNEL ALIGNMENT STUDY AREA

The Greenville Yard/Potential Tunnel Alignment Study Area is located in Jersey City, Hudson County on Upper New York Harbor. The study area is defined as the area within ¼ mile of Greenville Yard, the potential tunnel alignment, and the ventilation shaft located at the northeastern corner of the Global Marine Terminal/Auto Marine Terminal (NEAT) pier. The study area boundary does not extend west of the New Jersey Turnpike Extension/I-78 because the turnpike creates a visual and physical boundary between the more residential neighborhoods to the west and the industrial area to the east. The boundaries are roughly defined as Linden Avenue to the north, the Upper New York Harbor to the east, Upper New York Harbor and Harbor Drive to the south and the New Jersey Turnpike Extension/I-78 to the west.

Land Use and Neighborhood Character

Land use in the study area is exclusively industrial (see Figure 3-2) with a mix of port and marine related facilities, built industrial facilities, and large areas of open yard and storage facilities. Immediately surrounding the yard to the northwest is a juice processing facility; to the north is a scrap yard and a paper recycling facility; immediately to the southeast is a car port and parking area and on the next pier to the southeast is the Northeast Auto Marine Terminal (NEAT) and a garage facility; and to the west is the Greenville Branch and vacant land owned by Conrail Shared Assets (CSAO). Other uses in the study area include a crane storage and maintenance facility located along the southern shoreline and the Jersey City Industrial Park, located to the south along Port Jersey Boulevard. However, the vicinity of the yard has more of an underutilized character, including the deteriorated facilities of the float bridges and other remnants of a historically more active rail yard.

Zoning and Public Policy

Zoning in Jersey City is established in the City's Land Development Ordinance as well as area-specific supplemental Redevelopment Plans, for which there are some 58 plans mapped throughout the City. The western edges of the study area are mapped within a Port Industrial district, and the vast majority of the study area is mapped within the "Greenville Industrial Redevelopment Plan." The Port Industrial district is designated for the purpose of enhancing and accommodating the City's working waterfront and to take advantage of extensive transportation facilities.

The Greenville Industrial Redevelopment Plan was initially adopted in May 1989 and has been updated periodically; the latest revision dated November 1999. The plan was created to further the redevelopment goals of the blighted and underutilized industrial area. The overall plan is subdivided into a Terminal District and a Modern Industrial Park District, located primarily in the southwest third of the overall plan area. The Greenville Yard Study Area is primarily located in the Terminal District. Permitted uses include light industrial, warehousing and distribution, terminal facilities, roadways, public uses, open spaces, utilities, and retail and service.

In addition to the area-specific Greenville Industrial Redevelopment Plan described above, other public policy initiatives were identified as possibly influencing redevelopment opportunities in the study area.

Hudson County updated its Master Plan in 2001. The general goals include policies that encourage economic revitalization of the County's commercial and economic base, and improvements to the transportation network. Specifically, the plan seeks to support existing manufacturing and industrial uses through expansion and modernization and through the promotion of new manufacturing and industrial development. The plan also aims to assist in the implementation of development and redevelopment of the Hudson waterfront by encouraging growth of ports and by integrating waterfront development with adjacent neighborhoods through improved transportation networks.

PANYNJ and other agencies, such as NJDOT and NJTPA, are implementing other public policy and infrastructure investments within and adjacent to the Greenville Yard Study Area. Most notably, this includes Military Ocean Terminal Bayonne (MOTBY) Portway and CPIP initiatives. These are important long-term strategies to accommodate continued growth of cargo movement into the Port of New York and New Jersey and to improve truck and rail access to and from the ports. In addition, the City of Bayonne is proposing to redevelop MOTBY.

Community Facilities, Open Space, and Population Characteristics

No community facilities are located and no residents live within the study area. The only open space located within the Greenville Yard study area is a paved waterfront path and adjacent observation deck providing views of the ports, Brooklyn, Lower Manhattan, Upper New York Harbor, and the Statue of Liberty. The paved public waterfront path is used for recreational uses, such as jogging, rollerblading, walking, or biking.

GREENVILLE BRANCH STUDY AREA

Greenville Branch Study Area is defined as the area within 400 feet of the Greenville Branch from the New Jersey Turnpike Extension/I-78 to the east to Newark Bay to the west. The eastern portion of the study area is located within Jersey City and the western half is located within Bayonne, with the municipal boundary falling to the east of Mercer Park. The rail line is elevated on an embankment in the eastern portion of the study area and on an elevated structure in the western portion near Newark Bay.

Land Use and Neighborhood Character

As shown in Figure 3-3, land uses immediately adjacent to the Greenville Branch contain a mix of residential, commercial, retail, and auto-related, and industrial uses. The New Jersey Turnpike Extension/I-78 parallels the rail line and forms much of the study area's southern border. The study area is most notably an intensive use transportation corridor that includes the rail line, New Jersey Route 440, and the New Jersey Turnpike Extension/I-78. These highways serve as a gateway to both Bayonne and Jersey City.

The northern portion of the study area is primarily residential with a few shopping areas located along John F. Kennedy Boulevard, Old Bergen Road, and Ocean Avenue. John F. Kennedy Boulevard is a wide, four-lane street with metered parking lanes on either side of the boulevard and provides a major north/south access on the Bayonne Peninsula. Old Bergen Road and Ocean Avenue are quieter streets catering more to local residents. Mercer Park provides a neighborhood gathering space and a buffer between the residential areas to the east and the busy boulevard to the west. To the north of Mercer Park and outside the study area, there are several tall (approximately 20 stories tall) apartment buildings, while the residential neighborhood east of Ocean and Garfield Avenues, tends to have single family and semi-attached, one- and two-story houses. The area south of the rail line consists of industrial uses and automobile-related businesses, such as garages and body shops. Route 440 crosses this portion of the study area.

Zoning and Public Policy

In Jersey City, the Greenville Branch study area is mapped low density residential to the east of Old Bergen Avenue and multi-family mid rise residential west of Old Bergen Avenue to the Bayonne municipal boundary. In Bayonne, the area east of John F. Kennedy Boulevard, including Mercer Park, is zoned residential while the portion of the study area between John F. Kennedy Boulevard and Newark Bay is zoned for commercial uses.

The City of Bayonne adopted a new Master Plan in 2000. Key elements of the plan that are identified for and around the Greenville Branch Study Area include the identification of John F. Kennedy Boulevard as a gateway to the community from Jersey City; circulation priorities along Route 440 and the interstate; and that overall improvements to transportation infrastructure, particularly for rail freight, can improve traffic and truck congestion issues within the City of

Bayonne. In support of this latter policy objective, the master plan strongly endorses regional initiatives to improve the transportation infrastructure, most notably the Portway project.

Other public policy initiatives discussed under the Greenville Branch/Potential Tunnel Alignment Study Area are also applicable to this study area, including the Hudson County Master Plan; PANYNJ, NJDOT, NJTPA and other agency participating projects; the NJDEP CZM; and the designation of Jersey City and the City of Bayonne as special urban areas by the New Jersey State Legislature.

Community Facilities, Open Space, and Population Characteristics

No community facilities and only one open space are located within the study area. Mercer Park is located just to the north of the rail line, between John F. Kennedy Boulevard to the west and Merritt Street to the east. This space offers a walking trail, playground, baseball and softball field, basketball court, and benches.

In 2000 the Greenville Branch Study Area included an estimated 1,321 residents. For census tracts wholly or partially within the study area, nearly half of the residents were white, 23 percent were black, and nearly 24 percent were Hispanic.

In 1990, the study area included an estimated 1,136 residents, approximately 14 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (approximately 62 percent); 22 percent were black, and 17 percent were Hispanic. The 1989 median household income was $31,600 (1989 dollars) with approximately 17 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was more than in Hudson County, slightly lower than in Jersey City, and more than in Bayonne.

NATIONAL DOCKS SECONDARY STUDY AREA

The National Docks Secondary Study Area is defined as an area located within 400 feet of the rail line. The study area extends from the North Bergen Yard to the north to the Greenville Branch to the south. The rail corridor passes through the municipalities of North Bergen and Jersey City in Hudson County. For analysis purposes, the study area has been divided into two segments. Segment 1 includes the area from North Bergen Yard to Tonnelle Avenue (Route 1/9) south of Croxton Yard in Jersey City. Segment 2 extends south from this point to Greenville Branch.

Segment 1

West Side Avenue roughly bounds the study area to the west in the northern portion and Tonnelle Avenue (Route 1/9) runs parallel on the east side of the active rail line for nearly the entire length of the Segment 1 study area. 49th Street in North Bergen defines the northern boundary of the study area.

Land Use and Neighborhood Character. Land uses in the study area are primarily industrial, ranging from rail-associated operations to custom tile manufacturers and including a variety of warehouses and the North Bergen Sewage Treatment Plant (see Figure 3-4). The warehouses are in varying states of use and neglect. Vacant land and miscellaneous truck and automobile parking surround the highway infrastructure related to the Lincoln Tunnel Approach.

Within the study area, the streets are busy with a lot of tractor trailer truck traffic, other truck traffic, and cars. There is no on-street parking on any of the main traffic corridors and some

parking on local side streets. A major road infrastructure development in concert with the Portway project is currently underway at the intersection of Tonnelle and Secaucus Avenues. In the southern portion of the study area near Croxton Yard, the area is very congested with traffic exiting and entering the Lincoln Tunnel's Traffic Circle near the Pulaski Skyway.

Zoning and Public Policy. In North Bergen, the land in the rail corridor is zoned Industrial. The southern portion of the study area to the east of the rail line is located within Jersey City and is zoned HC for Highway Commercial. The study area west of the rail line in both North Bergen and in Jersey City falls under the zoning jurisdiction of the New Jersey Meadowlands Commission (formerly the Hackensack Meadowlands Development Commission) with a mix of manufacturing districts.

In North Bergen, the Township's master plan includes sections on proposed improvements to regional transit facilities and expanded intermodal facilities. In Jersey City, Segment 1 is in northern Jersey City, and municipal policies reflect the current commercial activity in place. As mentioned above, in Hudson County, the Master Plan recognizes the need for transportation improvements including system expansion, which incorporates the development of new transit and support facilities such as terminals, stations, operations buildings, etc. In addition, the plan also anticipates the need for increased freight rail capacity to alleviate problems with routing, congestion, scheduling conflicts, and operating speeds.

Community Facilities, Open Space, and Population Characteristics. No community facilities or open spaces are located within Segment 1 of the National Docks Secondary Study Area. In addition, no residents live within the 400-foot Segment 1 study area.

Segment 2

The Segment 2 study area includes the portion of the National Docks Secondary Study Area that extends from Tonnelle Avenue (Route 1/9) south of Croxton Yard in the northern section of Jersey City to the Greenville Branch in the southern section of Jersey City.

Land Use and Neighborhood Character. The study area covers a variety of urban neighborhoods, ranging from densely populated downtowns with a mix of residences and ground-floor retail and services concentrated around a transit node to more industrial areas with few or no residences and a lot of vehicle traffic (see Figure 3-5). Major highway routes for the area run parallel to the rail line for nearly the entire study area. The rail line is depressed by 40 to 60 feet surrounded by steep, rough, rock walls in the northern portion of the study area. The northern portion of the study area near Croxton Yard is more industrial than the southern portion. There is heavy tractor-trailer truck and vehicular traffic entering and leaving New York City. There are no sidewalks and not many pedestrians in the area. Businesses are industrial, warehousing, or auto-related, such as gas stations and auto repair.

There are a variety of land uses, including clusters of residential uses, schools, and open spaces, in the portion of the study area between Palisade and Hoboken Avenues and Grand Street. The New Jersey Turnpike Extension/I-78 roughly defines the eastern border of the study area.

The remainder of the study area between Johnston Avenue and the Greenville Branch is mostly industrial, except for a park and adjacent cemetery located west of the rail line near Chapel Avenue. The study area east of the rail line is mainly rail and highway right-of-way, including the New Jersey Turnpike Extension/I-78. There are a few warehouses west of the rail line at Communipaw Avenue. South of Communipaw Avenue to Bayview Avenue there are multiple rail lines with vacant land in between them.

Zoning and Public Policy. The northern portion of the study area is mostly zoned residential and Office/Residential, where the rail line runs through a densely populated part of Jersey City. The study area also includes portions of several Jersey City Redevelopment Plans.

Community Facilities, Open Space, and Population Characteristics. The Dickinson High School (Jersey City High School) is located along Palisade Avenue near the Holland Tunnel approach. This high school was built on a brow area overlooking Jersey City, and the rail line is depressed, approximately 40 to 50 feet, or more below the high school. The Hudson County School of Technology is located south of Montgomery Street and the rail line passes through its property. South of Montgomery Street at Grand and Merseles Streets is an Edison School, the Schomberg Charter School.

There are two open spaces located partially within the study area. One park area is located near a school at Grand and Merseles Streets and is adjacent to the elevated rail line. The park offers soccer and football fields, a playground, and tennis and basketball courts and is well maintained and used. The other open space is a ball field located at Bayside Park, adjacent to York Cemetery at Garfield and Armstrong Avenues.

In 2000, the study area included an estimated 6,110 residents. For census tracts wholly or partially within the study area, approximately 34 percent of the residents in the study area were black, 29 percent were white, 26 percent were Hispanic, and nearly 18 percent were Asian.

In 1990, the study area included an estimated 5,995 residents, slightly fewer residents than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (41 percent), 36 percent were black, 20 percent were Hispanic, and nearly 14 percent were Asian. The 1989 median household income was $24,240 (1989 dollars) with approximately 20 percent of the population living below the poverty level. The percentage of low-income residents in the study area was higher than in Jersey City and Hudson County as a whole.

P&H LINE/GREENVILLE BRANCH STUDY AREA

The P&H Line Study Area is defined as the area within 400 feet of the rail line from Croxton Yard in Jersey City, Hudson County, New Jersey to the Greenville Branch in Newark, Essex County, New Jersey. The Greenville Branch Study Area is the area within 400 feet of the Greenville Branch between the P&H Line and Oak Island Yard. The P&H Line from north to south crosses the Hackensack River and passes Kearny Yard in Kearny before crossing the Passaic River. West of the Passaic River the study area crosses New Jersey Turnpike/I-95, and parallels Route 1/9. The Greenville Branch Study Area is north of Newark International Airport.

Land Use and Neighborhood Character

As shown in Figure 3-6, the majority of the study area is industrial, except for the outer eastern edge of a residential and commercial area centered along Wilson Avenue in Newark. The industrial uses include warehouses, auto-related uses, and rail-related industries. The residential neighborhoods are located at the intersection of Ferry and Waydell Streets and between Main and Vincent Streets.

The northernmost and southernmost portions of the study area are industrial sites devoted to rail and associated uses. There are few roads accessing these areas, and most of the traffic is related to warehouse distribution. The central part of the study area west of the rail line is located within a mixed residential neighborhood. Wilson Avenue is a major thoroughfare in this area with

quieter and smaller side streets branching into the neighborhoods. The houses in this area are densely built with little or no yards, except for a 13-story apartment complex at Vincent Street.

Zoning and Public Policy

The study area includes land that falls under the jurisdiction of Newark, Jersey City, and the New Jersey Meadowlands Commission located in Jersey City and Kearny. For the most part, the study area is zoned for industrial uses, with exceptions in several areas.

Other plans that affect this study area are the City Of Newark's Master Plan, the Essex County Master Plan (as summarized in the Newark Master Plan), and the 1992 New Jersey State *Development and Redevelopment Plan* (with 1999 updates to an interim plan). In addition, the Portway and CPIP initiatives are being implemented within and adjacent to the study area. This area is also part of the area designated a special urban area by the New Jersey State Legislature (discussed above).

Community Facilities, Open Space, and Population Characteristics

There are no community facilities and only one publicly accessible open space located within the study area. A portion of a park containing a running track lies adjacent to the rail line at the intersection of McGregor Avenue and St. Charles Street near Berlin Street in Newark.

In 2000, the study area included an estimated 757 residents. (Even though the rail line is located within several municipalities, only Essex County residents were located within the study area.) For census tracts wholly or partially within the study area, approximately 73 percent of the residents in the study area were white, nearly 33 percent were Hispanic, about 8 percent were Black, and less than one percent were Asian.

In 1990, the study area included an estimated 492 residents, approximately 35 percent fewer residents than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (81 percent); 35 percent were Hispanic, nearly 9 percent were black, and less than one percent were Asian. The 1989 median household income was $23,500 (1989 dollars) with approximately 11 percent of the population living below the poverty level. The percentage of low-income residents in the study area was less than in Essex County as a whole and much less than Newark.

CHEMICAL COAST LINE STUDY AREA

The Chemical Coast Line Study Area is defined as the area within 400 feet of the rail line between Oak Island Yard in Newark, Essex County and the Port Reading Secondary Line in Middlesex County. From north to south, the study area traverses through various cities: Newark, City of Elizabeth, City of Linden, Carteret Borough, and Woodbridge Township. The study area has been divided into two segments; Segment 1 is the portion of the rail line between Oak Island Yard and the Staten Island Railroad, and Segment 2 is the portion of the rail line between the Staten Island Railroad and the Port Reading Secondary Line.

Segment 1

The Segment 1 study area includes the Cities of Newark and Elizabeth. The New Jersey Turnpike/I-95 parallels the rail line to the west.

Land Use and Neighborhood Character. As shown in Figure 3-7, the vast majority of the land within the study area comprises industrial and transportation uses with a small residential section

in the southern portion of the study area in Elizabeth. The industrial area consists largely of highway uses, port facilities, rail yards, and other transportation uses, including Newark International Airport to the west. The streets within the industrial areas are busy with large trucks and related port traffic. There is no parking along these routes and rail connections between the Chemical Coast Line and adjacent warehouses and ports cross the streets.

The portion of the study area south of Trumbull Street to 3rd Avenue is primarily residential with a few exceptions. To the west of the rail line and New Jersey Turnpike, there is a tall concrete wall that separates the transportation corridors from area residents. This concrete wall creates a visual and physical barrier between the residents in Elizabeth to the east and west of the rail line. South of Trumbull Street in the eastern portion of the study area there is a local park. A school across the street falls just outside the study area. Adjacent to the park within the study area, there is a new housing development.

Within the residential portion of the study area, the streets tend to be narrower with street parking and sidewalks. The rail line runs parallel to 3rd Street, which once was a major commercial strip in the area. There are many vacancies in the storefronts at ground level along the street. However, new residential development is occurring, which may encourage a revitalization of the area.

Zoning and Public Policy. The entire section of the study area located within Newark is zoned for a heavy industrial district. The southern section of the study area is located entirely within Elizabeth and falls within several zoning districts, including zones for manufacturing to the north and south, regional commercial uses, and manufacturing, research and commercial uses. In addition, the study area contains some commercial and residentially zoned areas. The entire western portion of the study area to approximately North Avenue is devoted to the New Jersey Turnpike/I-95 right-of-way and there are no zoning designations.

Relevant aspects of the municipal (Newark) and county (Essex) master plans are summarized for the Oak Island Yard Study Area above. In Union County, statewide planning affirms the urban and industrial base of the study area and promotes sound transportation investment to improve efficiency and reduce congestion. Port policy initiatives discussed under the Oak Island Yard Study Area also apply here. As noted above, both Elizabeth and Newark are designated as special urban areas by the New Jersey State Legislature.

Community Facilities, Open Space, and Population Characteristics. No community facilities and only one open space are located with the study area. Brophy Field is a Green Acres Project located adjacent to the rail line on the east side at the corner of Trumbull and 3rd Streets in Elizabeth. The park provides a ball field, jungle gym, and benches for neighboring residents.

In 2000, the study area included an estimated 2,470 residents. For census tracts wholly or partially within the study area, over half of the residents were white, 17 percent were black, and nearly 63 percent were Hispanic.

In 1990, the study area included an estimated 2,573 residents, approximately 4 percent more than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (nearly 60 percent), 22 percent were black, and 52 percent were Hispanic. The 1989 median household income was nearly $26,000 (1989 dollars) with approximately 21 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was more than in either Essex or Union County, more than in Elizabeth City, and less than in Newark.

Segment 2

Segment 2 of the Chemical Coast Line Study Area is defined as the area within 400 feet of the rail line between the Staten Island Railroad and Port Reading Secondary Line. The study area encompasses parts of Union County, including Elizabeth and Linden, and Middlesex County, including the Borough of Carteret and the Township of Woodbridge. The New Jersey Turnpike/I-95 parallels the rail line to the west and the Rahway River bisects the line.

Land Use and Neighborhood Character. There is a mix of land uses within the study area, including industrial, commercial, residential, and open space (see Figure 3-8). Land uses adjacent to the rail line north of the Rahway River tend to be industrial, with several gas and oil storage facilities located along the New Jersey shoreline near the Arthur Kill. South of the Rahway River, there are several large vacant industrial buildings northeast of New Jersey Turnpike, Exit 12. There is a small commercial strip containing convenience stores and a motel near Exit 12. Farther south, the eastern portion of the study area becomes more residential with single-family houses on small lots and front and rear yards. The rail line abuts some of the residential rear yards. The residential neighborhoods are quiet, with some houses abutting the rail right-of-way, where the rail line runs at-grade. The residential neighborhoods in Carteret and Woodbridge are made up of older two-story, single-family houses. The streets tend to be two lanes and wind through the neighborhoods. At the southern end of the study area west of the rail line, there is an open space used as a dog park.

Zoning and Public Policy. Within the City of Elizabeth, the study area is zoned for manufacturing. In the City of Linden, the study area is zoned for heavy industry. In the Borough of Carteret, all local zoning is mapped to the east of the rail line. There is no zoning mapped for the New Jersey Turnpike/I-95 corridor that encompasses the study area to the west of the Chemical Coast Line. Zoning to the east of the rail line is for heavy industry between the Rahway River and New Jersey Turnpike/I-95 Exit 12, highway commercial/business south to Monroe Street, and moderate density residential in the remainder of the study area, except for a light industrial zone to the west of the rail line in the Township of Woodbridge.

Community Facilities, Open Space, and Population Characteristics. There are no community facilities located in study area. At the southern end of the study area there is a dog park located at Rosewood Lane and 4th Street. The park is not fenced and there are no active use amenities. The dog park consists of a flat grassy area with a few trees.

In 2000, the study area included an estimated 1,157 residents. For census tracts wholly or partially within the study area, the majority of the residents were white (nearly 71 percent), nearly 21 percent were Hispanic, and 10 percent were black.

In 1990, the study area included an estimated 1,161 residents, slightly more than in 2000. For census tracts wholly or partially within the study area, nearly all of the residents were white (96 percent). The 1989 median household income was close to $48,000 (1989 dollars) with 3 percent of the population living below the poverty level. The percentage of low-income residents in the study area was less than Union and Middlesex Counties, Carteret, Woodbridge and Linden.

ARTHUR KILL LIFT BRIDGE STUDY AREA

The Arthur Kill Lift Bridge Study Area is defined as the area within 400 feet on either side of the inactive single-track rail line that runs between the Arthur Kill Lift Bridge and the Chemical Coast Line. The corridor is about a half mile in length and is located within the City of Elizabeth

in Union County. The far eastern portion of the rail line is elevated on trestle bridges near the Arthur Kill.

Land Use and Neighborhood Character

Land use is predominantly industrial within the study area but also contains a small area with a mix of residential and commercial uses, most notably along Bay Way (see Figure 3-9). The industrial uses include older and less active sites farther to the east and large-scale industrial and utility uses (i.e., oil refineries and public utilities) located to the west immediately outside of the study area. Interspersed are older row houses with some ground-floor commercial uses. The area is not well served by public transportation, and large highways dominate the landscape while providing no direct access to the area.

Zoning and Public Policy

The study area is zoned for manufacturing. The easternmost portion of the study area falls within NJDEP's CZM area. The policies associated with the CZM are discussed in detail in Chapter 15, "Coastal Zone Management." In addition, Elizabeth is a special urban area as identified by the New Jersey State Legislature.

Community Facilities, Open Space, and Population Characteristics

There are no community facilities or open spaces located within the study area.

In 2000, the Arthur Kill Lift Bridge Study Area included an estimated 221 residents. For census tracts wholly or partially within the study area, over half of the residents in the study area were white (56 percent); 40 percent were Hispanic, and 26 percent were black.

In 1990, the study area included an estimated 200 residents, approximately 10 percent fewer residents than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (67 percent), 26 percent were Hispanic, and 22 percent were black. The 1989 median household income was nearly $20,000 (1989 dollars) with approximately 32 percent of the population living below the poverty level. The percentage of low-income residents in the study area was much higher than in Union County and City of Elizabeth as a whole with 32 percent living below the poverty level.

STATEN ISLAND STUDY AREAS

There are two study areas located within the borough of Staten Island. The Arthur Lift Bridge/Arlington Yard Study Area is located at the northwestern corner of Staten Island along the industrial waterfront of the Arthur Kill, and extends from the Arthur Kill Lift Bridge to Arlington Yard. The Northern Staten Island Study Area extends from the eastern boundary of Arlington Yard along the Staten Island Railroad to and including the potential tunnel alignment in the eastern portion of the study area.

ARTHUR KILL LIFT BRIDGE/ARLINGTON YARD STUDY AREA

The Arthur Kill Lift Bridge/Arlington Yard Study Area is located within the communities of Arlington and Mariner's Harbor (see Figure 3-9). The study area is defined as the area within 400 feet of the Staten Island Railroad from the Arthur Kill Lift Bridge to Arlington Yard. The study area as a whole extends from the Arthur Kill to the west, and Grandview Avenue to the east.

Land Use and Neighborhood Character

The study area is largely characterized by industrial and port-related uses, a number of large open space areas (see "Open Space" below), and a small residential and commercial component located in the east. Several major roadways transect the study area in a north-south direction. The Staten Island Expressway is located to the south of the study area.

The industrial western portion of the study area is dominated by truck traffic heading to and from the Howland Hook Marine Terminal (HHMT) and can be noisy, particularly along Goethals Road North and to some extent along Western Avenue. The residential portion of the study area in the east is quieter with mostly local traffic.

The industrial uses located in the west are mainly low-lying and/or vacant. Most activity in this area happens along the waterfront of the Arthur Kill. HHMT has several large cranes, buildings and stacked containers located near the Arthur Kill. Port Ivory contains several vacant factory buildings, between one and approximately four stories, most of which can be seen from Western Avenue. The other industrial uses located throughout the rest of the study area are mostly nondescript factory or warehouse buildings.

South of the Staten Island Railroad and west of Western Avenue are vacant wetlands that are under various public and private jurisdictions. Arlington Yard is a 50-acre inactive rail yard. The yard is bordered by portions of the New York State Department of Environmental Conservation's (NYSDEC's) Goethals Bridge Pond Preserve, an electrical substation, a former landfill, and an industrial area.

North of Arlington Yard and east of Holland Avenue is a relatively new, 30-acre town house development located off of Arlington Place. Between South and Grandview Avenues, there is mostly residential development of detached and semi-detached single and two-family houses**.** There are also some vacant properties between South and Holland Avenues. In recent years, newer housing development in the community has consisted of attached townhouse and condominium development.

Zoning and Public Policy

Zoning in this area is predominantly manufacturing with some residential districts located on the eastern end of the study area. The Staten Island Railroad portion of the study area is located in a heavy manufacturing district, while Arlington Yard is located primarily in lighter manufacturing districts. There are two residential zoning districts east of Arlington Yard.

There are several public policy initiatives pertaining to the study area. Both New York City and State designated the "North Shore Empire Zone" in 1994, along the entire north shore of Staten Island. These economic development zones are designed to stimulate business growth in economically distressed areas by providing New York State tax credits and other local incentives to businesses that locate in the area.

The *Plan for the Staten Island Waterfront*, issued in 1994, is part of New York City's Comprehensive Waterfront Plan. Part of the study area near the Arthur Kill Lift Bridge is located in Reach 22, which encompasses four miles along the Kill Van Kull and upper portions of the Arthur Kill. Reach 22 has been designated a Significant Maritime and Industrial Area, as well as a Special Natural Waterfront Area. The *Plan for the Staten Island Waterfront* makes several recommendations for the future development of the reach, including protecting the wetlands in the area or minimizing the impacts of development near such wetlands; maintaining the area as a working waterfront with maritime uses; creating a City Planning designation for the

Staten Island Special Natural Waterfront Area to develop policy guidelines for future development; reactivating the North Shore Railroad for freight movement; and improving public access to the waterfront.

Community Facilities, Open Space, and Population Characteristics

No community facilities are located in the study area due to the predominance of industrial uses.

The study area crosses a number of natural areas, a park, and other open space areas. Goethals Bridge Pond Preserve, located to the west and to the south of Arlington Yard, is under NYSDEC's jurisdiction. The preserve is 150 acres and contains a 33-acre brackish pond that attracts a variety of foraging waterfowl. Mariner's Marsh Park, located adjacent to Arlington Yard's northern boundary, is publicly accessible and is under the jurisdiction of the New York City Department of Parks and Recreation (NYCDPR). The 107-acre park contains athletic fields and a number of walking trails. There are also wetlands and vacant parcels located west of Western Avenue and north of the Goethals Bridge, surrounding Old Place Creek.

In 2000, the study area included an estimated 296 residents. For census tracts wholly or partially within the study area, the majority of the residents were black (56 percent); 26 percent were Hispanic, and 23 percent were Hispanic.

In 1990, the study area included an estimated 228 residents, nearly 30 percent fewer than in 2000. For the census tracts that fall wholly or partially within the study area, 49 percent were black, 41 percent were white, and 19 percent were Hispanic. The 1989 median household income was nearly $22,000 (1989 dollars) with 27 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was much higher than in Richmond County or New York City as a whole.

NORTHERN STATEN ISLAND STUDY AREA

The Northern Staten Island Study Area includes the Staten Island Railroad from Arlington Yard to Alaska Street and the potential tunnel alignment beginning at Alaska Street within the Staten Island Railroad right-of-way to Tysen Street and continuing in a southeasterly direction across the northeast corner of Staten Island, to just south of the St. George Staten Island Ferry Terminal and the waterfront esplanade at New York Harbor. From west to east, the study area traverses various communities: Mariners Harbor, Port Richmond, West Brighton, Livingston, New Brighton, and St. George. All of these neighborhoods are developed and have been continuously inhabited for more than 100 years. The study area has been divided into four segments, as described under each segment study area below.

Segment 1

The Segment 1 study area (see Figure 3-10) is the area within 400 feet of the existing but unused Staten Island Railroad extending from the eastern boundary of Arlington Yard at South Avenue to Nicholas Avenue.

Land Use and Neighborhood Character. The Segment 1 study area extends through the Mariners Harbor community and the western portion of the community of Port Richmond. Overall, these areas are densely developed with a mix of uses and have a suburban character. The study area, particularly west of Lake Avenue, is a mostly residential community with detached one to two-story houses on narrow lots. The New York City Housing Authority's (NYCHA's) Mariners Harbor Houses are also located in the western portion of the study area, and contains several 6- to 7-story apartment buildings. In recent years, attached and semi-

detached houses have been developed on larger lots and parcels in the area. There are also some smaller industrial uses scattered among the residential streets. The area east of Lake Avenue contains industrial uses, as well as residential uses. Traffic in these neighborhoods is mostly relegated to two main thoroughfares, South Avenue at the western edge of the study area and Richmond Terrace outside the study area. These roads, as well as Morningstar Road, are noisy, but the residential streets off of the main thoroughfares are mostly quiet. There are some small commercial uses scattered through the neighborhoods and along Morningstar Road, but they are mostly small-scale services and shops that serve the immediate community.

Immediately north of the study area is Richmond Terrace. Richmond Terrace parallels the Kill Van Kull and experiences heavy truck traffic. Richmond Terrace also contains industrial uses to the north and commercial uses to the north and the south.

Zoning and Public Policy. The zoning in the study area reflects its mixed-use character and includes residential designations, commercial overlays, and manufacturing districts. This study area is part of the North Shore Empire Zone. For a full description of this zone, see the "Zoning and Public Policy" section of the Arthur Kill Lift Bridge/Arlington Yard Study Area.

Community Facilities, Open Space, and Population Characteristics. Several community facilities are located throughout the area. West of Lake Avenue, the community facilities are mostly churches, some of which are quite close to the railroad right-of-way. The Summerfield United Methodist Church is located at Harbor Road, north of the railroad right-of-way. Another religious institution is located south of the right-of-way on Linden Avenue. The Calvary Chapel is located on Maple Parkway, the Seventh Day Adventist Church on Union Avenue and Saint Clement's Church is located on Van Pelt Avenue. In the portion of the study area east of Lake Avenue, there are two community facilities. On Granite Avenue south of the railroad is the Eden II School for Autistic Children. The largest community facility in Segment 1 is Port Richmond High School, which is located west of Nicholas Avenue, adjacent to the railroad right-of-way.

The Port Richmond High School playing fields (soccer and baseball) are located adjacent to the railroad right-of-way and are the only open space facilities in the Segment 1 study area.

In 2000, the Segment 1 study area included an estimated 2,419 residents. For census tracts wholly or partially within the study area, there was nearly the same percentage, around 39 percent, of white and black residents. Approximately 28 percent of the population was Hispanic.

In 1990, the study area included an estimated 1,751 residents, 38 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white at 38 percent, 33 percent were black, and 19 percent were Hispanic. The 1989 median household income was approximately $32,000 (1989 dollars) with 20 percent of the population living below the poverty level. Overall, the percentage of low-income residents was much higher in the study area than in Richmond County or New York City as a whole.

Segment 2

The Segment 2 study area (see Figure 3-11) is the area within 400 feet of the Staten Island Railroad extending from Nicholas Avenue to approximately Alaska Street where the potential tunnel would meet grade. At Nicholas Avenue, the Staten Island Railroad is elevated until it passes over Richmond Terrace near Heberton Avenue and then travels along the waterfront of the Kill Van Kull slightly below the level of Richmond Terrace.

Land Use and Neighborhood Character. The study area is located within the community of Port Richmond. Residential areas are concentrated in the western and southern sections with the rest

of the study area being largely industrial in nature, particularly north of Richmond Terrace. Housing in Port Richmond is generally uniform with two to three-story detached houses on small lots, as well as garden apartments and smaller apartment buildings. There are also some newer attached and semi-detached housing developments in the community. Port Richmond has a historically vibrant commercial strip along Port Richmond Avenue, which includes specialty food stores, banks and other services for the community, and also larger stores such as furniture and lighting showrooms that serve a larger population outside of the immediate neighborhood. The industrial and maritime uses along Richmond Terrace are located east of Heberton Avenue, and are part of the greater industrial area that spans across the northern side of Richmond Terrace along the Kill Van Kull.

Overall, Port Richmond has a "town center" feel, especially around Port Richmond Avenue and Bennett and New Streets. The community is fairly quiet, with truck and other vehicular traffic relegated to Port Richmond Avenue, Richmond Terrace and Post Avenue. In the east, Jewett Avenue is a busy thoroughfare. Although vehicle use for area residents and visitors is high in this area, there is bus service available on major thoroughfares in the study area, such as Richmond Terrace and Port Richmond Avenue.

Zoning and Public Policy. The study area, which is zoned for manufacturing, residential and commercial uses, is also part of the North Shore Empire Zone. In addition, the area falls into an area that is part of Reach 22 in the New York City Waterfront Revitalization Plan. This reach includes land uses along the Kill Van Kull. For a full description of these areas, see the "Zoning and Public Policy" section of the Arthur Kill Lift Bridge/Arlington Yard Study Area.

Community Facilities, Open Space, and Population Characteristics. The study area contains small-scale community facilities, for the most part, religious institutions: Staten Island Reformed Church is located at the northern end of Port Richmond Avenue and Saint Mary of the Assumption is on Treadwell Avenue. There are no open spaces located in Segment 2.

In 2000, the Segment 2 study area included an estimated 1,400 residents. For census tracts wholly or partially within the study area, approximately the same number of residents were white and black (36 percent), and 35 percent were Hispanic.

In 1990, the study area included an estimated 1,037 residents, nearly 26 percent fewer than in 2000. For census tracts wholly or partially within the study area, half of the residents were white, 40 percent were black, and 17 percent were Hispanic. The 1989 median household income was approximately $31,700 (1989 dollars) with 14 percent of the population living below the poverty level. Overall, the percentage of low-income residents was much higher in the study area than in Richmond County and lower than in New York City as a whole.

Segment 3

The Segment 3 study area (see Figure 3-12) is defined as the area within ¼ mile of the open cut and cut and cover portions of the tunnel alignment. The open cut portion of the tunnel alignment would run under the Staten Island Railroad right-of-way from Alaska Street to Bement Avenue. The cut and cover portion, also under the right-of-way, would extend from Bement Avenue to Davis Avenue. The study area covers the area from approximately Clove Road in the west to Kissel Avenue in the east, and north from the water's edge at the Kill Van Kull to as far south as Henderson Avenue on its western end and Livingston Court on its eastern end.

Land Use and Neighborhood Character. The Staten Island Railroad right-of-way travels along the waterfront of the Kill Van Kull below the level of Richmond Terrace throughout Segment 3.

The uses immediately adjacent to the potential tunnel alignment are mostly industrial uses along Richmond Terrace. The uses north of Richmond Terrace are larger-scale, including some maritime uses.

The south side of Richmond Terrace is more mixed with industrial and residential uses. There are a number of smaller industrial and commercial uses, including a Con Edison office building and truck and equipment storage area near Bard Avenue. The remainder of the study area south of Richmond Terrace is almost entirely residential with some open space and institutional uses. There is a NYCHA public housing development, Markham Gardens, which is located on the southeast corner of the intersection Broadway and Richmond Terrace. This development contains low-scale attached townhouses with common garden and playground areas. Most residences in the study area are two-story detached houses.

Zoning and Public Policy. Segment 3 is zoned for both residential and industrial uses. North of Richmond Terrace, there are light and heavy manufacturing zoning districts and south of Richmond Terrace, there are two small light manufacturing districts: one located near Broadway and the other near Davis Avenue. There are several residential zoning districts in the study area, although all permit mostly low-scale density.

The study area is part of the North Shore Empire Zone and the northern portion of the study area is part of Reach 22 in the New York City's Comprehensive Waterfront Plan. For a full description of these zones, see the "Zoning and Public Policy" section of the Arthur Kill Lift Bridge/Arlington Yard Study Area.

Community Facilities, Open Space, and Population Characteristics. The only community facility located within the study area is a day care center located on Elm Street in the western portion of the study area.

The study area includes Corporal Thompson Park, located near Henderson Avenue and Broadway. The 10-acre park contains playing fields and a small pool. In the central area of the study area, on the block bounded by Bard and Davis Avenues and Livingston Court and Delafield Place is Walker Park. The 5-acre park contains tennis courts, a small playground and a cricket pitch. The park serves both the immediate community and is a destination park for users outside the community, due to the tennis courts. The eastern portion of the study area contains an open space near Snug Harbor Road that is under the jurisdiction of the NYCDPR.

In 2000, the Segment 3 study area included an estimated 2,624 residents. For census tracts wholly or partially within the study area, the majority of the residents were white (nearly 48 percent); 33 percent were black, and nearly 25 percent were Hispanic.

In 1990, the study area included an estimated 2,380 residents, about 10 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white at nearly 57 percent, 33 percent were black, and 17 percent were Hispanic. The 1989 median household income was nearly $32,000 (1989 dollars) with 18 percent of the population living below the poverty level. Overall, the percentage of low-income residents was much higher in the study area than in Richmond County and slightly lower than in New York City as a whole.

Segment 4

Segment 4 study area (see Figure 3-13) is the area within 400 feet of the bored section of the potential tunnel alignment, extending along the Staten Island Railroad right-of-way from Davis Avenue to Tysen Street and then continuing in a southeasterly direction through the

communities of New Brighton and St. George to the shoreline of New York Harbor just south of a waterfront esplanade and the St. George Staten Island Ferry Terminal.

Land Use and Neighborhood Character. The study area encompasses portions of the New Brighton and St. George communities. New Brighton is a residential area containing many types of housing, both private and publicly subsidized. Main thoroughfares through New Brighton are Jersey Street and Westervelt Avenue, as well as Richmond Terrace. The community also contains small commercial uses that serve the local population.

St. George is the civic center of Staten Island. It is also the transportation hub of the borough, where many of the bus lines that serve the island as well as the Staten Island Rapid Transit line meet at the Staten Island Ferry Terminal. St. George contains various types of residential development, including large tower apartment buildings. Bay Street, Richmond Terrace, and Stuyvesant Place are all busy with vehicular traffic pedestrian traffic, especially during the weekdays.

South of the Staten Island Ferry Terminal, there is a waterfront esplanade. There is also access to the residential uses along the waterfront in the study area via a pedestrian walkway along the harbor.

Zoning and Public Policy. The Segment 4 study area is primarily zoned residential with some commercial and manufacturing districts. Most of the residential area and Snug Harbor Cultural Center is located within the Special Hillsides Preservation District. This Special District is used to protect neighborhood character, preserve hillsides with aesthetic value and to guide development in reducing hillside erosion. All development in the Special District must be reviewed by the New York City Department of City Planning (NYCDCP).

The study area is part of the North Shore Empire Zone and the areas north of Richmond Terrace and along the waterfront near St. George are part of Reach 18 of New York City's Comprehensive Waterfront Plan. Recommendations for Reach 18 from the Plan include erosion control on the waterfront, establishing a task force to implement the North Shore Esplanade Plan and enhancing public access to the waterfront, and increasing public access to the waterfront. The North Shore Esplanade Plan, developed in 1988, was to create and reconstruct parkland along the north shore of Staten Island for recreational use. For a full description of the North Shore Empire Zone, see the "Zoning and Public Policy" section of the Arthur Kill Lift Bridge/Arlington Yard Study Area.

Community Facilities, Open Space, and Population Characteristics. The Snug Harbor Cultural Center is the preeminent community facility located in the study area. Snug Harbor contains city landmark buildings that are used for a wide variety of cultural uses: galleries, museums and performance spaces, an art school, a ballet school, as well as offices for community groups. The Staten Island Children's Museum and the Staten Island Botanical Garden are also located on the grounds of Snug Harbor. Immediately adjacent to Snug Harbor is the Snug Harbor Little League Complex, located on Snug Harbor Road and Kissel Avenue. On the north side of Richmond Terrace, on the shore of the Kill Van Kull, there is a boat dock located on Snug Harbor property.

Other community facilities in the study area include religious institutions, elementary schools, a day care center, and a United States Post Office. In addition, the study area contains office and meeting space for various non-profit organizations. The St. George Civic Center is located just outside the study area to the north.

Snug Harbor Cultural Center contains several open spaces among its 83 acres, including a meadow where outdoor concerts are held, the Staten Island Botanical Garden, and some natural marsh and wetlands in the south. North of Richmond Terrace, there is a boat dock and a path along the Kill Van Kull that is also part of Snug Harbor.

The Staten Island Bikeway and Cultural Trail is a comprehensive proposal for the increased development of bicycle use on Staten Island for mostly recreational use. The proposal was produced by the Staten Island Borough President's Office in 1994. Within Segment 4, "The Bay" bike trail is located in Snug Harbor and at the St. George Waterfront. The bikeway is designed to work in tandem with the North Shore Esplanade plan, which was sponsored by NYCDCP, as a public policy initiative to improve public access to the waterfront.

Segment 4 also contains Davis Playground, located adjacent to P.S. 31, at Layton Avenue and Bismark Avenue. This 1-acre playground contains various play equipment. There is also the waterfront esplanade to the north of the study area and some privately owned public space as part of the Bay Street Landing co-op building, located in the eastern portion of the study area. The Bay bike trail is located along the waterfront in this study area.

In 2000 the study area included an estimated 4,137 residents. For census tracts wholly or partially within the study area, the majority of the residents in the study area were white (42 percent); 36 percent were black, and 22 percent were Hispanic.

In 1990, the study area included an estimated 3,562 residents, nearly 14 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (53 percent), 35 percent were black, and 19 percent were Hispanic. The 1989 median household income was approximately $29,000 (1989 dollars) with nearly 16 percent of the population living below the poverty level. Overall, the percentage of low-income residents was much higher in the study area than in Richmond County and slightly lower than in New York City as a whole.

BROOKLYN STUDY AREAS

There are two study areas located within the borough of Brooklyn. The 65th Street Yard Study Area is located in the communities of Sunset Park and Bay Ridge in the southwestern portion of Brooklyn on an industrial waterfront. The second Brooklyn study area is the Bay Ridge Branch Study Area, which includes the Bay Ridge Branch of the LIRR, and several potential tunnel alignments extending from the Brooklyn shoreline and continuing under the Bay Ridge Branch to between 12th and 13th Avenues in Brooklyn where the tunnel alignment would meet existing grade. The Bay Ridge Branch is an 11 ½-mile rail line that runs between 65th Street Yard in Brooklyn and Fresh Pond Yard in Queens. Note that the portion of the Bay Ridge Branch located in Queens is discussed under the section "Queens Study Areas" below. Following is a description of the existing land use, zoning, neighborhood character, community facilities, open space and social conditions for the two Brooklyn study areas.

65TH STREET YARD STUDY AREA

The 65th Street Yard Study Area is located within the Sunset Park and Bay Ridge sections of Brooklyn (see Figure 3-14). The study area is defined as the area within a ¼ mile of 65th Street Yard. The study area around 65th Street Yard is generally bounded by the waterfront to the west; Brooklyn Army Terminal to the north; 4th Avenue to the east; and Bay Ridge Avenue and Owls Head Park to the south.

Land Use and Neighborhood Character

Much of the study area is characterized by industrial uses and transportation infrastructure. Residential uses are located in the southern and western portions of the study area, and Owls Head Park is located in the southwest portion.

65th Street Yard is located in Sunset Park along Brooklyn's industrial waterfront. The Brooklyn Army Terminal and the Owls Head Water Pollution Control Plant (WPCP) are other industrial uses located along the waterfront adjacent to the yard to the north and to the south, respectively. The Belt Parkway/Shore Road Drive and Owls Head Park act as a buffer between the industrial waterfront and the Bay Ridge residential neighborhood to the south. To the south, the streets in the Bay Ridge section of the study area are generally quiet, residential blocks. Some commercial activity is found along the avenues in Bay Ridge at the southern end of the study area, these streets tend to have busier pedestrian and vehicular traffic. In the northern portion of the study area, the industrial waterfront west of 2nd Avenue is generally inaccessible to the public. The streets in the northern section of the study area run generally in an east/west direction and terminate at the yard and the Brooklyn Army Terminal at 2nd Avenue. Traffic is light on these roads. The northeastern section of the study area, east of 2nd Avenue, is a transitional, mixed use area between the industrial waterfront and a more residential neighborhood inland and is dominated by the two, 31-story tall Bay Ridge Residential Towers.

Zoning and Public Policy

65th Street Yard is located in a manufacturing district. Along the waterfront, both the Brooklyn Army Terminal and the Owls Head WPCP share the manufacturing zoning district. The 31-story Bay Ridge Towers immediately to the east of the yard are in a residential zone. Light manufacturing and commercial districts are found immediately to the northeast of the site. Owls Head Park located south of the site has no zoning designation. The residential areas to the south and to the east are also within the Bay Ridge Special District. Commercial overlays are located along Bay Ridge and 3rd Avenues in the southwestern and southeastern portions of the study area.

There are several public policy initiatives pertaining to the study area. In 1994, both the City and State designated Sunset Park's industrial waterfront the "Southwest Brooklyn Empire Zone." As part of the Empire Zone Program, economic development zones are designed to stimulate business growth in economically distressed areas by providing New York State tax credits and other local incentives to businesses that locate in the area.

The "Plan for the Brooklyn Waterfront," issued in 1994, is part of New York City's Comprehensive Waterfront Plan. Both the 65th Street Yard and the Brooklyn Army Terminal are located in the Sunset Park Subarea of Reach 14. The Plan for the Brooklyn Waterfront makes several recommendations for the future development of the reach, including providing more public access to the waterfront; maintaining the area as a working waterfront with maritime uses; improving freight movement by enhancing intermodal connections in Sunset Park; improving truck routes and access to maximize freight movement; and implementing high-speed ferry service. This area has also been designated a Significant Maritime and Industrial Area.

A portion of the study area is also part of the In-Place Industrial Park (IPIP) Program. The local development corporation (LDC) overseeing the IPIP program in Sunset Park is the Southwest Brooklyn Industrial Development Corporation, which advises businesses in the area as well as assisting businesses locating to the area.

Community Facilities, Open Space, and Population Characteristics

There are several community facilities immediately adjacent to the north of 65th Street Yard including the New York City Police Department (NYPD) Harbor Unit and the NYPD Emergency Services K-9 Unit. Additional community facilities are also located in the southeastern and northeastern portions of the ¼-mile study area surrounding 65th Street Yard. St. Andrew the Apostle Church, facilities for the developmentally disabled, healthcare facilities, and other religious institutions are located in the southeastern residential section of the study area. The New York City Fire Department Engine Company 241, Ladder Company 109, station house is also situated in the southeastern portion of the study area at the corner of Wakeman Place and 3rd Avenue. In the northeastern portion of the ¼-mile study area, the 68th Police Precinct of the New York City Police Department is located on 65th Street between 3rd and 4th Avenues.

The predominant open space located within the ¼-mile study area surrounding 65th Street Yard is Owls Head Park. This large urban park is located in Bay Ridge and is bounded by the Belt Parkway to the north and west, Colonial Road to the east, and 68th Street to the south. It consists of approximately 27 acres of rolling hills, lawns, a children's playground, several multi-use courts, and other amenities. In addition to this park, several areas of open space are associated with the Belt Parkway and Shore Road Drive rights-of-way extending from the Owls Head WPCP to west of 3rd Avenue. These areas are visual amenities and consist primarily of landscaping and trees. The New York City Department of Transportation (NYCDOT) Sunset Greenway is located between 3rd and 4th Avenues and 66th and 67th Streets. This greenway consists of a walking path located in the grass and landscaping associated with Shore Road Drive right-of-way. John Allen Payne Park is located at 3rd Avenue between 64th and 65th Streets and contains approximately 1.5 acres.

In 2000, the 65th Street Yard Study Area included an estimated 7,672 residents. For census tracts wholly or partially within the study area, the majority of the residents were white (approximately 59 percent), 30 percent were Hispanic, and 15 percent were Asian.

In 1990, the study area included an estimated 6,654 residents, approximately 13 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (71percent); 26 percent of the population were Hispanic; and 12 percent were Asian. The 1989 median household income was approximately $31,000 (1989 dollars) with 16 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was lower than in Kings County or New York City as a whole.

BAY RIDGE BRANCH STUDY AREA

The Bay Ridge Branch Study Area includes the Bay Ridge Branch, from 65th Street Yard to the Brooklyn/Queens border, and several potential tunnel alignments extending from the shoreline and continuing under the Bay Ridge Branch to approximately between 12th and 13th Avenues in Brooklyn where the tunnel alignment would reach existing grade. The portion of the Bay Ridge Branch located in Queens is discussed under the section "Queens Study Areas." The study area has been divided into four segments, as described under each segment study area below.

Segment 1

The Segment 1 study area (see Figure 3-15) is the area within 400 feet of the bored section of two potential tunnel alignments; the northern alignment, part of the New Jersey tunnel alignment, extending from the shoreline at 65th Street Yard to between 8th and 9th Avenues

under the Bay Ridge Branch, and the southern alignment, part of the Staten Island tunnel alignment extending from the shoreline near Owls Head Park to between 8th and 9th Avenues. From 4th Avenue to near 9th Avenue, this alignment follows the same route as the northern alignment under the Bay Ridge Branch. This study area overlaps with substantial portions of the 65th Street Yard Study Area.

Land Use and Neighborhood Character. The study area consists of mixed uses, including industrial, transportation infrastructure, open spaces, residential, institutional and commercial uses. Like the 65th Street Yard Study Area, this study area contains the Owls Head WPCP, the Belt Parkway and Shore Road Drive rights-of-way, the NYCDOT Sunset Greenway, and the Bay Ridge Towers in addition to the 68th Police Precinct, residential and industrial uses.

The easternmost section of Segment 1, between 4th and 9th Avenues is where the two potential alignments follow the same route. As a result of the convergence of the elevated Gowanus Expressway, two subway lines, and the below-grade Bay Ridge Branch, the area is dominated by industrial, auto-related and transportation uses. Although predominantly industrial, the northern and southern perimeters of the eastern portion of Segment 1 edge into the residential neighborhoods of Sunset Park and Bay Ridge. Some commercial and institutional uses are scattered throughout the easternmost section of the study area. In addition, the first block of Leif Ericson Park is also located in the southern portion of the study area.

Zoning and Public Policy. The study area consists of manufacturing and residential zoning districts as well as parkland that has no zoning designation. The western portion of the study area overlaps with the 65th Street Yard Study Area (see above), and zoning is discussed in that section.

The easternmost section of Segment 1 between 4th and 9th Avenues contains light manufacturing districts along the rail line and the Gowanus Expressway. A residential district, with several commercial overlays, is located along the northern boundary of this section of the study area. In addition, Leif Ericson Park, with no zoning designation, is located along the southern boundary of this section of the segment.

There are several public policy initiatives in the study area. The study area is located in the Southwest Brooklyn Empire Zone, Reach 14 of New York City's Comprehensive Waterfront Plan, and IPIP Program. For a full description of these programs, see the "Zoning and Public Policy" section for the 65th Street Yard Study Area.

Community Facilities, Open Space, and Population Characteristics. The study area contains several community facilities, including the 68th Police Precinct, the St. Andrew the Apostle Church, and Engine 241 Ladder 109 of the New York City Fire Department (discussed above). In addition, the High School for Telecommunications and Technology is located on 4th Avenue between 67th and Senator Streets along the southern boundary of the study area. The Bay Ridge Baptist Church is located across the street from the high school on 4th Avenue.

Beit Elmaqdis, at 6th Avenue between 61st and 62nd Street, is an Islamic place of worship located in the northern portion of the eastern section of Segment 1. The Bay Ridge Christian Center is located at 7th Avenue and 64th Street in the southern portion of this section of the segment. Several other religious and educational institutions, healthcare facilities, and community clubhouses are scattered throughout the northern and southern sections of this section of the segment, despite its industrial character.

Several open spaces are located in the study area, including open spaces associated with the Belt Parkway and Shore Road Drive right-of-ways, John Allen Payne Park, Owls Head Park, and the NYCDOT Sunset Greenway. These open spaces are described above (see "65th Street Yard Study Area"). In addition, the study area includes the 69th Street Pier, which is a recreational pier located at the end of Bay Ridge Avenue in the westernmost section of the alignment. In 2000, the pier was renovated and contains various amenities including benches and tables. The pier provides public access to the waterfront including fishing and waterfront views. Several open spaces mentioned above, open space associated with Shore Road Drive and the NYCDOT Sunset Greenway are also located within the study area for the Staten Island tunnel alignment.

The first block of Leif Ericson Park is located east of 4th Avenue and is the only open space located within the easternmost section of the segment.

In 2000, the Bay Ridge Branch Segment 1 study area included an estimated 6,240 residents. For census tracts wholly or partially within the study area, nearly half of the residents were white (49 percent); 25 percent were Asian, and 31 percent were Hispanic.

In 1990, the study area included an estimated 5,297 residents, about 15 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (65 percent), 17 percent were Asian, and approximately 28 percent were Hispanic. The 1989 median household income was nearly $30,000 (1989 dollars) with approximately 17 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was lower than in Kings County or New York City as a whole.

Segment 2

The Segment 2 study area (see Figure 3-16) is defined as the area within ¼ mile of the cut and cover and open cut portions of the tunnel alignment. The cut and cover portion of the tunnel alignment would run under the existing Bay Ridge Branch from between 8th and 9th Avenues to 10th Avenue. The open cut portion, also under the Bay Ridge Branch would extend from 10th Avenue to just between 12th and 13th Avenues, where the tunnel would meet existing grade, which is already located in a cut below street grade. The study area extends from approximately 7th Avenue to west to just east of the intersection of 14th and New Utrecht Avenues to the east. The northern boundary is at approximately 56th Street and the southern boundary at approximately 67th Street.

Land Use and Neighborhood Character. The uses immediately surrounding the potential tunnel alignment of the study area include the Bay Ridge Branch itself and a mix of residential, industrial, institutional, commercial and vacant uses. Two mixed-use blocks extending north to roughly 59th Street frame the length of the Bay Ridge Branch to the north. These blocks transition the area from more industrial and commercial uses along the rail line to predominantly residential uses located in the remainder of the northern portion of the study area. The southeastern portion of the study area, to the east of Fort Hamilton Parkway, is predominantly residential with some commercial, institutional and industrial uses mainly located along the avenues. Although predominantly industrial in nature, the southwestern section, west of Fort Hamilton Parkway, contains a variety of uses, including open space, residential, institutional and commercial uses. The Leif Ericson Park and Square and a few other open spaces are located on several blocks near the southwestern boundary of the study area. Residential uses and ground-floor retail are found in the southwestern corner of the study area. The Leif Ericson Park buffers the industrial and transportation uses to the north of the park from the residential area located to the south.

Zoning and Public Policy. The study area contains manufacturing and residential districts. A light manufacturing district frames most of the rail line to the north in this segment. Most of the northern half of the study area is zoned for residential use with some commercial overlays located along the avenues. The northwestern portions of the study area are zoned medium density residential and the northeastern section is predominantly zoned for a mix of housing types. The area to the southeast of the rail line generally between Fort Hamilton Parkway and 14th Avenue is mainly zoned residential with commercial overlays located along Fort Hamilton Parkway and 11th Avenue respectively. A light manufacturing area is located at the southeastern edge of this segment around 14th and New Utrecht Avenues. The southwestern portion of the study area, west of Fort Hamilton Parkway, is predominantly zoned for manufacturing uses. The parks located in the southwestern section of the study area have no zoning designation.

Community Facilities, Open Space, and Population Characteristics. The study area marks the beginning of a predominantly residential area along the Bay Ridge Branch and therefore contains many community facilities. Mostly religious institutions of a variety of denominations are located in the northern half of this segment. P.S. 105, the Blythebourne School, is a large elementary school located on 10th Avenue between 58th and 59th Streets. Most of the smaller community facilities scattered throughout the northern section of the segment are religious institutions but also include educational and healthcare facilities. In addition, a small firehouse is located on 60th Street between 13th and New Utrecht Avenues. A cluster of large community facilities is located in southeastern section of the study area in the vicinity of 12th Avenue between 63rd and 66th Streets, including The Sisters of Mercy Convent, I.S. 187 and St. Rosalias Roman Catholic Church. The Hebrew Academy and another site of St. Rosalias are located at the intersection of 14th Avenue and 63rd Street. Several religious and educational institutions, healthcare facilities, and community clubhouses are scattered throughout the southwestern section of the segment, despite its industrial character.

The study area contains some of the 16.8 acres of Leif Ericson Park and Square. Portions of approximately two blocks of the park are located within the study area between 66th and 67th Streets and 8th Avenue and Fort Hamilton Parkway. In addition, the Parkville Youth Organization John C. Gallo Little League Fields are located between 8th and 9th Avenues and 65th and 66th Streets. A ballfield named "The Dust Bowl" is located on 8th Avenue between 65th and 66th Streets.

In 2000, the Bay Ridge Branch Segment 2 study area included an estimated 16,203 residents. For census tracts wholly or partially within the study area, the majority of the residents were white (61 percent) and 29 percent were Asian.

In 1990, the study area included an estimated 12,649 residents, about 22 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (nearly 82 percent) and 13 percent were Asian. The 1989 median household income was slightly over $25,000 (1989 dollars) with 20 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was lower than in Kings County and slightly higher than in New York City as a whole.

Segment 3

Segment 3 study area (see Figure 3-17) is the area within 400 feet of the Bay Ridge Branch extending between approximately 13th and Albany Avenues. Throughout the segment, the line is in a depressed cut until Albany Avenue, where the line begins to transition to grade.

Land Use and Neighborhood Character. The uses along the rail line in the westernmost portion of Segment 3 between 13th and 16th Avenues are mixed. The uses to the north of the rail line are industrial, residential, and commercial. South of the rail line the uses are predominantly residential between 13th and 14th Avenues, although a pocket of dense, active industrial uses is located south of the rail line between New Utrecht and 16th Avenues. The remainder of the study area, between 16th and Albany Avenues, is predominantly residential. Institutional uses are found throughout this section of the study area, most notably the Brooklyn College campus, which spans approximately 10 blocks north of the rail line from Ocean to Nostrand Avenues. Industrial (warehouses, parking lots, and auto-related uses), commercial, and institutional uses are located along the avenues with concentrations along 16th, Ditmas, 19th, MacDonald, Coney Island, Nostrand and Flatbush Avenues. Within the study area, three subway lines run perpendicular to the rail line. The F train is elevated over McDonald Avenue. The M/W lines run on the same elevated track located at New Utrecht Avenue. In addition, an at-grade subway (Q) is located between East 15th and 16th Streets. The N runs parallel to the Bay Ridge Branch and shares the open cut from the beginning of the segment until New Utrecht Avenue at which point the two lines continue in different directions. The avenues containing the elevated subway lines are generally congested and contain more industrial and commercial uses.

Zoning and Public Policy. In the study area, the rail line separates a light manufacturing district to the north and a residential district to the south between 13th and 14th Avenues. Between 14th and 16th Avenues, the zoning districts are generally light manufacturing to the south of the rail line and medium density residential to the north. The area between 16th and Albany Avenues is predominantly zoned for residential use. Clusters of commercial and industrial uses are located in small commercial zones at 18th, Coney Island, Nostrand and Flatbush Avenues. A light manufacturing district is located at MacDonald Avenue. A heavy commercial services commercial zone and commercial overlays are located along several avenues that transect the segment corridor. In addition, the area between MacDonald and Coney Island Avenues is part of the Ocean Parkway Special District.

Community Facilities, Open Space, and Population Characteristics. Many community facilities in the study area are adjacent to or near the rail line. The dominant community facility in the study area is Brooklyn College. Its campus is located on two superblocks generally bound by Ocean and Nostrand Avenues and the Bay Ridge Branch and Campus Road. The southern edge of the campus is adjacent to the tracks. Yeshivas (private Jewish schools) and religious institutions are also predominant community facilities located in this study area. Engine 247 Thawing Apparatus 64 of the New York City Fire Department is located on 60th Street between 13th and New Utrecht Avenues. Engine 260 is located at 126 Foster Avenue. The 66th Police Precinct is located at the corner of 16th Avenue and 59th Street. P.S. 180 Homewood School is a large elementary school on 16th Avenue between 56th and 57th Avenues. A large Yeshiva is situated just east of P.S. 180. A nursing home is located at 19th Avenue and 51st Street. In addition, healthcare facilities and a facility for people with disabilities are also located in the study area.

No open spaces are located within the Segment 3 study area.

In 2000, the Bay Ridge Branch Segment 3 study area included an estimated 17,236 residents. For census tracts wholly or partially within the study area, the majority of the residents were white (59 percent) and nearly 25 percent were black.

In 1990, the study area included an estimated 16,226 residents, about 6 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the population

was white (67 percent). Between 1990 and 2000, the black population remained nearly the same at 25 percent. The 1989 median household income was $31,000 (1989 dollars) with approximately 16 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was lower than in Kings County or New York City as a whole.

Segment 4

The Segment 4 study area (see Figure 3-18) is the area within 400 feet of the remaining Brooklyn portion of the Bay Ridge Branch, from Albany Avenue to Myrtle Avenue at the Brooklyn/Queens border. Between Albany Avenue and Glenwood Road, the rail line becomes at grade; between Glenwood Road and New Lots Avenue, the rail line is elevated or on an embankment; between New Lots Avenue and Evergreen Avenue, the rail line is depressed and travels through the East New York Tunnel; and between Evergreen Avenue and the Brooklyn/Queens border, the rail line is elevated or on an embankment.

Land Use and Neighborhood Character. The study area is mostly industrial and contains uses that range from utilities to scrap metal and construction businesses. The area includes the Brooklyn Terminal Market and New Lots Yard, a New York City Transit storage facility. Between Linden Boulevard and Sutter Avenue, the uses in the area become diversified. Residential, institutional, and open space uses are found in the area, in addition to transportation infrastructure and other industrial uses. There are a number of new low-density housing units in the area and vacant lots are being developed for residential use. Residential buildings between Linden Boulevard and Sutter Avenue include high-density, low-income, subsidized housing, especially west of the rail line in Brownsville and newer low-density single-family homes to the east in East New York. Many vacant lots in the residential area of East New York between Linden and Sutter Avenues are being developed with low-density houses giving the area a residential quality.

Elevated subways run along Van Sinderin and Livonia Avenues. The area becomes heavily industrial again between Sutter and Atlantic Avenues passing through the East New York Industrial Park. The northern portion of the study area, between Atlantic Avenue and Myrtle Avenues contains mixed uses. Transportation infrastructure is heavy around Broadway and Atlantic, Fulton, and Bushwick Avenues, including the LIRR and several subway tracks. Even though this area is relatively dense with industrial uses, open space, residential, institutional and commercial uses are scattered throughout this portion of the study area. The study area wraps around the Cemetery of the Evergreens and Trinity Cemetery. The area surrounding and to the north of the cemeteries contains residential, industrial, institutional and open space uses.

Zoning and Public Policy. The study area is predominantly zoned for manufacturing. Medium density residential zones extend north from around Linden Boulevard to Sutter Avenue along the eastern and western edges of the study area. Commercial overlays are located along several avenues in these residential zones. The East New York Industrial Park is located between Sutter Avenue and East New York Avenue and is zoned for light manufacturing. A small area on Bushwick Avenue is a zoned a heavy commercial district. Various residential zones are also found in this northernmost section of the study area.

There are several public policy initiatives in the study area. The study area is located in East New York's Empire Zone and the IPIP Program. The LDC of East New York oversees the IPIP program in East New York. For a full description of these programs, see the "Zoning and Public Policy" section for the Brooklyn Waterfront Study Area.

Community Facilities, Open Space, and Neighborhood Character. Dominated by industrial uses, the study area contains fewer community facilities than the other study area segments of the Bay Ridge Branch. A small religious institution is located on East 91st Street in the mid-section of the study area. Several community facilities are located north of Linden Boulevard. A few community facilities with residential components are located at Linden Boulevard and Van Sinderen Avenue and Blake and Snediker Avenues. Other facilities in this section of the study area are community service, religious, and healthcare-related. The East Brooklyn Congregation School for Public Service is located at Fulton and Van Sinderen Street. Our Lady of Lourdes is a large religious institution and elementary school located at Broadway and De Sales Place. A senior citizens' home is located on Evergreen and Pilling Streets. P.S. 384 Frances Carter School takes up the whole block bounded by Cooper and Moffat Streets, Wilson and Knickerbocker Avenues. A day care center is located directly across the street from P.S. 384.

Several parks are located within the study area, including Veteran's Memorial Park Triangle at the corner of Mother Gaston Boulevard and Hegeman Avenue. Lion's Pride Playground, just under an acre, is a children's playground located at Riverdale and Snediker Avenues. Open space is located on both sides of Livonia Avenue between Junius and Powell Streets. The park to the north is associated with NYCHA. A garden of the Greenthumb project is located across the street. The Callahan and Kelly Playground located at Truxton and Fulton Streets is approximately 3.7 acres. A small children's playground is located next to a childcare facility along Moffat Street in the northernmost section of the study area. The Junius Street Family Residence, a family shelter which opened in May 2003, is located on the corner of Junius Street and East New York Avenue.

In 2000, the study area included an estimated 13,377 residents. For census tracts wholly or partially within the study area, the majority of the residents were black (77 percent) and 20 percent were Hispanic.

In 1990, the study area included an estimated 13,364 residents, slightly fewer than in 2000. For census tracts wholly or partially within the study area, between 1990 and 2000, the demographic composition of the study area changed little. The majority of the residents were black at nearly 78 percent and 21 percent were Hispanic. The 1989 median household income was nearly $26,000 (1989 dollars). While similar to the overall median income of Brooklyn, the percentage of low-income residents in the study area was much higher than in Kings County or New York City as a whole (approximately 28 percent of the population living below the poverty level).

QUEENS STUDY AREAS

There are five study areas located within the borough of Queens. The Bay Ridge Branch Study Area extends from the Brooklyn-Queens border to the southern end of Fresh Pond Yard. The Fresh Pond Yard Study Area is located in south central Queens in the community of Glendale. The West Maspeth Yard Study Area is located west of the Fresh Pond Yard Study Area, within the West Maspeth neighborhood. Connecting these two study areas is the Montauk Branch Study Area. Last is the Fremont Secondary study area which extends from the northern boundary of Fresh Pond Yard to the Hell Gate Bridge, at the northern end of Queens. Following is a description of the existing land use, zoning, neighborhood character, community facilities, open space and social conditions for the five Queens study areas.

BAY RIDGE BRANCH STUDY AREA (QUEENS PORTION)

The Queens portion of the Bay Ridge Branch extends from the Brooklyn-Queens border to the southern boundary of Fresh Pond Yard at Cyprus Hills Street (see Figure 3-19). The study area includes the area within 400 feet of the rail line.

Land Use and Neighborhood Character

The Queens portion of the Bay Ridge Branch study area straddles the neighborhoods of Ridgewood and Glendale in southern Queens. The southern portion of the study area, south of Cyprus Avenue, is dominated by industrial uses and cemeteries. North of Cyprus Avenue is residential in nature. Busy commercial strips that serve the residential areas are located along Fresh Pond Road, Central Avenue, and Myrtle Avenue, within walking distance to area residents. The houses in the study area tend to be on densely developed lots with front yards along tree-lined streets. For the most part, vehicular traffic stays on the larger, more commercial streets and, therefore, the residential streets are quieter.

Zoning and Public Policy

The cemeteries in the southeastern corner of the study area are located within general residential zones. The majority of the eastern portion of the study area is zoned residential, except for portions adjacent to the rail line, which are zoned for light manufacturing use. The southwestern and western portions of the study area are also zoned for light manufacturing use except for some residential zoning along the western boundary of the study area. The northern portion of the study area is zoned medium density residential with commercial overlays. In addition, a light manufacturing district is adjacent to the rail line along the northern boundary of the study area.

Community Facilities, Open Space, and Population Characteristics

There are a few community facilities within the study area, including a local post office located along Myrtle Avenue near Decatur Street, two religious facilities near the intersection of Decatur Street and Forest Avenue, and P.S. 68, the Cambridge School, on St. Felix's Avenue.

There is one local park, P.S. 68 Playground/Evergreens Park at St. Felix and Seneca Avenues, located in the middle of the study area to the east of the rail line. This park consists of approximately 3.3 acres and offers playground uses, such as swing sets and jungle gyms for the primary school students and the neighborhood children and benches for passive use. There are also a few neighborhood green spaces located along 78th Avenue between 60th Street and Cypress Avenue.

In 2000, the Queens portion of the Bay Ridge Branch Study Area included an estimated 2,765 residents. For census tracts wholly or partially within the study area, over half of the residents were white (64 percent) and 21 percent were Hispanic.

In 1990, the study area included an estimated 2,352 residents, nearly 18 percent fewer than 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (nearly 83 percent); nearly 21 percent were Hispanic. The 1989 median household income was over $30,000 (1989 dollars) with 12 percent living below the poverty level. Overall, the percentage of low-income residents in the study area was slightly higher than in Queens County as a whole, but lower than in New York City.

FRESH POND YARD STUDY AREA

Fresh Pond Yard is located within the Glendale section of Queens (see Figure 3-20). The study area is defined as the area within a ¼ mile of Fresh Pond Yard. The study area generally extends from 60th Drive to the northwest, Metropolitan Avenue to the northeast, Cooper Avenue to the east, 75th Avenue to the south, and 60th Street to the west.

Land Use and Neighborhood Character

Fresh Pond Yard is divided into two areas—East Yard and West Yard. The yard extends from 71st Street at its far eastern end to Metropolitan Avenue and Fresh Pond Road to its far western end, and from the Montauk Branch to the north to Cyprus Hill Street at its furthest southern point. The study area spans four neighborhoods: Maspeth to the northwest, Middle Village to the northeast, Glendale to the southeast, and Ridgewood to the southwest.

The uses adjacent to the rail yard are mixed and include the Lutheran Cemetery to the north of East Yard and residential and industrial uses. In the eastern portion of the study area, houses are separated from the tracks by an iron fence and the road. In the southeast corner there is a clustering of industrial uses. Along the Bay Ridge Branch at the southern end of the East Yard are residential uses with a few industrial uses along the yard boundaries.

West Yard is also surrounded by mixed uses, including a large enclosed shopping center, Metro Mall, and residences to the north of the West Yard. The northwestern corner of West Yard is surrounded by industrial and auto-related uses. South of West Yard, the adjacent uses are warehousing and manufacturing, with the exception of Mafera Park in the southeast corner of West Yard.

The rest of the ¼-mile study area is predominantly residential to the south of the yard with mixed uses to the north. The densely populated residential areas to the southeast and southwest have some institutional, open spaces and commercial uses scattered throughout, typical of those found in residential areas. Commercial uses tend to be concentrated along Myrtle Avenue and Cyprus Hills Street in the southeast section and Fresh Pond Road in the southwest section. The southeast and southwest residential areas are visually and physically separated from one another by the yard. The New York City Transit (NYCT) subway traverses the southwest section on an embankment.

In the northwest section of the study area, Metropolitan Avenue is lined with predominantly auto-related commercial uses (occasionally with residential apartments above) and a few light industrial uses. In the vicinity of Eliot Avenue and Fresh Pond Road, there are similar uses. In addition to the auto-related and light-industrial uses, these commercial corridors offer neighborhood amenities. On the side streets off Metropolitan and Eliot Avenues, the area is predominantly residential. Another portion of the Lutheran Cemetery is also located in this portion of the study area. The northeast section of the study area is dominated by the cemetery, with the exception of an adjacent high school and a residential area at the eastern edge.

The neighborhoods surrounding the rail yard are well served by public transportation. The Glendale section of the study area consists primarily of low-rise residences on quiet tree-lined streets that dead end at the Fresh Pond Yard and its few abutting industrial and warehouse sites. The Ridgewood section of the study area is more densely developed than other portions of the study area. It consists primarily of attached houses and apartments, which are buffered from the noise and activity of the rail yard by Mafera Park. The residential blocks in the study area, for the most part, tend to be very quiet tree-lined streets.

Zoning and Public Policy

Study area zoning includes light manufacturing zones at the Fresh Pond Yard and in the area surrounding the yard and to the north. Medium density residential zones are located to the south of the yard, with commercial overlays along Myrtle Avenue and Fresh Pond Road.

Community Facilities, Open Space, and Neighborhood Character

There are a number of schools and religious facilities in the study area serving the local communities. In the northern portion of the study area, Christ the King Primary School and High School is located at Metropolitan Avenue, adjacent to the Lutheran Cemetery. In the eastern portion of the study area, south of the East Yard, there is a church and a Salvation Army. P.S. 91, Richard Arkwright School, is located along Central Avenue. Several more neighborhood churches are located within the southeastern portion of the study area. There is a post office located on Myrtle Avenue at Decatur Street. In the western portion of the study area, south of the West Yard, there are several religious and educational facilities. There is another Salvation Army and P.S. 88, Seneca School is located along Catalpa Avenue. In addition, the Catalpa Avenue YMCA nursery and day care are also located in this portion of the study area. In the northwestern portion of the study area near Metropolitan Avenue, there is a Catholic Church and associated private elementary school, Our Lady—Miraculous Medal School.

The study area contains several open spaces, Joseph F. Mafera Park, which was renovated in 1995, includes a roller rink with bleachers, baseball, basketball, and handball courts, softball and football fields, and play equipment. Mafera Park is located immediately adjacent to Fresh Pond Yard, just south of the West Yard. Glendale Playground is located in the eastern portion of the study area along Central Avenue between 70th and 71st Streets and contains a playground and benches. The Albert C. Benniger Playground is located on Madison Street near Fresh Pond Road. This play area in the southwestern portion of the study area provides neighborhood residents with a playground and benches.

In 2000, the study area included an estimated 27,973 residents. For census tracts wholly or partially within the study area, over half of the residents were white (nearly 78 percent), and 27 percent were Hispanic.

In 1990, the study area included an estimated 24,998 residents, approximately 12 percent fewer than 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (93 percent). The 1989 median household income was nearly $31,000 (1989 dollars), with 9 percent living below the poverty level. Overall, the percentage of low-income residents in the study area was slightly lower than in Queens County as a whole and considerably lower than in New York City.

MONTAUK BRANCH STUDY AREA

The Montauk Branch Study Area includes the area within 400 feet of the Montauk Branch from Fresh Pond Yard to the West Maspeth Yard site in West Maspeth (see Figure 3-21). The study area extends westward from the western boundary of Fresh Pond Yard at the intersection of Metropolitan Avenue and Fresh Pond Road to Grand Avenue and Rust Road. The following sections generally describe the study area from east to west.

Land Use and Neighborhood Character

The land uses closest to the rail line tend to be industrial with a few commercial facilities, including auto-related services. The easternmost portion, between Metropolitan Avenue, Fresh

Pond Road and Eliot Avenue is a mixed-use area with commercial and industrial uses along these main thoroughfares and some residential uses along the side streets. Between Eliot Avenue and Flushing Avenue in the eastern portion of the study area, the land uses adjacent to the rail are generally industrial and warehousing with residential uses beyond the industrial area, generally semi-attached single and multi-family houses. At 56th Road and Arnold Avenue the rail line is below grade, with steep embankments on either side. Warehouses are built on platforms over the rail line, which also provide public thoroughfares for vehicular traffic. The rail line is at-grade as it passes Flushing Avenue.

From Flushing Avenue to Grand Avenue, the study area is almost entirely industrial. There are exceptions to the industrial nature of this portion of the study area, including a few houses along 57th Street south of the rail line.

Between Fresh Pond Yard and Grand Avenue the rail line divides the neighborhoods of Maspeth to the north and Ridgewood to the south and physically and visually separates the residential neighborhoods on either side. The areas of these neighborhoods closest to the rail line tend to be noisy because of the industrial uses and associated trucks. However, the residential areas within the study area tend to be quiet with tree-lined streets. Going west from Fresh Pond Yard toward Grand Avenue, the neighborhoods are increasingly industrial and the roads are busier with truck and vehicular traffic.

Zoning and Public Policy

The Montauk Branch passes through a number of zoning districts, including a light manufacturing district at the eastern end of the study area and commercial overlay zoning within a residential district at Eliot Avenue. The residential district extends from Eliot Avenue to 59th Place within the study area northeast of the rail line and to Andrews Avenue within the study area southwest of the rail line. Between Andrews Avenue, 59th Place, and Grand Avenue, the area is zoned light manufacturing. However, there is a parcel, approximately one block large, southeast of Grand Avenue zoned for heavy industry.

Community Facilities, Open Space, and Population Characteristics

There are no community facilities or open spaces located within the Montauk Branch Study Area.

In 2000, the Montauk Branch Study Area included an estimated 1,400 residents. For census tracts wholly or partially within the study area, more than three-quarters of the residents were white (75 percent), and 33 percent were Hispanic.

In 1990, the study area included an estimated 1,200 residents, nearly 19 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (92 percent); 16 percent were Hispanic. The 1989 median household income was approximately $32,000 (1989 dollars), with 12 percent living below the poverty level. Overall, the percentage of low-income residents in the study area was slightly higher than in Queens County and much lower than in New York City as a whole.

WEST MASPETH YARD STUDY AREA

The site of West Maspeth Yard is located primarily within the West Maspeth section of Queens. The size of the expanded West Maspeth Yard would depend on the alternative, with the Double Tunnel System resulting in the largest yard. The study area is defined as the area within a ¼ mile of the larger site, roughly bounded by Calvary Cemetery to the northwest, 54th Road to the

north, Flushing Avenue to the east, and Stewart Avenue in Brooklyn (see Figure 3-22). Newtown Creek separates the Queens portion of the study area from the Brooklyn portion.

Land Use and Neighborhood Character

The Site. The larger yard (160 acres under the Double Tunnel System) would comprise primarily active and some vacant industrial uses, one residential use in the southeast portion of the site near 57th Street and Grand Avenue, and eight to nine acres of Maspeth Creek and a portion of Newtown Creek.

The expanded West Maspeth Yard site would contain a number of private sector businesses that would be directly displaced. The majority are businesses in warehousing and distribution, motor freight services, food distribution, printing and publishing, businesses services, and building materials. The site also contains a non-profit local development organization, a Metropolitan Transportation Authority (MTA) supply logistics facility, a residence, and vacant land. For more information on the businesses located within the expanded yard site, see Chapter 4, "Economic Conditions and Impacts."

¼-Mile Study Area. The study area is located in a primarily industrial area. Immediately bordering the expanded yard site are a few vacant properties to the northwest, the Montauk Branch and a large United Parcel Service distribution facility to the north along 56th Road, a mixed-use residential neighborhood to the east, and Newtown Creek to the west.

The dominant uses in the vicinity of the site are industrial and transportation-related, with buildings primarily used for warehousing and distribution purposes. There are also metal shops, lumberyards, food storage facilities, junkyards, auto-related uses, and a large vacant warehouse property along Grand Avenue at 49th Street. Several New York City governmental facilities operate within the study area, such as a NYCDOT repair shop in the southeast portion of the study area and Department of Sanitation (NYCDOS) warehouses located in the southwest portion.

The Brooklyn-Queens Expressway (BQE) traverses the northwest corner of the study area crossing Newtown Creek via the Kosciuszko Bridge. It is one of the city's busiest and most congested highways. The entire Brooklyn portion of the study area west of Newtown Creek is industrial. In addition to warehouses and small-scale industrial uses, this area includes a large energy facility and an industrial waste facility.

There are a few notable exceptions in this predominantly industrial study area. In the northernmost section of the study area, there are a few two- and three-story residential buildings along 55th Avenue at 46th Street and at 54th Drive and 43rd Street. Several of the former single-family dwellings have been subdivided into apartments. East of 56th Road (also called Rust Street south of Maurice Avenue) there is a residential neighborhood, including a church along Rust Street. The portion of the study area south of Grand Avenue near Rust Street contains a mix of smaller industrial uses, two small offices, residential uses, and a school. A recently opened bank branch is located along Grand Street at 49th Street on the west side of the street. The Calvary Cemetery is located in the northwest corner of the study area and separated from the rest of the study area by the BQE.

There are a few commercial uses located throughout the study area, including a restaurant located north of the project site at 55th Avenue and 48th Street. In addition, there are a few delis and convenience stores located along Maurice Avenue near 56th Road and there is a local diner

located at this intersection. The New Calvary Cemetery is located along the northeastern border of the study area.

Zoning and Public Policy

The majority of the study area is zoned for heavy industry, including the entire project site. The bulk of the area surrounding the project site is zoned for manufacturing uses, including zones for light, medium, and heavy industries. In the northwest portion of the study area where Calvary Cemetery is located, the area is zoned residential. Along 59th Street there is a residential district with a commercial overlay.

The "Plan for the Queens Waterfront," issued in 1992, is part of New York City's Comprehensive Waterfront Plan. The study area is located in Reach 13, which encompasses 3.5 miles along Newtown Creek and includes four tributaries: Dutch Kills, Maspeth Creek, Whale Creek, and English Kills. The "Plan for the Queens Waterfront" specifies two goals for the future development of the reach, including improving conditions for business by targeting infrastructure investment to meet the needs of expanding industrial uses and attracting new economic activity, and resolving existing environmental problems and safeguarding against new ones. The plan also recognizes the area as a Significant Maritime Industrial Area.

As described in Chapter 2, "Project Alternatives," the West Maspeth Local Development Corporation has proposed a business improvement district in West Maspeth to provide for increased security, supplemental sanitation services, marketing and promotion, and improved signage, among other improvements.

Community Facilities, Open Space, and Population Characteristics

There are no community facilities on the project site, but three are located within the ¼-mile study area. There is a religious facility located at 58th Street between 57th Road and 57th Drive east of the project site, a public elementary school on 57th Street between Grand and Flushing Avenues, and an adult care facility located at the edge of the study area at 58th Street near Flushing Avenue.

No open spaces are located on the project site or within the study area. However, the public elementary school's play area is currently under construction.

In 2000, the West Maspeth Yard Study Area included an estimated 1,905 residents (only one residential property is located within the project site). For census tracts wholly or partially within the study area, the majority of the residents were white (78 percent), and nearly 28 percent of the population was Hispanic.

In 1990, the study area included an estimated 1,675 residents. For census tracts wholly or partially within the study area, nearly all of the residents were white (91 percent) and Hispanics accounted for about 17 percent. The 1989 median household income was nearly $35,000 (1989 dollars), with approximately 10 percent living below the poverty level. Overall, the percentage of low-income residents in the study area was slightly lower than in Queens County and considerably lower than in New York City as a whole.

FREMONT SECONDARY STUDY AREA

The Fremont Secondary Study Area includes the area within 400 feet of the rail line, commencing at Fresh Pond Yard to the south and extending through the borough of Queens to the Hell Gate Bridge at the East River. The rail line is either depressed or at-grade between

Fresh Pond Yard and Queens Boulevard. Between Queens Boulevard and Broadway the rail line is slightly depressed with neighboring roads spanning the rail line. The northern portion of the Fremont Secondary, from 35th Avenue near Broadway to the Hell Gate Bridge is elevated. The study area has been divided into three segments, as described under each segment study area below.

Segment 1

Segment 1 study area (see Figure 3-23) is the area within 400 feet of the Fremont Secondary (formerly known as the New York Connecting Railroad as shown on existing maps) from the northern site boundary of Fresh Pond Yard to Queens Boulevard. The majority of the rail line of Segment 1 is slightly depressed or at-grade.

Land Use and Neighborhood Character. The study area is within the Queens neighborhood of Middle Village. From the northern boundary of Fresh Pond Yard to Juniper Boulevard South, the study area includes a shopping center, a high school, and a portion of the Lutheran Cemetery. The land uses along the eastern edge of this study area section are residential, including two institutional uses. From Juniper Boulevard South to the Long Island Expressway, the study area is predominantly residential, with a large, park at Juniper Boulevard and 76th Street. There is a large Catholic church and a school at Eliot Avenue. Retail and commercial uses are located along Eliot Avenue as well.

From the Long Island Expressway (LIE) to Queens Boulevard, the uses become more industrial and commercial. Along Grand Avenue there is a concentration of commercial and industrial uses. The section between Grand Avenue and 51st Avenue contains residential areas, particularly to the east of the rail line. A mixed-use area including industrial, institutional, and some residential uses is located north of 51st Avenue.

The houses in the neighborhood tend to be semi-attached 2- and 3-story row houses, some with garages attached to the houses. There are few bus lines to the area. The streets tend to be quiet, residential, and tree-lined. Metropolitan Avenue, the LIE, and Queens Boulevard are major east/west corridors in the area. The LIE physically divides the more residential areas to the south from the more mixed-use areas to the north. The residential streets in the north are also quiet, as most of the vehicular traffic through the area utilizes the larger arteries.

Zoning and Public Policy. The southern portion of the study area near Fresh Pond Yard is zoned for light manufacturing with a small section of residential zoning at the Lutheran Cemetery. From Metropolitan Avenue to the LIE the area is zoned for medium-density residential use. North of the LIE to Calamus Avenue, the study area immediately surrounding the rail line is within both a light and heavy manufacturing zone. The remainder of this portion is zoned residential, except at Grand Avenue where there is medium-density residential zoning with a commercial overlay. Between Calamus Avenue and 51st Avenue the study area is zoned for residential use. North of 51st Avenue the area is zoned light manufacturing, except from 48th Avenue to Queens Boulevard where the area is zoned medium-density residential with a commercial overlay.

Community Facilities, Open Space, and Population Characteristics. There are several schools in the study area, including Christ the King Primary School and High School located at Metropolitan Avenue. At Eliot Avenue, there are a Catholic church and elementary school, Our Lady of Hope, and P.S. 128, Juniper Valley. In the northern portion of the study area, between Queens Boulevard and 51st Avenue, a public intermediate school, I.S. 5, is located adjacent to a public assembly hall.

The 55.25 acre Juniper Valley Park, located at 76th Street between Juniper Boulevard North and Juniper Boulevard South, provides both passive and active uses, such as benches, trees, a ball field, and a track. At the intersection of 74th Street and 51st Avenue, is Long Island Mews a 0.323-acre park with benches and a jungle gym.

In 2000 the Fremont Secondary Segment 1 study area included an estimated 3,983 residents. For census tracts wholly or partially within the study area, the majority of the residents were white (72 percent), and nearly 20 percent were Asian.

In 1990, the study area included an estimated 3,865 residents, slightly fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (85 percent), and 11 percent were Asian. The 1989 median household income was over $36,000 (1989 dollars), with 8 percent living below the poverty level. Overall, the percentage of low-income residents in the study area was much lower than in Queens County or New York City as a whole.

Segment 2

The Segment 2 study area (see Figure 3-24) is the area within 400 feet of the Fremont Secondary from Queens Boulevard to the intersection of the rail line with the Hell Gate Line at 28th Avenue. The BQE abuts the rail line for most of the length of this Segment. The rail line in the southern portion of the study area is depressed and in the northern portion the rail line is elevated.

Land Use and Neighborhood Character. From Queens Boulevard to 34th Avenue, the study area is predominantly residential, with neighborhood institutional facilities, such as religious centers, health care facilities, and a private school. Roosevelt Avenue is a main commercial strip in the southern portion of the study area, lined with commercial and retail establishments.

North of 34th Avenue, the land uses are primarily industrial. Northern Boulevard, another major neighborhood commercial strip crosses the study area. There are some residential uses between Northern Boulevard and 31st Avenue along the eastern and western edges of the study area. At 31st Avenue, west of the BQE, there are several tall residential buildings. Across 31st Avenue to the south there is a large church.

Zoning and Public Policy. On the north side of Queens Boulevard, the area is zoned for heavy commercial services, as appropriate for a major transportation and commercial corridor. North of Queens Boulevard to Woodside Avenue, the area is zoned medium-density residential as is the area from Woodside Avenue to 37th Street. There are various commercial overlays along Roosevelt Avenue. North of 37th Avenue to the east of the rail line, the study area is zoned medium-density residential with a small pocket of higher density residential. West of the rail line, from 37th Avenue to the mid-block between 35th and 34th Streets, the area is zoned medium-density residential. North of this point the zoning is predominantly zoned for light manufacturing with some medium-density residential zoning.

Community Facilities, Open Space, and Population Characteristics. The southern portion of the study area between Queens Boulevard and Broadway contains numerous community facilities. Along Woodside Avenue there is S.D.A. School of Jackson Heights near 72nd Street, the St. Jacobus Lutheran Church across the street, and three religious facilities including a Catholic church and a 7th Day Adventist church. Directly north of Roosevelt Avenue, just south of Broadway there are two religious facilities located adjacent to a health care facility. The portion of the study area north of Broadway contains few community facilities. P.S. 152, Gwendoline N.

Alleyne School is located at the western border, just south of Northern Boulevard, and a private elementary school, Corpus Christi School is located 60th Street adjacent to the church along 31st Avenue. In addition, there is an athletic facility in the northernmost portion of the study area at the intersection of 27th Avenue and the BQE.

There are parks located at 34th Street between 69th and 70th Streets and at Broadway and 69th Street. In the northern portion of the study area, the 5 acre-St. Michael's Playground is located at the intersection of 30th Avenue and Boody Street east of the BQE.

In 2000, the Fremont Secondary Segment 2 study area included an estimated 4,958 residents. For census tracts wholly or partially within the study area, approximately 46 percent of the residents were Asian; the white and the Hispanic populations were about equal at 31 percent.

In 1990 the study area included an estimated 4,035 residents, nearly 23 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (47 percent), 38 percent were Asian, and 29 percent were Hispanic. The 1989 median household income was nearly $40,000 (1989 dollars), with 13 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was slightly higher than in Queens County, but lower than in New York City as a whole.

Segment 3

Segment 3 study area (see Figure 3-24) is the area within 400 feet of the Fremont Secondary from the point at which it intersects with the Hell Gate Line to the Hell Gate Bridge at the northern end of Queens. In Segment 3, the elevated Fremont Secondary and elevated Hell Gate Line run parallel.

Land Use and Neighborhood Character. The Segment 3 study area is located within three neighborhoods—Astoria, Steinway, and Ditmars. The eastern side of the study area from its southern end to the Grand Central Parkway, which runs parallel to Astoria Boulevard, is generally industrial in comparison to the residential area on the western side. The eastern portion contains many active warehouse and auto-related uses as well as commercial uses. Along Astoria Boulevard are commercial and retail uses.

The remainder of the study area from Astoria Boulevard to its northern end is primarily residential, ending at Astoria Park along the East River. The residential buildings in this area tend to be 2- to 3-story attached single- and multi-family homes. There are also some institutional, commercial and industrial uses and open space dispersed throughout the area. This portion of the study area crosses several major commercial corridors, which offer a variety of neighborhood retail amenities, including Astoria Boulevard, Steinway Street, 31st Street, 23rd Avenue, and Ditmars Boulevard along the northern boundary. These streets are very busy with pedestrian and vehicular activity, while the residential streets tend to be quieter.

Zoning and Public Policy. The study area's southern portion from 28th Avenue to the Grand Central Parkway/Astoria Boulevard lies within a light manufacturing district to the east and a medium-density residential district to the west of the rail line. North of Astoria Boulevard the area is zoned for medium-density residential uses. This area also includes several commercial overlays along Steinway, 31st Street, and 23rd Avenue.

The "Plan for the Queens Waterfront," issued in 1992, is part of New York City's Comprehensive Waterfront Plan. The Segment 3 study area is located partially in Reach 12, the West Queens Reach, which encompasses six miles along the East River, from the Astoria Con Edison power plant at 20th Avenue south to Newtown Creek. The plan makes several

recommendations for the future development of the reach, including encouraging redevelopment of the waterfront parcels for residential, retail, and community facilities; adopting Waterfront Access Plans for residential development sites where necessary to link existing public spaces in the reach; creating a continuous waterside public path for pedestrians, skaters, and cyclists in accordance with NYCDCP's publication, *Greenway Plan for New York City*; exploring the potential for street end public access or viewing areas adjacent to industrial uses; and improving public access to the waterfront.

Community Facilities, Open Space, and Population Characteristics. There are a few, small community facilities located with the study area. There is an athletic club at 25th Avenue and 50th Street in the southern portion of the study area in the industrial section of Astoria. In addition, the Lindsay-Dimotsis-Vallone Senior Center is located in Astoria. There is a Fire Station located along Astoria Boulevard between 42nd and 43rd Streets. There a few religious institutions located within the study area between 37th Street and 35th Street along 23rd Avenue, including St. Irene and a Korean Episcopal Church. There is a Fire Department located in the study area, north of the rail line, along 35th Street. There is a Hellenic Orthodox church along 33rd Street and another along 26th Street. A neighborhood post office is located near the intersection of 31st Street and 23rd Avenue.

The 66-acre Astoria Park, located along the East River between Ditmars Boulevard and Hoyt Avenue South, offers passive and active recreational uses, including baseball fields, Bocce courts, and one of the City's largest outdoor pools, Astoria Pool. Ralph Demarco Park is located underneath the Hell Gate Bridge along the shore of the East River.

In 2000, the Fremont Secondary Segment 3 study area included an estimated 8,689 residents. For census tracts wholly or partially within the study area, nearly 69 percent of the residents in the Queens study area were white, and 20 percent were Hispanic.

In 1990 the study area included an estimated 7,449 residents, nearly 17 percent fewer than in 2000. For census tracts wholly or partially within the study area, the majority of the residents were white (85 percent), and 18 percent were Hispanic. The 1989 median household income was slightly more than $32,000 (1989 dollars), with 9 percent of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was lower than in Queens County or New York City as a whole.

BRONX STUDY AREAS

There are three study areas located within or near the borough of the Bronx. The Fremont Secondary Study Area is located on an elevated track that passes through Randalls Island and Wards Island. This study area is part of Manhattan, but because it links the Queens and Bronx study areas, it is discussed in this section. The second study area is the Harlem River Yard/Oak Point Link Study Area which includes two project elements: the Harlem River Yard and the Oak Point Link. The Oak Point Link connects the Hudson River Line to Harlem River Yard, Fremont Secondary, Oak Point Yard, and Hunts Point. The third study area is the Oak Point Yard Study Area, which includes Oak Point Yard and Oak Point Link. This study area shares a common boundary with the Harlem River Yard/Oak Point Link Study Area along East 138th Street. Following is a description of the existing land use, zoning, neighborhood character, community facilities, open space and social conditions for the three study areas.

FREMONT SECONDARY (RANDALLS/WARDS ISLAND PORTION) STUDY AREA

The Fremont Secondary Study Area is located on Randalls Island and Wards Island (see Figures 3-25 and 3-26). The study area is defined as the area within 400 feet of the elevated track, which is located on the eastern side of the island.

Land Use and Neighborhood Character

Most of the island is open parkland. At the southern end of the study area, the elevated line travels along the western boundary of the NYCDEP's Wards Island WPCP. Directly north of the sewage treatment plant is the New York City Fire Department Training Academy. At the northern portion of the island, the elevated line travels above parkland. The Triborough Bridge elevated highway is to the west of the rail line.

There is technically no "neighborhood" on Randalls Island and Wards Island. The island is dominated by parkland and large institutional uses. There is bus service to the island, vehicular access from the Triborough Bridge, and a pedestrian walkway across the East River. Randalls Island and Wards Island are destination parks for people throughout the five boroughs. Dowling Stadium, a large outdoor concert and athletic venue, is located on Randalls Island. In addition to usual park uses, athletic contests as well as concerts and festivals are held on the island.

Zoning and Public Policy

Most of the study area is parkland which is not designated. The Wards Island WPCP and the Fire Academy are located in a heavy manufacturing district.

Community Facilities, Open Space, and Population Characteristics

The only community facility in the study area is the New York City Fire Department Training Academy. Randalls Island and Wards Island are characterized by mostly open spaces, both active and passive. There are two playgrounds located in the study area, Dowling Stadium, soccer fields, and baseball fields. There are no residents located within the Fremont Secondary Study Area on Randalls Island and Wards Island.

HARLEM RIVER YARD/OAK POINT LINK STUDY AREA

The Harlem River Yard/Oak Point Link Study Area is located on the southern tip of the Bronx in the neighborhood of Port Morris, as well as a small portion of Mott Haven (see Figure 3-27). The study area is defined as the area within a ¼ mile of Harlem River Yard and within 400 feet of the Oak Point Link; it is bounded to the north by the Major Deegan Expressway, the Bruckner Boulevard/Expressway East 136th Street, and East 138th Street; to the east by the East River; to the south by the Bronx Kill; and to the west by the Harlem River. The Oak Point Link is located along the northern boundary of the Harlem River Yard.

Land Use and Neighborhood Character

The Harlem River Yard is generally bounded by East 132nd Street to the north, the East River to the east, the Bronx Kill to the south and the Harlem River to the west. The area immediately surrounding the Harlem River Yard is mostly industrial, consisting of warehouses, construction material and supply stores, auto repair shops, and manufacturing businesses, all located along East 132nd Street.

North of Harlem River Yard, between Bruckner Boulevard and the Major Deegan Expressway, there is a mixed-use district of residential and industrial uses between Lincoln Avenue and

Brown Place. In this area, residential buildings with ground-floor retail are located near warehouses, moving and storage depots and other light manufacturing businesses.

The Major Deegan Expressway and Bruckner Boulevard/ Expressway create large visual and physical boundaries between the primarily industrial areas to the south and the more residential neighborhoods to the north. The small portion of the study area located north of the Major Deegan Expressway is mostly residential, interspersed with vacant land, institutional uses and open space. Development in the area includes low-scale attached housing as well as NYCHA Mitchell Houses, which are medium-density apartment buildings.

In the northeast portion of the study area, there is a mix of industrial uses as well as the Castle Oil Depot, located along the East River at East 138th Street and Locust Avenue. There is also a power generating facility located on East 132nd Street and Locust Avenue, along the East River. There are several small pockets of residential development, interspersed among the industrial areas, especially between East 133rd Street and East 134th Street and East 136th Street to East 138th Street, between Bruckner Boulevard and Willow Avenue.

Zoning and Public Policy

Almost the entire study area is zoned for manufacturing. The study area contains the Port Morris Special Mixed-Use District, which has a joint zoning designation of light manufacturing and medium-density residential. The special district is designed to promote both residential and light industrial uses and encourage investment in mixed residential/industrial neighborhoods for a wide variety of uses.

There are several public policy initiatives in the study area. The study area is located in the New York Empowerment Zone, a federal and state venture that was created in 1996 to revitalize the marketplace in upper Manhattan and the South Bronx. The empowerment zone is an economic initiative that uses public funds and tax incentives to encourage private investment in the area.

There is an IPIP Program designation for the Port Morris neighborhood. The LDC overseeing the IPIP program in Port Morris is the South Bronx Overall Economic Development Corporation, which advises businesses in the area already as well as assisting businesses locating to the area.

Port Morris, including most of the coastal South Bronx, is located in Reach 7 in the New York City Department of City Planning's "Plan for the Bronx Waterfront," issued in 1993, which is part of the New York City's Comprehensive Waterfront Plan. The Comprehensive Waterfront Plan is designed to present a long-range vision for New York City's waterfront. The principal issue in the reach is to support and strengthen an extensive and active industrial area. The South Bronx has also been listed as one of six Significant Maritime/Industrial Areas in New York City. Goals of the Plan include increasing rail access to the area, allowing more public access to the waterfront in some areas, and developing better truck and vehicular access to the area.

Community Facilities, Open Space, and Population Characteristics

There are very few community facilities located in the study area. There is a group home for adults located on East 136th Street and Willow Avenue. P.S. 154, an elementary school, is located on East 135th Street near Alexander Avenue. There is another Board of Education facility located at 165 Brown Place and 333 East 135th Street.

There are three parks located in the study area. Pulaski Park is a 1.43-acre park located on Bruckner Boulevard and Willis Avenue and contains a playground and basketball courts.

Playground 134 is located on Cypress Avenue and East 134th Street. Lozada Playground is located adjacent to P.S. 154 at East 135th Street and Alexander Avenue. This 1-acre park contains play equipment and basketball courts. A community garden is located near the Major Deegan Expressway and Lincoln Avenue.

In 2000, the Harlem River Yard/Oak Point Link Study Area included an estimated 2,037 residents. For census tracts wholly or partially within the study area, the majority of the residents were Hispanic (70 percent), 33 percent were black, and 27 percent were white.

In 1990, the study area included an estimated 2,087 residents, slightly more than in 2000. For census tracts wholly or partially within the study area, the racial composition of the area remained approximately the same. The majority of the residents in the Bronx study area were Hispanic (67 percent), 29 percent were black, and 28 percent were white. The 1989 median household income was nearly $10,400 (1989 dollars) with nearly half of the population living below the poverty level. Overall, the percentage of low-income residents in the study area was much higher than in Bronx County or New York City as a whole.

OAK POINT YARD/ OAK POINT LINK STUDY AREA

The Oak Point Yard/Oak Point Link Study Area is located in the South Bronx and encompasses parts of the neighborhoods of Hunts Point, Port Morris and Longwood (see Figure 3-28). The study area is defined as the area within ¼ mile of the Oak Point Yard and within 400 feet of the Oak Point Link. The study area as a whole generally extends from Lafayette Avenue to the north, Casanova Street to east, the East River to the south, East 138th Street to the southwest and Concord Avenue to the west. The study area shares its southwestern boundary along East 138th Street with the Harlem River Yard/Oak Point Link Study Area. The Oak Point Link is located along the northern boundary of the Oak Point Yard.

Land Use and Neighborhood Character

Oak Point Yard is generally bounded by the Bruckner Boulevard/Expressway to the northwest, Garrison and Barry Streets to the east, and the East River to the south. The area immediately surrounding the Oak Point Yard is characterized by mostly industrial uses.

Beyond the immediate vicinity of the yard, in the eastern section of the study area, there are smaller industrial and commercial uses, as well as a waste transfer station, a recycling transfer station and food distribution businesses. There are also a few residential uses in the northeast section south of the Bruckner Boulevard/Expressway. Bruckner Boulevard/Expressway separates the industrial areas to the south from the mixed-use area to the north. On the northern side of the Bruckner Boulevard/Expressway, land uses to the northwest are industrial. The northern portion of the study area is residential, with some commercial, institutional and retail uses dispersed throughout the area. Residential development is mostly three- to four-story attached rowhouses and small apartment buildings of about five stories with ground floor retail.

The residential neighborhood of Longwood, in the northern portion of the study area, is vibrant, with vehicular and pedestrian traffic along most streets, including the main thoroughfares of Longwood Avenue and Southern Boulevard. The area is fairly developed with housing. There are also commercial and retail uses in the area to serve the community's needs.

Hunts Point contains the Hunts Point Terminal Market, a large market that is located immediately east of the study area. There are also many other smaller food distribution centers and warehouses located outside of the confines of the market, throughout the Hunts Point

community. The market creates much truck and vehicular traffic through the Hunts Point community to the various highways and bridges that service the area. There is virtually no pedestrian traffic in this area.

Zoning and Public Policy

Most of the study area is zoned for manufacturing uses. There are several public policy initiatives in the study area. The study area is located in the New York Empowerment Zone, as well as within Reach 7 of New York City's Comprehensive Waterfront Plan. Hunts Point has its own IPIP program, which is overseen by the Hunts Point Local Development Corporation. For a full description of these programs, see the "Zoning and Public Policy" section for Harlem River Yard/Oak Point Link Study Area.

Community Facilities, Open Space, and Population Characteristics

Community facilities in the study area are located in the northern portion of the study area, in and around the residential community. The NYPD 41st Police Precinct is located at 1035 Longwood Avenue. There is a Police Athletic League Center located at 991 Longwood Avenue. St. Athanasius Church is located 826 Southern Boulevard, and there are New York City Board of Education facilities located at 658 Fox Street and 462 Wales Avenue.

There are several adjacent lots on Fox Street between Leggett Avenue and Longwood Avenue that are being used as a community garden. Fox Playground is a 0.94-acre park located on Fox Street and East 156th Street. Banana Kelly Park is a 0.61-acre park located near Beck Street and St. John Avenue. There is also an open space on Timpson Place near East 147th Street. All of these open spaces are in Longwood. South of the Bruckner Boulevard/Expressway, there is a public access pier extending into the East River at the southern tip of Tiffany Street, under the jurisdiction of NYCDPR.

In 2000, the study area included an estimated 11,370 residents. For census tracts wholly or partially within the study area, the majority of the residents were Hispanic (nearly 81 percent); nearly 28 percent were black, and 28 percent were white.

In 1990, the study area included an estimated 9,667 residents, approximately 17 percent fewer than in 2000. For census tracts wholly or partially within the study area, the racial composition remained approximately the same. The majority of the residents were Hispanic (77 percent), 30 percent were black, and 27 percent were white. The 1989 median household was a little more $10,600 (1989 dollars) with 52 percent living below the poverty level. Overall, the percentage of low-income residents in the study area was much higher than in Bronx County or New York City as a whole.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

INTRODUCTION

Described in this section is the No Action Alternative and how the project alternatives might affect land use, zoning and public policy, neighborhood character, community facilities, open space resources, and population characteristics for each study area. This impact assessment relies on adverse impacts identified in other chapters of this EIS, primarily visual character, noise, and traffic impacts.

The majority of the study areas both in New Jersey and New York are located in places where land uses already comprise industrial, commercial, or transportation uses. In these situations, the additional rail and related facilities are in keeping with the character of the area and with overriding zoning and public policies that distinguish these areas as industrial. Areas with residential land uses or with community facilities and open spaces along the rail rights-of-way are most sensitive to changing rail traffic patterns, most notably from potential noise impacts (see Chapter 10, "Noise and Vibration"). The changes in rail traffic patterns from the project alternatives, as well as the vehicular traffic changes, are shown in Chapter 8, "Transportation." Construction for the project alternatives could also result in construction impacts to adjacent residents, community facilities, or open spaces (see Chapter 16, "Construction and Construction Impacts").

Future population growth estimates for each study area are based on regional projections provided by the NJTPA and the New York Metropolitan Transportation Council (NYMTC). The estimates have been adjusted based on 2000 U.S. Census data. The growth projections are established for the No Action Alternative and would not be expected to change under the project alternatives. It is also noted that study areas with no existing residential populations are expected to remain uniformly industrial and commercial into the future (see Chapter 4, "Economic Conditions and Impacts").

NO ACTION ALTERNATIVE

There are several developments and public policy changes that are expected to occur in and adjacent to the New Jersey and New York City study areas under the No Action Alternative. The most notable changes are summarized below. Construction and operational activities related to these projects are not part of the Cross Harbor Freight Movement Project. They will be built or implemented regardless of the selection of any of the project alternatives.

NEW JERSEY

Under the No Action Alternative, construction activity within the rail corridor study areas would primarily consist of trackwork associated with the P&H Line, Greenville Branch, and Chemical Coast Line. In addition, CP is proposing to improve its intermodal facility at Oak Island Yard. In addition, many of the study areas will see roadway improvements implemented under Portway and other port improvement projects that are being planned and implemented, including the development of a portion of the former MOTBY for port development; and expansion of the Global Marine Terminal. It is expected that the Jersey City Redevelopment Agency would develop the Preferred Warehouse Freezer Project in the southwest portion of the Greenville Yard Study Area, bringing new warehouse space, office workers, and trucks to the area.

Population Characteristics

According to NJTPA, population in Hudson County is expected to increase by 7.3 percent between the years of 2000 and 2010 and by 9.9 percent between 2010 and 2025; Union County population is expected to increase by 0.3 percent between the years of 2000 and 2010 and increase by 4.2 percent between 2010 and 2025; Essex County population is expected to increase by 4.5 percent between the years of 2000 and 2010 and by 3.8 percent between 2010 and 2025; Middlesex County population is expected to increase by 7.5 percent between the years of 2000 and 2010 and by 9.5 percent between 2010 and 2025. As shown in Table 3-1, these countywide

Table 3-1
New Jersey Population Projections

Study Areas	2000	2010	2025
Hudson County	608,975	653,575	718,485
Greenville Branch	1,321	1,418	1,559
National Docks Secondary—Segment 2	6,109	6,556	7,208
Union County	522,541	524,341	546,470
Chemical Coast Line—Segment 1	2,470	2,479	2,583
Arthur Kill Lift Bridge	221	222	231
Essex County	793,633	829,533	861,168
P&H Line	757	791	821
Middlesex County	750,162	806,521	882,742
Chemical Coast Line—Segment 2	1,157	1,244	1,361

Source: New Jersey Transportation Planning Authority, 2002. Adjusted based on *2000 U.S. Census* data.

percentage changes have been applied to the individual study areas. Several study areas have no existing population base and this is expected to remain the same into the future with or without the project alternatives.

NEW YORK

Staten Island

In the Staten Island study areas, Howland Hook Marine Terminal will undergo an expansion and the adjacent Port Ivory Site will be redeveloped as an intermodal rail yard. Arlington Yard will be redeveloped into an intermodal facility and the Staten Island Railroad which will be reactivated between the Arthur Kill Lift Bridge and Arlington Yard as part of NYCEDC's Staten Island Railroad Reactivation project. Following construction, approximately two roundtrip trains would use the yards. In addition, an application is pending to rezone a large parcel lot located on the southwest corner of Nicholas Avenue and Richmond Terrace (located in the Northern Staten Island Study Area, Segment 1) from manufacturing to residential. The future site of the National Lighthouse Museum will be at the former U.S. Coast Guard Base (the abandoned Staten Island lighthouse depot complex), along the shoreline in St. George. The St. George Ferry Terminal will be reconstructed and developed as a mixed-used facility for commuters and a tourist attraction for visitors. In addition, The Trust for Public Land is negotiating the purchase of a nine-acre waterfront parcel of land north of Richmond Terrace near the intersection of Alaska Street.

Brooklyn

In the Brooklyn study areas, it is anticipated that several projects may occur by the future analysis years. The City of New York will sell municipal parking lots and air rights over the Bay Ridge Branch right-of-way for the development of "The Junction," a retail center and parking garage that will be located on a block bounded by Avenue H and Flatbush and Nostrand Avenues. To accommodate the proposed project, the site will be rezoned from C8-2 to C8-4 General Service District. These future developments over the rail right-of-way would not affect the current or future expanded use of the underlying rail lines.

There are several undeveloped lots located in the New Lots and East New York sections of Segment 4 of the Bay Ridge Branch Study Area. Much of this land is city-owned and has already been sold. Under the New York City Department of Housing Preservation and Development (NYCHPD)-sponsored Brooklyn Nehemiah Program, the East Brooklyn Congregations, a consortium of over 30 congregations, is working with the City to construct up to 700 single-family affordable homes in the East New York section of Brooklyn. While many of the houses have been built, it is anticipated that the construction of new low-density housing will continue to occur between Linden Boulevard and Sutter Avenue. These new construction sites are approximately 50 to 250 feet or more away from the Bay Ridge Branch.

In the same general area, NYCEDC has sold most of its vacant property in East New York to industrial companies and it is anticipated that they will be redeveloped with industrial uses. Many existing companies in the area are expanding by buying lots adjacent to or near their property and only small, scattered sites are still available. In addition, there may be an expansion of Flatbush Terminal by extending the Interborough Rapid Transit (IRT) subway line 1,200 feet alongside the Bay Ridge Branch.

Queens

Within the Fresh Pond Yard Study Area, there is one proposed development, currently in the approval process, for the construction of 70 housing units on a vacant parcel at Admiral Avenue, southwest of Metro Mall.

Bronx

Harlem River may be the location of an expanded solid waste management facility. To the east of the Oak Point Yard Study Area, in the Hunts Point Terminal Market, there are several new projects anticipated. A warehouse and distribution facility, new refrigeration facility, and parking facilities are being planned. Ground was broken in November 2001 on a site that will house the Fulton Fish Market, currently located in Lower Manhattan near South Street Seaport. Project completion is slated for 2005.

Population Characteristics

For all the New York City study areas, NYMTC projects modest population growth through the 2025 analysis year. Population in Richmond County is expected to grow by 4.8 percent between the years 2000 and 2010 and to grow by 12.9 percent between 2010 and 2025; Kings County population is expected to decrease by 0.6 percent between 2000 and 2010 and to grow by 3.2 percent between 2010 and 2025; Queens County population is expected to increase by 0.6 percent between 2000 and 2010 and by 4.2 percent between 2010 and 2025; Bronx County population is expected to grow by 0.8 percent between the years 2000 and 2010 and by 3.9 percent between 2010 and 2025. As shown in Table 3-2, these countywide percentage changes have been applied to each of the study areas.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

NEW JERSEY

The rehabilitation of the Greenville Yard and new trackwork would not alter the yard's current land use and would be compatible with Jersey City's existing zoning and public policies as the

Table 3-2
New York Population Projections

Study Areas	2000	2010	2025
Richmond County	443,728	464,800	524,800
Arthur Kill Lift Bridge/Arlington Yard	296	310	350
Northern Staten Island	10,582	11,085	12,515
Kings County	2,465,326	2,451,400	2,529,400
65th Street Yard	7,672	7,629	7,871
Bay Ridge Branch	53,056	52,756	54,435
Queens County	2,229,379	2,243,000	2,337,400
Bay Ridge Branch – Queens Portion	2,765	2,782	2,899
Fresh Pond Yard	27,973	28,144	29,328
Montauk Branch	1,432	1,441	1,501
West Maspeth Yard	1,905	1,917	1,997
Fremont Secondary	17,630	17,738	18,484
Bronx County	1,332,650	1,343,900	1,396,900
Harlem River Yard	2,037	2,054	2,135
Oak Point Yard	11,370	11,466	11,918

Source: New York Metropolitan Transportation Council, 2002. Adjusted based on *2000 U.S. Census* data.

yard and study area are part of the Greenville Industrial Redevelopment Plan. The public space located within the study area does not have a view of the yard. Therefore, there is no potential for adverse impacts on land use, zoning and public policy, or open space in the study area.

NEW YORK

Under the TSM Alternative, there would be minor construction and operational activities at the affected New York project sites. Construction activity would primarily consist of trackwork associated with rehabilitating 65th Street Yard and minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch. The minimal yard work and trackwork at existing yards and rail lines would not alter their neighborhood character or current land uses. There would be a slight increase in the number of trains using the Fremont Secondary. Since trains already use this line, this slight increase would not cause an adverse impact on the surrounding areas.

Therefore, there is no potential for adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space, in the New York study areas.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

NEW JERSEY

Greenville Yard

Four Greenville float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new track work. In addition, 16 barge trips would arrive and depart from the site each day, up from one round trip per day under the No Action Alternative. These improvements and the increased number of barges would be in

keeping with the industrial character of the study area, the yard's current land use and Jersey City's public policies.

Other New Jersey Study Areas

There would be a slight increase in the number of trains using the National Docks Secondary, P&H Line, Chemical Coast Line, and Greenville Branch. The minor increase in usage is not expected to change the neighborhood character or land use of the surrounding areas, as these rail lines are already in active use.

As a result, there are no anticipated adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the New Jersey study areas.

NEW YORK

65th Street Yard

Two additional float bridges would be constructed at 65th Street Yard similar to those recently constructed. Rehabilitation at the yard would also include new trackwork. In addition, approximately 16 roundtrip barge trips would occur each day, up from one roundtrip under the No Action Alternative. These improvements and the increased number of barges would be in keeping with the industrial character of the study area and the yard's current land use.

Other New York City Study Areas

Under the Expanded Float Operations Alternative, there would be minor new construction and operational activity at the affected New York project sites similar to that of the TSM Alternative. Construction activity would primarily consist of track work associated with minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch; and the expansion of the rail yard in West Maspeth, Queens at the Phelps Dodge and existing West Maspeth Yard sites. The minimal yard work and track work at existing yards and rail lines would be in keeping with their neighborhood character and current uses.

The creation of a new rail yard in Maspeth, Queens would require the construction of new tracks, internal roadways, and paved areas. The work required for this alternative would change an overgrown, underutilized area into an active industrial site. This is compatible with the surrounding study area, which is predominantly industrial.

There would be a slight increase in the number of trains using the Bay Ridge Branch and Fremont Secondary with the Expanded Float Operations Alternative. However, this minor increase in usage is not expected to change the neighborhood character or land use of the surrounding areas.

Therefore, there is no potential for adverse impacts on the land use, zoning and public policy, neighborhood character, community facilities, or open space in the New York study areas.

TUNNEL ALTERNATIVE

NEW JERSEY

For both the Single and Double Tunnel Systems, in New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur

Kill Lift Bridge and additional sidings along the Chemical Coast Line. In addition, an increase in train traffic could occur along certain rail lines under either tunnel alignment. Each study area is examined for the potential impacts that could occur under a specific tunnel alignment under both the Single and Double Tunnel Systems.

Greenville Yard/Potential Tunnel Alignment

Under both the Single and Double Tunnel Systems, the New Jersey tunnel alignment would be constructed within Greenville Yard and along the Greenville Branch. From an area just east of the New Jersey Turnpike Extension, tunnel construction would begin as an open cut adjacent to the Greenville Branch. When a depth of 35 feet below existing grade is reached just west of Greenville Yard (the tunnel portal), the tunnel would be constructed using cut and cover construction through the Greenville Yard to the shoreline at a depth of 65 feet where it would be connected to the immersed tube section. A tunnel ventilation shaft would be constructed at the northeast tip of the Global Marine Terminal/NEAT pier, east of the public open space located on the northern edge of the pier. Under the Tunnel Alternative it is anticipated that float bridge service would be eliminated and the site would be redeveloped.

Once complete and operational, under both tunnel systems, the increased train traffic in the tunnel would not have any effects on the land use or character of the study area. The cut and cover portion would not be visible, and the open cut portion would be located along an existing rail line in an industrial area. While this alternative would generate a greater amount of freight traffic, it is not expected that the increase in traffic would change the neighborhood character of Greenville Yard or the largely industrial study area that already contains considerable rail infrastructure. The increase in rail activity would not adversely impact the viewing platform and open space that is located within the study area, south of the rail yard.

Under both tunnel systems, the tunnel ventilation shaft at the northeast corner of the Global Marine Terminal/NEAT pier would be approximately 230 by 150 feet, and it would rise 50 to 60 feet above low to mean tide. It would not be a prominent or incompatible land use in the study area or from the public open space along the pier as elevated cranes and tall industrial equipment on and near Greenville Yard currently help to define the neighborhood character of the area.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space within the Greenville Yard Study Area under either tunnel system.

Chemical Coast Line

For both the Single and Double Tunnel Systems, under the Staten Island tunnel alignment, 30,000 feet of sidings would be required along the line north of its planned connection to the Staten Island Railroad. In general, the track construction would be in keeping with the rail line's current use.

Under both tunnel alignments for both tunnel systems, there would be increased train traffic on the Chemical Coast Line. As set forth in Chapter 10, "Noise and Vibration," the potential changes in noise levels at residential and open spaces adjacent to the Chemical Coast Line would not result in severe noise impacts. Thus, there would be no anticipated land use changes among the uses fronting the rail line, and there would be no overall effect on neighborhood character. In general, the increased traffic would be in keeping with the rail line's current role as an industrial and transportation corridor, particularly in the northern portion of the study area, which is where most of the increase in rail traffic is expected.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Chemical Coast Line Study Area under either the Single or Double Tunnel System.

Arthur Kill Lift Bridge

For both tunnel systems, under the Staten Island tunnel alignment, a second span would be constructed adjacent to the south side of the existing Arthur Kill Lift Bridge to accommodate additional rail traffic. The new span would be identical to the existing span. A viaduct would be constructed adjacent to the south side of the Staten Island Railroad to connect the new span to the Chemical Coast Line.

Since the new span across the Arthur Kill would be constructed immediately adjacent to the existing span and to the nearby Goethals Bridge, located a short distance to the south, it is not expected that the new span would affect the neighborhood character of the study area. The bridge is located in an industrial area along the Arthur Kill. The few residents within the study area are located along the busy I-278 transportation corridor. Therefore, there are no anticipated adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Arthur Kill Lift Bridge Study Area under either tunnel system.

Greenville Branch

Freight traffic along the rail line would increase substantially under both the New Jersey and Staten Island tunnel alignments of both the Single and Double Tunnel Systems. There are residential uses and a park (Mercer Park) along the rail right-of-way. Key potential impacts to these uses would be visual impacts generated by the additional train traffic.

As described in Chapter 5, "Visual and Aesthetic Considerations," there is the potential for an adverse visual impact along this rail line under the New Jersey tunnel alignment because the rail line is elevated and there would be substantial increases in the number of trains. Construction of the Second Waverly Loop would be consistent with surrounding land uses. These visual impacts are unlikely to result in changes to underlying land uses or affect overall neighborhood character because the area is already a heavily used transportation corridor, the increased train traffic would be in keeping with the rail lines' current land use, and the affected area represents a relatively small portion of the neighborhood.

As described in Chapter 10, "Noise and Vibration," there would be a noise impact to nearby residents with the implementation of the New Jersey alignment of either the Single or Double Tunnel Systems. With the Single Tunnel System, the affected area would be 155 feet. With the Double Tunnel System, the affected area would extend to 181 feet. Mitigation measures are discussed in Chapter 10. These noise impacts are unlikely to result in changes to underlying residential land uses or affect overall neighborhood character because the area is already a heavily used transportation corridor, the increased train traffic would be in keeping with the rail lines' current land use, and the affected area represents a small portion of the neighborhood.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Greenville Branch Study Area.

National Docks Secondary

Under the Single Tunnel System there would be no connection to the National Docks Secondary; however, because of regional train reroutings, freight traffic is expected to increase on this line, and noise mitigation is proposed. Under the Double Tunnel System, a connection to

the National Docks Secondary would be constructed, and freight traffic would increase under both the New Jersey and Staten Island tunnel alignments. Along the rail line there are locations where residences, community facilities, and open spaces are located in close proximity to the active right-of-way. The National Docks Secondary is located along a busy and noisy transportation corridor that includes not only the existing rail line but also the New Jersey Turnpike.

The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be no noise impacts on open space or community facilities under either the Single or Double Tunnel System. In addition, under the Single Tunnel System, there would be no noise impacts on residences in Segment 2 for the New Jersey tunnel alignment. However, there would be noise impacts (absent mitigation) on residential uses in Segment 2 under the Staten Island tunnel alignment under the Double and Single Tunnel System. In areas where the rail line is elevated, the affected area would be approximately 108 feet for the Double Tunnel System and 91 feet for the Single Tunnel System.

These noise impacts are unlikely to result in changes to underlying residential land uses or affect overall neighborhood character because the area is already a heavily used transportation corridor, the increased train traffic would be in keeping with the rail lines' current land use, and the affected area represents a small portion of the neighborhood.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the National Docks Secondary Study Area.

P&H Line

While freight traffic along the P&H Line would increase under both the New Jersey and Staten Island tunnel alignments under both tunnel systems, there would be no adverse visual, noise or other impacts that would affect land use or neighborhood character. In general, the increased traffic would be in keeping with the rail line's current role as an industrial and transportation corridor. In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the P&H Line Study Area.

Oak Island Yard

Although there would be an increase in freight traffic using Oak Island Yard under either tunnel alignment of both tunnel systems, the yard is already active with freight traffic. The increased freight traffic would be in keeping with the rail yard's current land use and the industrial character of the study area which has no residential uses, community facilities, or open spaces. Therefore, there is no potential for adverse impacts on the land use, zoning and public policy, or neighborhood character of the study area.

NEW YORK

Staten Island Study Areas

Only the Staten Island tunnel alignment is applicable to the Staten Island study areas. With the New Jersey tunnel alignment, there would be no increase in train traffic to or from Staten Island facilities.

Arthur Kill Lift Bridge. As discussed above, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span under both the Single and Double Tunnel Systems. From the bridge to Arlington Yard, the existing embankment would be enlarged to

accommodate a second track. For the reasons discussed above under New Jersey, and because the bridge and rail line are in an industrial area, there is no potential for adverse impacts on the land use, zoning and public policy, neighborhood character, community facilities, or open space in the study area.

Arlington Yard. Construction of a new mainline track and rehabilitation of an existing mainline track would be performed at Arlington Yard for the additional trains that would pass through the yard under both the Single and Double Tunnel Systems. (In the No Action Alternative, a smaller number of trains would terminate at the yard, and no trains would pass through.) The reactivation of Arlington Yard is based on current economic development policies of New York City.

The area surrounding the yard is a mix of industrial uses, open space (Mariner's Marsh Park and Goethals Bridge Pond Preserve), and some residential uses. The noise assessment (see Chapter 10, "Noise and Vibration") shows that under both tunnel systems, the increase in noise generated by the freight tunnel rail traffic would result in noise impacts (absent mitigation) on the residents and open spaces in the area. For residential areas, the affected area would be between approximately 108 and 209 feet from the edge of the Staten Island Railroad running through the yard; for open spaces, the affected area would be between approximately 100 and 132 feet depending on the tunnel system.

There are few residences within the affected area. The southern portion of Mariner's Marsh Park closest to the rail yard is a quiet passive use area with hiking trails surrounding several ponds. Goethals Bridge Pond Preserve is composed of marshy and natural areas. Small portions of the 150-acre Goethals Bridge Pond Preserve and 107-acre Mariner's Marsh Park would be affected; however, these areas are not frequented by people.

These noise impacts are unlikely to result in changes to underlying residential or open space land uses or affect overall neighborhood character because the area is predominantly industrial and the affected area represents a relatively small portion of the neighborhood and park. In addition, based on the small areas affected by noise increases, overall functionality of the open spaces would remain intact.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Arlington Yard Study Area under either tunnel system.

Northern Staten Island—Segment 1. Under both the Single and Double Tunnel Systems, the currently inactive Staten Island Railroad would be rehabilitated and a second mainline track would be constructed. In Segment 1, the rail lines run in a depressed cut. Under both systems, clearance heights would be increased at 11 sites along the line between South Avenue and John Street. Because the rail line is currently inactive, the increase in rail activity would be substantial.

As part of the clearance work, the existing right-of-way (which currently is wooded) would be cleared for a width of 40 feet through the clearance work area. However, approximately 20 feet of the existing vegetation would remain on either side of the tracks to buffer the rail line from the residential houses that are located adjacent to it. Rehabilitation of the tracks would be consistent with the "Plan for the Staten Island Waterfront," which calls for the reactivation of the North Shore Railroad for freight movement. For these reasons, it is not expected that these improvements would affect the neighborhood character and land uses in the study area or the rail line's relationship to the surrounding area.

Along the rail line, there are locations where residences, community facilities, and an open space are located in close proximity to the active right-of-way. As analyzed in Chapter 10, "Noise and Vibration," the addition of trains on the inactive rail line would result in noise impacts (absent mitigation) under both the Single and Double Tunnel Systems. The noise analysis estimates that the rail line would generate such impacts for about 108 to 209 feet outward from the edge of the rail line for residential uses, and between 100 and 132 feet for open space uses depending on the tunnel system. For community facilities the impacts would extend outward from the rail line for 61 feet under the Double Tunnel System; there would be no noise impacts on community facilities under the Single Tunnel System. Two churches and two schools, the Eden II School for Autistic Children and Port Richmond High School are located along the right-of-way. There are playing fields associated with the high school.

The noise impacts are unlikely to result in changes to underlying residential land uses or affect overall neighborhood character because the affected area represents a relatively small portion of the neighborhood. The increased noise levels are unlikely to affect the existing functional use of the ballfields, which are active recreation resources. In addition, the functional use of the churches is not expected to be notably altered. Noise impacts on the schools would be mitigated as described in Chapter 10.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Northern Staten Island Study Area, Segment 1.

Northern Staten Island—Segment 2. As with Segment 1, Segment 2 would experience a substantial increase in freight activity under both the Single and Double Tunnel Systems. The rail line is elevated for part of the Segment 2 study area between Nicholas Avenue and Richmond Terrace and slightly below grade from this point to Alaska Street. The elevated portion of the rail line travels through the Port Richmond community, which is primarily residential with some commercial and industrial uses, while the below grade portion travels through a heavily industrial area.

As described in Chapter 5, "Visual and Aesthetic Considerations," under both tunnel systems the new rail traffic along the inactive, elevated and visible portion of the rail line would create an adverse visual impact.

In addition, as set forth in Chapter 10 "Noise and Vibration," it is anticipated that there would be noise impacts on residences within a certain distance of the elevated portion of the rail line (within 452 feet under the Single Tunnel System and within 871 feet under the Double Tunnel System), and for community facilities and open spaces (within 143 feet under the Single Tunnel System and 189 feet under the Double Tunnel System). Due to these noise impacts over large distances, there would be an adverse impact on neighborhood character under both tunnel systems.

There are no parks located within the potentially affected area and only one community facility, a church. The church is located at the edge of the impacted area (under the Double Tunnel System), therefore, noise levels would not be much higher than existing conditions and its functional use is not expected to be substantially altered.

In the non-elevated portion, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space under either tunnel system.

Northern Staten Island—Segment 3. Under both tunnel systems, the landside portion of the tunnel alignment in Staten Island would begin along the Staten Island Railroad right-of-way at Alaska Street. From here to Bement Avenue (the location of the tunnel portal), the tunnel would be in an open cut. Continuing along the right-of-way to Davis Avenue, the tunnel would be built of cut and cover construction. The open cut excavation would increase in depth from 0 to 35 feet below existing grade, while the cut and cover excavation would increase from 35 to 65 feet below grade. (For land use and neighborhood character impacts during construction see Chapter 16, "Construction and Construction Impacts.")

The study area is largely industrial along the rail right-of-way and Richmond Terrace, with residential uses and open spaces located south of Richmond Terrace. There are no community facilities in the study area. After construction is complete, new train traffic in the tunnel would have few effects on the neighborhood character of the study area. The cut and cover portion would not be visible, and the open cut portion would be located within the Staten Island Railroad right-of-way below existing grade; the tunnel would not block any views of the waterfront and views of the rail line would be limited to the surrounding streets. Near the open cut section, the residential uses with one exception (a residence at Barretta Lane) and open spaces are buffered from the rail line by Richmond Terrace and intervening industrial uses. After construction, the cut-and-cover portion of the site could be redeveloped to provide improved waterfront access consistent with the North Shore Esplanade Plan and the Bikeway and Cultural Trail Proposal.

Therefore, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Northern Staten Island Study Area, Segment 3 under either tunnel system.

Northern Staten Island—Segment 4. Under both tunnel systems, the tunnel would be bored from Davis Avenue southeast to the shoreline at Pier 2. There would be no visual change since new train traffic would be at least 65 feet below existing grade and any ground-borne noise or vibration impacts would be mitigated. Therefore, the bored tunnel would have no adverse impacts on the neighborhood character, land use, zoning and public policy, community facilities, and open space resources of the study area under either tunnel system.

In this segment, under both tunnel systems, a tunnel ventilation shaft would be constructed in the harbor near the seaward end of Pier 2. The ventilation shaft's footprint would be approximately 230 by 150 feet, and it would rise 50 to 60 feet above low to mean tide. There would be no noise impacts associated with the vent structure. As discussed in Chapter 5, "Visual and Aesthetic Considerations," the vent shaft would have adverse impacts on the views from the public walkway along the shore. However, views of the waterfront would still be available from other locations on the public walkway and the overall functionality of the open space would remain intact. Therefore, no adverse impacts on open space are expected.

Overall, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, and open space resources in the Northern Staten Island Study Area, Segment 4 under either tunnel system.

Brooklyn Study Areas

65th Street Yard. Under both tunnel systems, 65th Street Yard would continue to serve as a rail yard and, under the New Jersey tunnel alignment, the site of the tunnel ventilation and

construction shaft. The ventilation and construction shaft for the New Jersey tunnel alignment would be approximately 230 feet by 150 feet and would rise 50 to 60 feet above the water level. Rehabilitation of the yard would include trackwork.

There would be no adverse noise, traffic or visual impacts associated with improvements and operational activities that would occur at the yard. Existing land uses along the waterfront are primarily limited to industrial complexes and the adjacent elevated expressways. The expressways separate the rail yard from the residential uses and open spaces in the study area, such as Owls Head Park and Leif Ericson Park and Square. There would be limited rail and truck traffic generated by the yard. The improvements at the yard would be consistent with the City's policies by supporting and promoting the area's continued use as an industrial area as stated in the "Plan for the Brooklyn Waterfront."

Therefore, there would be no adverse effects on land use, zoning and public policy, neighborhood character, community facilities, and open space resources in the 65th Street Yard Study Area under either tunnel system.

Bay Ridge Branch of the LIRR—Segment 1. In Brooklyn, under both the New Jersey and Staten Island tunnel alignments of both tunnel systems, the tunnel would be bored to a location between 8th and 9th Avenues. There would be no visual change since new train traffic would be at least 65 feet below existing grade and any significant ground-borne noise or vibration impacts would be mitigated. Therefore, the bored tunnel would have no adverse impacts on the neighborhood character, land use, zoning and public policy, community facilities, and open space resources of the study area.

The ventilation shaft for the Staten Island tunnel alignment, under both tunnel systems, would be constructed in the harbor near the seaward end of the public 69th Street pier. The ventilation shaft's footprint would be approximately 230 by 150 feet, and it would rise 50 to 60 feet above low to mean tide. There would be no noise impacts associated with the vent structure. As discussed in Chapter 5, "Visual and Aesthetic Considerations," the vent shaft would adversely affect views from the 69th Street pier. The ventilation shaft would interrupt expansive views west on the pier toward Staten Island, affecting the public's enjoyment of these waterfront views, and it would diminish the sense of openness experienced by pier users. This visual impact would affect the character of the open space resource, but not its overall functionality or use and therefore would not be considered an adverse impact on open space resources. No adverse visual impacts would occur on other open spaces or uses in the study area, including Owls Head Park and the Shore Promenade, which are further removed from the vent shaft.

In addition, the vent shaft would cast shadows on the pier throughout the year beginning in the early afternoon until the end of the day's analysis period. On each day the shadows reach their maximum extent at the end of the analysis period. On June 21st when the shadow would fall approximately parallel to the pier at 7 PM, the shadow would reach 186 feet along the 593-foot long pier. On May 6/August 6 the shadow would be a maximum of 178 feet along the pier. On March 21/September 21 the shadow would reach up to 115 feet along the pier, but because of the angle of the sun, would cover only a roughly triangular area. On December 21 the shadow would only reach up to 33 feet along the pier and because of the angle of the sun would only cover a relatively small triangular area. The pier contains benches and picnic tables and is well used. Shadows would fall on some of the benches and tables in most, if not all, seasons. However, even at its greatest extent on June 21, the shadow would cover less than a third of the pier. Further, this maximum shadow would occur in the summer when a shadow might be appreciated, and the minimum shadow would occur on December 21 when sunlight

might be appreciated.

Above the bored section of the tunnel, there would be some clearance work performed. Although a greater number of trains would use the portion of the Bay Ridge Branch that travels through this section, no adverse neighborhood character or land use impacts are expected under either tunnel system due to the limited number of additional trains, the industrial nature of the area, and the existing heavily used transportation corridors in the area.

Therefore, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, and open space resources in the Bay Ridge Branch Study Area, Segment 1 under either tunnel system.

Bay Ridge Branch of the LIRR—Segment 2. Under both tunnel systems, the tunnel would be built of cut and cover construction from a location between 8th and 9th Avenues to approximately 10th Avenue (the tunnel portal location) and would continue in an open cut to a location between 12th and 13th Avenues along the Bay Ridge Branch right-of-way. The cut and cover excavation would rise from 65 feet below grade at the tunnel portal to the west to 35 feet below grade at the eastern end where it would meet the open cut. The open cut depth would rise from 35 feet below grade and meet existing grade which is already located in a cut below street grade. Freight traffic within and along the open cut portion of the study area would increase substantially under both tunnel systems.

After construction is complete, new train traffic in the tunnel would have few effects on the neighborhood character of the study area. The cut and cover portion would not be visible, and the open cut portion would be located within the Bay Ridge Branch right-of-way below existing grade. The study area along the open cut portion of the rail right-of-way contains a mix of residential and industrial uses with some community facilities. The land uses are buffered from the right-of-way by 61st and 62nd Streets. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be no noise impacts on residential uses, open spaces, or community facilities in the study area under either tunnel system.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Bay Ridge Branch Study Area, Segment 2 under either tunnel system.

Bay Ridge Branch of the LIRR—Segment 3. Freight traffic along this section of the Bay Ridge Branch would increase substantially under both tunnel systems. In addition, clearance heights would be increased, new track would be laid, and associated utility work within the existing Bay Ridge Branch right-of-way would be conducted.

In general, the clearance work improvements are not expected to substantially alter the neighborhood character of the rail line or its relationship to the surrounding study area since most views of the Bay Ridge Branch are blocked by fencing and walls and because the rail line is in a cut below street grade along the entire length of this segment.

However, the increased train activity would have considerable effects. Along this section of the Bay Ridge Branch there are a mix of residential (including low-, mid-, and high-rise buildings) and industrial uses, as well as community facilities. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be noise impacts (absent mitigation) on residences and a nursing home within 580 feet of the rail line, and on community facilities within 77 feet of the rail line. Under the Double Tunnel System, due to these noise impacts on residential uses over large distances, there would be an adverse impact on

neighborhood character. Under the Single Tunnel System, there would be impacts within 260 feet of the rail line on residences and no impacts on community facilities; therefore, there would be no adverse impacts on neighborhood character under the Single Tunnel System.

Community facilities located within the affected area (Double Tunnel System only) include Brooklyn College, P.S. 180 and a large yeshiva. Other facilities potentially located within the study area include healthcare facilities and religious institutions. Increased noise levels would not be expected to alter the functional use of the religious institutions. Noise impacts on the schools would be mitigated as described in Chapter 10.

Bay Ridge Branch of the LIRR—Segment 4. As in Segment 3, freight traffic along this section of the Bay Ridge Branch would increase substantially. Both systems would involve increasing clearance heights between New Lots and Liberty Avenues, laying new track, and conducting associated utility work within the existing Bay Ridge Branch right-of-way. In addition, two sidings of up to 10,000 feet in length would be placed on either side of the two mainline tracks at a location between East 43rd and East 98th Streets. In general, these clearance and track improvements are not expected to substantially alter the rail line or its relationship to the surrounding study area. The changes would be minor and would occur within the right-of-way of the existing rail line.

In Segment 4, the alignment includes areas located in a depressed cut, a tunnel between East New York and Evergreen Avenues, and areas located along an embankment. In most areas of greatest sensitivity—where residential uses abut the rail corridor—train tracks are located in a deep cut below grade, thereby minimizing the potential for adverse impacts to occur. The elevated portions of the Bay Ridge Branch tracks are located in a dense transportation corridor where elevated IRT, BMT, and Independent Subway System (IND) subway lines run both parallel to and cross over the Bay Ridge Branch. Furthermore, the vast majority of the land uses within this portion of the study area are industrial, further minimizing the potential sensitivity of noise generated by the increased train traffic.

The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be noise impacts (absent mitigation) on residential uses under the Double Tunnel System within approximately 142 feet of the at- or below-grade sections of the right-of-way. For the elevated portions, the noise impacts would extend approximately 307 feet. There would be no noise impacts on open spaces or community facilities. Under the Single Tunnel System, the areas of impact would be less. Along the at- or below-grade sections of the right-of-way there would be no impacts on residences. Along the elevated portions, the affected area would be 153 feet.

Most residential areas are located along the at- or below-grade sections. Community facilities located within the affected northern elevated section of the rail line include P.S. 384 and a day care center. There is one open space in this area—a playground located at Moffat Street. The noise impacts are unlikely to result in changes to underlying residential land uses or affect overall neighborhood character because the affected area represents a relatively small portion of the neighborhood. In the elevated northern section, residential uses are largely buffered by the elevated subway line. The increased noise levels are unlikely to affect the functional use of the playground, which is an active recreational resource.

Therefore, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, and open space resources in the Bay Ridge Branch Study Area, Segment 4 under either tunnel system.

Queens Study Areas

Bay Bridge Branch (Queens Portion). As in Brooklyn, freight traffic along this section of the Bay Ridge Branch would increase substantially. The rail line is elevated on an embankment in this section.

Along this section of the Bay Ridge Branch there are a mix of residential and industrial facilities, as well as a number of community facilities and an open space, Evergreen Park. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be noise impacts (absent mitigation) on residences under the Double Tunnel System within approximately 496 feet of the right-of-way, and on community facilities and open space within 153 feet. Due to these noise impacts on residential uses over large distances, there would be an adverse impact on neighborhood character. Under the Single Tunnel System, the areas of impact would be less. Along the at- or below-grade sections of the right-of-way the noise impact area would be 115 feet. Along the elevated portion of north of Evergreen Avenue the area potentially affected by noise impacts would be 248 feet.

Community facilities within the affected area include P.S. 68 and a religious facility. Increased noise levels would not be expected to alter the functional use of the religious institution. Noise impacts on the school would be mitigated as described in Chapter 10. Although the noise impacts would affect about half of Evergreen Park, the park is primarily used for active uses and no change would be expected in the overall character of the open space.

Fresh Pond Yard. Under both tunnel systems, substantial increases in train traffic and yard activity over current levels of activity would be expected at Fresh Pond Yard. Both systems would also require construction work to provide adequate clearances at two bridges and the installation of new through tracks from the Bay Ridge Branch to the Montauk Branch. The clearance work would require underpinning, excavation of a trench, and reconstruction of overpasses. These clearance and track improvements would occur within the yard and are therefore not expected to substantially alter the yard's relationship to the surrounding study area.

Residential land uses near the yard, except along Admiral Avenue north of the yard and along a portion of Otto Road, are buffered from the yard by adjacent industrial uses or neighboring streets. Mafera Park is buffered from the rail yard by a large land embankment, which visually obscures and separates the park from the rail yard. There is one location at the park, behind a chain link fence surrounding a ballfield, where the rail yard is visible. However, the rail yard is depressed here, and from most locations in the ballfield it is not visible. In addition, Lutheran Cemetery and a school are located to the north of the rail yard.

As shown in Chapter 10, "Noise and Vibration," there would be noise impacts (absent mitigation) on the nearby residential uses within 361 feet of the yard. These noise impacts are unlikely to result in changes to underlying residential uses or affect overall neighborhood character because the affected area represents a relatively small portion of the neighborhood. There would be no noise impacts on community facilities or on the park.

As a result, there are no anticipated impacts on land use, neighborhood character, zoning and public policy, community facilities, or open spaces in the Fresh Pond Yard Study Area under either tunnel system.

Montauk Branch. Freight traffic along the rail line would greatly increase under both tunnel systems. As with the Bay Ridge Branch, clearance heights along the Montauk Branch between Fresh Pond Yard and the expanded West Maspeth Yard intermodal facility would be increased.

Again, this would primarily involve underpinning at clearances and the excavation of a trench within the right-of-way. In addition, overpasses at Fresh Pond Road would need to be reconstructed. Improvements would be made to the two existing main line tracks between Fresh Pond Yard and West Maspeth Yard. It is not expected that these improvements would greatly alter land uses adjacent to the rail line or the rail line's relationship to the surrounding study area. The construction work would be minor and would occur within the right-of-way of the existing rail line, a substantial portion of which is below grade.

The study area contains a mix of industrial and residential uses, but no community facilities or open space. The much greater number of trains that would use the rail line would result in potential noise impacts (absent mitigation) on residential land uses within approximately 251 feet of the rail line under the Single Tunnel System and 354 feet under the Double Tunnel System (see Chapter 10, "Noise and Vibration"). These noise impacts are unlikely to result in changes to underlying residential uses or affect overall neighborhood character because the affected area represents a relatively small portion of the neighborhood and the residences have historically been located along an active rail line.

As a result, there are no anticipated impacts on land use, neighborhood character, zoning and public policy, community facilities, or open spaces in the Montauk Branch Study Area under either tunnel system.

West Maspeth Yard. The existing rail yard in West Maspeth, Queens, would be expanded into an intermodal rail yard. Under the Single Tunnel System the yard would be approximately 108 acres; under the Double Tunnel System, the yard would be approximately 160 acres. The yard would serve as a loading and unloading site for the interchange of intermodal freight between rail and trucks. The required work consists of demolishing a number of warehouses and other commercial and industrial buildings and laying new track. Under the Double Tunnel System, a storage facility would be built at the center of the site, as described in Chapter 2, "Project Alternatives." Expansion of the yard under the Double Tunnel System would require filling in Maspeth Creek and a portion of Newtown Creek. Additional buildings would be acquired and demolished for the larger West Maspeth Yard.

An important consideration in evaluating impacts to the overall character of the study area is that the intermodal rail yard would require relocation of approximately 25 to 29 existing businesses located within the potential site boundary under the Single Tunnel System and 44 to 52 businesses under the Double Tunnel System. The Double Tunnel System would also require the displacement of one residence located within the potential site boundary. (See Chapter 4, "Economic Conditions and Impacts," for more information regarding the displacement of existing businesses.) In terms of overall neighborhood character, the displacement of these businesses and one residential dwelling is not expected to adversely impact the overall neighborhood character as the businesses represent only a small portion of the overall inventory of business in the West Maspeth area and many businesses may be able to be relocated in the immediately surrounding area. The single residential dwelling was already a land use somewhat inconsistent with the surrounding industrial character of the study area, and would be compensated for relocation (see "Mitigation Measures" below), and therefore its displacement would not by itself be considered an adverse impact of the project.

The intermodal freight facility to be constructed under the Double Tunnel System would be a large complex and would be relatively tall in comparison to many of the existing buildings within the surrounding area, as described in Chapter 5, "Visual and Aesthetic Considerations." Under both tunnel systems the facility would also bring more activity and considerable numbers

of trucks to the study area, which is already quite busy with truck traffic. The trucks would primarily travel along designated truck routes on their way to and from the LIE and BQE. There would be significant traffic impacts at eight intersections within the study area under the Single Tunnel System and at an additional intersection (for a total of nine) under the Double Tunnel System. These impacts could be fully mitigated. As shown in Chapter 10, "Noise and Vibration," the noise generated by the yard and truck activity would not result in significant noise impacts on residential or other uses in the area. The project site is zoned M3 and this use would be consistent with the zoning.

In general, the yard under either tunnel system would not cause a substantial change to overall neighborhood character since West Maspeth is already one of the City's most intensive industrial districts. In terms of overall public policy, the project's filling of Maspeth Creek under the Double Tunnel System is within a significant Maritime Industrial Area as identified in the City's "Plan for the Queens Waterfront" (see Chapter 15, "Coastal Zone Management").

As a result, there are no anticipated impacts on land use, neighborhood character, zoning and public policy, community facilities, or open spaces in the West Maspeth Yard Study Area under either tunnel system.

Fremont Secondary—Segments 1 and 2. Freight traffic along these sections of the rail line would increase under both tunnel systems. The rail line is slightly depressed or at grade in these sections with the exception of the area between Broadway and the merge with the Hell Gate Line in the northernmost part of Segment 2. The increase in rail line use would be most noticeable in those areas where the rail line is elevated. However, in the portion of the study area where the rail line is elevated, it is surrounded by other active transportation uses, such as the BQE or elevated subway lines.

The study area contains a mix of residential, industrial, transportation, community facility and open space uses. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that under the Double Tunnel System, residential uses within approximately 207 to 276 feet of the at- or below-grade sections of the right-of-way and 595 feet of the elevated section north of Broadway would be subject to noise impacts (absent mitigation). Community facilities and open spaces would not be affected by increases in noise levels, except within 161 feet of the elevated sections of the rail line north of Broadway. Under the Single Tunnel System residential uses along the at- or below-grade sections of the right-of-way would not be affected. Within 86 feet of the elevated section, residential uses would experience noise impacts; community facilities and open space within 101 feet of the elevated sections would be affected.

The noise impacts are unlikely to result in changes to underlying residential land uses or affect overall neighborhood character because the rail line is already in active use and the affected area represents a relatively small portion of the neighborhood, particularly in the non-elevated sections. In the elevated section, the residential uses are buffered by the BQE or industrial areas abutting the rail line. Community facilities located within the affected area north of Broadway include Corpus Christi School and a church. The functional use of the religious institutions and healthcare facility is not expected to be altered. Noise impacts on the school would be mitigated as described in Chapter 10.

As a result, there are no anticipated impacts on land use, neighborhood character, zoning and public policy, community facilities, or open spaces in the Fremont Secondary Study Area, Segments 1 and 2 under either tunnel system.

Fremont Secondary—Segment 3. Under both tunnel systems, freight traffic would increase along this section of the rail line combined with traffic on the Hell Gate Line, which is an active passenger line. The rail line is elevated in this section.

Residential uses are the predominant land use in this study area, with industrial uses located in the southern end. There are a number of community facilities and parks. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be noise impacts on residences within approximately 233 feet of the right-of-way under the Double Tunnel System, but no impacts on community facilities and open space.

These noise impacts under the Double Tunnel System are unlikely to result in changes to underlying residential uses or affect overall neighborhood character because the affected area represents a relatively small portion of the neighborhood and the rail line is in active use.

In sum, there would be no adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in the Fremont Secondary Study Area, Segment 3 under either tunnel system.

Bronx Study Areas

Fremont Secondary (Randalls/Wards Island Portion). The rail line travels through a park, a wastewater treatment facility, and a NYFD training academy. The rail line is surrounded by other active transportation uses. As with the Fremont Secondary Study Area, Segment 3, no noise impacts on the open space resource are expected under either tunnel system. Therefore, there would be no potential adverse impacts on land use, zoning, and public policy, neighborhood character, community facilities, or open space resulting from the increased train traffic in this portion of the Fremont Secondary.

Harlem River Yard/Oak Point Yard. The tunnel would generate some additional traffic at these yards. This activity would take place within the boundaries of the yard and would be in keeping with the sites' current uses. In addition, the yards are located in primarily industrial areas. Most residents within the study areas are located on the other side of the Major Deegan Expressway from the rail yards and any residents located closer to the rail yards are buffered from the rail lines by other industrial uses and buildings. Therefore, there are no potential adverse impacts on land use, zoning and public policy, neighborhood character, community facilities, or open space in these study areas under either tunnel system.

D. MITIGATION MEASURES

As examined above, the range of potential impacts on land use, zoning and public policy, neighborhood character, community facilities, and open space is generated by the increase in rail traffic, primarily based on potential increases in noise levels that may affect the character and functionality of uses and facilities within any given study area. Impacts may also occur from the impairment of use for a community or open space resource and the direct displacement or change of land use. It is noted that other than at the West Maspeth Yard, the project does not itself result in a direct land use change in that rail lines would be built or reconstructed within existing rights-of-way.

Potential adverse impacts occur only under the Tunnel Alternative. For Staten Island and portions of New Jersey, the potential for impacts varies based on the potential tunnel alignment (Staten Island or New Jersey).

NOISE GENERATED IMPACTS

Noise impacts are evaluated based on the sensitivity of land use and, as determined in the noise analyses set forth in Chapter 10, "Noise and Vibration," residential uses, community facilities, and open spaces adjacent or near the rail line are predicted to experience increases in noise levels (absent noise mitigation measures) due to the increased train traffic generated by the project. Within each of the line segments analyzed in this chapter, the distance away from the rail line in which noise impacts may be considered significant varies depending on the track location (e.g., in a tunnel, in a depressed cut, at grade, elevated on a viaduct, or elevated on an embankment) and the presence or absence of structures and buildings along the rail line that shield noise from areas beyond. In general, given that these sensitive uses are located in busy urban communities and have historically been located adjacent to active rail lines, the potential increases in overall noise levels are not expected to result in changes to the existing neighborhood character with the exception of three locations: along the elevated portion of the Staten Island Railroad and along Segment 3 and the Queens portion of the Bay Ridge Branch.

The detailed assessment of potential noise mitigation measures presented in Chapter 10, "Noise and Vibration," provides a range of possible methods to avoid or reduce noise impacts on sensitive uses. The primary method available would be the construction of noise barriers along the rights-of-way either in the depressed cut next to the tracks, along track embankments along sections of Fresh Pond Yard, or other suitable locations. It is assumed that, where appropriate, noise barriers would be designed to be visually integrated with the communities where they would be located (see Chapter 5, "Visual and Aesthetic Considerations").

For many of the affected residences and community facilities, the noise barriers would be an effective mitigation that reduces or eliminates noise impacts for any of the identified sensitive uses. However, as noted in the noise analysis, noise barriers cannot be used on rail line sections that are elevated on viaducts and the noise barriers are unlikely to be an effective measure for buildings greater than two stories in height and other possible mitigation measures would be investigated. These noise impacts may remain unmitigated if no practicable measures are identified.

There is a adverse impact on overall neighborhood character around the viaduct portion of the Staten Island Railroad. This determination is based on the large land area likely to experience noise increases (a maximum distance of about 870 feet from the tracks) and the area's relatively quiet setting under existing and No Action scenarios. Nonetheless, there are no proposed additional mitigation measures available to alleviate overall neighborhood character changes that result from the project alternative. Thus, the Richmond segment would remain an unmitigated adverse impact of the Tunnel Alternative for the Staten Island tunnel alignment. Along Segment 3 and the Queens portion of the Bay Ridge Branch, the other areas where adverse neighborhood character impacts have been identified, noise barriers would be effective in mitigating the neighborhood character impacts, particularly since many of the buildings in the areas are two stories.

No adverse impacts were identified for community facilities. For schools, this is because as described in Chapter 10, "Noise and Vibration," a commitment has been made to mitigate noise impacts. In particular, it is assumed that potential noise impacts on schools would be examined for additional site-specific mitigation measures.

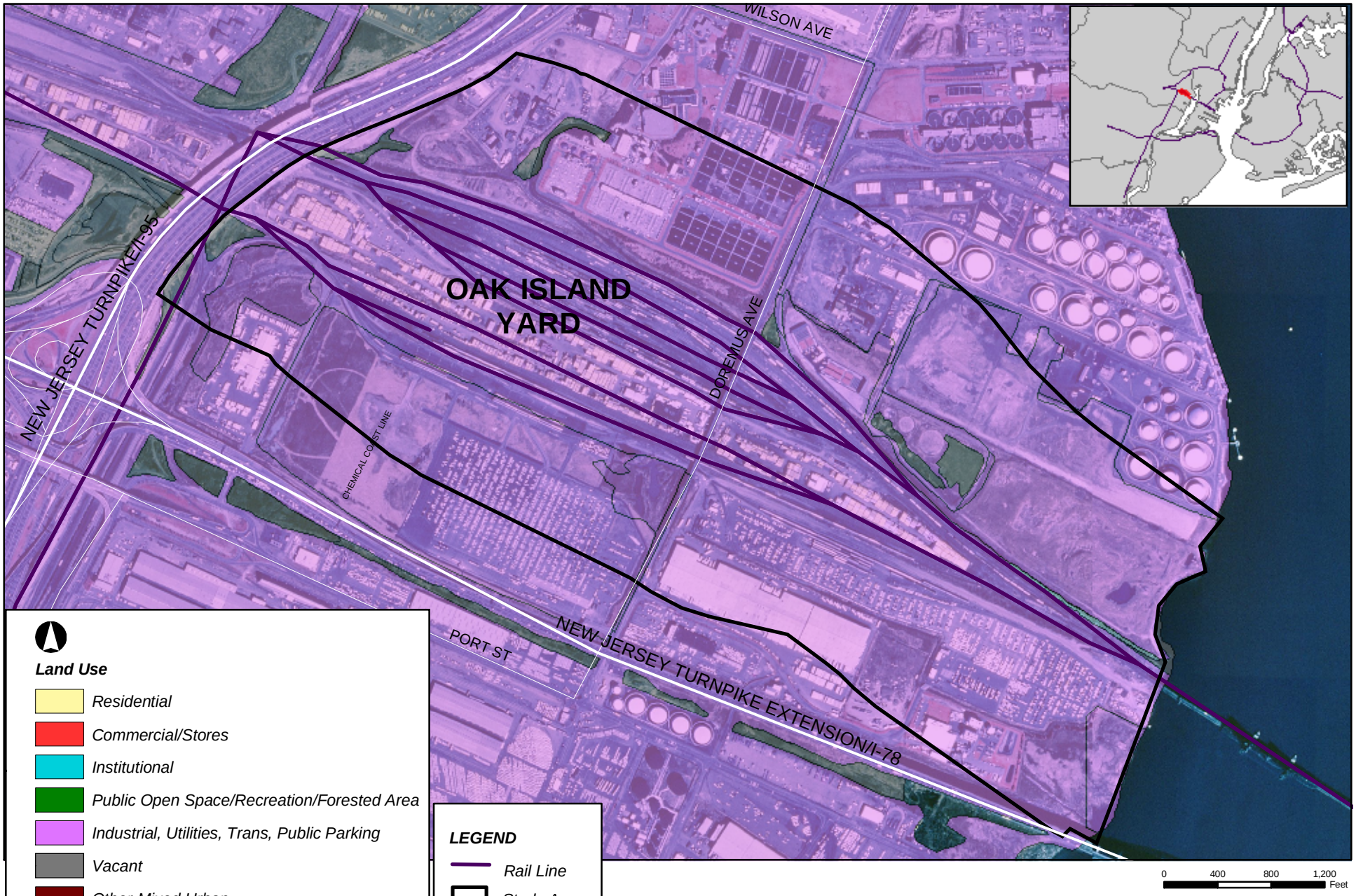
Similarly, noise mitigation measures may or may not mitigate impacts to those areas of parks, playgrounds, and open space resources that are located near or adjacent to the rail line. These

areas typically have no tall structures so noise barriers, where implemented, would be effective. As noted in the analyses, there are no anticipated cases where noise generated by the project would impact the use or function of open space resources in the study area, and no mitigation measures are proposed.

In summary, the Tunnel Alternative would increase noise levels within all the segment study areas examined. Where noise impacts may occur on sensitive land uses, including residences, community facilities, and open space, the net effect is that there is likely to be some impact on overall neighborhood character along the rail lines as there would be perceptible increase in noise generated by the increased train traffic. For most segments, the change in neighborhood character is not considered adverse since they are already urban communities many of which are already characterized by their busy and noisy transportation corridors. In addition, the areas likely to experience increased noise levels are limited to rail frontage properties or those within limited distances from the rail line. As a result, the changes are generally confined to small areas within a larger neighborhood or community, thereby minimizing the effect of the project on the larger neighborhood.

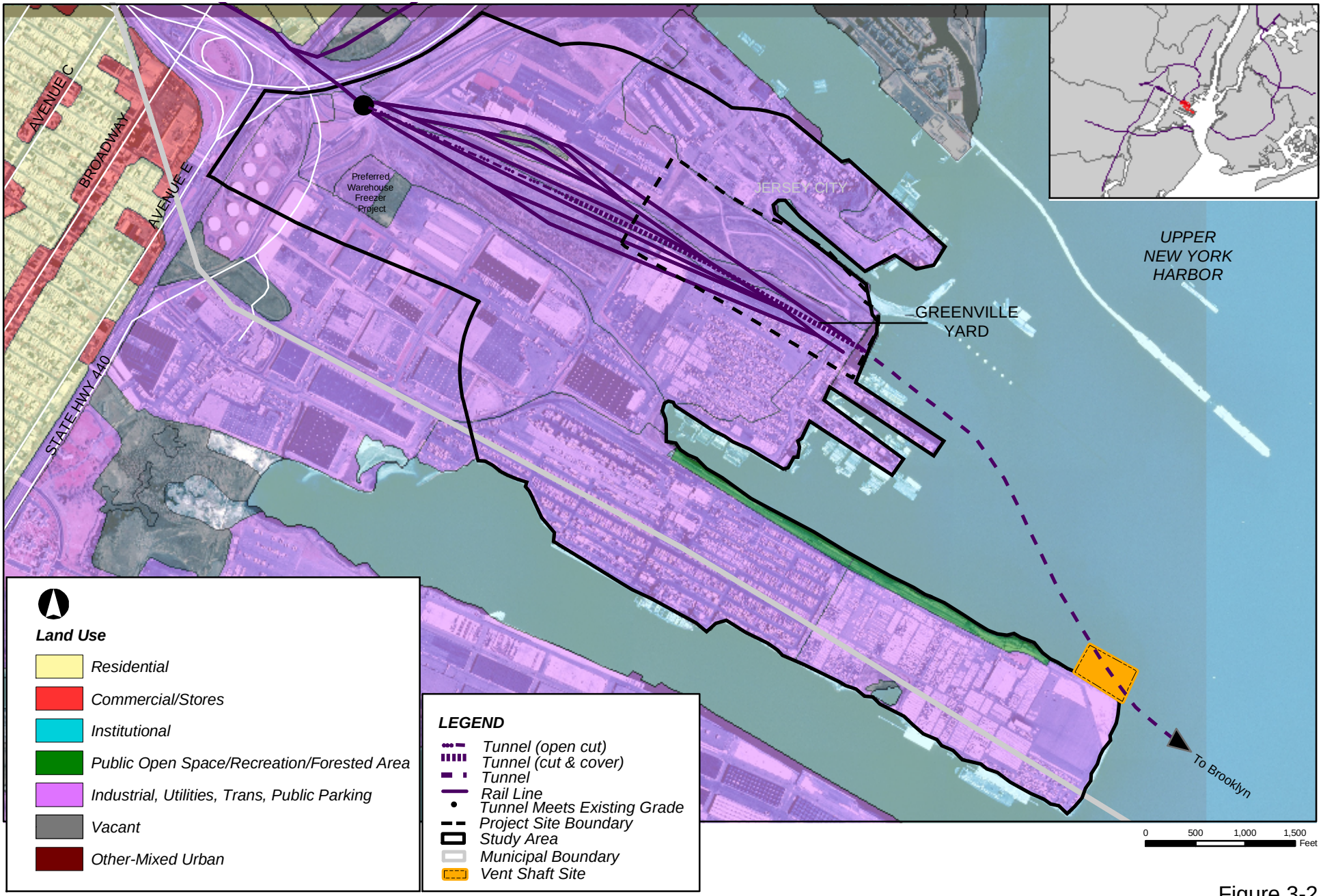
DIRECT LAND USE DISPLACEMENT IMPACTS

The intermodal freight facility in West Maspeth, Queens under the Single Tunnel System would result in the displacement of approximately 25 to 29 businesses and an MTA facility. Under the Double Tunnel System, a total of 44 to 52 businesses, the MTA facility, and one residence would be displaced. Mitigation measures for the businesses are discussed in Chapter 4, "Economic Conditions and Impacts." Chapter 4 also outlines general relocation policies for the residence that would be displaced under the Double Tunnel System. Specific additional measures that would apply to the residence includes payment of fair market value for acquired property, include moving expenses, and replacement housing payments. The federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, and the Uniform Relocation Act Amendments of 1987 (together, the Uniform Act) requires that housing resources meet the needs of displaced residents in terms of size, price, rental, location, and timely availability, and payments must be made to displaced residents at the time they are needed to obtain replacement housing. ✷



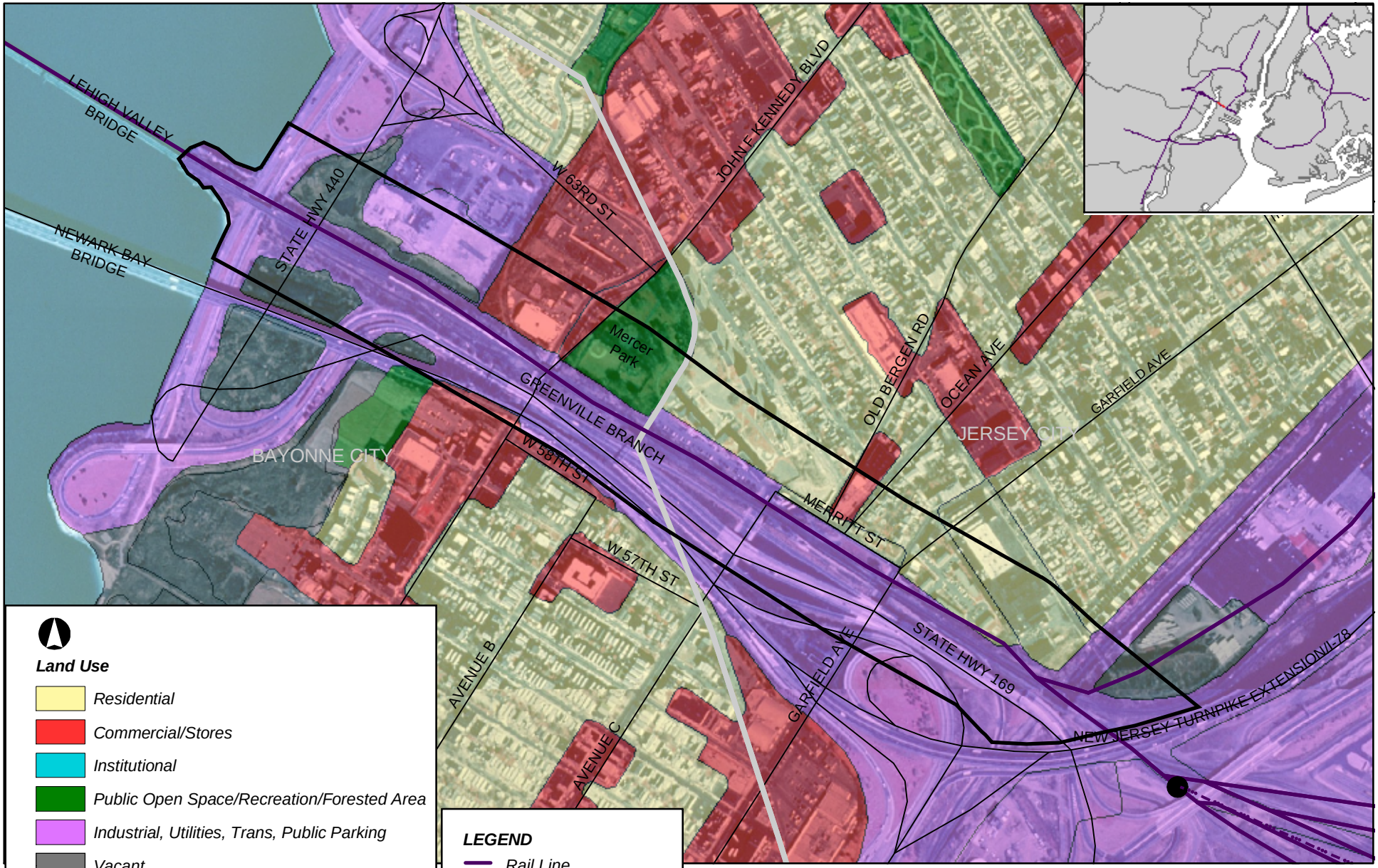
Source: NJDEP Aerials, 1995-1997.

Figure 3-1
Oak Island Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Source: NJDEP aerials, 1995-1997

Figure 3-2
Greenville Yard/Potential Tunnel Alignment Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT



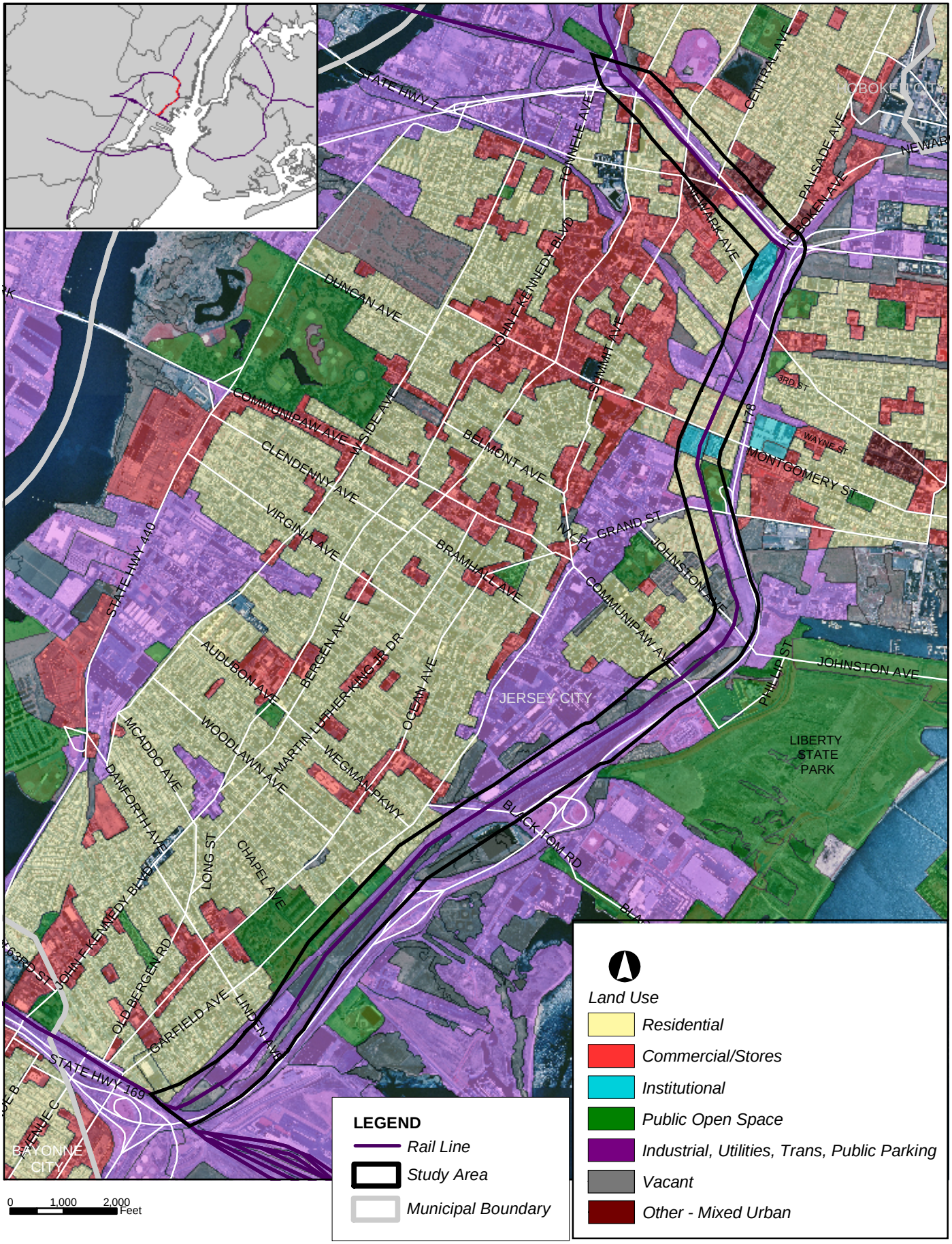
Source: NJDEP aerials, 1995-1997

Figure 3-3
Greenville Branch Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT



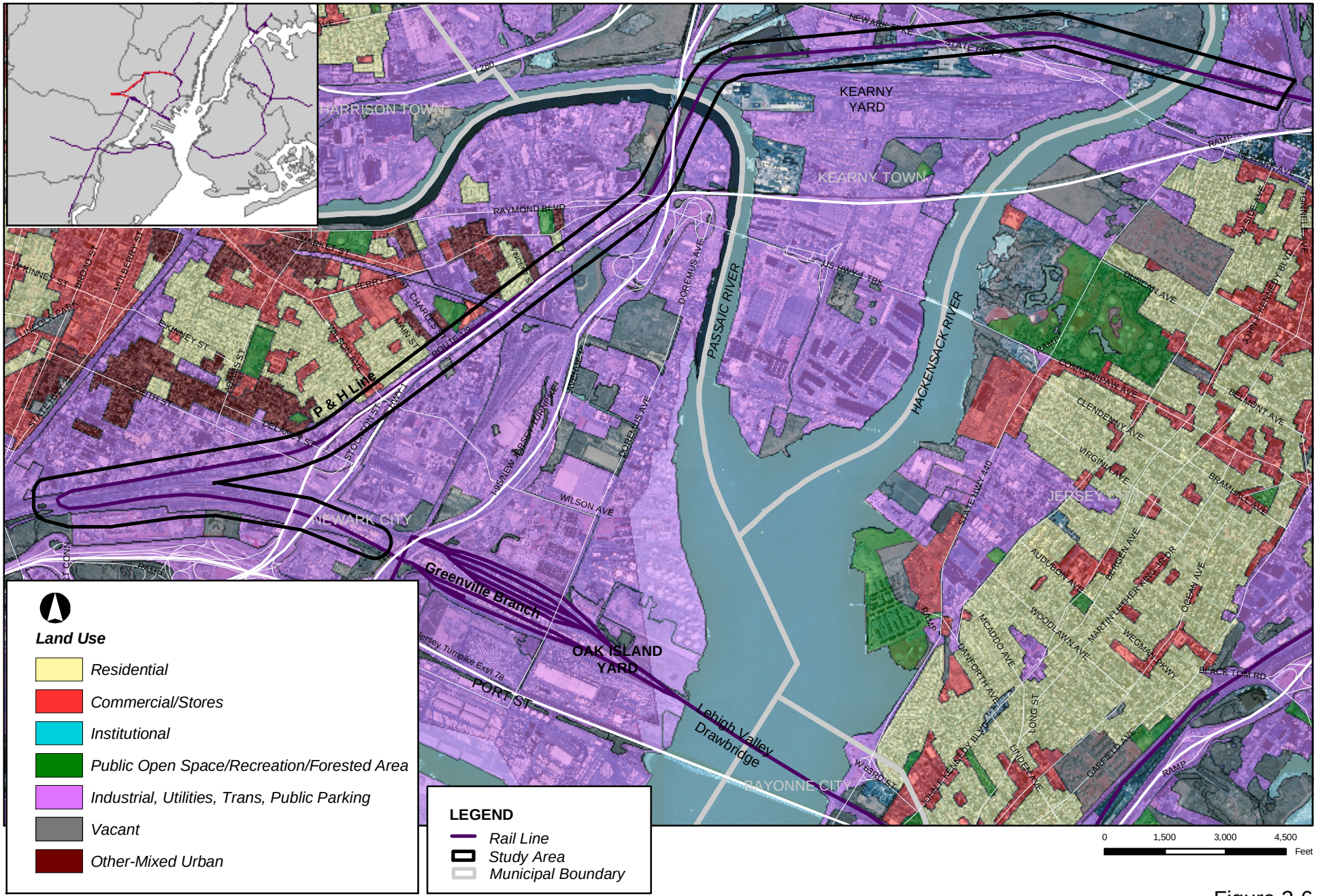
Source: NJDEP Aerials, 1995-1997.

Figure 3-4
National Docks Secondary Study Area-Segment 1
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Source: NJDEP Aerials, 1995-1997.

Figure 3-5
National Docks Secondary Study Area-Segment 2
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Source: NJDEP aerials, 1995-1997

Figure 3-6
P & H Line/Greenville Branch Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

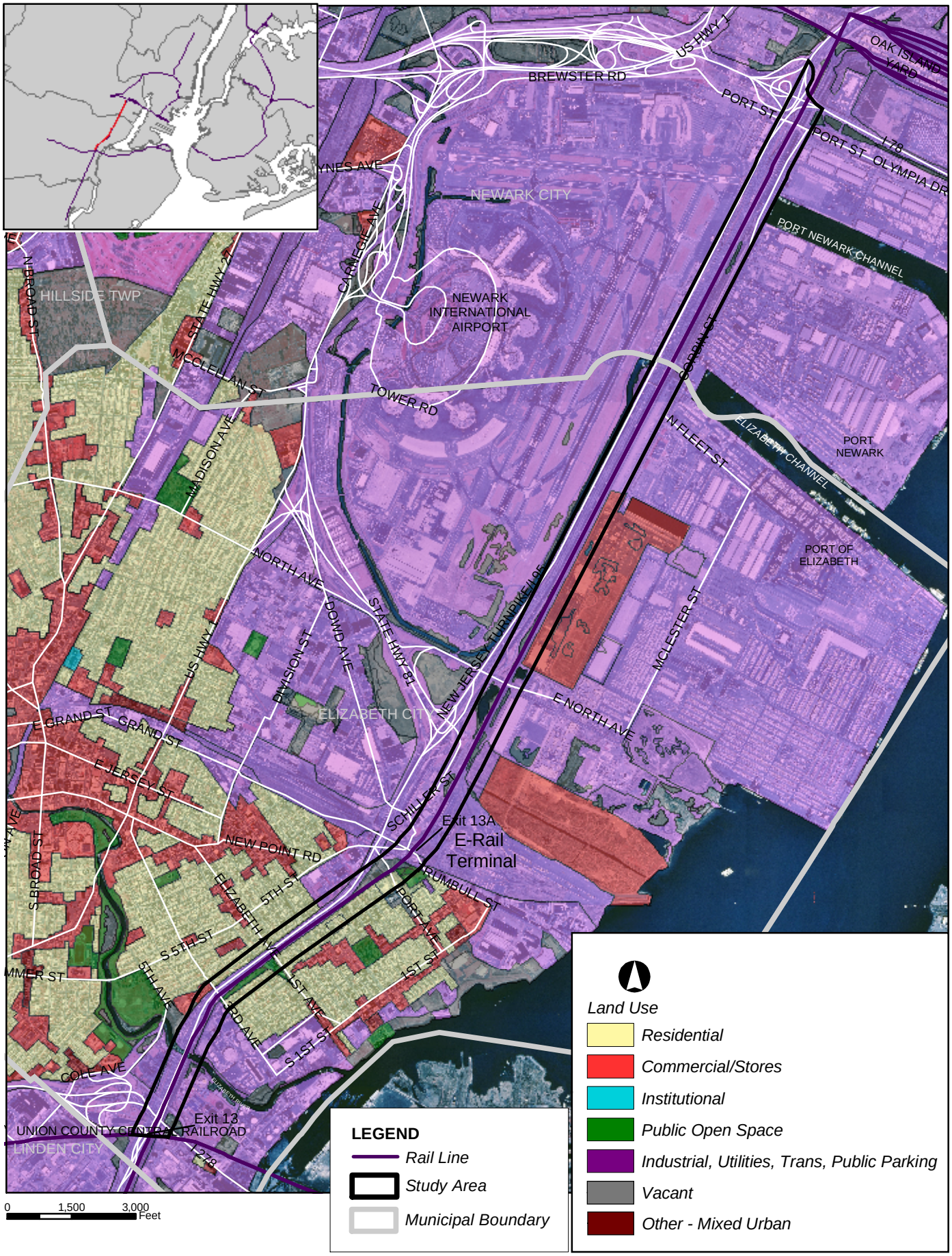
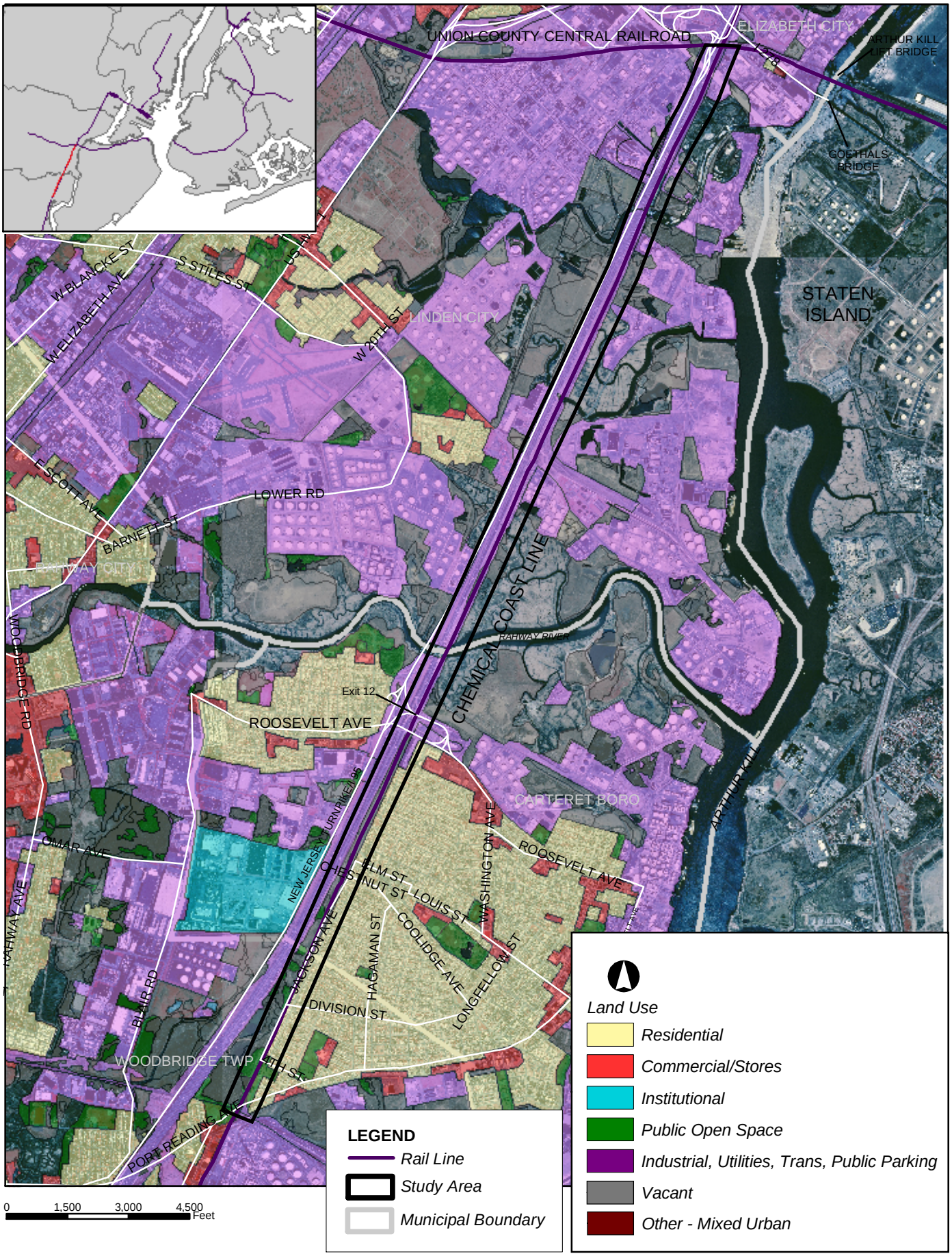


Figure 3-7
Chemical Coast Line Study Area-Segment 1
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Source: NJDEP Aerials, 1995-1997.



Source: NJDEP Aerials, 1995-1997.

Figure 3-8
Chemical Coast Line Study Area-Segment 2
CROSS HARBOR FREIGHT MOVEMENT PROJECT

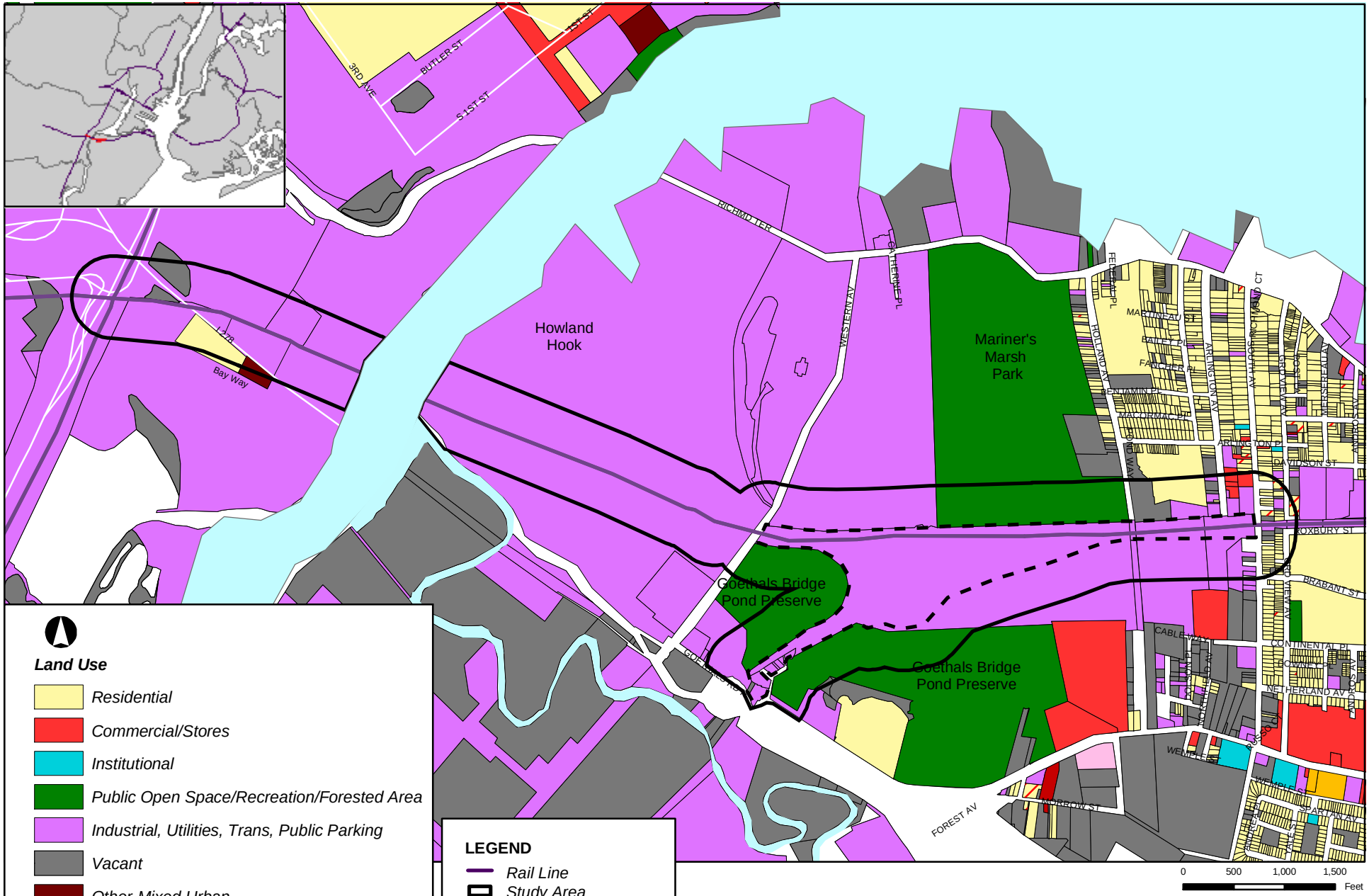


Figure 3-9
Arthur Kill Lift Bridge/Arlington Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

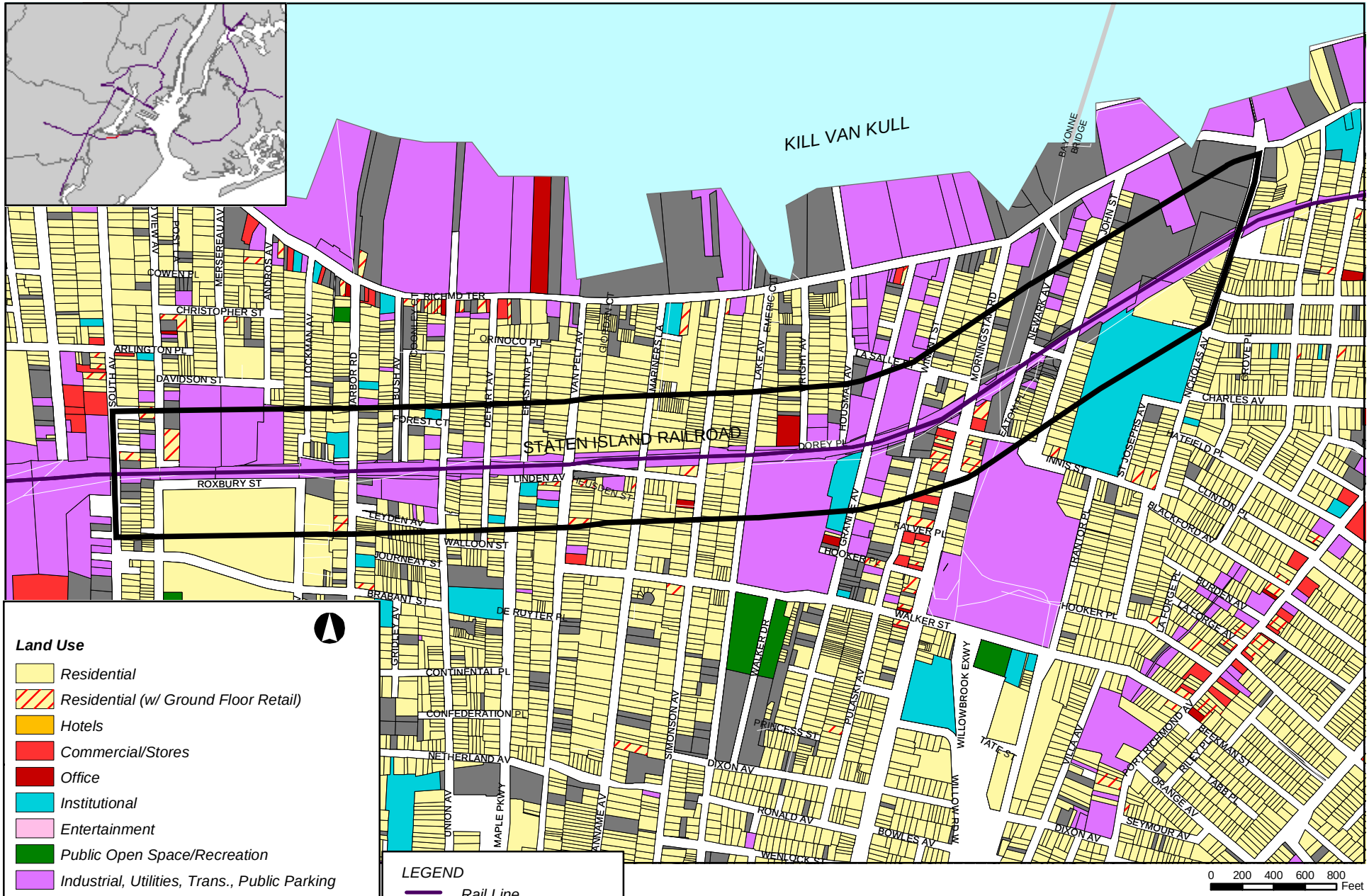


Figure 3-10
Northern Staten Island Study Area-Segment 1

CROSS HARBOR FREIGHT MOVEMENT PROJECT

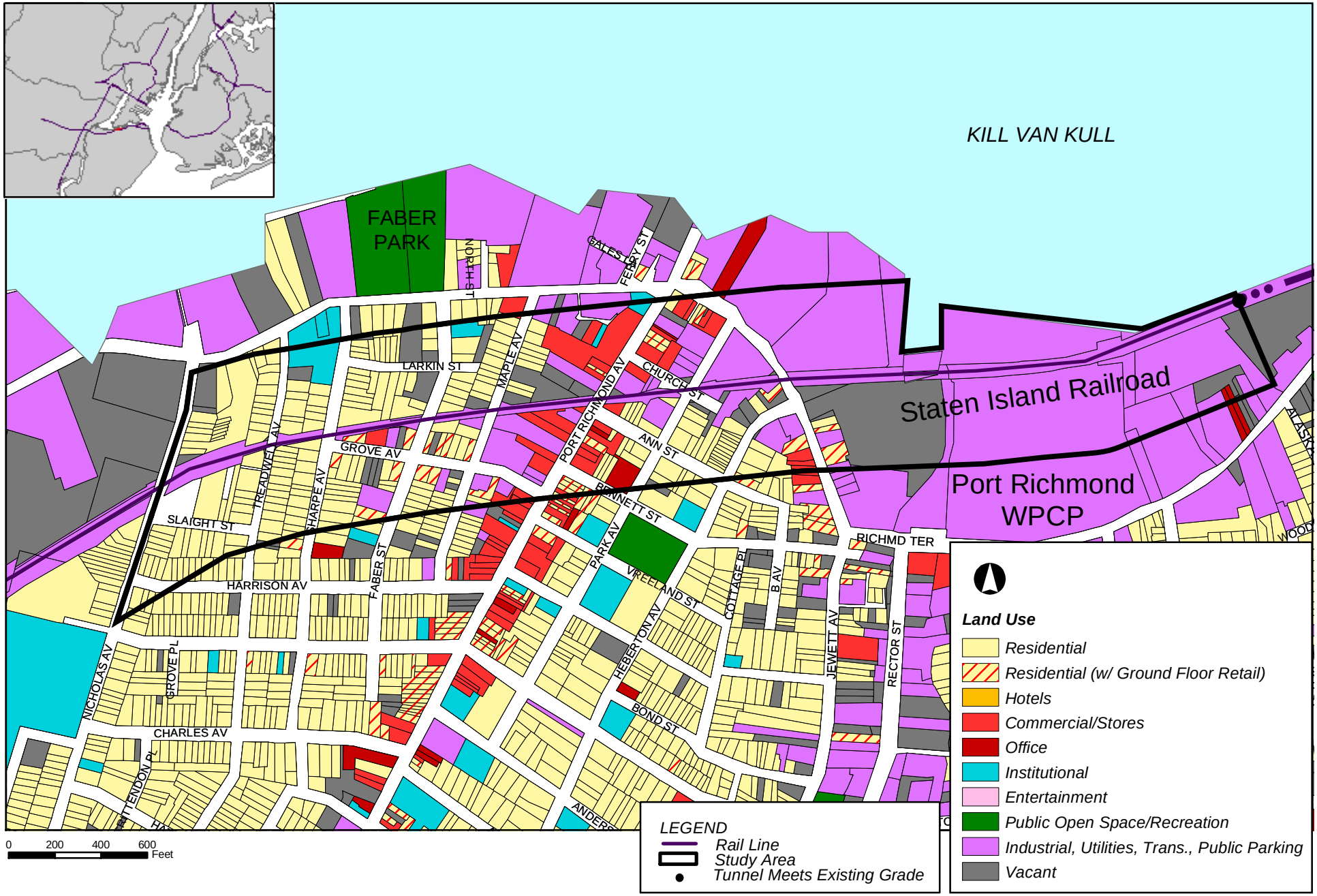


Figure 3-11

Northern Staten Island Study Area-Segment 2

CROSS HARBOR FREIGHT MOVEMENT PROJECT

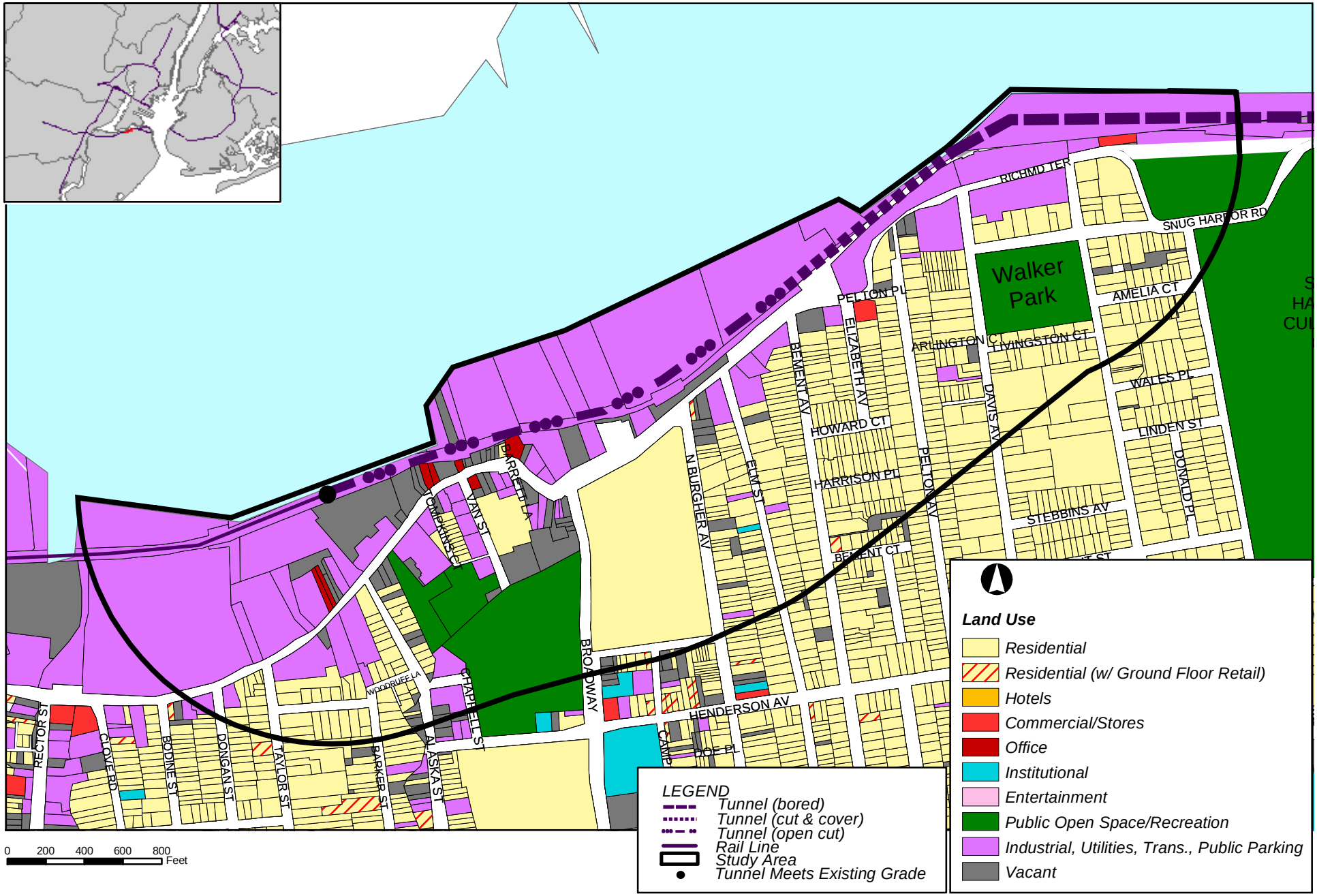


Figure 3-12
Northern Staten Island Study Area-Segment 3
CROSS HARBOR FREIGHT MOVEMENT PROJECT

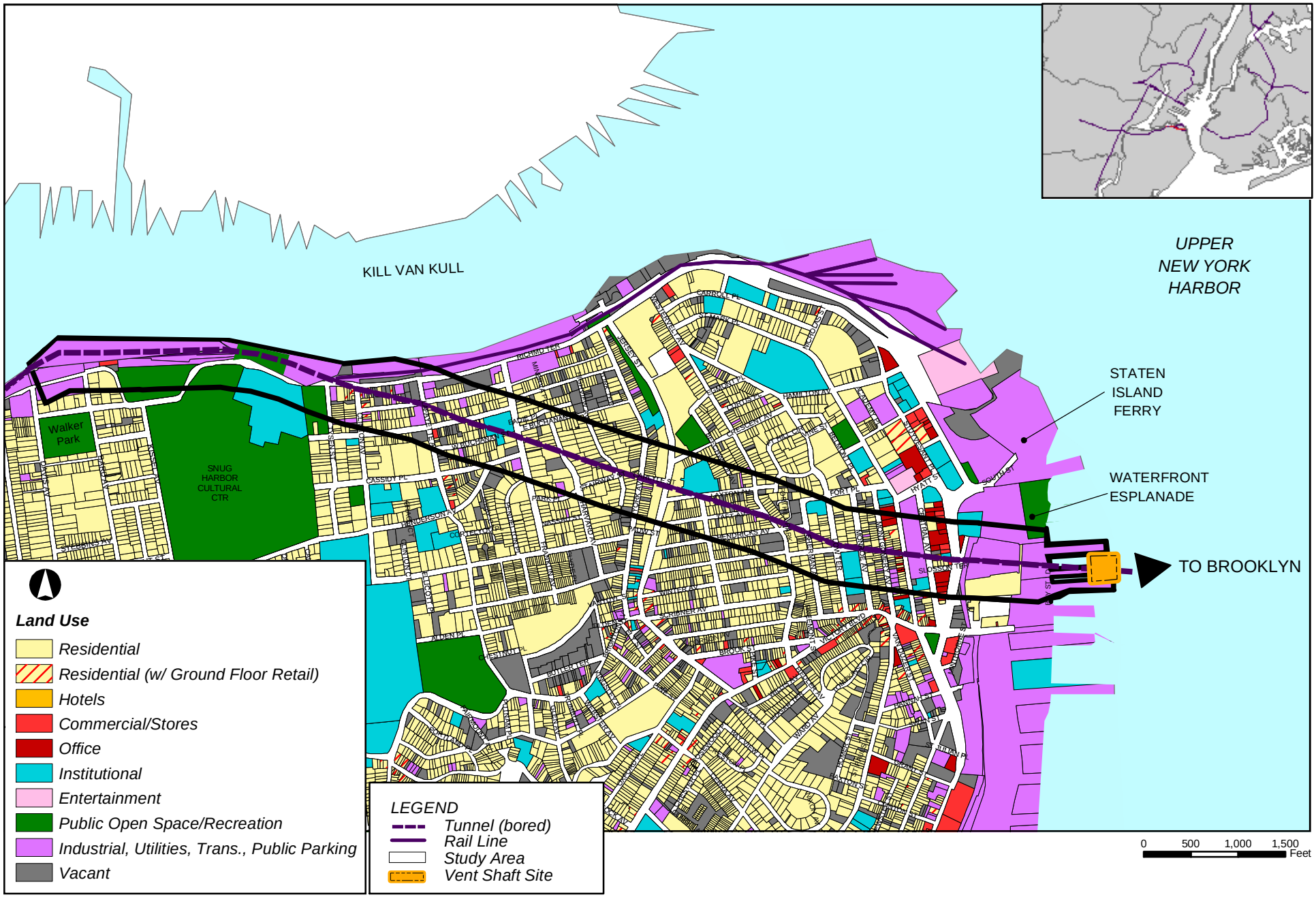


Figure 3-13
Northern Staten Island Study Area-Segment 4
CROSS HARBOR FREIGHT MOVEMENT PROJECT

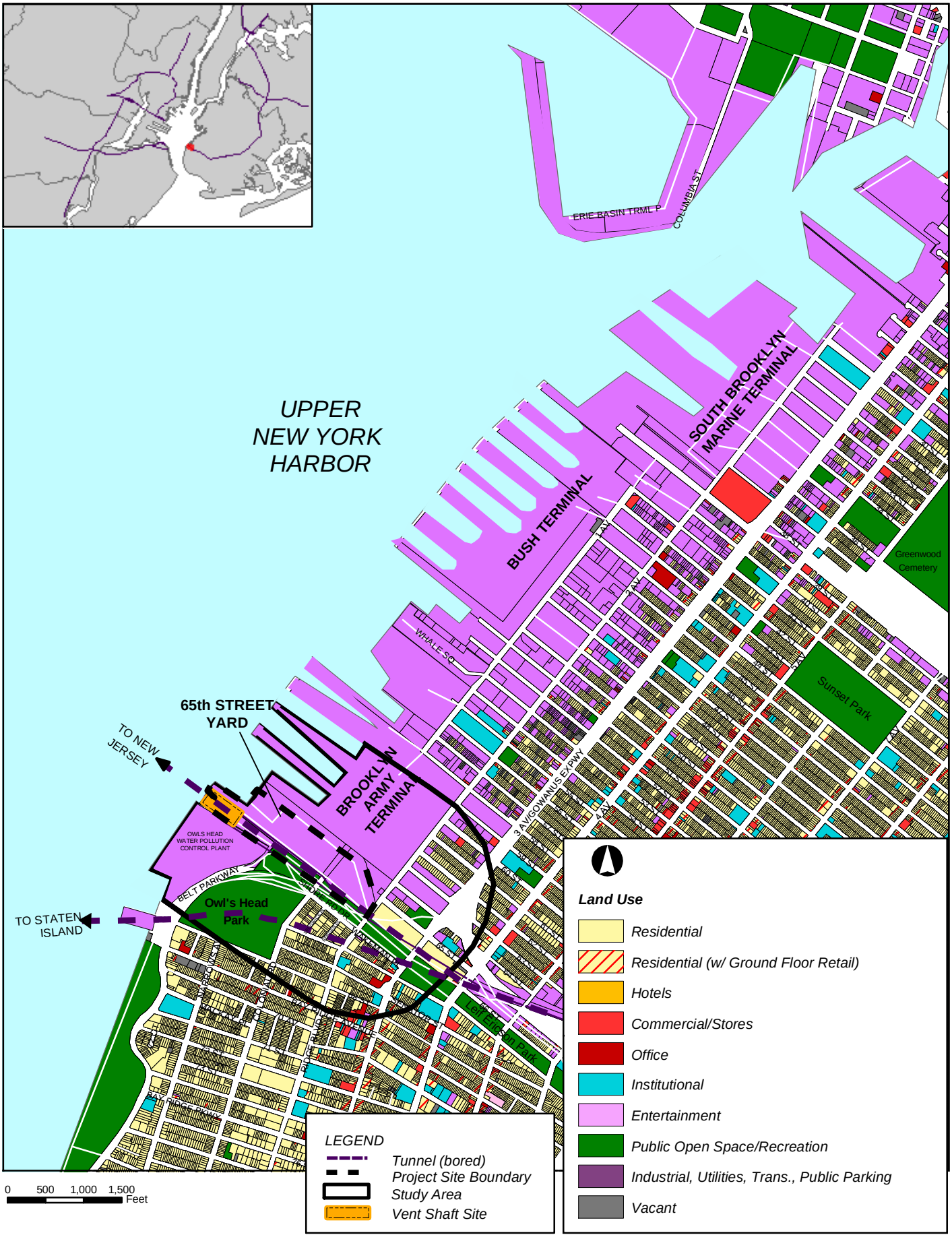


Figure 3-14
65th Street Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

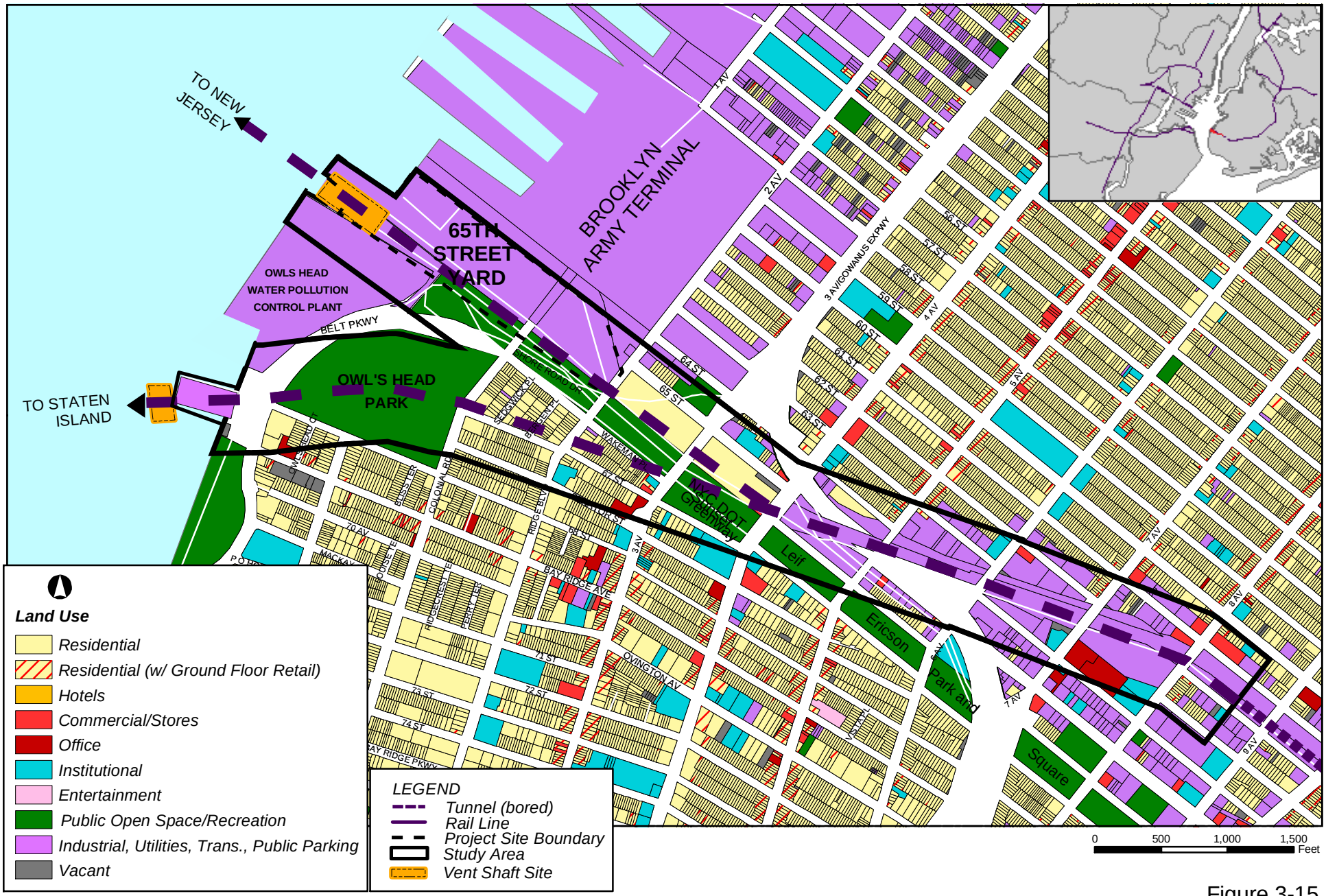


Figure 3-15

Bay Ridge Branch Study Area-Segment 1

CROSS HARBOR FREIGHT MOVEMENT PROJECT

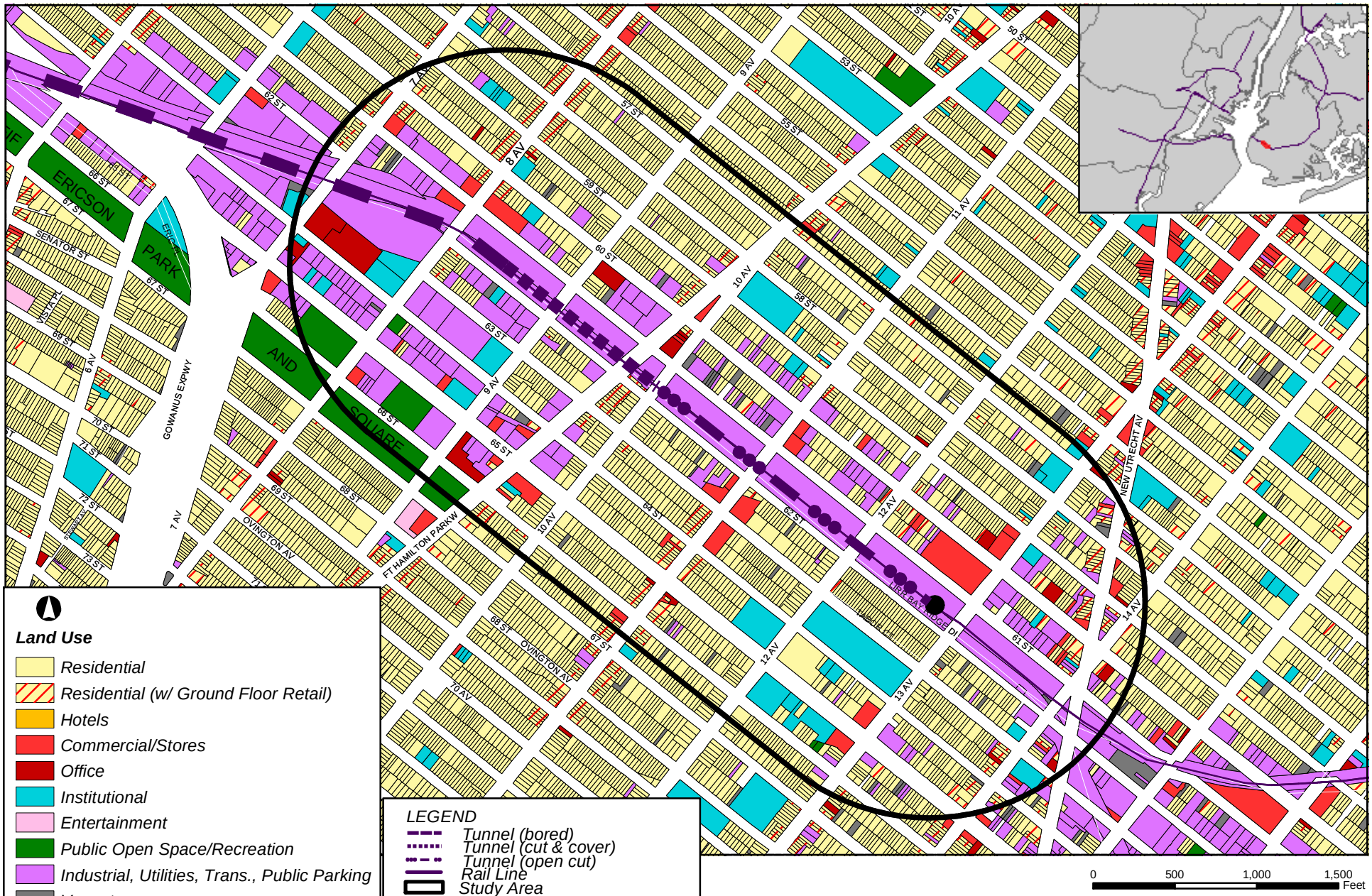


Figure 3-16
Bay Ridge Branch Study Area-Segment 2

CROSS HARBOR FREIGHT MOVEMENT PROJECT

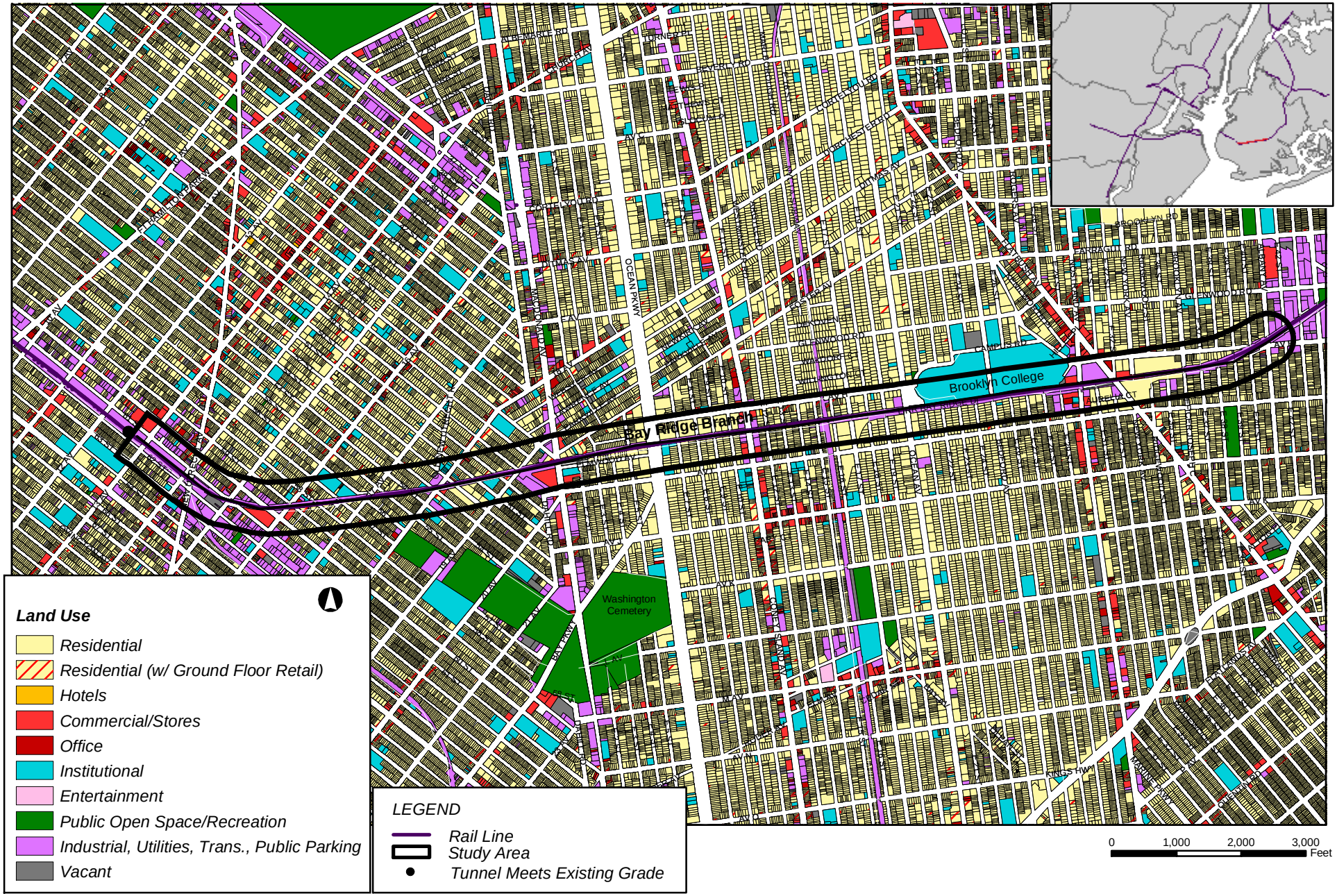


Figure 3-17
Bay Ridge Branch Study Area-Segment 3
CROSS HARBOR FREIGHT MOVEMENT PROJECT

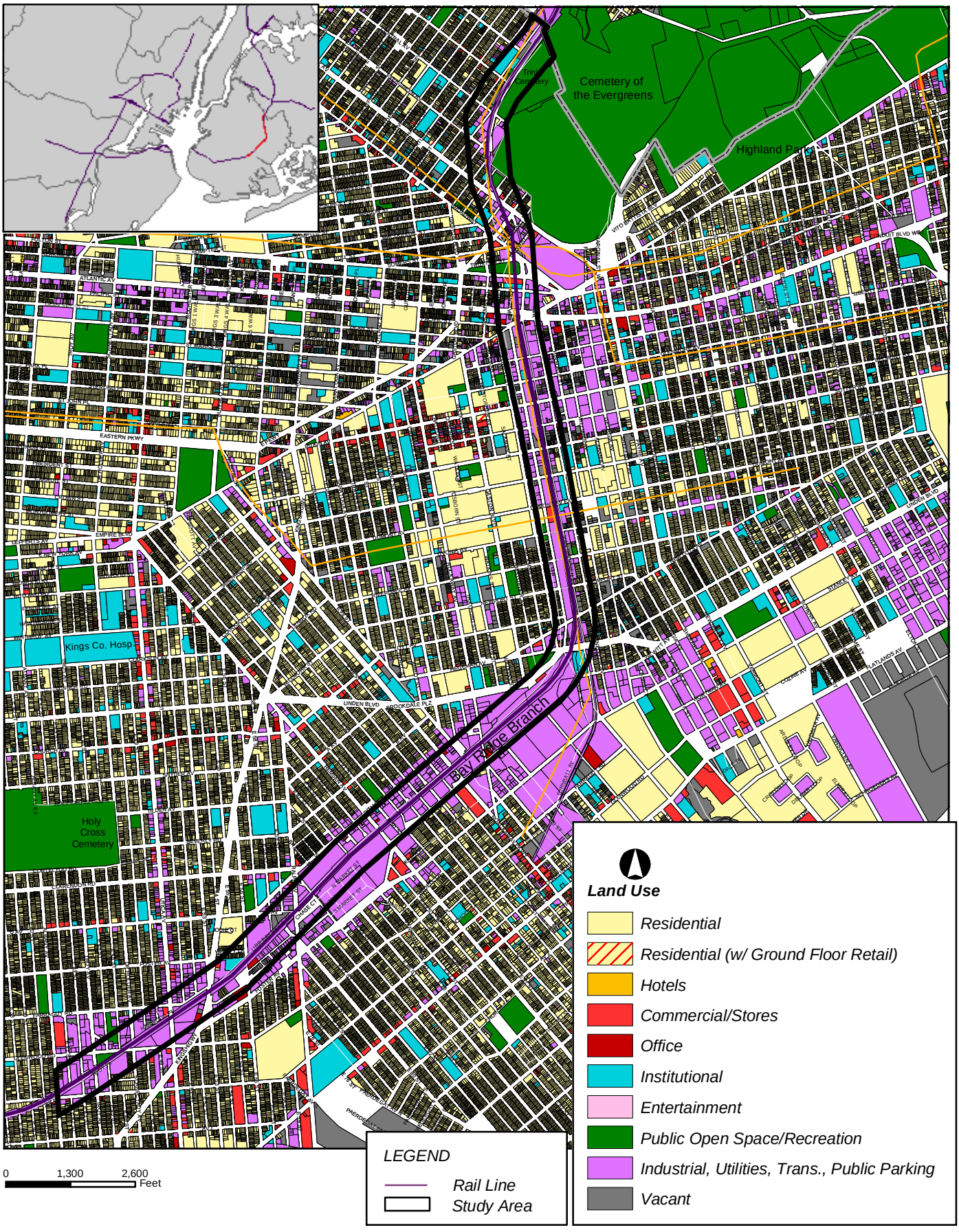


Figure 3-18
Bay Ridge Branch Study Area-Segment 4
CROSS HARBOR FREIGHT MOVEMENT PROJECT

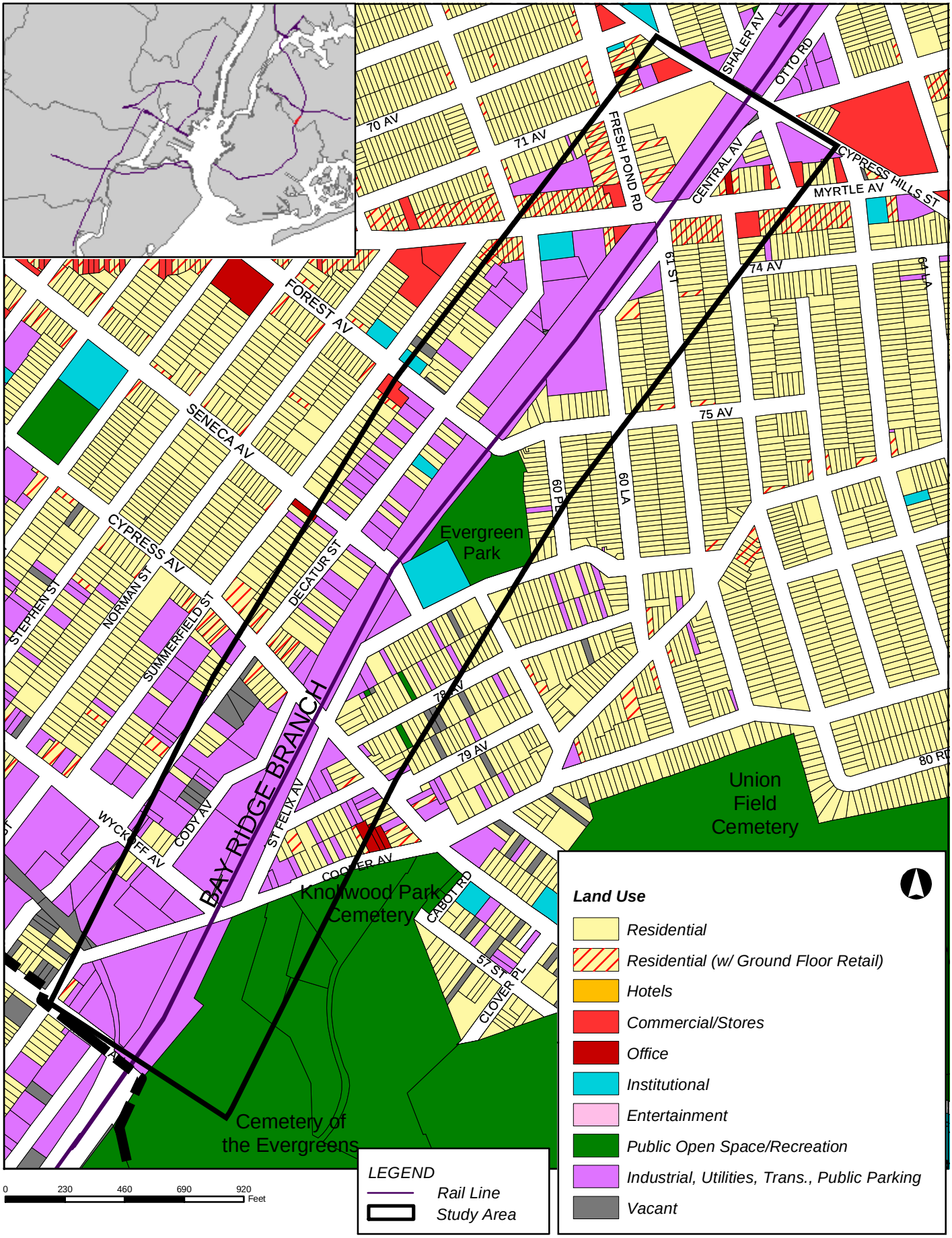


Figure 3-19

Bay Ridge Branch Study Area-Queens Portion

CROSS HARBOR FREIGHT MOVEMENT PROJECT

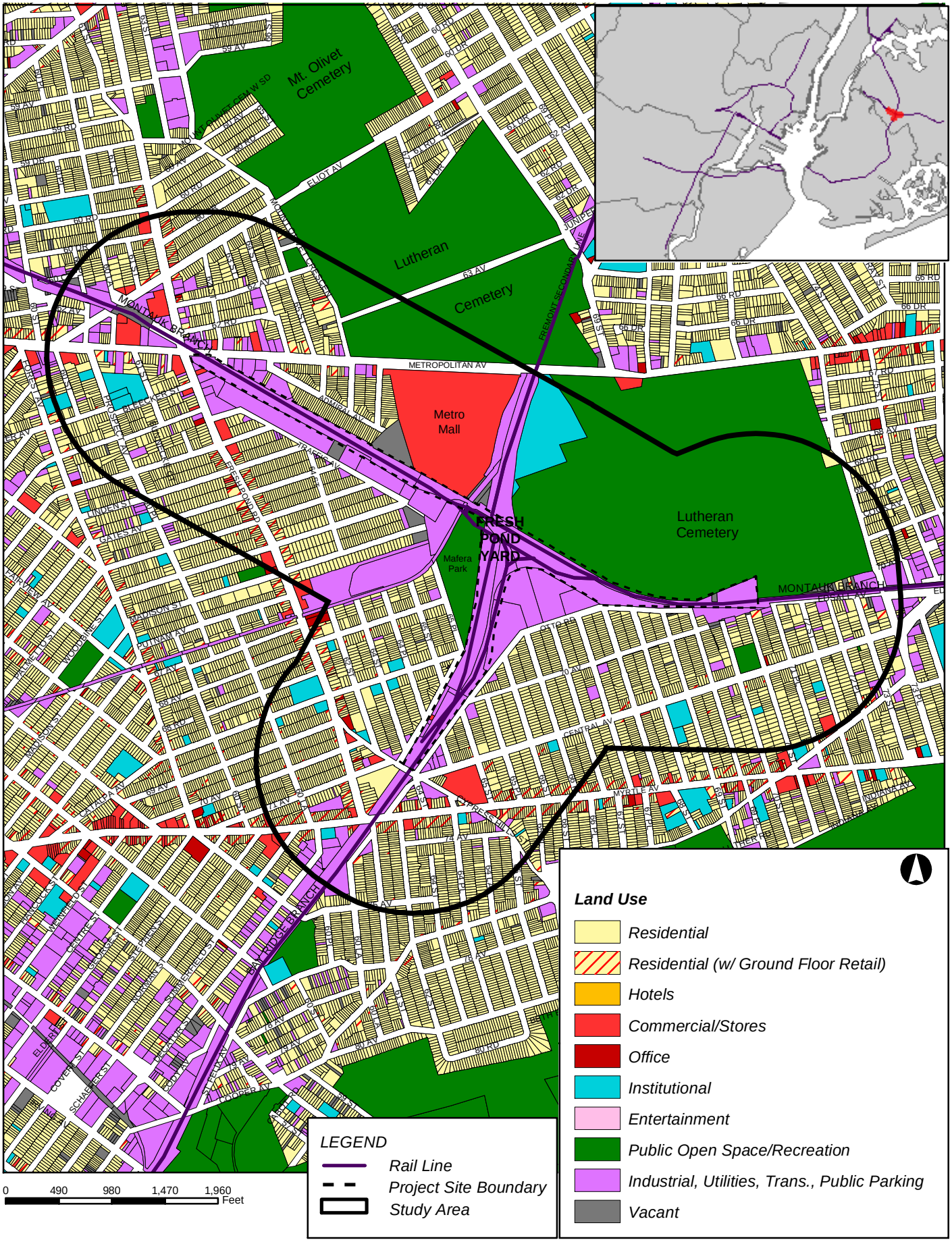


Figure 3-20
Fresh Pond Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

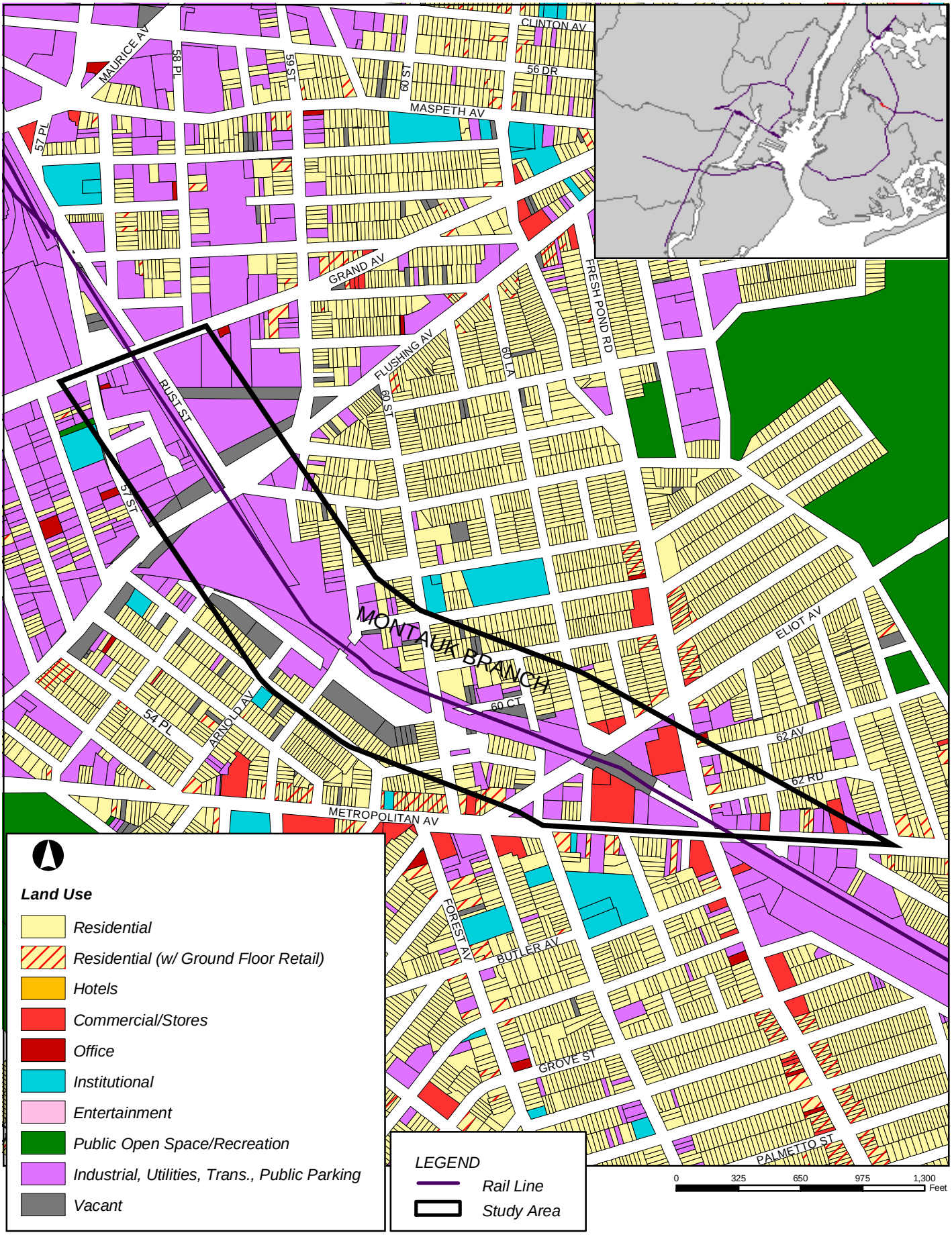


Figure 3-21
Montauk Branch Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

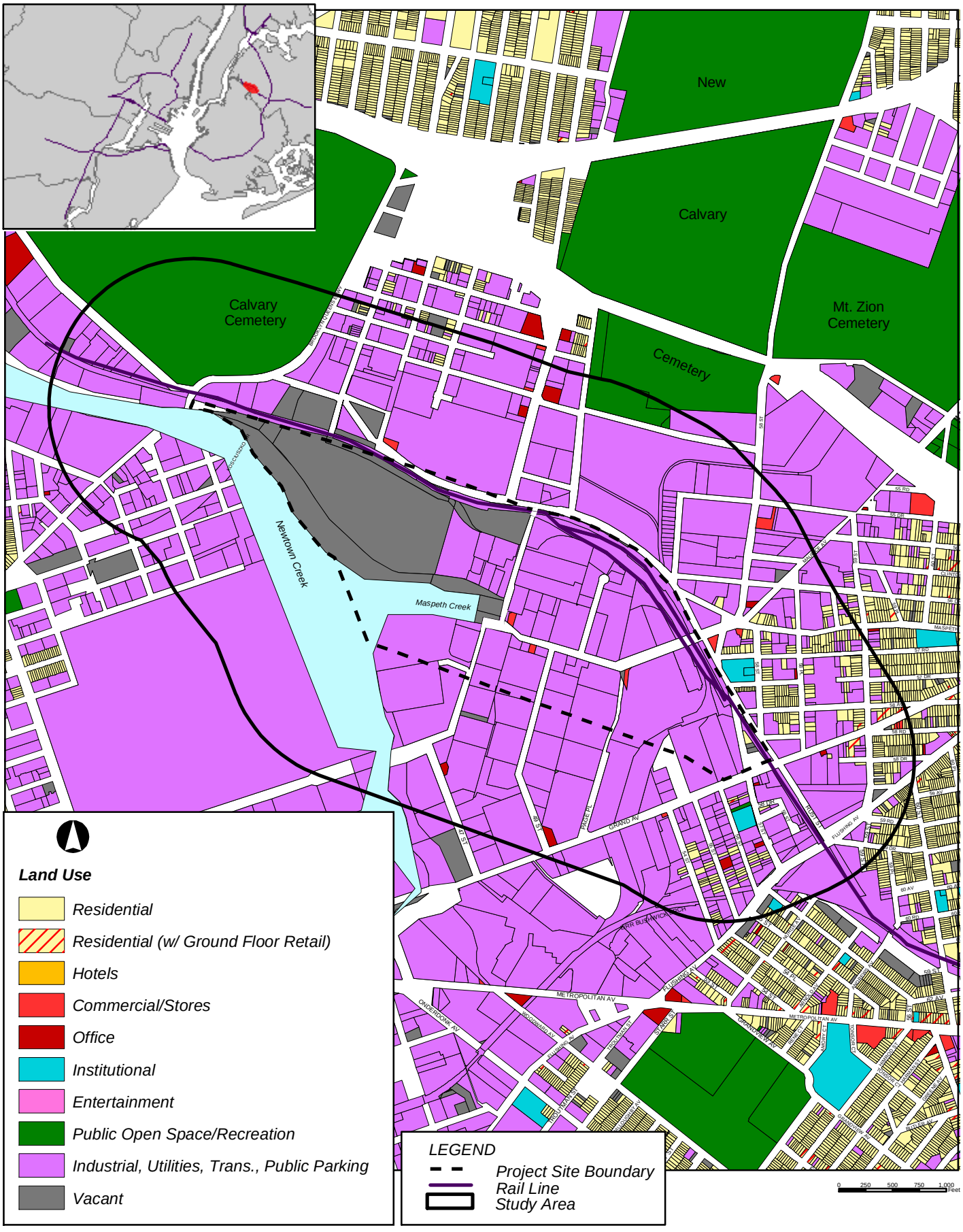


Figure 3-22
West Maspeth Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

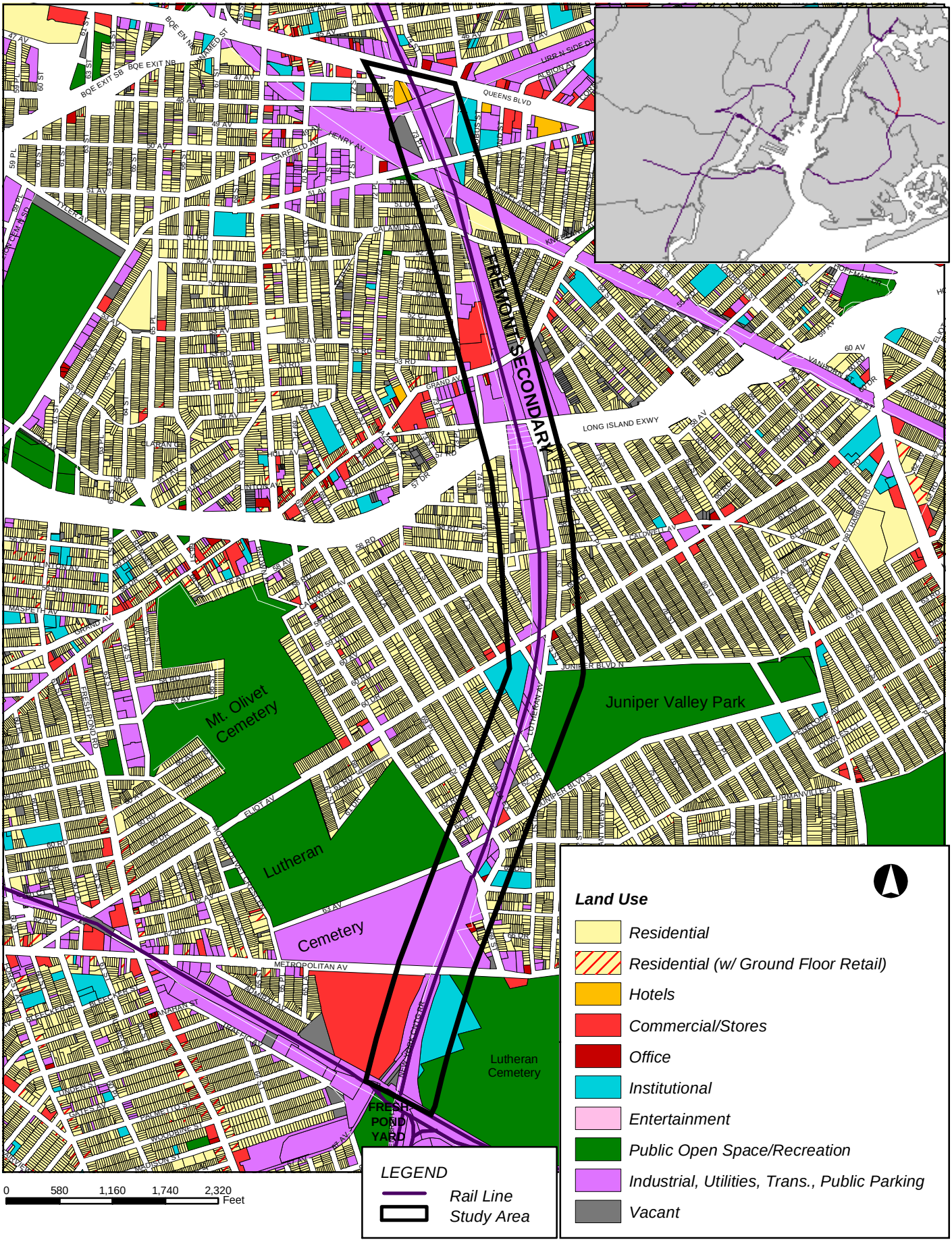


Figure 3-23
Fremont Secondary Study Area-Segment 1
CROSS HARBOR FREIGHT MOVEMENT PROJECT

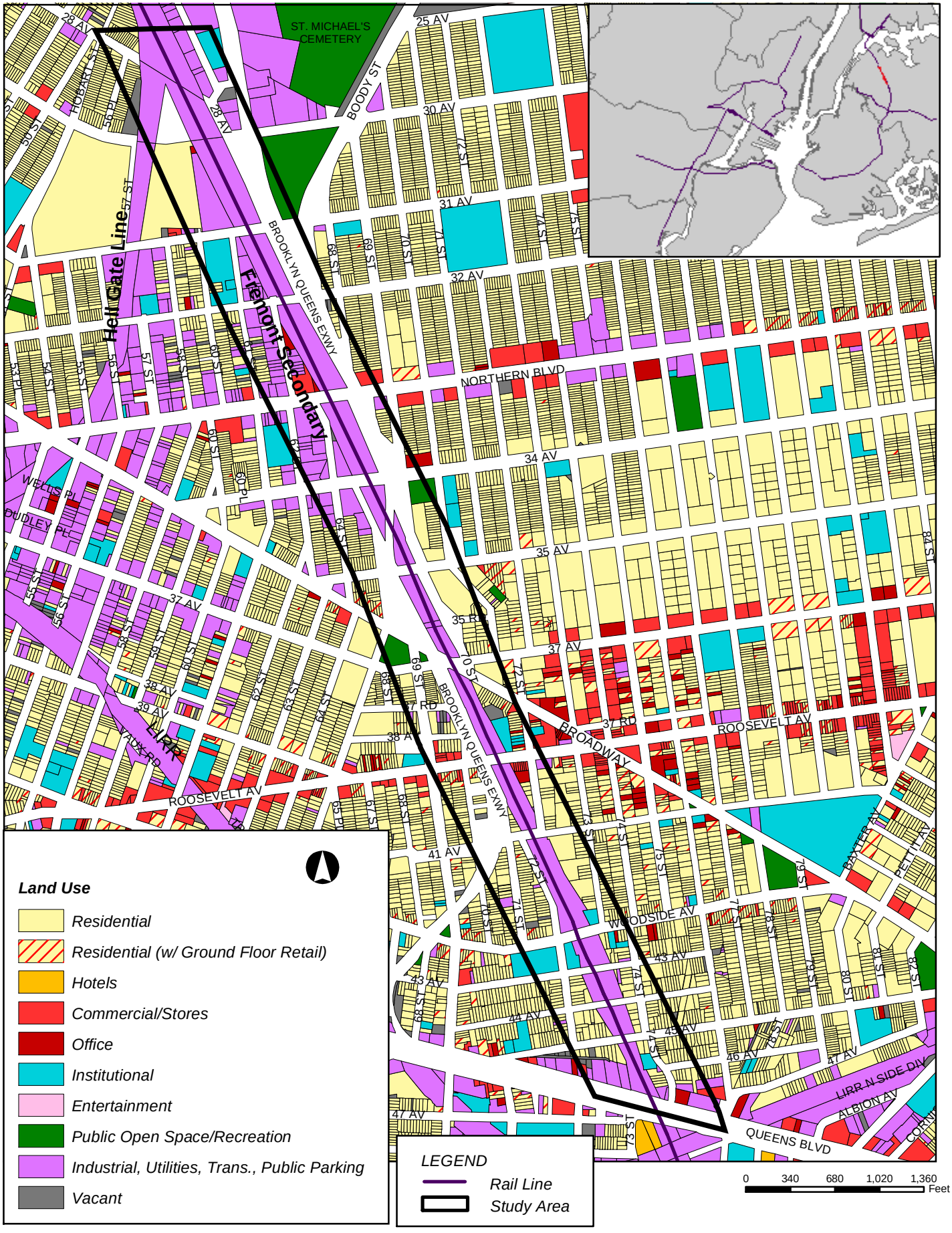


Figure 3-24
Fremont Secondary Study Area-Segment 2

CROSS HARBOR FREIGHT MOVEMENT PROJECT

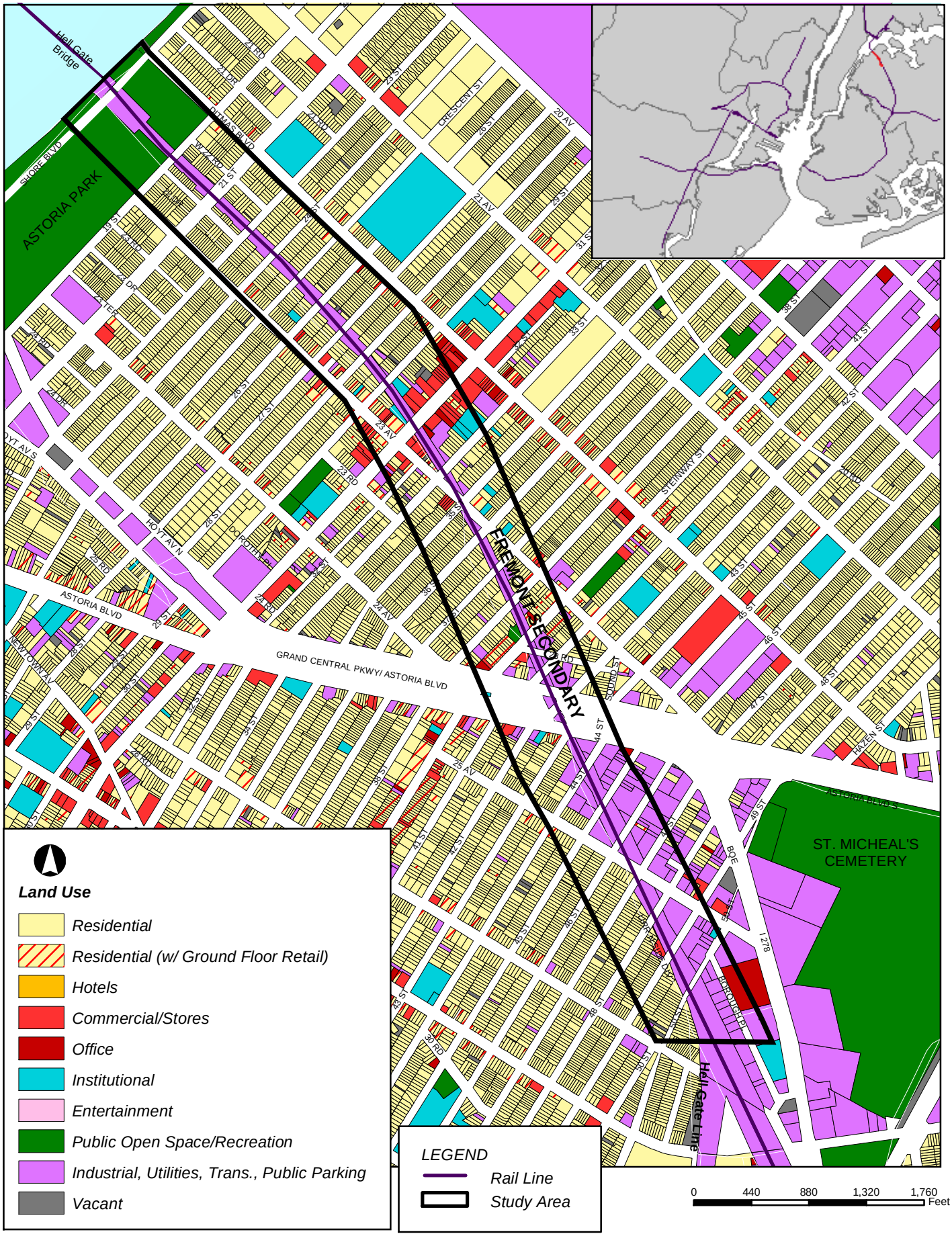


Figure 3-25
Fremont Secondary Study Area-Segment 3

CROSS HARBOR FREIGHT MOVEMENT PROJECT

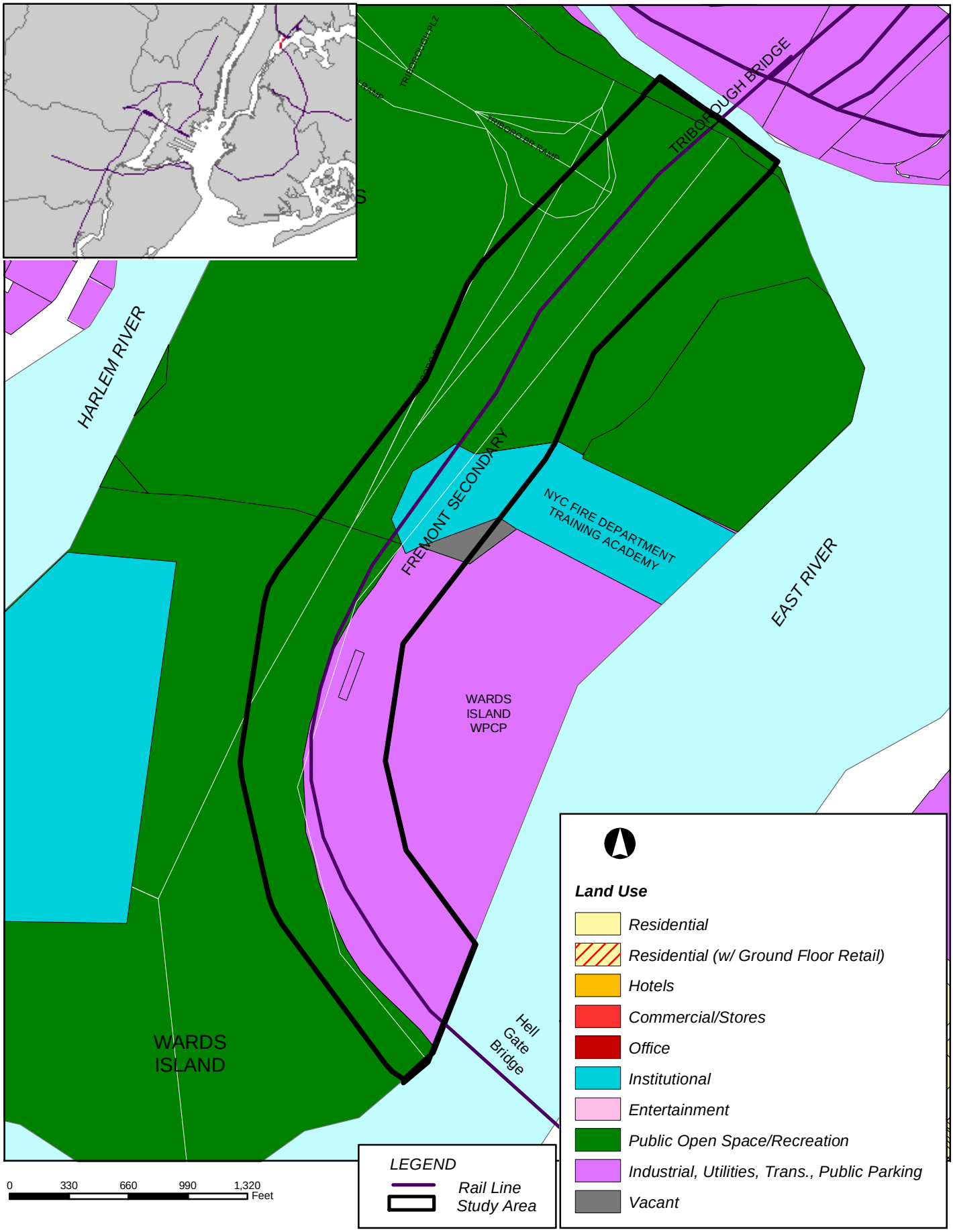


Figure 3-26
Fremont Secondary (Randalls/Wards Island Portion) Study Area

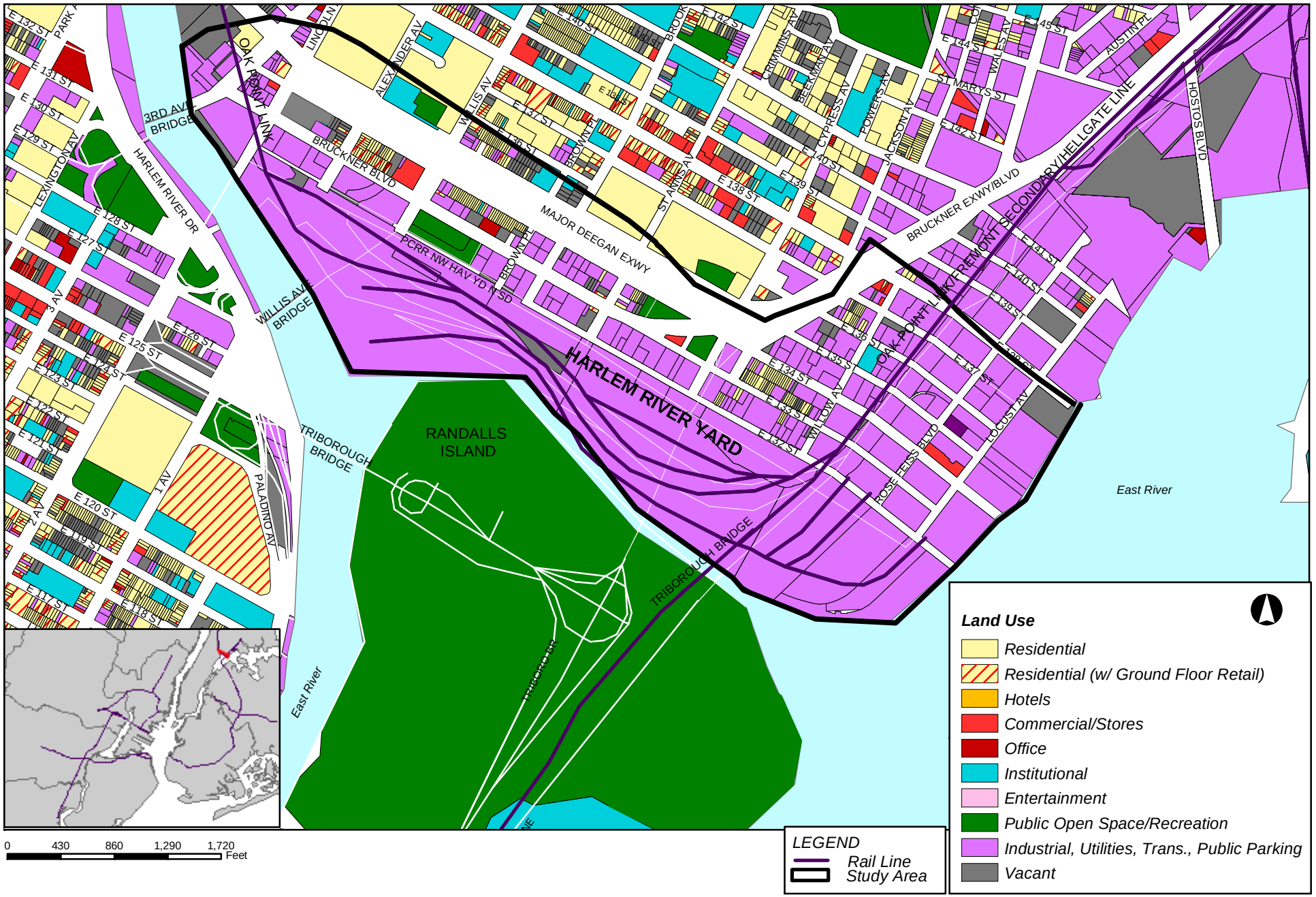


Figure 3-27
Harlem River Yard/Oak Point Link Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

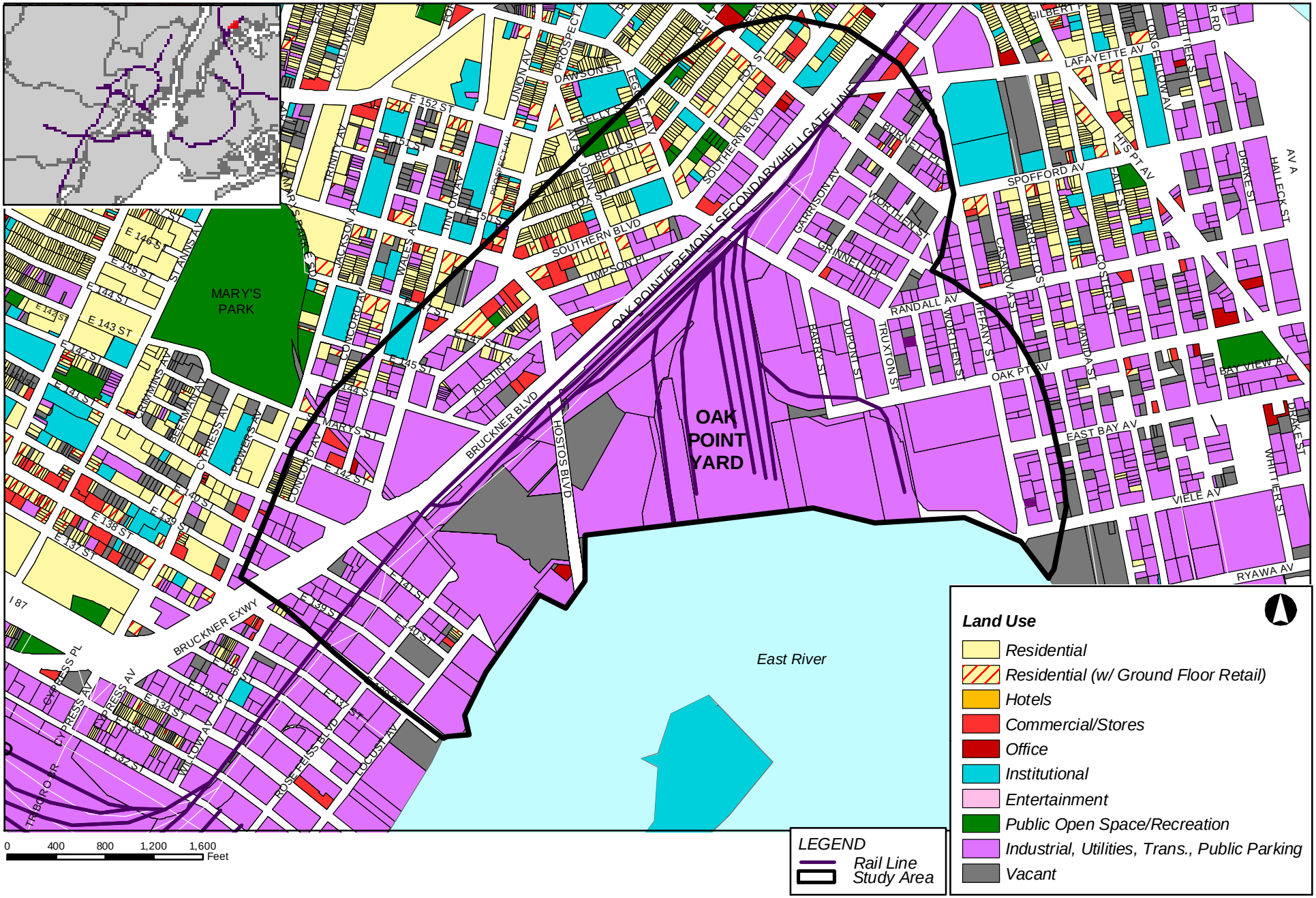


Figure 3-28
Oak Point Yard/Oak Point Link Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

A. INTRODUCTION AND METHODOLOGY

INTRODUCTION

Examined in this chapter are the potential economic impacts associated with the alternatives described in Chapter 2, "Project Alternatives." The chapter begins with an explanation of the methodology used to analyze current and future economic conditions and assesses the probable impacts from the project alternatives. Existing economic conditions are then described in potentially affected counties, including Brooklyn, Queens, Richmond, and the Bronx in New York, and Hudson in New Jersey, which are the counties where effects from the project would occur most directly. Particular emphasis is placed on long-term trends in employment in major industries throughout the counties, as well as the current employment and the number and types of businesses located in local study areas within a ¼-mile of each rail yard site. Future economic conditions without the project alternatives are described under the No Action Alternative. Because the Tunnel Alternative and the Expanded Float Operations Alternative were found to have potentially significant benefits on economic conditions, regional impacts are quantified and described for the New York Metropolitan region, New York State, New Jersey, and the United States. Probable impacts on employment and business operations are also described for the ¼-mile local study areas.

Described in the final section of the chapter are the financial assistance and services that would be available to displaced businesses, as required by federal and state laws that regulate business relocation.

METHODOLOGY AND APPROACH

REGIONAL IMPACTS

Assessed in this chapter are three types of regional economic impacts: direct economic impacts due to infrastructure improvements (travel efficiency and cost savings), induced business attraction, and total macroeconomic impacts (employment, business sales, income, etc.) to various geographic regions (counties and states).

Estimates of project capital and operational costs are provided in Chapter 2, "Project Alternatives," Chapter 20, "Financial Analysis," and Chapter 16, "Construction and Construction Impacts." A benefit-cost analysis is provided in Chapter 20. See also Appendix 7 for more details on these analyses.

Travel Efficiency and Cost Savings

The project alternatives' transportation improvements (primarily the Tunnel Alternative) are intended to lead to direct travel efficiency benefits. Some existing rail trips to the East-of-Hudson region in New York City and Long Island would benefit from reduced travel times,

increased reliability and reduced costs. Trips that are currently projected to use trucks may divert from truck to rail to capture cost savings. In addition, the reduction of truck trips due to increased rail usage would improve highway efficiency for the remaining auto and truck trips. The magnitude of these user benefits to businesses, individuals, and society in general, are a component of the rationale for public investment in cross-harbor freight movement improvements.

These travel efficiency and cost savings benefits are estimated using travel network, modal diversion, and user benefit models, as described in Chapter 8, "Transportation." The result is an estimate of direct user benefits for rail and highway users expressed in dollars. Highway benefits used in the regional economic impact analysis are defined as travel time savings, operating cost changes, and accident savings and are calculated by the NYMTC "Best Practices Model" year 2025 travel demand model, as implemented with TRANSCAD software. The 2025 forecasts from the NYMTC model produce results for post-processing to monetize benefits. For purposes of the economic analysis, these benefits are allocated based on the type of trip to geographic regions and industries. Personal auto trips (i.e., including commuter but not business "on-the-clock") are included in the benefit-cost analysis but are not included in the regional economic impact analysis since they do not significantly impact the flow of dollars to the region, even though they do provide a societal benefit. All highway user benefits for truck trips and on-the-clock auto trips are included in the regional economic analysis. Highway efficiency benefits are allocated to geographic regions based on origin-destination patterns and further allocated to industries based on industry mix and each industry's typical use of trucking in the production process.[1]

For the purposes of the economic analysis, travel efficiency and business cost savings benefits are allocated to regions based on origin-destination patterns[2]—50 percent to the origin, 50 percent to the destination (the monetized value is essentially split between shipper and receiver). These benefits vary by region depending on each region's share of origin-destination patterns for highway and rail trips. For example, most trips that benefit from the project will have at least an origin or destination in the East-of-Hudson region, which therefore will receive 50 percent of the benefit.

Travel efficiency and cost savings for businesses are estimated for 2025 (the travel model forecast year) and vary from 2000 based on growth in freight rail, and vehicle miles of travel (for highway benefits). For example, highway benefits were derived based on growth in vehicle miles of travel (0.87 percent per year). Direct economic impacts are input to the REMI economic simulation model over time (i.e., the tunnel is expected to begin service between 2011 and 2015 and the region would begin to accrue some benefits at that time, but the full benefit of the tunnel is forecast in 2025).

Travel efficiency and cost savings impacts by industry, combined for rail and highway, are used as direct inputs for entry into the Regional Economic Models, Inc. (REMI) dynamic simulation model to estimate macroeconomic impacts for the region (see "Regional Macroeconomic Im-

[1] Transportation use by industry, split between rail, air, water, for-hire trucking, own-account trucking, and gas/pipeline is estimated by the Transportation Satellite Accounts (TSAs) developed jointly by the U.S. Bureau of Transportation Statistics and the U.S. Bureau of Economic Analysis.

[2] As calculated from the Reebie 2002 TRANSEARCH database of regional commodity flows forecast to year 2025 by DRI/WEFA.

pacts" below). Unlike most static input-output models, the REMI model reflects industry cost reductions and these reductions increase the competitiveness of a region's economy over time, leading to greater economic output, employment, and income. Standard input-output models only allow for the analysis of a one-time spending or employment impact, unlike REMI, which examines impacts over time, including changing industry productivity, production costs, and prices.

Induced Business Attraction and Business Retention

In addition to travel efficiency and cost savings impacts, major infrastructure improvements (i.e., greatly enhanced freight rail service east of the Hudson River) have the potential to induce warehousing, distribution, and manufacturing business attraction to the region. Areas in Brooklyn and Queens, in particular, have the potential to attract new activity (primarily warehousing/distribution). Manufacturing employment, in particular, has been in great decline in New York City over the past 25 years and this project would not reverse that trend. However, it is possible that some existing manufacturing/warehousing firms that otherwise would leave the city could benefit from substantially improved freight rail service and, as a result, may remain.

A number of methods were combined to assess these potential impacts. First, industry trends over the past 10 to 15 years were assessed. Second, interviews were conducted with local economic development experts, including local development corporations and industrial parks, to determine the potential for business attraction and retention as a result of the project alternatives. These meetings were invaluable in determining which locations and industries are likely to benefit from this project. For example, East New York (Brooklyn), which sits along the Bay Ridge Branch could benefit greatly because of its vast and growing industrial sites, and the potential for more intense land use if rail sidings are properly sited.

Third, areas that are likely to be impacted were identified for further detailed examination. The focus of this analysis is the expanded West Maspeth Yard, the nearby East Williamsburg industrial park, East New York industrial areas along the Bay Ridge Branch, and industrial, warehousing and distribution concentrations at Hunts Point in the Bronx. Other areas in Brooklyn, Queens, and the rest of the study area may also see lesser but still important impacts.

Fourth, a land use data analysis was performed to quantify this impact. The New York City detailed land use database was used to identify vacant and industrial land around the areas most likely to be impacted.[1] Based on the amount of land available for further manufacturing/warehousing development or re-use, estimates of potential economic activity are derived using conversion factors for employees per square foot. The estimates of new economic activity by industrial neighborhood are constrained by the amount of available industrial/warehousing land; the amount of industrial/warehousing activity in the region today; and the potential for development and re-use in each area as determined through local interviews.

In addition, this analysis is complemented by data obtained from the commercial realtor Greiner-Maltz Company of New York. Real estate data were obtained for areas near West Maspeth (Queens and Brooklyn), East New York, and Greenpoint. These data included estimates of vacant and existing building square footage for each industrial areas around the expanded West Maspeth Yard, and availability rates for each (i.e., how much square footage is currently vacant and for sale). For this analysis, we used an estimate of building square foot per lot. The ratio for

[1] Real Property Assessment Data (RPAD), from the New York City Department of Finance.

warehouses was 83% and for factories and industrial buildings it was 117%. These reflect a combination of the fact that buildings tend not to occupy all of the land on a given lot, but that some buildings will be multi-story.

Two additional features of this analysis are worth mentioning. First, because there is an inherently speculative component to this analysis, conservative assumptions are used throughout and sensitivity analysis provides "low" and "high" estimates of business attraction to indicate a reasonable range. Actual impacts would vary within this range depending on other factors such as the level of industrial recruitment/promotion activities and broader economic trends. Second, to ensure that the benefits of travel efficiencies and business attraction are not double-counted, expanded industrial, warehousing and distribution activity generated by travel efficiencies were subtracted from the estimates of business attraction. Expanded activity resulting from the first round effect of travel efficiencies reduces the amount of developable or re-used building space for the business attraction analysis.

Business attraction impacts are quantified in terms of new employees by industry, with a focus on rail-freight-related industries. These impacts are phased in over a 15-year time period from when the tunnel is completed to reflect the time lag inherent in business attraction resulting from improved transportation. Similar to the analysis of travel efficiencies and cost savings, the business attraction impacts are entered into the REMI model to capture total macroeconomic benefits for the region. One of the key features of the REMI model is that while jobs are measured by their location, personal income (earnings of the workers) is adjusted to reflect commuting patterns, and, therefore, the place of residence. This is important in terms of properly accounting for the ripple effects of consumer spending (for example, commuters from New Jersey working in New York City likely spend much of their earnings in New Jersey).

It is important to note that there will be two counter-veiling effects of the project in the primary impact area: 1) the development of an intermodal yard at West Maspeth will result in business displacement; and 2) the introduction of new rail service into the region will attract supporting industries to adjacent areas. The impacts of the construction of the intermodal yard on existing businesses, and the mitigation strategies for addressing these impacts, are described later in this chapter. It is important to note here, however, that the existence of substantial vacant land and industrial/warehousing space within the impact area makes it possible to both successfully mitigate the imapct of the West Maspeth yard land takings by relocating businesses within the area, and to attract new businesses to the area

Regional Macroeconomic Impacts

As briefly described above, travel efficiency and cost savings and business attraction and retention impacts are translated into inputs for the REMI simulation model to estimate total regional economic impacts. The impacts are measured at various geographic levels:

- A 30-county Metropolitan New York region which includes the 14 counties in New York, 13 counties in New Jersey, and 3 counties in Connecticut.[1]
- New York State (includes all counties in state).

[1] Connecticut: Fairfield, Litchfield, New Haven; New Jersey: Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren; New York: Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester.

- New Jersey (includes all counties in state).
- United States.

The REMI model performs four key functions for the regional economic analysis:

- It estimates the macroeconomic effects (employment, income, etc.) of travel efficiency benefits that are measured by travel time savings and cost savings;
- It estimates total economic impacts, i.e., multiplier effects from additional business and consumer spending, from the direct changes caused by the project;
- It estimates impacts over time in a dynamic fashion as changes to the economy affect prices, wages, and other competitiveness factors; and
- Besides regional impacts, it estimates economic impacts for specific geographic jurisdictions, such as counties or states.

LOCAL METHODOLOGY

Various sources of economic data were used to assess local impacts including the New Jersey Department of Labor (NJDOL) and the New York State Department of Labor (NYSDOL) county level employment data. Workplace estimates for each of the study areas were obtained at the census tract level from Claritas, Inc., a supplier of demographic and business marketing information.

Additional sources for the local impact assessment included fieldwork, GIS land use data derived from New York City Department of Finance Real Property Assessment Data (RPAD) and the New Jersey Department of Environmental Protection (NJDEP) Land Use Land Cover Data. Locations of industrial areas were also identified using zoning maps.

Information for displaced businesses in West Maspeth, Queens was gathered through field work and the following sources: Dunn & Bradstreet, Claritas, Inc., Cole's Criss-Cross Directory Look-ups, real estate data from Greiner & Maltz, and RPAD.

B. EXISTING CONDITIONS

This section focuses on existing local economic conditions in study areas of existing and potential rail yards that would be affected by the alternatives. An overview of existing regional economic conditions is provided in Chapter 1, "Project Purpose and Need" and Chapter 8, "Transportation." Tables showing trends in total private sector employment and business employment are provided in Appendix 7, "Land Use and Economic Conditions." This section provides a discussion of economic conditions in Hudson County, New Jersey and Richmond County, Kings County, Queens County, and Bronx County, New York, as they are the counties that would be most directly affected by the project. The county-level overview is followed by a closer look at employment levels and types of businesses found within each of the rail yard study areas—Greenville Yard Study Area in New Jersey, and 65th Street Yard Study Area, West Maspeth Yard Study Area, Harlem River Yard Study Area, and Oak Point Yard Study Area in New York City.

NEW JERSEY

HUDSON COUNTY ECONOMIC OVERVIEW

Total private sector employment in Hudson County stood at just over 200,000 in 2000, a decrease of more than 90 percent from 1960 (see Appendix 7). The most substantial loss was between 1970 and 1980 where total employment decreased 93 percent from 2.5 million in 1970 to less than 180,000 in 1980. Every major industry lost employment over the 40-year period. Most non-manufacturing industries experienced a slight turn-around beginning in the 1980s. While this brought a halt to the severe decline in employment that occurred in the 1960s and 1970s, the gains in the 1980s and 1990s were small by comparison. Manufacturing employment had no reprieve from its losses, which continued throughout the 40-year period, with the steepest declines occurring in the 1970s. The largest employer in 2000 was the service sector with over 56,000 employees followed by retail trade and the FIRE sector with 32,000 and 31,000 employees.

The manufacturing sector in Hudson County suffered decreases between 1960 and 2000, losing more than 1.3 million jobs or 98 percent of its employment. The biggest decrease in manufacturing employment occurred between 1970 and 1980 when 1.2 million jobs were lost. By 2000, manufacturing represented only 12 percent of Hudson County's total private sector employment compared to 61 percent in 1960.

GREENVILLE YARD STUDY AREA—ECONOMIC OVERVIEW

The study area is an industrialized area and is part of the Port of New Jersey (Global Marine Terminal, Auto Marine Terminal [NEAT], and Military Ocean at Bayonne [MOTBY]). The study area has approximately 643 acres of land area, of which 51 percent is in industrial use and 49 percent is vacant. As discussed in Chapter 3, the Greenville Industrial Development Plan was created to redevelop blighted and underutilized industrial areas.

Employment in the Study Area

The study area had 1,283 private sector employees in 2001 (see Appendix 7). In contrast to the study areas east of the Hudson River, wholesale trade was the predominant industry in the Greenville Yard study area, employing 408 workers, or nearly one-third of all private sector employees. The transportation industry provided 265 jobs or 21 percent of the total employment in the study area, while manufacturing employed 250 workers, or about 20 percent of private sector employment.

Types of Businesses in the Study Area

There were approximately 60 businesses in the study area in 2001. The service industry, which provided only 8 percent of the total jobs, had 21 service sector businesses, representing more than one-third of all business establishments in the study area. There were 15 retail trade establishments, making up 25 percent of all the businesses. The three largest employers (i.e., wholesale trade, transportation, and manufacturing) maintained a total of 18 businesses in the study area, with no one industry having more than 7 establishments. However these businesses averaged 52 employees per establishment compared to 9 employees per establishment for the retail trade and service industries.

The proximity of the Greenville Yard Study Area to the New Jersey Turnpike Extension and Route 440 provides good accessibility for trucks delivering or picking up goods from businesses

in the study area. Most of the businesses in the study area are located in large 1- to 2-story warehouse buildings with large parking lots that can accommodate the numerous trucks loading and unloading their goods. In the northern section of the study area is Tropicana-Dole Products, Inc. Businesses located north of Harbor Drive include NDL, a freight transportation company, and Summit Import Corporation. Along Industrial Drive there are large warehouse buildings that house other wholesale and distribution businesses.

Port Jersey Boulevard is a main east-west street running from the New Jersey Turnpike Extension through the study area to Upper New York Bay, primarily servicing the freight operations of Global Marine Terminal and NEAT, as well as a crane equipment storage and maintenance facility. Several other major warehouses and transportation operations are housed in the Port Jersey Distribution Services complex, also accessible from Port Jersey Boulevard, including Shipco Air Freight, Phoenix Warehouses, Jordache Ltd., Fubu clothing, and a New Jersey Diesel Emission Inspection Center. The BMW Vehicle Preparation Center is located in this vicinity on Colony Road.

NEW YORK

RICHMOND COUNTY

Economic Overview

Employment. In 2000, Staten Island had the fewest private sector employees of any of the City's five counties, a total of 81,500 (see Appendix 7). In fact, Staten Island contained less than 1 percent of the City's total private sector employment in 2000, and never contained more than 1 percent of the City's private sector employment in the 40-year period analyzed. On the other hand, every major industrial category, except manufacturing, experienced dramatic increases in employment between 1960 and 2000, exceeding 100 percent growth in every category.

As in all other counties, employment in the service sector soared in Staten Island, growing by nearly 750 percent to 38,900 employees in 2000. Retail trade has expanded with the opening of several large shopping malls, and the expansion of commercial strips serving local neighborhoods. Retail trade was the second largest employer in Staten Island, with 19,800 employees or nearly 25 percent of all private sector jobs in the county in 2000.

Despite the substantial gains in private sector employment as a whole, trends in manufacturing paralleled the experience of all other counties, and declined nearly 80 percent over the 40-year period. By 2000, all types of manufacturing industries employed only 1,900 workers, or approximately 2 percent of Staten Island's total private sector employment.

Locations of Industrial Areas. Staten Island has large swaths of manufacturing zones concentrated along the West Shore Expressway in the northwest corner of the Staten Island Expressway (near Arlington Yard and Port Ivory) and along its western border (West Shore and Outerbridge). Industrial areas can also be found along the north shore between the Richmond Terrace and the Kill Van Kull, and on the east shore between the Verrazano Narrows Bridge and the St. George Terminal (see Figure 4-1). It should be again noted that Staten Island had fewer than 2,000 employees in the manufacturing sector in the year 2000. About one-fourth of the employment in this area was engaged in the manufacture of transportation equipment (ship building and repair), and stone, clay and glass products, located along the shore areas.

Northwestern Staten Island Study Area

The Northwestern Staten Island Study Area includes the area within ¼ mile of Arlington Yard, Port Ivory, and Howland Hook and is located within the communities of Arlington and Mariners Harbor. There are approximately 923 acres of land area in the Northwestern Staten Island Study Area, of which 61 percent is industrial, 18 percent is vacant, and 2 percent is commercial.

Employment in the Study Area. There were 1,313 total private sector employees in the study area in 2001 (see Appendix 7). Approximately 60 percent of the jobs were in three major industrial categories, including transportation, retail trade, and manufacturing. The transportation industry provided 318 jobs, or 24 percent of all the private sector employment in the study area. Retail trade employed 263 workers, representing 20 percent of the employment in the study area. And while manufacturing provided only about 2 percent of all private sector jobs throughout the county, there were 217 manufacturing workers in the study area in 2001, representing nearly 17 percent of the employment. In fact, the Northwestern Staten Island Study Area contained about 11 percent of all manufacturing jobs in the county. Service sector jobs numbered 151, making up about 11 percent of the employment in the study area.

Types of Businesses in the Study Area. There were 133 private business establishments located within the study area in 2001 (see Appendix 7). Although there were only 151 service sector jobs in the study area in 2001, there were 37 service establishments, composing nearly 28 percent of all private sector businesses in the study area. Approximately 58 percent of these service establishments are business and repair services. Retail establishments accounted for almost 18 percent of all businesses in the study area while the construction industry made up 14 percent. The transportation industry, which employed more workers than any other major industrial category in the study area, had 18 businesses.

Most prominent among the transportation businesses is the Howland Hook Marine Terminal, located in the western portion of the study area along the Arthur Kill. Nearby is the partially vacant Proctor and Gamble complex. Other major businesses in the area include a Coca-Cola distribution facility and Texas Eastern Transmission Corp., a company that provides jet fuel, both located near the intersection of Western Avenue and Goethals Road, below the Goethals Bridge. On the corner of Mesereau Avenue and Davidson Street is a manufacturing warehouse that includes businesses such as ACE Wiring Cable, Designer Greeting, Staten Island Diesel Power, and S.N. Tanner.

KINGS COUNTY

Economic Overview

Employment. Total private sector employment in Brooklyn decreased by 18 percent between 1960 and 2000, losing approximately 91,000 jobs (see Appendix 7). The majority of this loss was in the manufacturing sector, where employment decreased from 224,600 in 1960 to only 41,700 in 2000, representing an 81 percent loss over 40 years. Despite this substantial decline, manufacturing was still the third largest employer in the county in 2000, representing more than 10 percent of all private sector jobs.

While the manufacturing sector was losing jobs, the service industry was experiencing a dramatic increase in employment, adding over 107,000 jobs between 1960 and 2000, and growing by 128 percent. In 2000, there were 191,400 employees in the service sector, more than four times the employment in manufacturing. Retail trade was the second largest employer in the county in 2000 with 66,800 employees. Employment in both wholesale trade and the FIRE industries re-

mained relatively stable between 1960 and 2000, each with 27,000 to 28,000 jobs. The transportation/communications industry (which includes trucking and warehousing) suffered a 21 percent loss during the same period, providing 25,900 jobs in 2000.

Locations of Industrial Activity. The principal industrial areas in Brooklyn are located along the waterfront in South Williamsburg, Northside (Williamsburg), Greenpoint, Sunset Park, and Red Hook. Further east, there are manufacturing uses along Atlantic Avenue, in Bedford-Stuyvesant, and in East New York. In the south-central portion of the borough there are industrial concentrations in the Flatlands and McDonald Avenue areas (see Figure 4-2).

Manufacturing uses in Greenpoint are concentrated along the East River and Newtown Creek. The principal manufacturing industries along the East River include paper and allied products, rubber and plastics, and miscellaneous manufacturing. In the Newtown Creek area, a large portion of the manufacturing jobs are found in metal fabrication, apparel, chemicals and allied products, and industrial equipment. The Newtown Creek Water Pollution Control Plant is located along Newtown Creek. Several soft drink bottlers are located nearby.

One of the principal industrial areas in this northern section of the borough is the East Williamsburg In-Place Industrial Park (IPIP). Established in 1983 and currently encompassing about 650 acres, the industrial park is bordered by the Brooklyn-Queens Expressway to the north, Bushwick Avenue to the west, Newtown Creek to the east and Flushing Avenue to the south. The industrial park includes approximately 600 small to medium sized companies, including major businesses such as Pfizer Inc., Boar's Head Provisions Company, Kryton Ironworks, Miron Lumber Company, Ambrosino Construction Corp., Adco Paper & Packaging, Astoria Imports Ltd., Martin Greenfield Clothiers, Ltd., Budweiser and Mona Lisa Fine Furniture. Field surveys of the industrial park indicate that the vacancy rate in industrial buildings is likely to be very low.

In recent years, manufacturing uses have been relocating from the Greenpoint and Williamsburg neighborhoods as residential uses move west toward the East River. Several large sites along the river, such as the Schaefer Brewery and the Kedem Winery in South Williamsburg, are being rezoned for residential uses, and other sites in the Northside and Greenpoint neighborhoods, including the USA Waste site and the Lumber Exchange Terminal site, are being considered for redevelopment with non-manufacturing uses. In addition, the State of New York plans to construct a park in this neighborhood.

Farther south in the borough along the waterfront, the Brooklyn Navy Yard in South Williamsburg has experienced some resurgence of manufacturing under the direction of the Brooklyn Navy Yard Development Corporation. The principal manufacturing uses in the Navy Yard include printing and publishing, furniture and fixtures, and miscellaneous manufacturing. In addition, the Navy Yard maintains its ship repair (transportation equipment) activities, as well as apparel, textile mill products, and chemical and allied products. North of the Williamsburg Bridge, manufacturing includes food and kindred products (including Domino Sugar), apparel and textile mill products, as well as fabricated metals, industrial equipment, miscellaneous manufacturing and furniture and fixtures.

South of the Navy Yard, industrial uses are primarily located along the waterfront in Red Hook and Gowanus. Non-manufacturing uses are more dominant in Red Hook, including water transportation (i.e., the container port, trucking, warehousing, and special trade contractors). Manufacturing in the Gowanus neighborhood includes furniture and fixtures, apparel, printing and publishing, and miscellaneous manufacturing.

Farther to the south along the waterfront, industrial activity is principally located in the Sunset Park neighborhood and the 65th Street corridor, near the 65th Street Yard. Sunset Park was established as a major port for maritime trade during the late 19th century. In the early 20th century the development of the Bush Terminals (Industry City) and the Brooklyn Army Terminal (BAT) provided many businesses with manufacturing, warehousing, and distribution space. During the 1960s, industrial activity in Sunset Park, particularly port-related transportation, warehousing, and distribution, diminished with the creation of container ports and transportation and warehousing facilities across the harbor in New Jersey. This trend undermined Brooklyn's maritime industry and facilitated the overall decline of the borough's manufacturing base.

The trend was somewhat reversed in Sunset Park beginning in the 1980s with the establishment of the 400-acre Sunset Park In-Place Industrial Park (IPIP) in 1982. Stretching from 17th Street to 65th Street and from 3rd Avenue to the waterfront, the industrial park includes businesses in the apparel trades, food processing and distribution, metal fabricating, construction, furniture and woodworking industries. 65th Street Yard and the South Brooklyn Marine Terminal are located within the IPIP. Most prominent among the signs of industrial stabilization include the successful redevelopment of the Brooklyn Army Terminal and Industry City, where a large portion of the tenants are involved in apparel manufacturing. Nearby, the 65th Street corridor, paralleling the tracks of New York City Transit and the Bay Ridge Branch, contains manufacturers involved in fabricated metals and publishing.

Further east, the East New York and Brownsville neighborhoods also contain industrial uses, most notably the East New York IPIP. Created in 1980, the boundaries of the 70-acre industrial park are Atlantic Avenue to the north, Sheffield Avenue to the east, Sutter Avenue to the south, and Powell Street to the west. The Bay Ridge Branch of the LIRR runs through the IPIP. There are approximately 300 businesses in the industrial park in a variety of industries such as metal fabricators, furniture manufacturers, wholesale distributors of durable goods, and manufacturers of non-ferrous metals.

65th Street Yard Study Area

The 65th Street Yard Study Area has a land area of 203 acres that is defined by a ¼-mile radius from the yard. Industrial land uses are the most prominent in the study area, occupying 44 percent of the land area, compared to only 0.2 percent by commercial uses. Only 0.2 percent of the land area is vacant.

Employment in the Study Area. In 2001, there were 3,027 private sector workers employed in the 65th Street Yard Study Area (see Appendix 7). Manufacturing industries employed 699 workers, representing almost 17 percent of the total employment in the study area. The service sector is the second highest employer with 555 workers making up 13 percent of all employees. Wholesale trade employed 488 people, making up almost 12 percent of all workers. Rounding out the five largest employers in the study area are retail trade and construction industry, each of which provided less than 7 percent of the private sector employment in the study area.

Types of Businesses in the Study Area. As described above, the study area is located within the Sunset Park IPIP. There were 214 private businesses within the study area in 2001 (see Appendix 7). Approximately 21 percent of all businesses (45) were service establishments. Retail and wholesale trade represented approximately 19 percent of the businesses in the study area respectively. Manufacturing industries were the leading employer with 24 businesses.

With the exception of the Brooklyn Army Terminal, the majority of the businesses found in the 65th Street Yard study area are small scale manufacturing industries that are intermixed among the residential uses.

Located along the waterfront, the Brooklyn Army Terminal is a large six-to seven-story warehouse complex, extending from 58th to 63rd Streets. Originally used for transport of war materials by ship and train during WWI and WWII, the complex now houses 72 private businesses involved in light manufacturing, warehousing, and distribution and back-office operations.

QUEENS COUNTY

Economic Overview

Employment. Private sector employment in Queens grew moderately by 29 percent between 1960 and 2000, adding nearly 82,000 jobs, despite a decline in employment during the 1970s (see Appendix 7). Like all other boroughs, the majority of the growth occurred in the service sector, which added more than 111,900 workers, an increase of 244 percent during the 40-year period. Service businesses provided about 158,000 jobs, the highest number of any private industrial sector. Both the transportation sector and the retail sector are important generators of economic activity, each employing 73,900 workers in 2000. Since 1960, transportation-related businesses have added 30,000 jobs in Queens, representing a substantial increase of 68 percent during the 40-year period; retail stores have added 13,400 jobs for a 22 percent increase. Manufacturing was the third largest employer in Queens, providing 45,500 jobs. However, unlike all other industrial sectors in the county, manufacturing suffered a 66 percent decrease in employment, losing nearly 89,000 jobs since 1960. Despite this loss, manufacturers located in Queens had shipments valued at more than $7.0 billion in 1997, with value added by the manufacture of more than $3.9 billion.

Wholesale trade, on the other hand, has been the most stable industrial sector in the county, adding only about 3,000 jobs during the 40-year period, growing by about 11 percent. In 1997, wholesale trade businesses in Queens had sales of $14.2 billion.

Locations of Industrial Activity. Manufacturing in Queens is concentrated in areas just across the East River from Manhattan, including Hunters Point, Long Island City, and Dutch Kills, as well as in West Maspeth, Ridgewood, Glendale, Flushing, College Point, Willets Point, and Jamaica neighborhoods. The industrial areas surrounding LaGuardia Airport and JFK Airport primarily contain businesses associated with the air transportation industry, such as handling and transportation of airfreight, as well as some construction-related uses and wholesaling (see Figure 4-3).

The Long Island City In-Place Industrial Park (IPIP) was created in the 1980s to support the manufacturing industry in Queens. Bounded by the Queensboro Bridge and Queens Boulevard to the north, Van Dam Street and Newtown Creek to the east, the East River to the west, and the northern tip of Brooklyn to its south, the industrial park contains over 900 acres with over 2,000 businesses in fashion/apparel, high-tech, food processing, printing and publishing and media. Some of the more prominent businesses include Pepsi-Cola, Silvercup Studios, Fink Baking, Ryerson-Thypin Steel, Avirex Ltd., Kruysman Corp., Milton Paper Co., Ambassador Food Services, Prime Time Transportation, and Advanced Graphic Services.

West Maspeth is located to the east of Long Island City. The area has a concentration of metal fabrication, textile mill products, and paper and allied products, as well as trucking and ware-

housing because of its proximity to the Long Island Expressway and the Brooklyn-Queens Expressway. Ridgewood is known for its apparel and textile mill products, and paper and allied products. Manufacturing in Flushing and College Point (including an industrial/corporate park) includes food and kindred products, stone, clay and glass products, primary metals, and electronic and electrical equipment. There are also construction businesses and wholesale trade in these areas.

The Jamaica neighborhood, located in southeastern Queens, contains a variety of industrial activity, including the manufacturing of food products; apparel; fabricated metal; and stone, clay and glass products. Jamaica is also home to an In-Place Industrial Park (IPIP), created in the early 1990s to support manufacturing businesses in the area, and is bounded by 93rd Avenue to the north, 109th Avenue to the south, Hollis Avenue to the east and the Van Wyck Expressway to the west. There are approximately 300 businesses in the industrial park involved in food processing, wholesale distribution, fabricated metals and electric and electronic equipment. Companies that have established a presence in the park include Elmhurst Dairy, Interstate Bakeries, Abbott Industries, J&L Aidikes, Ultimate Display Industries, and J&F Manufacturing.

West Maspeth Yard Study Area

The study area encompasses 532 acres, of which approximately 74 percent (394 acres) is in industrial use. There are three commercial uses within the study area: a video store located on the corner of Maspeth Avenue and 49th Street, and two delis on Maspeth Avenue, all of which occupy less then 1 percent (slightly over 1 acre) of the total land. Nine percent of the land (47 acres) in the study area is vacant; this includes the site of West Maspeth Yard.

Employment in the Study Area. There were 8,752 private sector employees working in the study area in 2001 (see Appendix 7). The transportation industry was the leading employer, providing 1,919 jobs, or 22 percent of total private sector employment. These jobs are primarily involved with local trucking and freight forwarding. Manufacturing industries in the study area employed 1,886 workers or 22 percent of the total employment in the study area. Nearly 72 percent of the manufacturing jobs were involved in the production of non-durable goods, probably related to the manufacture of food products.

Construction-related businesses employ 1,429 workers, or about 16 percent of the private sector employment in the study area, primarily in trucking and warehousing. Wholesale trade provided jobs for 1,265 workers, or about 15 percent of the employment in the study area.

Types of Businesses in the Study Area. West Maspeth benefits from proximity to major transportation routes. Superior truck access to the LIE and BQE, supplemented by rail freight via the New York & Atlantic Railway, has helped expand industrial activity in West Maspeth, continuing the neighborhood's history as one of the key industrial concentrations in Queens.

There were 436 private sector businesses located within the study area in 2001 (see Appendix 7). Although the transportation industry employed the highest number of workers, there were more wholesale trade businesses located in the study area then any other business—109 wholesale trade businesses making up 25 percent of all businesses in the study area.

Some of the more intensive industrial uses in the study area are trucking companies, warehousing, and distribution companies. These larger warehouses and distribution facilities are located along 56th Road and Maspeth Avenue in close proximity to the rail lines. The northern portion of the study area generally contains businesses that manufacture and/or distribute building materials. Along Review Avenue the industries are smaller construction, manufacturing, and

transportation businesses. The southeastern portion of the study area contains heavier industrial uses with a Department of Sanitation facility and trucking companies. On 49th Street south of the Montauk Branch, the Davis & Warshaw building, a five- to six-story industrial loft, supplies plumbing supplies and fabricates pipes.

BRONX COUNTY

Economic Overview

Employment. Total employment in the Bronx grew by less than 1 percent between 1960 and 2000 (see Appendix 7). Although total employment appears stable over the 40-year period, there was a considerable decline in manufacturing employment matched by dramatic increases in services industries. As in Brooklyn, manufacturing industries in the Bronx lost 43,000 jobs or 80 percent of their employees from 1960 to 2000. By 2000, manufacturing jobs represented less than 6 percent of total private sector employment in the Bronx, compared to 29 percent in 1960. As manufacturing was suffering these losses, service industries gained 59,100 jobs for an increase of 139 percent during the same time period. By 2000, the service sector became the leading employer in the Bronx with over 101,000 jobs, followed by retail trade with over 30,000 jobs. The transportation and communications industry suffered the second highest decline in jobs after manufacturing, with a 41 percent decrease in employment between 1960 and 2000.

Locations of Industrial Activity. Manufacturing in the Bronx is concentrated in the South Bronx within the Hunts Point and Port Morris neighborhoods; in the East Bronx within the Bronx River and Zerega neighborhoods; in the Mid-Bronx within the Bathgate and Morrisania neighborhoods; in the West Bronx along the Harlem River; and in the North Bronx within the Wakefield and Eastchester neighborhoods (see Figure 4-4).

The Port Morris neighborhood (at the southern tip of the Bronx) contains a variety of manufacturing uses, including metal fabricating, food and kindred products, leather and leather finishing, and furniture and fixtures. Port Morris also includes the Port Morris IPIP, an 800-acre site, established in the 1980s. It is bounded by the East River on the east, Harlem River on the west, the Bronx Kill to the south and the Bruckner Expressway and the Major Deegan Expressway to the north. The Port Morris In-Place Industrial Park contains approximately 100 businesses involved in plastics, paper products, metal working and furniture.

Located at the Hunts Point Peninsula just below the Bruckner Expressway in the South Bronx, the Hunts Point IPIP is a 400-acre site that was established in 1980. During the 20th century, the Hunts Point area began experiencing industrial expansion as businesses moved to the area, attracted by its proximity to the tri-state region, its existing rail lines, and the availability of space for industrial and commercial uses. During the 1960s and 1970s, two important events occurred that helped the area become an economic zone—the opening of the New York City Produce Market in 1967 and the Hunts Point Meat Market in 1974. Today, the industrial park is home to more than 600 businesses in apparel and textile manufacturing, construction, food manufacturing and distribution, transportation, chemicals and plastics, and wood, lumber and paper products. With the Port Morris IPIP, the two industrial parks form a broad swath of industrial activity on the southern waterfront of the borough.

Industrial activity in the mid-Bronx is located primarily in the Bathgate IPIP, which was established in 1980. This is a 21.5-acre site, generally bounded by the Cross Bronx Expressway to the north, Claremont Parkway to the south, Washington Avenue to the west and 3rd Avenue to the east. The park spans 12 city blocks, and includes 8 buildings with 522,000 square feet of

space for light industrial, distribution, office and educational uses. More than 100 businesses in the park specialize in pharmaceuticals and food processing, and a variety of manufacturing, including businesses such as Golden Krust Bakery, ABCO Fire Door Company, Clay Park Labs, Majestic Shapes, a clothing manufacturer, and Kleener King. Another smaller industrial area in the mid-Bronx is located in the Morrisania neighborhood, which contains textile mill products, trucking, and warehousing.

The Bronx River area has a modest manufacturing base, with concentrations of automotive repair shops and fuel oil dealers. Manufacturing uses in the Zerega neighborhood are more intensive, with larger sprawling industrial buildings and auto-related uses.

The Wakefield and Eastchester neighborhoods (which border Westchester County) include concentrations of construction-related employment, as well as local and interurban transit (primarily express bus storage and maintenance), wholesale trade, and automotive repair.

Industrial uses are scattered along the Harlem River in the West Bronx. They primarily include food processing and wholesaling in the Bronx Terminal Market, automotive repair (particularly in the Highbridge area), construction, and printing and publishing (including H.W. Wilson Publishing Company, which has had its headquarters in the Bronx since 1917).

Harlem River Yard Study Area

The Harlem River Yard Study Area is located in the southern tip of the Bronx in the Port Morris community. The study area covers approximately 285 acres of land. Approximately 73 percent of the land is occupied by industrial use. Residential areas, which are found along East 134th and East 135th Streets, and mixed among industrial uses east of the Bruckner Expressway, occupy about 12 percent of the land area. Commercial uses make up less then 1 percent of the total land area in the study area, and contain establishments such as McDonald's, Goodyear Tire, and several fast food and deli-type stores.

Employment in the Study Area. There were 3,920 private sector employees in the Harlem River Yard Study Area (see Appendix 7). Approximately 27 percent or 1,040 worked in manufacturing industries. The Harlem River Yard Study Area contained nearly 10 percent of all manufacturing jobs in the Bronx. About 22 percent, or 852 of all employees in the Bronx, worked in the service sector, more than half of which were in the professional and related-health services. The construction and wholesale trade industries employed a relatively similar number of workers, with 580 and 556 jobs, respectively, representing 15 percent and 14 percent of the total private sector employees in the study area. Retail trade was the fifth largest employer with 448 employees, representing 11 percent of all private sector jobs within the study area.

Types of Businesses in the Study Area. The Harlem River Yard is located within the Port Morris IPIP. In 2001, 243 business establishments were located within the Harlem River Yard Study Area. Although the manufacturing sector was the largest employer, it ranked fifth in the study area in terms of the number of businesses (24), representing less than 10 percent of all establishments. In comparison, 24 percent (58 establishments) were service-related businesses. The construction industry provided the second largest number of establishments (51), representing 21 percent of all businesses in the study area.

Heavier manufacturing uses are located in the northeast portion of the Harlem River Yard Study Area. Businesses along Locust Avenue and Rose Feiss Boulevard are mostly large three- to five-story loft buildings, housing tenants such as USA Waste Management, Feiss Industries, an MTA Cable Station, a large NYPA generating plant, and a sprawling Castle Oil storage and distribu-

tion facility. Further west are smaller scale warehouse buildings, with tenants such as the Padded Wagon, U-Haul, Miss Grimble (a dessert manufacturer), Rosenzweig Lumber, and Special Edition (a clothing manufacturer).

Businesses west of Brook Avenue on 132nd Street are also large two- to three-story loft buildings, including the new NY Post Printing Plant on the Harlem River Yard site, Everlast, Empire Erectors, and Allied Waste Service of NY. Bruckner Boulevard is a very busy artery lined with small- to medium-scale businesses, such as Verizon, Zaro's Bread Basket (a commercial bakery), Academy Glass & Mirrors, Shleppers Moving, Big John's Moving, Flat Rate Moving, Storage USA, Kelly's Furniture, and Borda Products, which provides equipment to physicians and surgeons.

Oak Point Yard Study Area

The Oak Point Study Area incorporates portions of the neighborhoods of Port Morris, Longwood, and Hunts Point. Although the Bruckner Expressway, a major, limited-access highway (I-278) runs north-south through the study area, the roadway is elevated and provides no access to the study area, except at its intersection with the Major Deegan Expressway (I-87). Local streets, including Hunts Point Avenue, Leggett Avenue, and Tiffany Street provide the principal points of access to the industrial area east of the Bruckner Expressway. The study area includes approximately 304 acres of land, of which 76 percent is occupied with industrial uses, such as manufacturing loft buildings, garages and gas stations, warehouses, transportation and distribution facilities, and utilities. Residential and commercial uses, generally located northwest of Bruckner Boulevard, occupy 9 percent and 2 percent of the land area, respectively. Approximately 4 percent of the land is vacant, and is primarily located in the northeast and southwest sections of the study area.

Employment in the Study Area. There were 6,278 private sector employees within the Oak Point Study Area (see Appendix 7). Approximately half of them worked in the service sector and manufacturing industries, i.e., 1,658 service sector employees and 1,564 manufacturing employees. The Oak Point Yard Study Area contained about 14 percent of all manufacturing jobs in the Bronx. Nearly 60 percent of the manufacturing jobs were involved in the production of non-durable goods. Because of the proximity of the Hunts Point IPIP (the City's principal wholesale food market), a high percentage of these employees probably work in food manufacturing businesses. The construction industry employed 915 workers, representing 15 percent of all private sector employees in the study area. With less than 14 percent of the total employment in the study area, wholesale trade provided 867 jobs. Retail trade provided employment for 676 or 11 percent of the total private sector employment in the study area.

Types of Businesses in the Study Area. In the Oak Point Yard Study Area, the service sector employed the largest number of workers in the study area, and it had the most business establishments (150).

The predominant land use in the study area is industrial, with much of it located east of Bruckner Boulevard. The northeastern part of the study area primarily contains one- to three-story warehouse buildings that are occupied by a mix of businesses, including a Frito Lay distribution center, Victory Food Service, Baldor Specialty Foods, F.W. Honerkamp Co., Mayrich Construction Corp., Tri-Boro Fibers, NY Organic Fertilizer, and a waste management facility, all in close proximity to the Oak Point Yard itself.

South of East 149th Street and east of Bruckner Boulevard buildings are generally larger scale three- to eight-story lofts, and include businesses such as Manhattan Beer Distribution (Coors),

Sunrise Dairy Distribution, Union Standard Equipment Corp., and Colonial Steel Corp. A 2-story warehouse building contains a distributor of paper products, and a newly constructed warehouse is to be occupied by a lighting fixture company.

Several large-scale businesses are located east of Bruckner Boulevard in the vicinity of East 149th Street, including a Coca-Cola distribution center, Brooklyn Sugar Company, Stuyvesant Fuel Service Corp. and CON-AGG Recycling Corp., which recycles used concrete. Also located on East 149th Street is Jetro, a large, food wholesaler and New Haven Trucking Company, occupying land that was formerly vacant.

Businesses west of Bruckner Boulevard include a mix of auto-related uses, food distributors, such as Farm Fresh Produce, Ehrlich Wholesale Grocer, T&T Import/Yellow Star Produce, which imports and distributes tropical produce, and a variety of other businesses, such as American Self-Storage, Smolka Company Inc., which provides bathroom and kitchen furnishings, Perna Carting Corp., a waste removal service, and Mayo Express, a moving company.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

REGIONAL IMPACTS

The economy of the project study area under the No Action Alternative is forecast to grow considerably over the next 26 years. From 1999 to 2025, the region's economy will expand as total employment and population levels grow, personal consumption, and personal income increase, and the gross regional product of the area expands. Employment growth for the overall Metropolitan New York region (including parts of New Jersey and Connecticut) is expected to be roughly in line with United States' growth trends, but population and personal income are expected to lag the national average.[1]

As Table 4-1 indicates, total employment in the Metropolitan New York region, New York State, and New Jersey is forecast to grow at just under the rate of the United States over the next 26 years (19 percent versus 20 percent). Population growth in the Metropolitan New York region, New York State, and New Jersey, on the other hand, is not expected to be as robust as the United States. The population of the Metropolitan New York region is only expected to grow 15 percent, which compared to the U.S. forecast of 37 percent, is considerably smaller. This is characteristic of the northeastern part of the U.S. and especially mature metropolitan areas such as the Metropolitan New York region, which still experience growth in employment, but do not experience rapid growth in population. This is due primarily to the relatively high population density levels in these areas that make less densely populated (and less expensive) surrounding areas more attractive to new residents.

[1] Personal Consumption represents purchases by individuals of durable goods (cars, major appliances, etc.), non-durable goods (food and clothing), and services. Personal consumption accounts for the largest share of U.S. gross domestic product (investment, government and net exports being the other components). Gross Regional Product is the value of all goods and services produced in a region and is commonly used as the basis for comparing the overall economic size and growth of regions, states, and countries (also referred to as Gross Domestic Product at the national level).

Table 4-1
Employment, Population, and Personal Income Projections

Region	Total Employment		Growth	Total Population		Growth	Personal Income		Growth
	1999	2025		1999	2025		1999	2025	
Metropolitan New York Region	11,087	13,205	19%	19,109	22,027	15%	707	1,172	66%
New York State	10,339	12,281	19%	18,197	20,308	12%	624	1,024	64%
New Jersey	4,654	5,549	19%	8,143	9,659	19%	281	475	70%
United States	163,760	196,182	20%	272,692	373,289	37%	8,335	23,568	182%

Note: Total employment and total population measures are in thousands; personal income measures are in billions of dollars. All dollar amounts are in 2002 dollars.
Source: Regional Economic Models, Inc.

In addition to employment and population predictions, Table 4-1 also predicts slower growth in personal income in the Metropolitan New York region, New York State, and New Jersey as compared to the United States. While employment growth is still expected in the region, population growth is expected to concentrate in less densely populated areas (such as southern and western parts of the country). Since personal income is tied to place of residence rather than place of work, associated personal income growth would be higher outside the metropolitan area. To a lesser degree, this slower growth can also be attributed to the relatively high per capita income levels in the Metropolitan New York region, in New York State, and in New Jersey as compared to the rest of the United States.

As shown in Table 4-2, personal consumption and gross regional product forecasts for the United States are slightly higher than the Metropolitan New York region from 1999 to 2025. Table 4-2 also examines anticipated growth in employment by major industry for the Metropolitan New York region and the United States, which are relatively similar across most industries. Employment in transportation and public utilities is forecast to grow somewhat faster in the Metropolitan New York region compared to the United States. While employment in finance, insurance and real estate (FIRE) in the Metropolitan New York region is expected to decrease by 5 percent, employment in FIRE for the United States is forecast to grow by 6 percent. Major industry growth sectors include services (most of the growth); retail trade; transportation and public utilities; and agricultural services, forestry, and fisheries—(a relatively small industry in the metropolitan area). Those projected to be in decline include manufacturing, wholesale trade, and construction.

Table 4-3 displays the forecasted change in output by industry. Forecasts for output by industry in the Metropolitan New York region and the United States are also relatively similar.[1] Output by industry is forecast to be greater in the Metropolitan New York region when compared to the United States in construction, FIRE, and transportation and public utilities. It is important to note that industries with a negative employment growth forecast, such as manufacturing, wholesale trade, and trucking and warehousing have a positive forecast in terms of output over the next 26 years. This is possible because of increasing productivity of workers over time. In addition,

[1] Output by industry represents all business sales of both intermediate and final goods and services.

Table 4-2
Economic and Employment Forecast for the Metropolitan New York Region and the United States

Measure	Metropolitan New York Region			United States		
	1999	2025	Growth	1999	2025	Growth
Gross Regional Product	$844	$2,565	204%	$9,916	$30,835	211%
Personal Consumption	$583	$1,639	181%	$6,751	$19,270	185%
Employment by Sector						
Manufacturing	953	889	-7%	19,249	17,921	-7%
Wholesale Trade	618	501	-18%	7,472	6,457	-14%
Services	4,145	6,149	48%	51,661	77,923	51%
Retail Trade	1,481	1,519	3%	26,915	29,308	9%
FIRE	1,324	1,262	-5%	12,979	13,700	6%
Transportation and Public Utilities	643	741	15%	7,972	8,446	6%
Trucking and Warehousing	121	86	-28%	2,517	1,810	-28%
Construction	472	470	-.4%	9,253	8,833	-5%
Agricultural Services, Forestry, and Fisheries	78	130	67%	2,048	3,124	53%

Note: Personal consumption and gross regional product measures are in billions of dollars; employment by industry sector measures are in thousands. All dollar amounts are in 2002 dollars. Trucking & warehousing is not a major industry sector (it is a two-digit Standard Industrial Classification code industry) but is a key sector in the Cross Harbor Freight Movement study.

Source: Regional Economic Models, Inc. (REMI)

Table 4-3
Output by Industry Forecasts

Output by Industry	Metropolitan New York Region			United States		
	1999	$2025	Growth	1999	2025	Growth
Manufacturing	$288	$509	77%	$5,318	$10,657	100%
Wholesale Trade	$104	$187	80%	$1,065	$2,012	89%
Services	$313	$605	93%	$3,115	$6,138	97%
Retail Trade	$78	$127	63%	$1,367	$2,369	73%
FIRE	$354	$690	95%	$2,459	$4,575	86%
Transportation and Public Utilities	$124	$242	95%	$1,424	$2,751	93%
Trucking and Warehousing	$16	$31	94%	$298	$586	97%
Construction	$63	$79	25%	$872	$1,051	21%
Agricultural Services, Forestry, and Fisheries	$3	$4	33%	$59	$81	37%

Notes: Trucking and warehousing is not a major industry sector (it is a two-digit Standard Industrial Classification code industry) but is a key sector in the Cross Harbor Freight Movement study.

Above units are in millions of dollars.

Source: Regional Economic Models, Inc. (REMI)

while manufacturing employment in both the United States and Metropolitan New York region is expected to decline by the same rate (7 percent), U.S. output is projected to increase by more than the Metropolitan New York region. This can only be due to either a different mix of

manufacturing industries, lower projected productivity increases, or a combination of those two effects. In this case, it is more likely that the Metropolitan New York region's mix of manufacturing industries are concentrated more heavily in those with relatively low expected productivity enhancements.

LOCAL IMPACTS

Under the No Action Alternative, several port projects are planned within the New Jersey Study Areas, including the development of a portion of the former Military Ocean Terminal at Bayonne (MOTBY) for port facilities and expansion of the Global Marine Terminal. Roadway improvements in the area will be implemented under Portway, and some increases in rail, truck and barge activities are expected to result from these projects. In addition, Canadian Pacific is proposing to improve its intermodal facility at Oak Island Yard.

In the Brooklyn Study Areas, the South Brooklyn Marine Terminal (SBMT) will undergo two phases of development. The first phase is the creation of an intermodal facility including an on-dock rail yard, and other improvements. The second phase includes the development of a 90- to 105-acre auto marine terminal. In addition, the tracks adjacent to the terminal along First Avenue between 39th and 65th Streets will be upgraded to serve intermodal and port facilities along the Brooklyn waterfront. In the Bronx Study Areas, the Fulton Fish Market is expected to be moved to the Hunts Point Peninsula by 2005.

These activities may affect economic conditions in project study areas through increased employment, increased demand for existing businesses, and induced attraction for new businesses. Construction and operational activities related to the No Action Alternative are not part of the Cross Harbor Freight Movement Project and would be implemented with or without the project.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

As discussed in Chapter 8, "Transportation," the TSM alternative is forecast to divert only about 69,000 tons of cargo annually. This is about 15 percent of the forecast diversion of the Expanded Float Operations Alternative, and less than 1 percent of the diversion potential of the Tunnel Alternative. As shown in Chapter 8 and this chapter, the Expanded Float Operations Alternative generates minimal transportation and economic benefits to the region. Given that the diversion impact of the Expanded Float Operations Alternative is more than five times that of the TSM Alternative, it is reasonable to believe that the TSM Alternative would have negligible impacts. Therefore, no quantitative assessment of this alternative is provided.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

REGIONAL IMPACTS

The impact analysis for this alternative incorporates one stream of direct economic impacts-reduced industry production costs due to travel efficiencies and cost savings (rail and highway). Regional macroeconomic impacts (including multiplier effects) based on REMI modeling are also quantified. The combined results represent the total economic benefits of the alternative. All benefits are shown for the year 2025 in 2002 dollars. The Expanded Float Operations Alternative would not generate substantial rail service east of the Hudson River. Therefore, it is not expected that business attraction/retention benefits would be significant for this alternative. A complete stream of economic benefits is shown in Chapter 20, "Financial Analysis," and Appendix 7.

Travel Efficiency and Cost Savings for Business Trips

The Expanded Float Operations Alternative would result in direct travel efficiency benefits. Some existing rail trips to New York City and Long Island would benefit from reduced travel times, increased reliability and reduced costs. Some commodity truck trips would divert from truck to rail to capture cost savings. And the reduction of truck trips from increased rail usage, would improve highway efficiency for the remaining auto and truck trips. Table 4-4 presents the following three main components of the travel efficiency and cost savings for business trip benefits for the year 2025:

Table 4-4
Travel Efficiencies and Cost Savings
for the Expanded Float Operations Alternative in 2025*

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
Personal highway travel**	$1.3	$0.6	$1.2	$2.0
New rail trips using the Float, diverted from a truck trip	$0.8	$0.8	$0.02	$1.6
Existing rail trips that benefit from using the Float	$0.01	$0.01	$0.0	$0.02
Business oriented highway trips benefiting from reduced highway congestion due to reduced truck trips	$0.4	$0.2	$0.3	$0.7
Total	**$2.5**	**$1.6**	**$1.5**	**$4.3**

Notes: * All figures are shown in millions of 2002 dollars.
** Personal (non-business) highway travel benefits are not inputs for the regional economic impacts analysis, which takes into account only business cost savings. However, estimates of personal highway travel benefits are included in the total benefits used in the benefit-cost analysis.

- New rail trips using the Expanded Float Operations Alternative would divert trips from truck trips. (The dollar-based estimate of the cost savings derived by diverting a truck trip to rail takes into account travel time and reliability differences.)[1]
- Existing rail trips would benefit from using the Expanded Float Operations Alternative. The monetized benefits to shippers that would accrue from reduced travel time and cost, and improved reliability for trips using the Expanded Float Operations Alternative as compared to the Selkirk Bridge (close to Albany).[2]
- Business-oriented highway trips (truck and on-the-clock auto) would benefit from reduced highway congestion (as a result of reduced truck trips). The dollar-based estimate for business-oriented highway trips would benefit from accident cost savings, vehicle operating cost

[1] As calculated by the Shipper Choice Model.

[2] As calculated by the Shipper Choice Model.

savings, and travel time savings from the reduction in the number of trucks on the highway system.[1]

The Metropolitan New York region (including parts of New Jersey and Connecticut) would receive an estimated $1.2 million in travel efficiencies and cost savings for business trips and $1.3 million for personal (non-business) trips in 2025 under the Expanded Float Operations Alternative, for a total of $2.5 million. A total benefit of $1.6 million is estimated to accrue to New York State. New Jersey is expected to receive a benefit of $1.5 million, and the United States as a whole is estimated to receive $4.3 million in travel efficiencies and cost savings for business and personal trips.

Regional Macroeconomic Impacts

REMI modeling indicates that secondary effects would result in about 100 new jobs in the Metropolitan New York region, and personal income is anticipated to increase by $8 million in 2025 (see Table 4-5). Similarly, employment in New York State is expected to increase by about 100 jobs and personal income is anticipated to increase by $7 million. Employment in New Jersey is expected to increase by 14 jobs and personal income is estimated to increase by $1 million. Overall personal income in the United States is expected to increase by $10 million in 2025.

Table 4-5
Results of the REMI Regional Macroeconomic Impacts Analysis for the Expanded Float Operations Alternative in 2025*

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
Employment	107	103	14	0
Personal Income	$8	$7	$1	$10

Note: * All dollar figures shown in millions of 2002 dollars.
Source: Regional Economic Models, Inc. (REMI).

The economic benefit for the United States is the largest because it receives the entire travel efficiency and cost savings benefits of the alternative including the regional level benefits, the benefit of reduced long haul truck trips throughout the country, and more efficient rail and truck trips.

LOCAL IMPACTS

The expanded float service and expanded West Maspeth Yard would generate some increase in employment to handle the day-to-day operations of the yards (i.e. maintenance, repair, loading and unloading of goods, etc.). Businesses located near these sites would benefit from access to improved freight transportation. Any increased noise or other impacts due to increased freight

[1] As calculated by the NYMTC "Best Practices Model" year 2025 travel demand model, as implemented with the TRANSCAD software. The 2025 forecasts from the NYMTC model produce results for post-processing to monetize benefits.

activity at these yard sites would be insignificant due to the industrial nature of the neighborhoods in which they are located.

ECONOMIC IMPACT OF RAIL OPERATIONAL EXPENDITURES

Economic impacts from the car float operations and maintenance expenditures are smaller than the construction period impacts, but indicate less of a difference than the massive one-time capital expenditures needed to construct a rail tunnel. Direct annual expenditures of $18.2 million generate $24 million of personal income for the Metropolitan New York region in 2025, and over 370 jobs. Again, the impact is somewhat larger in New York State because that is where the bulk of additional float operational activity would occur. Still, a substantial amount of the operational activity of the float would also take place in New Jersey, creating benefits including $10 million of personal income, $18 million in GRP, and over 150 jobs.

Although the benefit of operating and maintaining the Expanded Float Operations Alternative is allocated to both New Jersey (Hudson County) and New York State (Brooklyn), New York State would derive a larger benefit of the purchases of equipment and increased employment required to operate and maintain the car float operation. This is primarily due to the size of the New York State economy relative to New Jersey. Accordingly, New York State would capture a larger share of increased demand for goods and services (the multiplier effect) as compared to New Jersey, because it has a greater capacity to supply (meeting increased demand), and consume additional goods and services.

The annual operating and maintenance expenditures under the Expanded Float Operations Alternative are roughly 90 percent of the annual operating and maintenance of the Single Tunnel System. Ostensibly, the annual operating and maintenance expenditures for the Single Tunnel System should be less than the Expanded Float Operations Alternative because running a train through a tunnel is less costly than maintaining a network of floats and barges. The largest cost element of the Single Tunnel System is the capital cost of building the tunnel; operating and maintaining freight rail service is a relatively much smaller expense (see Table 4-6). The capital cost of the Expanded Float Operations Alternative is, however, substantially smaller (with correspondingly fewer benefits to the transportation system) than the Single Tunnel System, which is discussed in the following section.

Table 4-6
Economic Impacts of Operating and Maintaining the Expanded Float Operations Alternative in 2025

Benefit	Metropolitan New York Region	New York State	New Jersey
Personal Income	$24 M	$16 M	$10 M
Gross Regional Product	$38 M	$24 M	$18 M
Employment	377	256	157

Source: Regional Economic Models, Inc. (REMI)

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

Regional Impacts

The Single Tunnel System is expected to generate travel efficiency and cost savings benefits for rail and highway trips (direct effects) and business attraction (induced effects). These impacts are translated into inputs for the REMI model to estimate total regional macroeconomic impacts (personal income and employment). The results of the three assessments represent the total economic benefits of the project alternative. All benefits in this section are shown for the year 2025 in 2002 dollars. A complete stream of economic benefits is provided in Chapter 21, "Financial Analysis" and Appendix 7.

Travel Efficiency and Cost Savings for Personal and Business Trips. The Single Tunnel System would result in direct travel efficiency benefits. Some existing rail trips to the East-of-Hudson region in New York City and Long Island would benefit from reduced travel times, increased reliability, and reduced costs. Some commodity truck trips would be diverted from truck to rail to capture cost savings. In addition, increased rail usage would reduce truck trips and improve highway efficiency for the remaining auto and truck trips. Tables 4-7 and 4-8 (for the New Jersey tunnel alignment and Staten Island tunnel alignment respectively) display the benefits to personal (non-business) highway travel, as well as the following three main components of travel efficiency and cost savings for business trip benefits for the year 2025:

Table 4-7
Travel Efficiencies and Cost Savings for the Single Tunnel System (New Jersey Tunnel Alignment) in 2025*

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
Personal highway travel**	$10.4	$4.7	$9.4	$15.9
New rail trips using the tunnel, diverted from truck trips	$11.2	$12.1	$0.4	$27.7
Existing rail trips that benefit from using the Tunnel	$0.6	$0.6	$0.0	$1.1
Business oriented highway trips benefiting from reduced highway congestion due to reduced truck trips	$3.2	$1.5	$3.0	$5.8
Total	**$25.4**	**$18.9**	**$12.8**	**$50.5**

Notes: * All figures are shown in millions of 2002 dollars.

** Personal (non-business) highway travel benefits are not inputs for the regional economic impacts analysis, which takes into account only business cost savings. However, estimates of personal highway travel benefits are included in the total benefits used in the benefit-cost analysis.

Table 4-8
Travel Efficiencies and Cost Savings for the Single Tunnel System (Staten Island Tunnel Alignment) in 2025*

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
Personal highway travel**	$10.3	$4.6	$9.3	$15.7
New rail trips using the tunnel, diverted from truck trips	$7.2	$7.7	$0.2	$16.2
Existing rail trips that benefit from using the Tunnel	$0.1	$0.1	$0.0	$0.2
Business oriented highway trips benefiting from reduced highway congestion due to reduced truck trips	$3.1	$1.5	$2.9	$5.8
Total	**$20.7**	**$13.9**	**$12.4**	**$37.9**

Notes: * All figures are shown in millions of 2002 dollars.

** Personal (non-business) highway travel benefits are not inputs for the regional economic impacts analysis, which takes into account only business cost savings. However, estimates of personal highway travel benefits are included in the total benefits used in the benefit-cost analysis.

- New rail trips using the tunnel would lessen the number of truck trips. (The dollar-based estimate of the cost savings derived by diverting a truck trip to rail takes into account travel time and reliability differences.)[1]
- Existing rail trips that benefit from using the tunnel. The monetized benefits to shippers would accrue from reduced travel time and cost and improved reliability for trips using the tunnel as compared to the Selkirk Bridge (close to Albany).[1]
- Business-oriented highway trips (truck and business-auto) would benefit from reduced highway congestion as a result of reduced truck trips. The dollar-based estimate for business-oriented highway trips benefiting from accident cost savings, vehicle operating cost savings, and travel time savings due to a reduction in the number of trucks on the highway system.[2]

The Metropolitan New York region (including parts of New Jersey and Connecticut) would receive an estimated $14.1 million in travel efficiencies and cost savings for business trips and $10.4 million in savings for personal (non-business) trips in 2025 under the New Jersey tunnel alignment, for a total of $25.4 million. Similarly, a benefit of $18.9 million is estimated to accrue to New York State (this amount is different from the metropolitan area because benefits to parts of New York State are not included in the Metropolitan New York region total, and parts of New Jersey and Connecticut are not included in the New York State total). New Jersey is expected to receive a benefit of $12.8 million, and the United States as a whole would receive

[1] As calculated by the Shipper Choice Model.

[2] As calculated by the NYMTC "Best Practices Model" year 2025 travel demand model, as implemented with the TRANSCAD software. The 2025 forecasts from the NYMTC model produce results for post-processing to monetize benefits.

$50.5 million in travel efficiencies and cost savings for business and personal trips; $28.8 million of this total are due to improved rail service and operation.

Induced Business Attraction. A major infrastructure improvement (i.e., greatly enhanced regional freight rail service to East-of-Hudson) has the potential to generate new warehousing, distribution, and manufacturing businesses not previously located within the Metropolitan New York region. Evidence from case studies shows that freight-based infrastructure investments, such as the Cross Harbor Freight Movement Project, can lead to increased economic activity, particularly warehousing and other freight intensive activities. Freight-based infrastructure investments can improve transportation capacity, efficiency, reliability, and the levels of service. Major transportation investments can create cost savings for businesses, making areas more attractive for business relocation and retention. The detailed appendix to this economic analysis (Appendix 7) provides a thorough examination of the likely business attraction/retention effects including numerous case studies. The business attraction/retention model, based on a detailed land use analysis, estimates the number of new jobs that would accompany this increase in economic activity. These results are shown in Table 4-9, and incorporate the following:

Table 4-9
Net Business Attraction by Region
for the Single Tunnel System in 2025

Region	Net Job Creation-New Jersey Alignment	Net Job Creation-Staten Island Alignment
Bronx	3,040	2,830
Queens	1,800	1,670
Kings	2,740	2,600
Long Island	1,060	1,000
Total	**8,640**	**8,100**

- Interviews with local development experts in the New York City region, combined with land use data analysis, helped to determine the specific industrial areas east of the Hudson River that are likely to experience an increase in business attraction/retention and a corresponding increase in employment. The land use data analysis utilizes the Real Property Assessment Data (RPAD) from the New York City Department of Finance.[1]
- The land use data analysis is complemented by real estate data obtained from the Greiner-Maltz Company of New York for areas in West Maspeth (Queens and Brooklyn), East New York, and Greenpoint, including availability rates for vacant and existing sites.
- Estimates of employment growth in Brooklyn, Queens, the Bronx, and Long Island presented in this section are provided for the year 2025, up to 15 years after the anticipated completion of the tunnel. To account for the time lag inherent with business attraction, employment growth is expected to accrue over a 15-year time period as businesses adjust their logistics and locational decisions over time to capture the full benefits of the Cross Harbor improvements.

[1] Refer to the technical appendix to this section for a complete list of interviewees, and a detailed explanation of the induced business attraction methodology.

- Land lost as a result of the West Maspeth Yard expansion is not included in the land use portion of the induced business attraction analysis so as to avoid overstating induced business attraction impacts. It was assumed that no jobs would be lost as a result of the displaced businesses at West Maspeth Yard, but rather, that the jobs would be relocated elsewhere in the region.
- Ninety percent of the benefit would be purely a regional competitiveness benefit to the East-of-Hudson region, impacting the future growth of manufacturing and warehousing activity. The remaining 10 percent of the benefit is a national-level benefit and reflects the foreign direct investment and productivity benefits of business relocation.[1] Offsets are necessary to reflect the fact that this benefit is primarily a benefit to the region rather than a national level benefit. Employment offsets were applied to New Jersey, Upstate New York, and the rest of the United States.

The New Jersey and Staten Island tunnel alignments of the Single Tunnel System would result in the creation of 8,640 and 8,100 jobs respectively, through business attraction and retention in Brooklyn, Queens, the Bronx, and Long Island. Net job creation in Brooklyn and Queens is projected to be between 2,740 and 2,600 jobs in Brooklyn and between 1,800 and 1,670 new jobs in Queens. The location of the expanded West Maspeth Yard in Queens, but in close proximity to Brooklyn, would provide dramatically improved freight rail service to businesses located within 4 miles of the yard. The Bronx is also expected to receive a net job creation benefit in the range of 2,830 to 3,040 jobs in 2025, primarily due to improved rail service to the Oak Point Yard and the Hunts Point industrial area. Finally, improved rail service to the Pilgrim Yard would stimulate rail intensive business attraction and retention on Long Island creating an estimated 1,000 to 1,060 new jobs under the alternative tunnel alignments in 2025.

Based on lower projections of total rail volume moving to the East of the Hudson, induced business attraction under the Staten Island tunnel alignment is expected to be lower than the New Jersey tunnel alignment. The Staten Island induced business attraction employment forecasts are estimated to be 93 percent of the Greenville business attraction forecast, based on a 7 percent difference in diversion of truck traffic.

A final conceptual note about business attraction is that while it typically represents an economic development benefit for the region where the transportation improvement occurs (mainly east of the Hudson River), it likely reflects a change in the distribution of economic activity rather than generation of new economic activity (at the national level). The Tunnel Alternative improvements reflect an efficiency gain for the region and nation, but also a regional competitiveness boost that inherently helps the East-of-Hudson area relative to the rest of the country. This aspect, largely experienced through business attraction, is primarily a gain for the East-of-Hudson area but may represent a reduction of future economic growth for the rest of the country, as there is a limited national pool of resources—in particular, labor. This implies some reallocation of future growth from other areas (such as New Jersey) towards the East-of-Hudson area. The reallocation will vary by industry depending on each region's share of national industry employment.

[1] The 10 percent estimate is consistent with national level industry analyses of infrastructure investments by Ishaq Nadiri; for FHWA.

Regional Macroeconomic Impacts. Table 4-10 displays the results of the REMI regional macroeconomic economic analysis for the Metropolitan New York region, New York State, and New Jersey for the Single Tunnel System for each tunnel alignment. REMI modeling indicates that multiplier and business attraction jobs would result in 16,900 new jobs in the Metropolitan New York region and personal income is anticipated to increase by $890 million in 2025 under the New Jersey tunnel alignment. Similarly, employment in New York State is expected to increase by 16,850 and personal income is anticipated to increase by $850 million. Employment in New Jersey is also expected to increase by 1,200 and personal income is estimated to increase by $120 million. Overall personal income in the United States is expected to increase by $205 million in 2025. New Jersey economic benefits are the result of increased travel efficiencies and multiplier effects (additional business and consumer spending), but do not include business attraction/retention gains.

Table 4-10
Results of the REMI Regional Economic Impact Analysis, Single Tunnel System, 2025

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
New Jersey Tunnel Alignment				
Employment	16,900	16,850	1,200	0
Personal Income (in millions)	$890	$850	$120	$205
Staten Island Tunnel Alignment				
Employment	15,530	15,440	1,040	0
Personal Income (in millions)	$820	$780	$100	$170

Source: Regional Economic Models, Inc. (REMI).

Under the Staten Island tunnel alignment, employment in the Metropolitan New York region is expected to increase by 15,530, and personal income is anticipated to increase by $820 million in 2025. Employment in New York State is expected to increase by 15,440 and personal income is anticipated to increase by $780 million. Employment in New Jersey is also expected to increase by 1,040 and personal income is estimated to increase by $100 million. Overall personal income in the United States is expected to increase by $170 million in 2025. As with the New Jersey tunnel alignment, New Jersey economic benefits are the result of increased travel efficiencies and multiplier effects (additional business and consumer spending), but do not include business attraction/retention gains.

The United States column represents the national level impact of the Single Tunnel System. Travel efficiencies and cost savings for business trips increase the total factor productivity of the United States economy, which in turn increases the personal income of the nation. Key findings include:

- The economic impact for the Metropolitan New York region and New York State is larger than that of the United States because the United States receives the productivity benefit of this project, but the Metropolitan New York region and New York State accrue benefits from *both* productivity (travel efficiencies), and regional competitiveness (net business attraction/ retention) benefits.

- The employment impact at the United States level is not expected to be considerably different from zero (i.e., no change) since long-run national level employment is determined by demographic trends and labor force participation (ignoring short-term business fluctuations). The Tunnel Alternative is not expected to change United States demographic or labor force trends.
- The results of the United States analysis cannot be added to the regional results as they represent the entire national level impact of the alternative.

Economic Benefits Compared to the No Action Alternative

Table 4-11 compares the expected increase in employment under both tunnel alignments to the No Action Alternative economic forecast for the Metropolitan New York region. Table 4-12 compares personal income in these areas to the No Action Alternative forecast. Economic impacts from each table are based on the full REMI economic impact results presented previously.

Table 4-11
Metropolitan New York Employment Change for the Single Tunnel System Compared to the No Action Alternative Economic Forecast

Industry	Existing Conditions	No Action Alternative 2025*	New Jersey Tunnel Alignment 2025	Percent Change**	Staten Island Tunnel Alignment 2025*	Percent Change**
Manufacturing	953	889	893	0.4	892	0.3
Warehousing	121	86	90	4.2	89	3.7
Wholesale Trade	618	501	503	0.4	503	0.4

Notes:
*All employment shown in thousands.
**No Action Alternative and tunnel alignment.
All employment changes are rounded to the nearest thousand.
Source: Regional Economic Models, Inc. (REMI).

Table 4-12
Personal Income Change for the Single Tunnel System Compared to the No Action Alternative Economic Forecast

Industry	Existing Personal Income*	No Action Alternative 2025*	New Jersey Tunnel Alignment 2025	Percent Change	Staten Island Tunnel Alignment 2025	Percent Change
Metropolitan New York Region	$707	$1,172	$1,173	0.08	$1,173	0.07
New York State	$624	$1,025	$1,026	0.08	$1,026	0.08
New Jersey	$280	$475	$475	0.03	$475	0.02

Note: * All figures are in billions of 2002 dollars; percentages are estimated from values in Table 4-10.
Source: Regional Economic Models, Inc. (REMI).

Highlights from these tables include:

- Employment impacts represent both business attraction and *retention*. The tunnel would not reverse forecasted declines in manufacturing, warehousing, and wholesale trade employment as shown in Table 4-11. However, it is possible that some existing manufacturing/warehousing firms that otherwise would leave the region could benefit from greatly improved freight rail service and may be retained in the region. In other words, the positive employment impacts for these industries imply a stemming of projected No Action Alternative trends (i.e., job loss).

- Despite the relatively large magnitude of employment impacts for the Single Tunnel System, manufacturing and wholesale trade impacts still represent less than 1 percent of total employment in each respective industry in 2025.

  Warehousing employment is estimated to increase by 3,600 jobs under the New Jersey alignment, representing 4.2 percent of total warehousing employment in 2025. Based on economic forecasts for the region, the tunnel's impact would retain and attract 3,600 jobs for an industry that is expected to lose 35,000 jobs over the next 25 years. Warehousing employment is estimated to increase by 3,200 jobs under the Staten Island tunnel alignment, representing 3.7 percent of total warehousing employment in 2025. Based on economic forecasts for the region, the tunnel's impact will retain and attract 3,200 thousand jobs for an industry that is expected to lose 35,000 jobs over the next 25 years. While not completely reversing the forecasted decline in warehousing employment, substantially improved freight rail service would require an expansion of warehousing and distribution facilities, helping to retain warehousing firms that would benefit from the increase in demand for their services.

- Personal income impacts that are over $850 million for the Metropolitan New York region and New York State under the Single Tunnel System in 2025 represent less than two-tenths of a percent of total personal income in each respective geographic area. Thus, although 850 million dollars in personal income seems like a large number, and does in fact represent a significant benefit of the project, it represents a small part of total regional wealth and is a credible estimate of the relative impact of a major transportation infrastructure investment project. However, as discussed previously, the TSM alternative would have negligible economic benefits, and, as shown in Table 4-5, the Expanded Float Operations would generate only $8 million in personal income in the Metropolitan region, $7 million in New York State, and $1 million in New Jersey.

Local Impacts

Rail Yards.

Greenville Yard, Jersey City. The tunnel would be located under Greenville Yard and along the Greenville Branch east of the New Jersey Turnpike Extension. Since trains would pass directly under Greenville Yard without stopping, the New Jersey tunnel alignment would not negatively impact local businesses near the yard and would also not generate any employment in the yard itself. There is a potential for displacement of the float bridge operation under either tunnel alignment. Once the tunnel is constructed, the yard site could be redeveloped for a variety of uses. Any noise impacts to local businesses along the tunnel alignment would be insignificant because of the heavily industrial nature of the area in which it is located.

65th Street Yard, Brooklyn. 65th Street Yard would continue to serve as a rail yard with increased capacity for goods delivered via the tunnel. Approximately two daily round trip trains would travel to and from the yard under this alternative.

Expanded operations at the yard would generate some direct increases in employment to handle the day-to-day operations (i.e., maintenance, repair, loading and unloading of goods, etc.). Existing businesses located near these sites would benefit from access to improved freight transportation. In addition, there is the potential for induced business growth. For example, at the Brooklyn Army Terminal (BAT), which is located directly north of 65th Street Yard, current vacancies in warehouse buildings could potentially be occupied by businesses associated with rail freight operations (i.e., trucking companies, warehouses, insurance, bonds, etc.) or other manufacturing and service industries that would benefit from reduced shipping costs and proximity to rail freight facilities.

Any increased noise or other impacts caused by increased freight activity at the yard would be insignificant because of the industrial nature of the area in which it is located. The 65th Street Yard study area is zoned M1 and M2, which allows businesses to generate some levels of noise.

West Maspeth Yard, Queens. As explained in Chapter 2, "Project Alternatives," introducing intermodal rail service to West Maspeth Yard will require an expansion of the existing rail yard site. The proposed intermodal rail yard will require new infrastructure including maintenance facilities, additional rail lines, and other related services. To accommodate this expansion, existing businesses on the site of the proposed yard will have to be acquired through eminent domain to make room for new infrastructure associated with the expansion. Vacant land in the area will also be utilized to facilitate the development of West Maspeth Yard. For the Single Tunnel System, an approximately 108-acre intermodal rail yard would be sited in West Maspeth, Queens (see Figure 4-5). The site would include the current West Maspeth Yard site, the MTA site, and part of the former Phelps Dodge refinery.

Direct Impacts on Businesses Located Within Potential Yard Site. While the yard would result in benefits to businesses on a local and regional level, the creation of the yard would directly displace between approximately 25 to 29 businesses with a range of 1,185 to 1,383 employees on the project site. Table 4-13 shows businesses by industry type that would be potentially displaced. Wholesale trade makes up the largest portion of the displaced businesses, representing 9 out of the 29 businesses or approximately 31 percent of the total. Business services and motor freight transportation and warehousing are also a substantial presence within the project site with 5 and 3 businesses each, accounting for almost 17 percent and 10 percent respectively of all businesses. There is also one commercial use (video store) on the project site.

The wholesale trade industry employs the highest number of workers with 343 out of 1,383 employees, representing almost 25 percent of the total workforce within the project site. Business services industry is the second leading employer with approximately 304 employees or 22 percent of all employees. Motor freight transportation and warehousing, printing and publishing, and engineering, accounting, research, management, and related services each employ at least 100 employees representing between 11 percent and 13 percent of total employment in the project site. In addition to these businesses, one government facility—MTA Division Supply Logistics—would be displaced.

Table 4-13
Existing Private Businesses and Employment Within the Expanded West Maspeth Yard Site (Single Tunnel System)

Industry Type	Number of Businesses*	Percent of Total Businesses	Number of Employees*	Percent of Total Employees
Apparel	1	3.4	80	5.8
Automotive Repair, Services & Parking	1	3.4	5	0.4
Building Materials, Hardware, Garden Supply, & Mobile Home Dealers	1	3.4	13	0.9
Business Services	5	17.2	304	22.0
Electric, Gas & Sanitary Services	2	6.9	22	1.6
Engineering, Accounting, Research, Management, & Related Services	1	3.4	150	10.8
Food Stores	1	3.4	42	3.0
Industrial & Commercial Machinery & Computer Equipment	1	3.4	24	1.7
Membership Organizations	1	3.4	1	0.1
Motion Pictures	1	3.4	2	0.1
Motor Freight Transportation and Warehousing	3	10.3	185	13.4
Plumbing, Heating & Air-Conditioning	1	3.4	32	2.3
Printing, Publishing & Allied Industries	1	3.4	180	13.0
Wholesale Trade	9	31.0	343	24.8
TOTAL	**29**	**100.0**	**1,383**	**100**

Note: * Businesses were identified through field observations, GIS, web searches, Cole's Criss-Cross Directory and data from Claritas Connect/Claritas, Inc. Marketplace, and Dunn & Bradstreet Data. The various sources indicated a range in the number of businesses in the project site, from 25 to 29. This table shows the highest number of businesses that would be displaced.
Source: Field surveys conducted Spring 2002; Claritas Connect/Claritas, Inc.; Marketplace, Dunn & Bradstreet Data 2001

The creation of the expanded West Maspeth Yard would result in substantial displacement. As described in "Mitigation Measures," below, there is more than adequate building space available in the West Maspeth area to relocate these businesses. In addition, financial assistance and other relocation services would be provided to displaced entities, as required by federal and state laws that regulate business relocation.

Secondary and Induced Effects on Businesses Located in the Vicinity of the Potential Yard Site. The creation of an intermodal freight facility would benefit existing businesses located within at least four miles of the yard in Queens and Brooklyn. It would also be likely to induce business development including businesses that rely on freight transport as well as distribution and warehouse businesses that would serve the yard (see "Regional Impacts" above).

The area surrounding the expanded West Maspeth Yard site is primarily industrial with a wide range of businesses, including warehouse and distribution, trucking, food distribution, printing and publishing, building materials, motor freight services, and business services. The majority of these businesses rely heavily on truck transport to receive goods and ship their products throughout the city and region. Many of these businesses would very likely benefit from the

lower transportation costs of using rail service compared to trucking and from improved delivery of their goods because of better transportation access. Businesses located near the intermodal yard would also likely experience employment growth as a result of the increased efficiency and higher productivity.

There would be no significant noise impacts from increased rail and freight activity on these local businesses because the businesses are located in industrialized manufacturing districts with M1, M2, and M3 zoning designations. These manufacturing districts generally allow for noxious uses that create industrial nuisances such as noise. Although some traffic impacts are predicted in the vicinity of the yard (see Chapter 8, "Transportation"), these impacts would be mitigated. Regional benefits include decreased truck traffic on the nearby highways (BQE and LIE).

Harlem River Yard and Oak Point Yard. These yards would experience some additional increased freight activity under the Single Tunnel System. Businesses located near these sites, such as Hunts Point Market, would benefit from access to improved freight transportation. Any increased noise or other impacts from increased freight activity at the yards would be insignificant because of the industrial nature of the area in which they are located.

Rail Lines. As shown in Table 2-4 in Chapter 2, "Project Alternatives," rail lines in New Jersey and New York would experience considerable increased operational activity under the Single Tunnel System. The increased operational activity along these rail lines would not result in any adverse impacts on local businesses located within the study area along the rail lines. The businesses within these study areas are all located in manufacturing areas or along busy commercial corridors. Benefits could accrue to industrial and commercial businesses located along the rights-of-way; freight could potentially be delivered directly to businesses via sidings along the rail lines. This is particularly feasible along the Bay Ridge Branch and Montauk Branch.

Economic Impact of Rail Operational Expenditures

Expenditures associated with the operation of the Cross Harbor project would generate economic impacts for the Metropolitan New York City region and surrounding states. Operation of the tunnel is more labor-intensive than capital-intensive; therefore, expenditures have relatively large impacts on personal income and consumer spending, as opposed to the purchases of raw materials associated with construction expenditures. Operation and maintenance expenditures borne by state and local governments also represent opportunity costs, since these dollars likely would otherwise be spent on different government services and infrastructure but with similar economic impacts.

The methodology used to calculate the economic benefits of operation and maintenance expenditures is similar to the methodology used for construction expenditures. Detailed year-by-year operation and maintenance expenditures (i.e., costs) were used as input variables to the REMI economic simulation model to analyze the total regional economic impact of operating the Cross Harbor transportation improvements. The analysis of operational expenditures was more straightforward than the construction expenditure analysis since most costs are consistent with typical railroad operations and can be input into REMI as additional railroad industry output. Operating and maintenance expenditures for the Tunnel Alternative are expected to begin to accrue in 2010, and operating and maintenance expenditures for the Expanded Float Operations Alternative are expected to begin in 2006. As with the construction expenditure analysis, the operation and maintenance expenditure analysis was performed for Metro New York City, New York State, and the State of New Jersey.

Important notes regarding the analysis include the following:

- These results represent the impact of operating and maintaining the Single Tunnel System alternative, but do not include the impact of more efficient goods movement and accessibility to markets.
- It is important to keep in mind that while this impact would contribute economic activity to the region, similarly sized alternative expenditures would also likely contribute an equal impact (regardless of its benefit to the transportation system).
- The REMI model measures jobs by their location, but personal income (earnings of workers) is adjusted to reflect commuting patterns, and therefore place of residence. This is important in terms of properly accounting for the ripple effects of consumer spending (for example, commuters from New Jersey working in New York City likely spend much of their earnings in New Jersey and their earned income is attributed to New Jersey).
- Benefits by region are not additive (i.e., left to right).

The Single Tunnel System includes two cost elements that are not included in the operating and maintenance expenditures for the Expanded Float Operations Alternative:

- The cost of expanding and operating West Maspeth Yard; and
- The inclusion of annual deposit to a fund (rainy day or sinking fund) for future major repairs/rehabilitation to the Single Tunnel System.

As a result, the operating and maintenance cost of the Single Tunnel System is greater than the Expanded Float Operations Alternative.[1]

Table 4-14 displays the impact of operating and maintaining the Single Tunnel System in 2025. Economic impacts from the rail operations and maintenance expenditures are much smaller than the construction period impacts. Direct annual operating and maintenance expenditures of $20.4 million generate $50 million of personal income and 560 jobs for the Metropolitan New York region in 2025. The impacts are concentrated in New York State because that is where the majority of additional rail operational activity (especially around the expanded West Maspeth site) will occur. Still, New Jersey benefits from $12 million of personal income, $15 million in GRP, and over 170 jobs.

Table 4-14
Economic Impacts of Operating and Maintaining the Single Tunnel System in 2025

Benefit	Metropolitan New York Region	New York State	New Jersey
Personal Income	$50 M	$43 M	$12 M
Gross Regional Product	$46 M	$37 M	$15 M
Employment	560	450	170
Sources: Regional Economic Models, Inc. (REMI)			

[1] Economic impacts from construction expenditures associated with the Tunnel Alternative, including employment benefits, are discussed in Chapter 16, "Construction and Construction Impacts."

DOUBLE TUNNEL SYSTEM

Regional Impacts

The Double Tunnel System would generate the same type of regional impacts as the Single Tunnel System discussed in the previous section, but to a greater degree.

Travel Efficiency and Cost Savings for Business Trips. The potential Double Tunnel System is expected to result in increased direct travel efficiency benefits and cost savings relative to the Single Tunnel System. Tables 4-15 and 4-16 display the personal travel benefits and the same three main components of the travel efficiency and cost savings for business trip benefits for the year 2025 as the Single Tunnel System.

Table 4-15
Travel Efficiencies and Cost Savings for the Double Tunnel System (New Jersey Alignment) in 2025*

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
Personal highway travel**	$32.3	$14.6	$29.4	$49.7
New rail trips using the Tunnel, diverted from truck trips	$24.0	$25.5	$1.0	$76.6
Existing rail trips that benefit from using the Tunnel	$7.6	$7.2	$0.07	$15.2
Business oriented highway trips benefiting from reduced highway congestion due to reduced truck trips	$9.9	$4.7	$9.2	$18.3
Total	**$73.8**	**$52.0**	**$39.7**	**$159.8**

Note: * All figures are shown in millions of 2002 dollars.
** Personal (non-business) highway travel benefits are not inputs for the regional economic impacts analysis, which takes into account only business cost savings. However, estimates of personal highway travel benefits are included in the total benefits used in the benefit-cost analysis.

The Metropolitan New York region (including parts of New Jersey and Connecticut) receives an estimated $41.5 million in travel efficiencies and cost savings for business trips and $32.3 million for personal (non-business) trips in 2025 under the New Jersey tunnel alignment, for a total of $73.8 million in benefits. Similarly, a total benefit of $52 million is estimated to accrue to New York State. New Jersey is expected to receive a benefit of $39.7 million. The United States as a whole would receive $159.8 million in travel efficiencies and cost savings for personal and business trips; $91.8 million of this total are because of improved rail service and operation. The benefits are slightly less for the Staten Island alignment.

Induced Business Attraction. Similar to the Single Tunnel System, the Double Tunnel System would also have the potential to induce warehousing, distribution, and manufacturing businesses to the region as well as improve transportation capacity, efficiency, reliability and the levels of service. Appendix 7 provides a detailed examination of the likely business attraction/retention effects to the region.

Table 4-16
Travel Efficiencies and Cost Savings for the Double Tunnel System (Staten Island Alignment) in 2025*

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
Personal highway travel**	$32.3	$14.6	$29.4	$49.6
New rail trips using the Tunnel, diverted from truck trips	$16.6	$17.1	$1.5	$56.0
Existing rail trips that benefit from using the Tunnel	$1.3	$0.6	$0.0	$2.8
Business oriented highway trips benefiting from reduced highway congestion due to reduced truck trips	$9.8	$4.7	$9.1	$18.1
Total	**$60.0**	**$37.0**	**$40.0**	**$126.5**

Note: * All figures are shown in millions of 2002 dollars.
** Personal (non-business) highway travel benefits are not inputs for the regional economic impacts analysis, which takes into account only business cost savings. However, estimates of personal highway travel benefits are included in the total benefits used in the benefit-cost analysis.

As shown in Table 4-17, the New Jersey and the Staten Island tunnel alignments would result in the creation of 15,200 and 13,400 jobs, respectively, through business attraction and retention in Brooklyn, Queens, the Bronx, and Long Island. Similar to the Single Tunnel System, net job creation in Brooklyn and Queens is projected to be the greatest relative to the other counties in the study area with over 5,900 jobs in Brooklyn for the New Jersey Tunnel alignment and 4,500 new jobs in Queens. The Bronx is also expected to receive a net job creation benefit in the range of 3,450 jobs in 2025 for the New Jersey Tunnel alignment, while Long Island would gain an estimated 1,290 new jobs.

Table 4-17
Net Business Attraction by Region for the Double Tunnel System in 2025

Region	Net Job Creation-New Jersey Alignment	Net Job Creation-Staten Island Alignment
Bronx	3,450	3,050
Queens	4,500	4,000
Kings	5,960	5,200
Long Island	1,290	1,150
Total	**15,200**	**13,400**

Like the Single Tunnel System, induced business attraction under the Staten Island alternative is expected to be lower than the New Jersey alignment. The Staten Island induced business attraction employment forecasts are estimated to be 87 percent of the Greenville business attraction forecast, based on a 13 percent difference in diversion of truck traffic.

Regional Macroeconomic Impacts. Table 4-18 displays the results of the REMI regional macroeconomic economic analysis for the Metropolitan New York region, New York State, and New Jersey for the Double Tunnel System for each tunnel alignment.

Table 4-18
Results of the REMI Regional Economic Impact Analysis, 2025

Benefit	Metropolitan New York Region	New York State	New Jersey	United States
New Jersey Alignment				
Employment	29,890	29,670	2,120	0
Personal Income (in billions)	$1.6	$1.5	$0.2	$0.6
Staten Island Alignment				
Employment	26,120	25,910	1,860	0
Personal Income (in billions)	$1.4	$1.3	$0.2	$0.5

Source: Regional Economic Models, Inc. (REMI).

REMI modeling indicates that multiplier and business attraction jobs would result in 29,890 new jobs in the Metropolitan New York region and personal income is anticipated to increase by $1.6 billion in 2025 under the New Jersey tunnel alignment. Employment in New York State is expected to increase by 29,670 and personal income is anticipated to increase by $1.5 billion. Employment in New Jersey is also expected to increase by 2,120 and personal income is estimated to increase by $200 million. Overall personal income in the United States is expected to increase by $600 million in 2025. New Jersey economic benefits are the result of increased travel efficiencies and multiplier effects (additional business and consumer spending), but do not include business attraction/retention gains.

Under the Staten Island tunnel alignment, employment in the Metropolitan New York region is expected to increase by 26,120, and personal income is anticipated to increase by $1.4 billion in 2025. Similarly, employment in New York State is expected to increase by 25,910 and personal income is anticipated to increase by $1.3 billion. Employment in New Jersey is also expected to increase by 1,860 and personal income is estimated to increase by $200 million. Overall personal income in the United States is expected to increase by $500 million in 2025. As with the New Jersey tunnel alignment, New Jersey economic benefits are the result of increased travel efficiencies and multiplier effects (additional business and consumer spending), but do not include business attraction/retention gains.

Economic Benefits Compared to the No Action Alternative

Table 4-19 compares the expected increase in employment under the Double Tunnel System (both alignments) to the No Action Alternative economic forecast for the Metropolitan New York region. Table 4-20 compares personal income in these areas to the No Action Alternative forecast. Economic impacts from each table are based on the full REMI economic impact results presented in the previous section.

Table 4-19
Employment Change for the Double Tunnel System Compared to the No Action Alternative Economic Forecast

Industry	Existing Conditions	No Action Alternative 2025*	New Jersey Alignment 2025	Percent Change**	Staten Island Tunnel Alignment 2025*	Percent Change**
Manufacturing	953	889	896	0.8%	895	0.7
Warehousing	121	86	92	7.2%	92	6.4
Wholesale Trade	618	501	505	0.9%	505	0.8

Notes:
*All employment shown in thousands.
**No Action Alternative and tunnel alignment.
All employment changes are rounded to the nearest thousand.
Source: Regional Economic Models, Inc. (REMI).

Highlights from these tables include:

- The Double Tunnel System would not reverse forecast declines in manufacturing, warehousing, and wholesale trade employment as shown in Table 4-19. Similar to the Single Tunnel System, it is possible that some existing manufacturing/warehousing firms that otherwise would leave the region could benefit from greatly improved freight rail service and may be retained in the region.

Table 4-20
Personal Income Change for the Double Tunnel System Compared to the No Action Alternative Economic Forecast

Industry	Existing Personal Income*	No Action Alternative 2025*	New Jersey Tunnel Alignment 2025	Percent Change	Staten Island Tunnel Alignment 2025	Percent Change
Metropolitan New York Region	$707	$1,172	$1,174	0.14	$1,173	0.12
New York State	$624	$1,025	$1,027	0.15	$1,026	0.13
New Jersey	$280	$475	$475	0.04	$475	0.04

Note: * All figures are in billions of 2002 dollars; percentages are estimated from values in Table 4-10.
Source: Regional Economic Models, Inc. (REMI).

- Despite the relatively large magnitude of employment impacts for the Double Tunnel System, manufacturing and wholesale trade impacts still represent less than 1 percent of total employment in each respective industry in 2025.
- Warehousing employment is estimated to increase by 6,200 jobs under the New Jersey tunnel alignment, representing 7.2 percent of total warehousing employment in 2025. Warehousing employment is estimated to increase by 5,500 jobs under the Staten Island tunnel alignment, representing 6.3 percent of total warehousing employment in 2025.

Local Impacts

Rail Yards.

Greenville Yard, Jersey City. The potential impacts under the Double Tunnel System would be the same as discussed previously for the Single Tunnel System.

65th Street Yard, Brooklyn. The potential impacts under the Double Tunnel System would be the same as discussed previously for the Single Tunnel System.

West Maspeth Yard, Queens. A new approximately 160-acre intermodal rail yard would be sited in West Maspeth, Queens. As shown on the site plan (see Figure 4-6), the yard would contain storage and unloading areas and a multi-level storage structure, as described in Chapter 2, "Project Alternatives." Construction of the yard would require filling in Maspeth Creek and a portion of Newtown Creek—a total of 8 to 9 acres. The project site extends from the Kosciuszko Bridge on the east, along 56th Road on the northwest to Grand Avenue on the south and Maspeth and Newtown Creek on the west.

Direct Impacts on Businesses Located Within Potential Yard Site. The creation of the 160-acre yard would directly displace approximately 44 to 52 businesses with 2,199 to 2,521 employees on the project site. Table 4-21 shows businesses by industry type that would be potentially displaced. Wholesale trade makes up the largest portion of the displaced businesses, representing 19 out of the 52 businesses or approximately 37 percent of the total. Business services and motor freight transportation and warehousing are also a presence within the project site with 6 and 4 businesses each, accounting for almost 12 percent and 8 percent, respectively, of all businesses. There is also one commercial use (video store) on the project site.

The wholesale trade industry employs the highest number of workers with 486 out of 2,521 employees, almost 19 percent of the total workforce within the project site. The motor freight transportation and warehousing industry is the second leading employer with approximately 430 employees or 17 percent of all employees. Business services, paper and allied products, and food and kindred products each employ at least 300 employees, representing between 12 percent and 13 percent of total employment in the project site. In addition to these businesses, one government facility—MTA Division Supply Logistics—and a residence would be displaced (see also Chapter 3, Land Use, Zoning and Public Policy, Neighborhood Character, and Social Conditions").

The creation of the expanded West Maspeth Yard would result in substantial displacement. As described in "Mitigation Measures," below, there is more than adequate building space available in the West Maspeth area to relocate these businesses. In addition, financial assistance and other relocation services would be provided to displaced entities, as required by federal and state laws that regulate business relocation.

Secondary and Induced Effects on Businesses Located in the Vicinity of the Expanded West Maspeth Yard Site. The benefits of the intermodal freight facility on existing businesses would be similar to the benefits under the Single Tunnel System discussed in the previous section.

Table 4-21
Existing Private Businesses and Employment Within the Expanded West Maspeth Yard Site (Double Tunnel System)

Industry Type	Number of Businesses*	Percent of Total Businesses	Number of Employees*	Percent of Total Employees
Apparel	1	1.9	80	3.2
Automotive Repair, Services & Parking	1	1.9	5	0.2
Building Materials, Hardware, Garden Supply, & Mobile Home Dealers	2	3.8	30	1.2
Business Services	6	11.5	304	12.1
Construction-Special Trade	1	1.9	12	0.5
Eating & Drinking Places	4	7.7	24	1.0
Electric, Gas & Sanitary Services	2	3.8	22	0.9
Engineering, Accounting, Research, Management & Related Services	1	1.9	150	6.0
Food & Kindred Products	1	1.9	322	12.8
Food Stores	1	1.9	42	1.7
Industrial & Commercial Machinery and Computer Equipment	1	1.9	24	1.0
Lumber & Wood Products	1	1.9	N/A	-
Membership Organizations	1	1.9	1	0.04
Motion Pictures	1	1.9	2	0.1
Motor Freight Transportation and Warehousing	4	7.7	430	17.1
Paper & Allied Products	2	3.8	335	13.3
Plumbing, Heating & Air-Conditioning	1	1.9	32	1.3
	1	1.9	38	1.5
Printing, Publishing & Allied Industries	1	1.9	180	7.1
Wholesale Trade	19	36.5	486	19.3
TOTAL	52	100.0	2,521	100

Note: * Businesses were identified through field observations, GIS, web searches, Cole's Criss-Cross Directory and data from Claritas Connect/Claritas, Inc. Marketplace, and Dunn & Bradstreet Data. The various sources indicated a range in the number of businesses in the project site, from 44 to 52. This table shows the highest number of businesses that would be displaced.
Source: Field surveys conducted Spring 2002; Claritas Connect/Claritas, Inc.; Marketplace, Dunn & Bradstreet Data 2001

Harlem River Yard and Oak Point Yard. As described under the Single Tunnel System, these yards would experience increased activity, yielding benefits to nearby businesses.

Rail Lines

Similar to the Single Tunnel System, the increased operational activity along these rail lines under the Double Tunnel System would not result in any substantial impacts on local businesses located within the study area along the rail lines.

Economic Impact of Rail Operational Expenditures

Economic impacts from the rail operations and maintenance expenditures are much smaller than the construction period impacts (see Table 4-22). Direct annual expenditures of $29.9 million generate $75 million of personal income for the Metropolitan New York region in 2025, and over 800 jobs. The impacts are concentrated in New York State because that is where the majority of additional rail operational activity (especially around the expanded West Maspeth site) would occur. Still, New Jersey benefits from $18 million of personal income, $22 million in GRP, and over 250 jobs.

Table 4-22
Economic Impacts of Operating and Maintaining the Double Tunnel System in 2025

Benefit	Metropolitan New York Region	New York State	New Jersey
Personal Income	$75 M	$63 M	$18 M
Gross Regional Product	$68 M	$55 M	$22 M
Employment	822	661	252

Source: Regional Economic Models, Inc. (REMI)

D. MITIGATION MEASURES

SINGLE TUNNEL SYSTEM

As described above, there are approximately 25-29 businesses located within the expanded West Maspeth Yard site that would be displaced by the construction and operation of the yard. Twenty-seven of the 29 businesses that would be displaced currently occupy over 600,000 square feet of building space (see Table 4-23). Of the 27 businesses, approximately 21 or 72 percent, occupy fewer than 50,000 square feet of building space each. Two other businesses, making up 7 percent of all businesses, occupy between 50,000 and 100,000 square feet each. An additional four businesses (14 percent) occupy between 100,000 and 200,000 square feet each. The remaining two businesses (Galasso Trucking, and Benjo Trucking), occupy just over 190,000 square feet of land primarily used for freight storage and accessory land for truck parking and loading and unloading.

Potential relocation of these businesses to areas in Queens and Brooklyn has been assessed based on current real estate data (see Table 4-24). Over 1.5 million square feet of vacant industrial building space is currently on the market for lease or for sale within the Maspeth area alone—more than enough to meet the minimum 600,000 square feet required by all the displaced businesses. For businesses requiring large parcels of accessory land (i.e., trucking companies), there is an additional 700,000 square feet of vacant land available for lease or for sale in Maspeth. Other industrial building space and vacant industrial land are also currently available in other nearby locations in Brooklyn including Greenpoint, Bushwick, and East New York.

Table 4-23
Building Space and Land Area
Occupied by Displaced Businesses

	Number of Businesses	Total Square Feet	Percent of Total
Building Space (sq. ft.)			
Less than 50,000 sq. ft.	21	215,175	72.4%
50,000 - 100,000 sq. ft.	2	128,620	6.9%
100,000 - 200,000 sq. ft.	4	283,072	13.8%
Subtotal	27	626,867	93.1%
Land Area (sq. ft.)			
Benjo Trucking	1	96,980	3.4%
Galasso Trucking	1	94,147	3.4%
Subtotal	2	191,127	6.9%
TOTAL	**29**		**100%**

Source: New York City Department of Finance Real Property Assessment Data (RPAD), 2001.

Table 4-24
Vacant Industrial Land and Vacant
Businesses Availabe for Lease and for Sale

		Unimproved Land			Existing Buildings		
Zip Code	Location	Total Industrial Land (sq. ft.)	Percent Vacant	Vacant Industrial Land (sq. ft.)	Total Industrial Building (sq. ft)	Percent Vacant	Total Vacant Building (sq. ft.)
11378	Maspeth	20,463,292	3.5	716,215	22,239,185	7.0	1,556,743
11207	East NY	4,226,947	6.2	262,071	6,825,014	4.3	290,063
11222	Greenpoint	10,518,428	8.5	894,066	26,977,548	20.7	5,584,352
11237	Bushwick	5,644,766	2.5	141,119	7,777,597	4.5	349,992
Total		**40,853,433**		**2,013,472**	**63,819,344**		**7,781,150**

As the project progresses, a more refined relocation analysis will be necessary to ensure that proposed relocation sites are adequate in size and location for the displaced businesses. While the vacant square footage reported in Table 4-24 is for year 2002, the general trends in available industrial space in the greater Maspeth area suggest that adequate industrial space will exist at the time of project commencement. Overall, manufacturing employment in Queens and New York City is declining, resulting in a reduced demand for industrial space. As discussed in Chapter 3, West Maspeth is one of New York City's most industrial districts and is zoned accordingly. It is likely that a sufficient amount of vacant industrial space, zoned for industrial uses, will be available to absorb the relocation of the displaced businesses.

DOUBLE TUNNEL SYSTEM

The approximately 44 to 52 businesses that would be displaced by the construction and operation of the yard are located within the expanded West Maspeth Yard site for the Double

Tunnel System. Forty-eight of these 52 businesses currently occupy about 1.5 million square feet of building space (see Table 4-25). Of the 48 businesses, approximately 37, or 71 percent, occupy less than 50,000 square feet of building space each. Five other businesses, making up 10 percent of all businesses, occupy between 50,000 and 100,000 square feet each. An additional five businesses (10 percent) occupy between 100,000 and 200,000 square feet each. One business, a cardboard manufacturing company, occupies over 200,000 square feet of building space. The remaining four businesses, three trucking companies (Yellow Freight, Galasso Trucking, and Benjo Trucking) and a Federal Express ground facility, occupy 920,443 thousand square feet of land primarily used for freight storage and accessory land for truck parking and loading and unloading. (For the displacement of the one residence located in the expanded West Maspeth Yard site, see "Mitigation Measures" section of Chapter 3, "Land Use, Zoning and Public Policy, Neighborhood Character, and Social Conditions").

Table 4-25
Building Space and Land Area
Occupied by Displaced Businesses

	Number of Businesses	Total Square Feet	Percent of Total
Building Space (sq. ft.)			
Less than 50,000 sq. ft.	37	374,863	71.2%
50,000 - 100,000 sq. ft.	5	405,864	9.6%
100,000 - 200,000 sq. ft.	5	471,364	9.6%
Over 200,000 sq. ft.	1	280,294	1.9%
Subtotal	48	1,532,385	92.3%
Land Area (sq. ft.)			
Benjo Trucking	1	96,980	1.9%
Galasso Trucking	1	94,147	1.9%
Yellow Freight Trucking	1	320,176	1.9%
Federal Express Ground	1	409,140	1.9%
Subtotal	4	920,443	7.7%
TOTAL	**52**		**100**

Source: New York City Department of Finance Real Property Assessment Data (RPAD), 2001.

As discussed above, there are over 1.5 million square feet of vacant industrial building space for lease or for sale within the Maspeth area alone, and 6.2 million square feet in nearby industrial areas, more than enough to meet the 1.5 million square feet required by all the displaced businesses. There is also an additional 700,000 square feet of vacant industrial land available in Maspeth for businesses requiring accessory land (i.e., trucking companies). Based on current zoning in the area and overall trends in manufacturing, it is anticipated that more than adequate space will be available in the future to accommodate the displaced businesses.

THE UNIFORM ACT

Once the property needs have been defined for the project, a New York State or New York City lead agency would be responsible for acquiring right-of-way and other real estate interests necessary to complete the project. The acquisition process would consist of the following six

steps: identification of required real estate once final design information is available; appraisal of required property; acquisition, either through negotiation or eminent domain; settlement or litigation of any claims for additional compensation or property damage; relocation of occupants if necessary; and property management, including demolition of improvements. The lead agency would adhere to the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, and the Uniform Relocation Act Amendments of 1987 (together, the Uniform Act). The rights of owners and tenants of real property acquired to implement the proposed project are protected under the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, and the Uniform Relocation Act Amendments of 1987 (together, the Uniform Act). (The proposed project may also subject to the New York State Eminent Domain Procedure.) As described below, the Uniform Act specifies the procedures for appraisal and acquisition of real property, relocation services, moving assistance and payments, replacement housing payments, and other allowable expense payments.

Once the project's final design is under way, property identification plans would be developed to identify every parcel affected by the project and to define the need for property acquisitions and/or easements. From property identification plans, preliminary title reports would be obtained to ascertain the owners of record and legal descriptions of the parcels. The parcels would then be certified as needed for the project and the acquisition process initiated.

The Uniform Act provides for fair, uniform, and equitable treatment of persons displaced from their businesses and homes by federal and federally assisted programs. It also establishes fair, uniform, and equitable land acquisition procedures. The Act recognizes that displacement of businesses often results in their closure, and aims to minimize the adverse impact of displacement in order to maintain the economic and social well-being of communities. Overall, the Act is designed to ensure that individuals do not suffer disproportionate injuries as a result of programs and projects designed for the benefit of the public as a whole, and to minimize the hardship of displacement on such persons.

As part of the procedure for preparing the acquisition stage relocation plan, all site occupants would be personally interviewed to determine their specific relocation needs, and would be furnished a copy of the state's informational booklet and fully informed of all benefits to which they may be entitled.

BUSINESSES/TENANTS

The Uniform Act provides entitlements to qualified businesses displaced as part of a federal and federally assisted program, including reimbursement for the following relocation expenses:

- Actual reasonable moving and related expenses for: transportation of personal property up to 50 miles, disconnecting, dismantling, removing, packing, crating, reassembling, and reinstalling relocated machinery, equipment, and other personal property, including connection to utilities available nearby; storage of the personal property for a period not to exceed 12 months; insurance for the replacement value of the personal property in connection with the move and necessary storage; any license, permit, or certification required of the displaced business at the replacement location; replacement value of property lost, stolen, or damaged in the process of moving (not through the fault or negligence of the displaced person, his or her agent, or employee) where insurance covering such loss, theft, or damage is not reasonably available; professional services necessary for planning, moving and installing the relocated personal property at the replacement location; and re-lettering signs

and replacing stationery on hand at the time of displacement that are made obsolete as a result of the move.

- Actual direct loss of tangible personal property incurred as a result of moving or discontinuing the business based on the fair market value of the item for continued use at the displacement site, less the proceeds from its sale or the cost to move and reinstall the item, whichever is the lesser.
- Purchase of substitute personal property, if an item of personal property that is used as part of a business is not moved but is promptly replaced with a substitute item that performs a comparable function at the replacement site or the cost to move and reinstall the item, whichever is the lesser.
- Actual reasonable payment for expenses required to search for a replacement location, not to exceed $1,000, including transportation, fees to a real estate agent to locate a replacement site, exclusive of any fees or commissions related to the purchase of the site, and time spent searching.
- Other moving-related expenses that are not listed as ineligible, as determined to be reasonable and necessary.

BUSINESS RE-ESTABLISHMENT

In addition to the above-mentioned payments, a small business or nonprofit organization is entitled to receive a payment, not to exceed $10,000, for expenses actually incurred in relocating and reestablishing such small business or nonprofit organization at a replacement site, including:

- Repairs or improvements to the replacement real property as required by federal, state or local law, code, or ordinance;
- Modifications to the replacement property to accommodate the business operation or make replacement structures suitable for conducting the business;
- Construction and installation costs, for exterior signing to advertise the business;
- Provision of utilities from right-of-way to improvements on the replacement site;
- Redecoration or replacement of soiled or worn surfaces at the replacement site, such as paint, paneling, or carpeting;
- Licenses, fees, and permits when not paid as part of moving expenses;
- Feasibility surveys, soil testing and marketing studies; and
- Professional services in connection with the purchase or lease of a replacement site;
- Advertisement of the replacement;
- Estimated increased costs of operation during the first two years at the replacement site for items such as:
  - Lease or rental charges
  - Personal or real property taxes
  - Insurance premiums

  - Utility charges;
- Impact fees or one-time assessments for anticipated heavy utility usage.

FIXED PAYMENT FOR MOVING EXPENSES

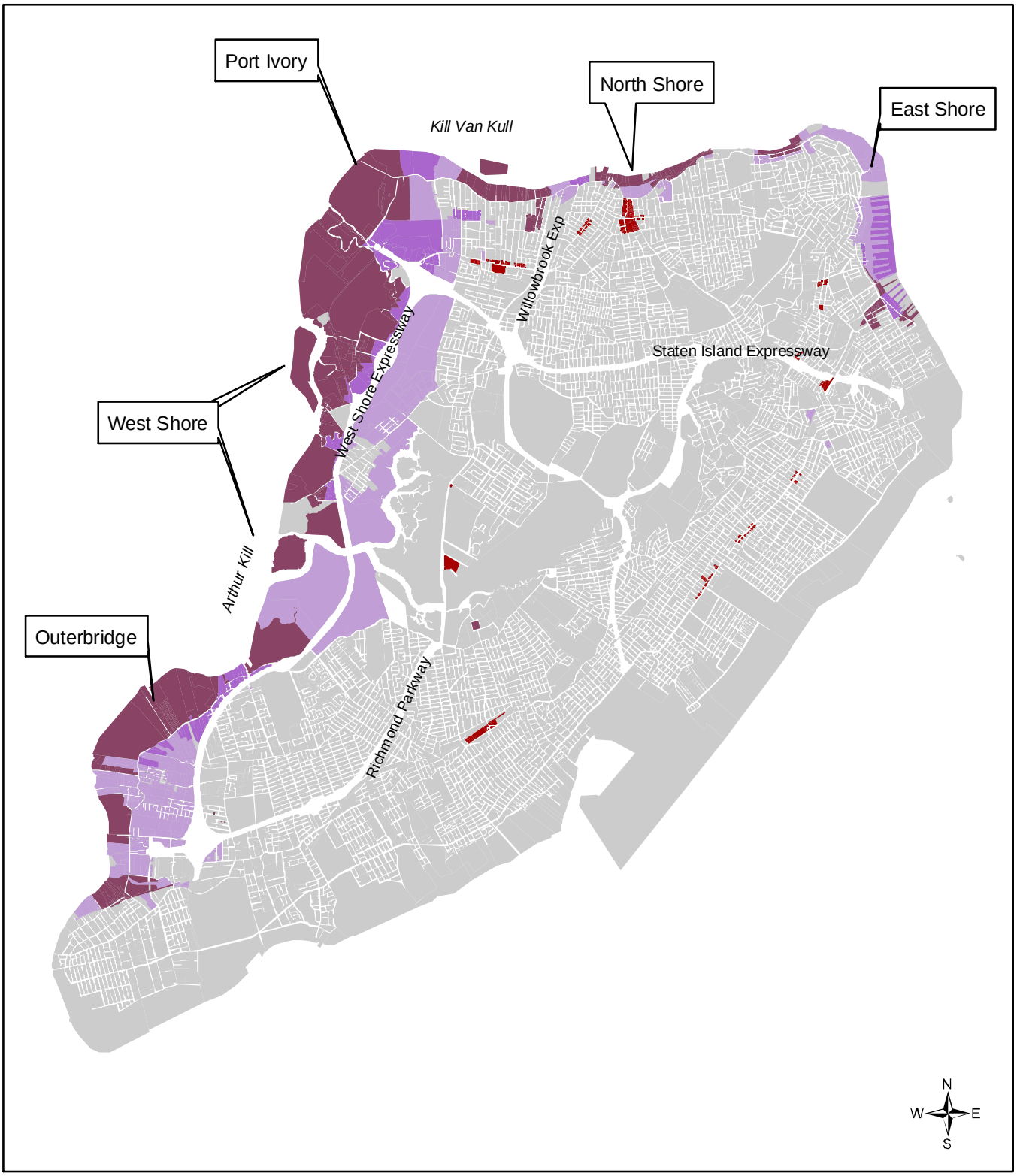
A displaced business may be eligible to choose a fixed payment in lieu of the payments for actual moving and related expenses, and actual reasonable reestablishment expenses, as provided. Such fixed payment to an eligible business, except for payment to a nonprofit organization, shall equal the average annual net earnings of the business but not less than $1,000 or more than $20,000. The displaced business is eligible for the payment if it is determined, among other conditions, that the business cannot be relocated without a substantial loss of its existing patronage (clientele or net earnings). A business is assumed to meet this test unless it is determined that it will not suffer a substantial loss of its existing patronage.

BUSINESSES/OWNERS

Owners of properties that would be acquired would be compensated at fair market value. (Owner refers to either the fee owner of the property or the tenant-owner of improvements on it). Entitlements for property owners under the Uniform Act include the following:

- Expeditious acquisition, with every reasonable effort made to acquire the property by negotiation;
- Notice to the owner as soon as feasible of the interest in acquiring the property and basic protections;
- Just compensation for property, which may not be less than the acquiring agency's approved appraisal of the fair market value;
- Determination of just compensation by a court of law (if not acquired by negotiated agreement);
- The opportunity to accompany the appraiser who appraises their property;
- Written statement of, and summary of the basis for the amount established by the acquiring agency as just compensation;
- Payment of the agreed upon purchase price (or a deposit in the court) before being required to surrender possession of the property;
- Reimbursement for certain expenses incidental to transfer of title to the acquiring agency, such as recording fees, boundary surveys, and transfer taxes;
- Reimbursement for certain litigation expenses;
- At least 90 days' written notice to vacate occupied property;
- Relocation services and payments, where applicable; these may involve housing supplements, moving cost, etc. for residential acquisitions, or reestablishment, moving costs, etc. for business, nonprofit, or farm acquisitions; and
- Written statement or brochure advising property owners of their rights and entitlements, and assurance that they receive all of the services and payments to which they are entitled under federal and state law and regulations.

As discussed in Chapter 3, the Uniform Act also requires that housing resources meet the needs of displaced persons in terms of size, price, rental location, and timely availability, and that payments be made to displaced residents at the time they are needed to obtain replacement housing. ✳



Manufacturing Zones

- M-1
- M-2
- M-3

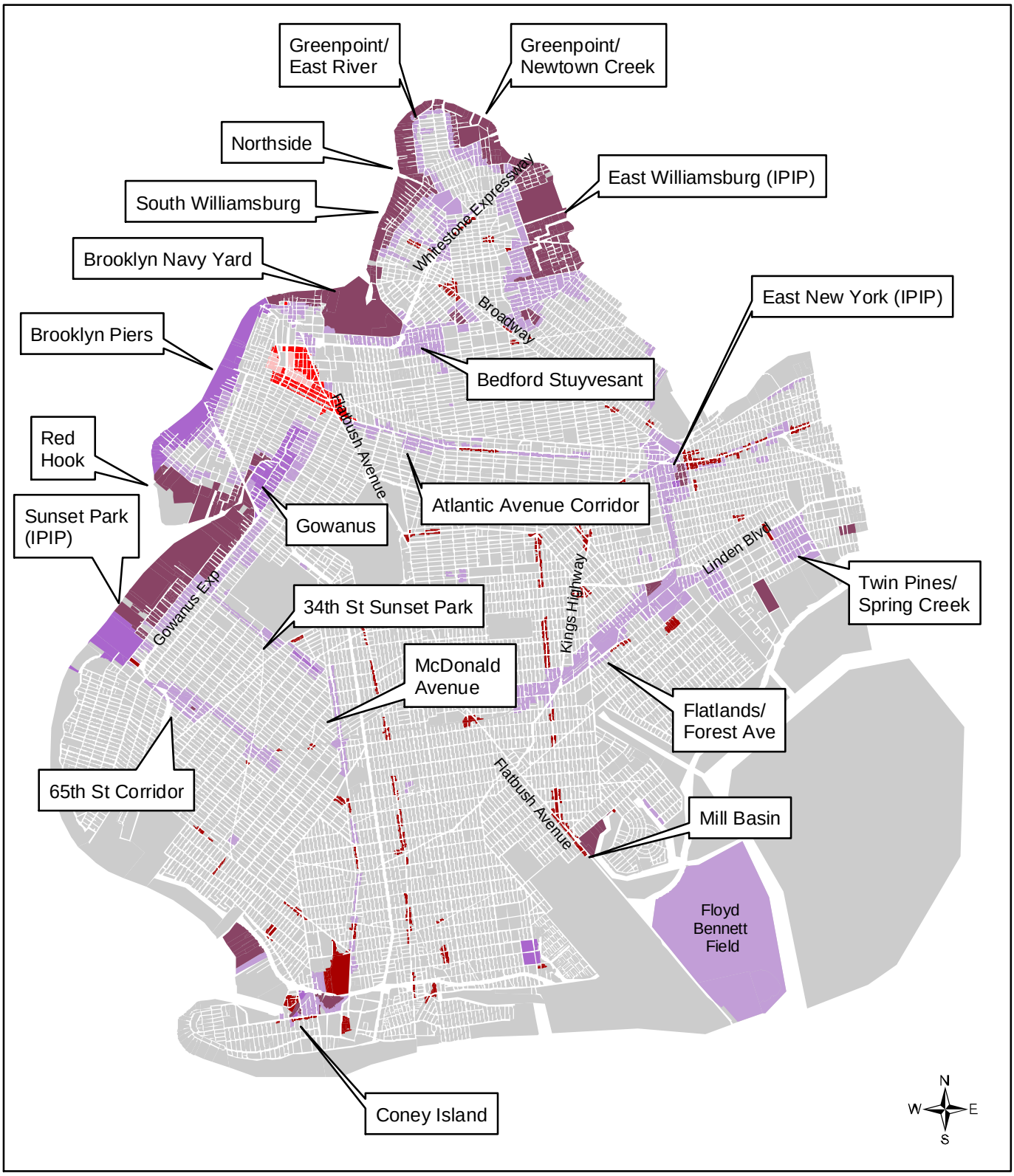
Heavy Commercial Zones

- C-5
- C-6
- C-8

IPIP = In-Place Industrial Park

Note: See Chapter 3 Table 3-1 for Zoning Definitions
Source: RPAD '01

Figure 4-1
Industrial Areas in Staten Island
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Manufacturing Zones

- M-1
- M-2
- M-3

Heavy Commercial Zones

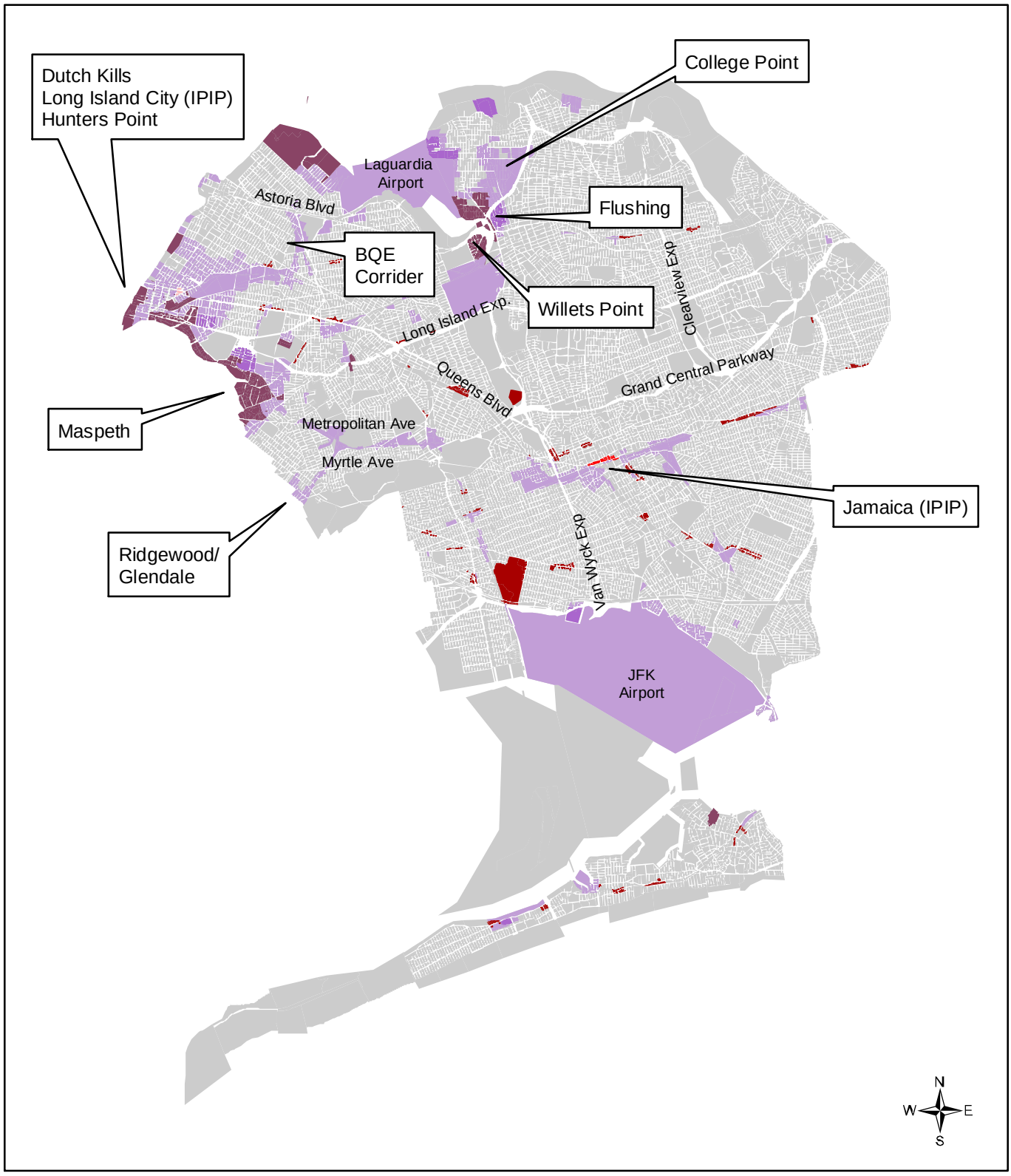
- C-5
- C-6
- C-8

IPIP = In-Place Industrial Park

Note: See Chapter 3 Table 3-1 for Zoning Definitions
Source: RPAD '01

Figure 4-2
Industrial Areas in Brooklyn
CROSS HARBOR FREIGHT MOVEMENT PROJECT

2-03



Manufacturing Zones

- M-1
- M-2
- M-3

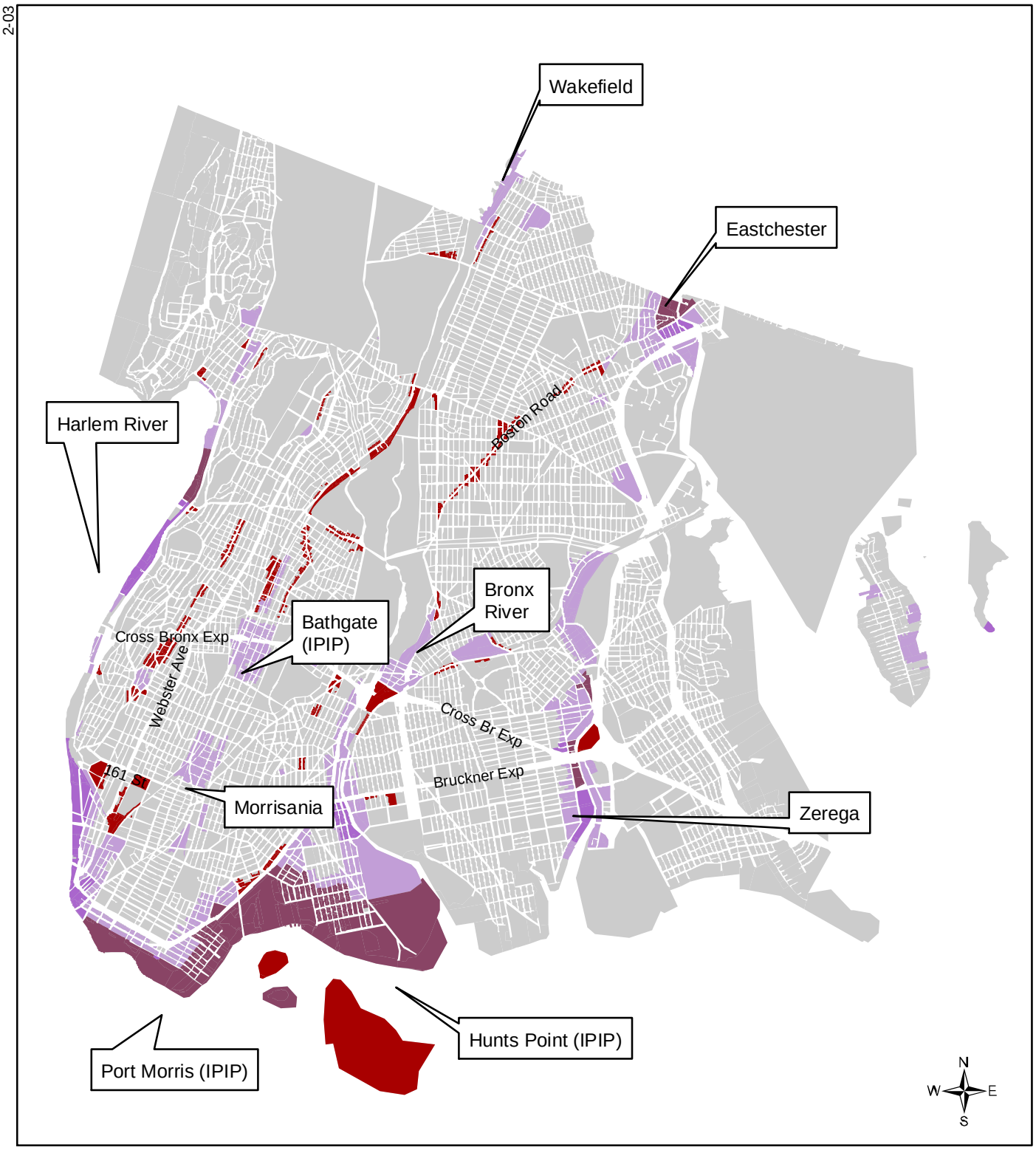
Heavy Commercial Zones

- C-5
- C-6
- C-8

IPIP = In-Place Industrial Park

Note: See Chapter 3 Table 3-1 for Zoning Definitions
Source: RPAD '01

Figure 4-3
Industrial Areas in Queens
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Manufacturing Zones

- M-1
- M-2
- M-3

Heavy Commercial Zones

- C-5
- C-6
- C-8

IPIP = In-Place Industrial Park

Note: See Chapter 3 Table 3-1 for Zoning Definitions
Source: RPAD '01

Figure 4-4
Industrial Areas in Bronx
CROSS HARBOR FREIGHT MOVEMENT PROJECT

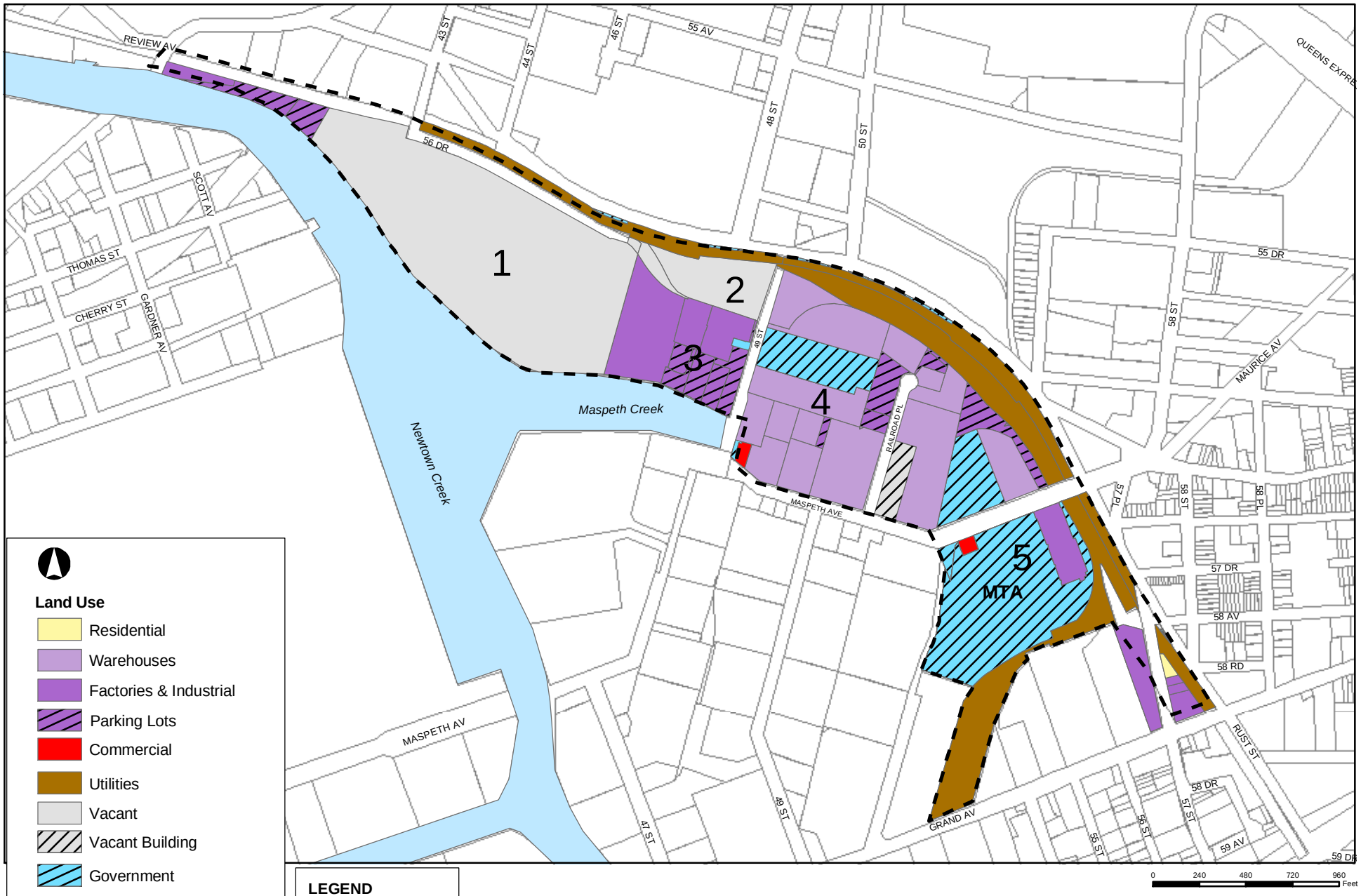


Figure 4-5
Single Tunnel System - West Maspeth Yard
CROSS HARBOR FREIGHT MOVEMENT PROJECT

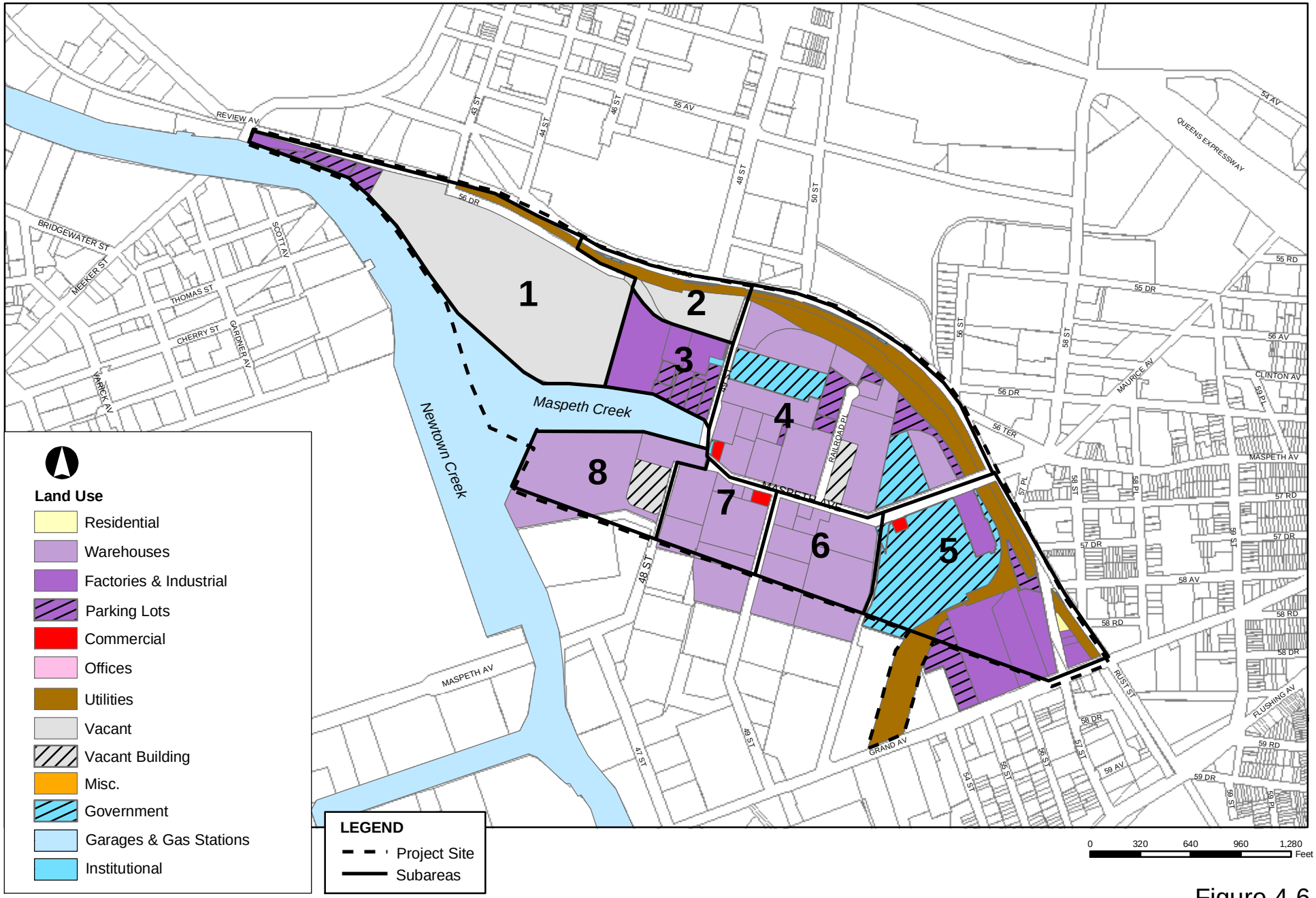


Figure 4-6
Double Tunnel System - West Maspeth Yard
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 5: Visual and Aesthetic Considerations

A. INTRODUCTION AND METHODOLOGY

Assessed in this chapter are visual and aesthetic considerations related to construction and/or operation of the project alternatives for the Cross Harbor Freight Movement Project.

REGULATORY FRAMEWORK

Title 36 U.S.C. 109(h), in calling for the promulgation of guidelines to assure the consideration of the environmental effects of proposed projects, discusses aesthetics as a matter that must be fully considered. This concern is repeated in FHWA Technical Advisory T6640.8 which provides guidance on the preparation of environmental documents.

FRA Procedures for considering environmental impacts (4910-06P) specifically include aesthetic environment and scenic resources. These indicate that an EIS should identify any significant changes likely to occur in the natural landscape and in the developed environment and also discuss the consideration given to design quality, art, and architecture in project planning and development as required by USDOT Order 5610.4.

METHODOLOGY

Identified in this chapter are study areas for the portions of the project that would be visible or have the potential to have visual impacts. A description of the visual environment, identification of the visual quality of the area and any visually sensitive resources, and a description of the viewers of the project are included for each visual study area. Potential impacts are explained for each of the project alternatives and measures to mitigate any adverse impacts are considered, as necessary.

The identification of study areas and the assessment of impacts are focused on alternatives that would potentially have visual impacts and on the areas where such impacts could occur. Portions of the Transportation Systems Management (TSM) Alternative and Expanded Float Operations Alterative (including construction of new float bridges and new rail yard construction), and elements of the Tunnel Alternative (including ventilation structures for the new freight tunnel, increases in track clearance heights, rehabilitation/creation of rail yards, and a new bridge) may affect visual resources.

DEFINITION OF THE STUDY AREAS

The study areas are described and mapped within the individual study area discussions below in Section B, "Existing Conditions." Study areas include sites that may potentially be affected by construction or that may experience effects once construction is completed and the project is operational. The project area, including each of these project sites, is shown on the project context map (see Chapter 2, Figure 2-1).

The study areas defined for the three project alternatives are as follows:

- For below grade portions of the rail lines, the study area for construction and operational impacts is the area within 50 feet. This also includes visually non-intrusive construction activities—although they would be assessed differently based on their relatively short durations.
- Where potential visual effects may extend further, as where rail traffic would be substantially increased on at grade and elevated sections of the rail lines, the study area is the area within 150 feet. A study area of 150 feet has also been defined for construction-period activities associated with the cut and cover and open cut portions of the tunnel alignments.
- A study area of 400 feet has been defined around the potential new rail bridge across the Arthur Kill as well as around the larger ventilation structures required for tunnel sections under New York Harbor off the New Jersey, Staten Island, and Brooklyn waterfronts. A 400-foot study area has also been defined around the potential rail yard in West Maspeth, Queens. This takes into consideration the larger areas potentially affected by these larger and more visually prominent structures.
- For rail yards in industrial areas, the study area was defined as the area within 50 feet of the rail yard. For rail yards with adjacent residential uses or public open space, the study area was expanded to consider potential viewsheds from those uses.

Once the project is completed and operational, there would be no difference in the visual characteristics above-grade for the bored and cut and cover portions of the tunnels. Therefore, no visual study area for operations has been defined for this type of construction. In addition, no visual study area has been defined for construction impacts within the bored portions of the tunnels, which also would not be visible at ground level.

IDENTIFICATION OF VISUAL AND AESTHETIC CONSIDERATIONS WITHIN THE STUDY AREAS

Visual surveys were undertaken of each of the study areas both to confirm the appropriateness of the study area definition and to identify visual and aesthetic considerations. For each study area a description of the visual environment was developed. The visual environment contains resources that form the stimuli upon which visual experience is based. The description of the visual environment focused on the existing landscape (including any visually sensitive resources) and viewers in the study area.

The visual quality of the area and any visually sensitive resources in each of the study areas were identified. Visual resources are physical features that make up the visible landscape, and include land, water, vegetative, and man-made elements (Federal Highway Administration, Esthetics and Visual Quality Guidance Information, August 18, 1986). The New York City Environmental Quality Review (CEQR) Technical Manual defines visual resources as an area's unique or important view corridors, vistas, or natural or build features, and an area's visual environment as its physical appearance (dominant building types and their sizes, shapes, and arrangement on blocks, the street pattern, and streetscape elements) as well as noteworthy views that give the area its distinctive character. Finally, a description of the viewers of the project based on surrounding land uses and transportation was developed. Since this is a freight movement project, the view from the route to the surrounding area is not a consideration.

EVALUATION OF POTENTIAL IMPACTS ON VISUAL AND AESTHETIC RESOURCES

Potential impacts are assessed for each of the project alternatives in each study area. The assessments are based on the degree of change anticipated in the characteristics of the visual environment and whether or not changes would affect visual quality or specific visual resources. In addition, the viewers who would see the changes and the duration of their views were taken into consideration. Measures to mitigate any adverse impacts are identified, as necessary.

B. EXISTING CONDITIONS

Maps of the study areas indicating photograph locations, and photographs of selected visual resources, are provided in this chapter. Additional photographs of the study areas are provided in Appendix 1, "Visual and Cultural Resources."

NEW JERSEY STUDY AREAS

OAK ISLAND YARD STUDY AREA

Affected Area

The Oak Island Yard Study Area is located in an industrial area; therefore, the study area is the area within 50 feet of the rail yard.

Visual Context

The study area surrounding the Oak Island Yard is heavily industrial with port-related facilities.

Visual Resources

There are no visual resources within the Oak Island Yard Study Area. Although Newark Bay is visible from the yard and the immediately surrounding area, there are no publicly accessible sections of the waterfront.

Viewers and Duration of Views

Viewers of the yard are limited to motorists traveling on Doremus Avenue and the New Jersey Turnpike and to workers in the yard and in surrounding industries. The duration of motorists' views is short. Workers in the yard have views of long duration since their daily work activities are located within the yard itself, while the duration of views for workers in surrounding industries is less sustained since they would not be focusing on the yard.

GREENVILLE YARD/POTENTIAL TUNNEL ALIGNMENT STUDY AREA

Affected Area

The Greenville Yard/Potential Tunnel Alignment Study Area is located in an industrial area; therefore, the study area is the area within 50 feet of the rail yard and is extended to 150 feet near the cut and cover and open cut portions of the potential tunnel alignment (see Figure 5-1). The cut and cover portion would be located mainly within Greenville Yard; therefore, the study area for the rail yard includes the study area for this portion of the tunnel. The open cut portion is along the Greenville Branch, extending from Greenville Yard to a point just east of the New Jersey Turnpike Extension. The study area also includes the area within 400 feet of the potential tunnel ventilation shaft to be located adjacent to the northeast corner of the Global Marine

Terminal/Auto Marine Terminal (NEAT) pier in New York Harbor. The study area is located in an area with relatively flat topography. Greenville Yard is widest on the eastern side towards the harbor, narrowing at the westernmost boundary where the yard connects with the Greenville Branch. Although Greenville Yard has an active railcar float operation, only a small portion of the original railroad tracks and structures exist today. The remaining tracks that lead up to the transfer float bridges have become overgrown with weeds and vegetation, indicating the lack of shipping activities at the yard. There are four railcar float transfer bridges located in the yard; however, only one is operational. Structures located on the property include a lift building located on the operating float bridge; numerous east-west tracks; storage areas; a forklift; a gantry crane; several trailers used as storage sheds; two trailers used as office space; and an unpaved parking area.

Visual Context

Greenville Yard is located in a heavily industrial area. A portion of Port Jersey Boulevard on the Global Marine Terminal/NEAT pier is open to the public and provides waterfront views of the ports, Greenville Yard, Brooklyn, the Statue of Liberty, and Lower Manhattan (see Photographs 1-3 of Figures 5-2 and 5-3). A small, wooden public observation deck exists along Port Jersey Boulevard. The tunnel ventilation shaft would be located at the northeast corner of this pier. The area along the pier is industrial, and is primarily used as a large parking area for automobile storage. Port Jersey Boulevard is the main access road, and provides access to the public observation deck.

The New Jersey Turnpike Extension (located immediately west of the study area) separates the study area from the rest of Jersey City and creates a visual and physical barrier between the residential neighborhoods to the west and the industrial rail yard to the east.

Visual Resources

Visual resources within the Greenville Yard/Potential Tunnel Alignment Study Area include waterfront views of Upper New York Harbor, the Statue of Liberty, Brooklyn, and Lower Manhattan. These resources are visible from a public observation deck located at the end of Port Jersey Boulevard (see Photograph 2 of Figure 5-2, above).

Viewers and Duration of Views

Viewers in the study area are limited to workers and visitors to a public observation deck along Port Jersey Boulevard. Partial, distant views may also be available from portions of Liberty State Park. Industrial development of the surrounding area obscures views of the yard and the proposed location of the tunnel ventilation shaft from other locations, such as Port Liberte. As the surrounding area is heavily industrialized, it is likely that the tunnel ventilation shaft would blend into the overall industrial view in this direction. The public observation deck along Port Jersey Boulevard is located in the midst of a heavily industrialized area; therefore, public views available from this location are of industrial structures. Workers on the Global Marine Terminal/NEAT pier and in Greenville Yard would have views of long duration since their daily work activities are located within the study area, while the duration of views for workers in surrounding industries is less sustained since they would not be focusing on the yard and pier. The tunnel ventilation shaft would be visible from the public observation deck, and viewers from this location would have views of long duration. However, only a portion of the yard is visible from this point, the transfer float bridges are barely visible, and the Greenville Branch as well as the railroad tracks leading to the transfer float bridges cannot be seen.

GREENVILLE BRANCH STUDY AREA

Affected Area

The Greenville Branch Study Area includes the railroad right-of-way that runs between the New Jersey Turnpike Extension and the Oak Island Yard. The line crosses Newark Bay via the Lehigh Valley Drawbridge. The eastern portion of the rail line is on an embankment, while the western portion is elevated. The study area for the Greenville Branch is the area within 150 feet of the rail line.

Visual Context

The study area surrounding the rail line is a mix of residential, commercial, and industrial buildings. The rail line is located in an area where large highways (Route 440 and the New Jersey Turnpike Extension/I-78) create a strong visual presence. Route 440 crosses the rail line, while the New Jersey Turnpike Extension/I-78 runs along its southern border and then crosses the line. North of the rail line, along Merritt Street, buildings generally are two-story attached and detached houses. A large 13-story apartment building is located on the western end of the street. Mercer Park is located at the end of the street and provides a walking trail, playground, and athletic fields.

Visual Resources

There are no visual resources within the Greenville Branch Study Area.

Viewers and Duration of Views

Viewers in the study area include residents who live on Merritt Street, workers in commercial and industrial facilities in the area, and motorists traveling on Merritt Street and the surrounding highways. Residents who live on Merritt Street bordering the rail line would have views of long duration while workers and motorists tend to have views of short duration. Workers' views are mostly experienced while traveling to and from work and during lunch, and motorists traveling through the area would not be focusing on the rail line.

NATIONAL DOCKS SECONDARY STUDY AREA

The National Docks Secondary Study Area extends from 49th Street to the north to the Greenville Branch to the south. The boundaries of the study area vary from 50 to 150 feet from the rail line, depending on whether the rail line is below grade, at grade, or elevated. For analysis purposes, the study area has been divided into Segments 1 and 2, described below.

Segment 1

Affected Area. The Segment 1 study area includes a portion of the National Docks Secondary Study Area, which extends from North Bergen Yard within the Township of North Bergen to the north to Tonnelle Avenue (U.S. Routes 1 and 9) south of Croxton Yards in Jersey City to the south. The majority of the rail line in Segment 1 is at grade, except at County Road where it is elevated. Thus, the study area extends 150 feet on either side of the rail line. West Side Avenue roughly bounds the study area to the west in the northern portion and Tonnelle Avenue (U.S. Routes 1 and 9) runs parallel on the east side of the active rail line for nearly the entire length of the Segment 1 study area.

Visual Context. The study area surrounding the rail line is heavily industrial with a few areas of residential development.

Visual Resources. There are no visual resources within the study area.

Viewers and Duration of Views. Viewers in the study area include workers, primarily those in industries along Dell and West Side Avenues, and motorists traveling on these streets and along rail line crossings. Workers and motorists would tend to have views of short duration, since the rail line primarily runs behind industrial buildings and is not highly visible.

Segment 2

Affected Area. The Segment 2 study area includes the portion of the National Docks Secondary Study Area that extends from Tonnelle Avenue south of Croxton Yards to the Greenville Branch in the southeastern section of Jersey City (see Figure 5-4). Portions of the rail line in Segment 2 are below grade, and the study area extends 50 feet on either side of the rail line in these areas. The rail line also is elevated and at grade in various areas, and the study area extends 150 feet on either side of the rail line at these locations.

Visual Context. The study area surrounding the rail line is a mix of industrial, residential, commercial, and institutional buildings. In the northern portion of the study area the rail line travels in the Bergen Arches and Eric Cut—a narrow concrete and blue trap rock canyon of train tunnels and open-air rail beds. The arches extend nearly 5,000 feet east/west between JFK Boulevard and Palisade Avenue. The Pulaski Skyway travels north of and parallel to the rail line in this portion of the study area. Since most of the rail line is below grade in the northern section of the study area, the study area is only 50 feet on either side of the rail line; thus, the rail corridor does not have a visual presence in the area. Within this northern portion of the study area, the rail line travels through a densely developed urban neighborhood containing commercial and residential properties. Residential properties include apartment buildings and detached houses. Houses generally are two to three stories tall, most with replacement windows and synthetic siding; and they appear to have been constructed during the late 19th and early 20th centuries.

After Palisade Avenue, the rail line passes Dickinson High School (Jersey City High School). Just east of this school, the rail line bends towards the south, with the New Jersey Turnpike Extension/I-78 running almost parallel to the rail corridor on the east. From this point south, the rail line is elevated at several locations. The rail line runs on an elevated trestle near Merseles Street. A public park is located on the east side of the trestle. The park area is well maintained and offers soccer and football fields, a playground, and tennis and basketball courts. The rail line is carried by the National Docks Railroad Bridge as it crosses over Pacific Avenue. At this point, the rail line runs very close to Lafayette Gardens, a complex of three-story brick apartment buildings located at Pacific Avenue and Barbara Place. The area near Pacific Avenue is developed with new, two-story, semi-detached housing. As the rail line travels south, it runs along vacant lots and industrial areas. The rail line is elevated at Johnston Avenue, and continues to run alongside the New Jersey Turnpike Extension/I-78 near Liberty State Park. From this point the rail line travels primarily at grade and runs south of the former Central Railroad of New Jersey tracks, which now serve as the right-of-way for the Hudson-Bergen Light Rail Transit System. The rail line travels along vacant lots as it crosses Chapel Avenue, south of York Cemetery. The rail line continues along an undeveloped area until it connects with the Greenville Branch.

Visual Resources. Visual resources within the study area include Dickinson High School (Jersey City High School) and the National Docks Railroad Bridge over Pacific Avenue (see Photographs 4 and 5 of Figures 5-3 and 5-5).

Viewers and Duration of Views. Viewers in the study area include residents, workers, and motorists. The rail line is below grade through much of the study area, and is only visible from adjacent properties in these areas. Residents who live near elevated portions of the rail line would experience views of long duration. Workers and motorists tend to have views of short duration. Workers' views are mostly experienced while traveling to and from work and during lunch. Motorists traveling through the area would have views of short duration as they would not be focusing on the rail line.

CHEMICAL COAST LINE STUDY AREA

Within the Chemical Coast Line Study Area the rail line is either at grade or elevated, and thus the study area is the area within 150 feet of the rail line. For analysis purposes, the study area has been divided into Segments 1 and 2, described below.

Segment 1

Affected Area. Segment 1 of the Chemical Coast Line Study Area is defined as an area located within 150 feet of the rail line between Oak Island Yard to the north and the Staten Island Railroad to the south. The New Jersey Turnpike/I-95 parallels the active rail line to the west for the entire length of the rail line.

Visual Context. The northern portion of the study area is located in an industrial area, while south of Trumbull Street it is residential and commercial. The northernmost portion of the study area is located near the Oak Island Yard, east of the New Jersey Turnpike/I-95. The area is highly industrial, with warehouses and port-related facilities. As the rail line travels south, it is bordered by highway and rail rights-of-way. The rail line also travels along the eastern portion of Newark Airport.

As the rail line travels south into Elizabeth, there is a tall concrete wall west of it that serves as a barrier to the New Jersey Turnpike/I-95. This concrete wall creates a visual and physical barrier between the residents in Elizabeth to the east and the area west of the rail line. The portion of the study area south of Trumbull Street, extending to 1st Avenue is primarily residential and commercial. 3rd Street runs parallel to the rail line, just outside the border of the study area. A park (Brophy Field) is located at the intersection of 3rd Street and Ripley Place. The side streets that connect with 3rd Street and lead to the rail line primarily consist of late 19th to early 20th century, front-gabled frame houses, two to two-and-one-half stories tall. There is a small public playground adjacent to the rail line on East Jersey Street. The rail line is elevated as it crosses through this portion of the study area.

The study area continues south along Lt. Glenn Zamorksi Drive, which runs parallel to the rail line. The west side of the street consists of a low berm, which leads to the rail line. There is a concrete wall adjacent to the rail line that serves as a barrier to the New Jersey Turnpike/I-95. The east side of the street consists of a series of late 19th to early 20th century houses. Generally, the houses are wood frame, two to two-and-one-half stories in height, with synthetic siding and replacement windows. The remaining southern portion of the study area as it approaches the Staten Island Railroad is located in an industrial area that consists of highway and rail right-of-way.

Visual Resources. There are no visual resources within the study area.

Viewers and Duration of Views. Viewers in the study area include residents, workers and motorists. Residents who live in the southern portion of the study area near the elevated track

have views of long duration. Workers and motorists traveling through the study area tend to have views of short duration since they would not be focusing on the rail line. Workers' views are mostly experienced while traveling to and from work and during lunch. The concrete wall for the New Jersey Turnpike/I-95 that runs alongside the rail line creates a visual and physical barrier that obscures many other viewer groups from seeing the rail line.

Segment 2

Affected Area. Segment 2 of the Chemical Coast Line Study Area is defined as the area within 150 feet of the rail line between the Staten Island Railroad to the north and the Port Reading Secondary Line to the south. The study area encompasses parts of Union and Middlesex Counties. It travels from the City of Elizabeth in the northern part of the study area through the City of Linden and the Borough of Carteret within the southern part of the study area. The New Jersey Turnpike/I-95 parallels the rail line to the west and the Rahway River bisects the line.

Visual Context. The northern portion of this study area is located in a remote, primarily undeveloped area. The rail line continues to travel parallel to the New Jersey Turnpike/I-95. After the rail line crosses the Rahway River and travels south, it begins to enter a residential area in the Borough of Carteret. The rail line is at grade for this portion of the study area. The rail line travels by an apartment complex near Wedgewood Drive and Monroe Avenue that consists of two-story brick apartment buildings. The rail line continues to travel south through a residential neighborhood consisting of one- and two-story modern homes constructed during the latter half of the 20th century. The rail line runs adjacent to the rear yards of houses located on Jackson Avenue, Rosewood Lane, and Carteret Street. As the rail line travels along Carteret Street, the west side of the street is an undeveloped open grass field, while modern homes are located along the east side of the street.

Visual Resources. There are no visual resources within the study area.

Viewers and Duration of Views. Viewers in the study area include residents and motorists. Since much of the rail line travels behind the rear yard of private houses, the rail line is highly visible to residents from their homes, and less visible to motorists traveling through the area. Residents who live in areas where the rail line travels along their rear yard, or across the street from their homes would have views of long duration. The rail line is not visible from most streets in the study area, but where it is, it is not expected that motorists would be focusing on the rail line and thus would have views of short duration.

ARTHUR KILL LIFT BRIDGE STUDY AREA

Affected Area

The Arthur Kill Lift Bridge Study Area within New Jersey is defined as the area within 150 feet of the Staten Island Railroad between the Chemical Coast Line and the Arthur Kill Lift Bridge, and an area of 400 feet from the location of the proposed new rail bridge across the Arthur Kill (see Figure 5-6). The rail line is elevated on a trestle in the far eastern portion of the study area, near where it crosses the Arthur Kill Lift Bridge to Staten Island.

Visual Context

The study area is primarily industrial, although there is a small scattering of detached frame residential houses on Krakow Street. These houses are 1 to 2½ stories tall with front gabled roofs and appear to have been constructed during the late 19th to early 20th century. A two-story brick

apartment building is located at the corner of Amboy Avenue and Krakow Street and appears to date to the late 19th or early 20th century. Industrial buildings and structures in the study area include multi-story brick industrial and factory buildings and trailers. Oil tanks are located near the shoreline, north of the Arthur Kill Lift Bridge. The area immediately adjacent to the Arthur Kill is grassy, undeveloped shoreline, and the areas immediately adjacent to the elevated rail line are primarily grassy and undeveloped.

Visual Resources

Visual resources within the study area include the Goethals Bridge and the Arthur Kill Lift Bridge. The Goethals Bridge, which has a span of 672 feet and a total length of 7,109 feet, is a steel cantilevered bridge that spans the Arthur Kill between Howland Hook, Staten Island and Elizabeth, New Jersey. The visible steel truss of the bridge is painted a light gray/sky blue color. The Arthur Kill Lift Bridge is a rail bridge that crosses the Arthur Kill between Howland Hook, Staten Island and Elizabeth, New Jersey (see Photograph 6 of Figure 5-5). The bridge is constructed of steel and concrete and has a main span of 558 feet in length that is suspended between two shore towers. The steel truss of the bridge is a dark, black color.

Viewers and Duration of Views

Viewers in the study area include residents, workers and motorists. The elevated rail line travels through a small residential neighborhood. Residents in this area would have views of long duration due to the close proximity of the rail line to their homes. Workers in the industrial areas within the study area, as well as motorists traveling on through streets within the study area, would have views of short duration since they would not be focusing on the rail line. Viewers of the Arthur Kill Lift Bridge and the Goethals Bridge would be limited to workers and motorists traveling through the industrial area near the bridges or on the Goethals Bridge. These viewers would tend to have views of short duration, as they would not be focusing on the bridges.

STATEN ISLAND STUDY AREAS

ARTHUR KILL LIFT BRIDGE AND ARLINGTON YARD STUDY AREAS

Affected Area

The Arthur Kill Lift Bridge and Arlington Yard Study Areas are located at the northwestern corner of Staten Island along the industrial waterfront of the Arthur Kill and Newark Bay (see Figures 5-6 and 5-7). The study area is the area within 50 feet of Arlington Yard, since the site is located in an industrial area and is surrounded by wooded areas and thick vegetation. The study area also includes a radius of 400 feet around the potential new rail bridge across the Arthur Kill. The new bridge would be located adjacent and south of the existing Arthur Kill Lift Bridge. The area is largely characterized by port and industrial facilities. The topography is flat and features salt marshes and vacant land areas.

Arlington Yard is a 50-acre inactive rail yard. Railroad tracks survive, but much of the area immediately surrounding the track alignment is overgrown with vegetation and there is a wooded section strewn with debris (see Photograph 4 of Figure 5-2 and Photograph 5 of Figure 5-3). The yard is bordered by Western Avenue and a portion of New York State Department of Environmental Conservation (NYSDEC) Goethals Bridge Pond Preserve to the west. The eastern boundary is formed by South Avenue. The former Proctor and Gamble site lies to the

northwest and Mariners Marsh Park to the north. To the south is the former A&A Landfill and the Goethals Bridge Pond Preserve.

Visual Context

The area immediately surrounding Arlington Yard contains mostly industrial and commercial facilities, with a small residential area located east of Arlington Yard. There is a distinct boundary formed by South Avenue and Holland Avenue, where industry is located west of these streets and residential areas are located to the east. Most industrial buildings in the area are nondescript factory or warehouse buildings. A number of natural wetland areas and open spaces are located adjacent to Arlington Yard. Mariners Marsh Park is located adjacent to Arlington Yard's northern boundary while Goethals Bridge Pond Preserve is located adjacent to its western and southern boundary.

Visual Resources

The Goethals Bridge and Arthur Kill Lift Bridge are two important visual resources in the surrounding area. These resources are described above, under "Arthur Kill Lift Bridge Study Area" (see Photographs 6 and 7 of Figures 5-5 and 5-8).

Mariners Marsh Park (located just north of Arlington Yard) and Goethals Bridge Pond Preserve (located west and south of Arlington Yard) are two other visual resources in the surrounding area. Mariners Marsh Park is a 107-acre park that contains athletic fields and a number of walking trails. Arlington Yard is visible only from the southernmost portion of this park due to vegetation and topography. Goethals Bridge Pond Preserve is a 150-acre site that contains a 33-acre brackish pond that attracts a variety of foraging waterfowl. The northern boundary of this preserve is wooded, thus obscuring most views of Arlington Yard from within the preserve.

Viewers and Duration of Views

Viewers in the study area are limited to motorists and workers. The duration of views from moving automobiles is short, and it is expected that workers would also have views of short duration as they would not be focusing on the rail line. Viewers of Arlington Yard are limited to motorists and visitors to Mariners Marsh Park and the Goethals Bridge Pond Preserve. Motorists would have views of short duration. Visitors to Mariners Marsh Park would have views of the yard only from the southernmost portion of the park and they would have views of long duration. Likewise, visitors to Goethals Bridge Pond Preserve would have views of the yard only from the northernmost portion of the preserve and they would have views of long duration. Due to existing vegetation and topography, Arlington Yard is not visible from the small residential area to the east.

NORTHERN STATEN ISLAND STUDY AREAS

Segment 1

Affected Area. The Northern Staten Island Study Area, Segment 1, follows the alignment of the Staten Island Railroad from South Avenue east to Nicholas Avenue. The rail yard right-of-way is below grade throughout Segment 1, and the study area includes the area within 50 feet of the rail line. The study area is primarily residential, with some industry.

Visual Context. The area is densely developed with a mix of residential and industrial uses. The residential development appears to date from the late 19th and early 20th century through the mid 20th century. Most houses are detached frame buildings, 2- to 2½ stories tall, with gabled

roofs and synthetic siding on the exterior. Properties have narrow lots, with small front and rear yards, and little, if any, side yards. Due to the dense and urban development of the area, vegetation is sparse, although there are scattered mature trees located on streets within the study area. Much of the railroad right-of-way is wooded and overgrown with vegetation.

Visual Resources. There are no visual resources within the study area.

Viewers and Duration of Views. Viewers in the study area include residents, workers, and motorists. Since the rail line is below grade through this area, it would only be visible to residents in adjacent properties who would have views of long duration. The rail line would be visible to workers and motorists, but their views would be of short duration since they would not be focusing on the below grade sections of the rail line.

Segment 2

Affected Area. The Northern Staten Island Study Area, Segment 2, follows the alignment of the Staten Island Railroad from Nicholas Avenue east to Alaska Street. The rail line is either at grade or elevated in this segment, and as a result the study area is the area within 150 feet of the rail line.

Visual Context. The study area is located near the north shore of Staten Island and is relatively flat, with no parks or open public spaces. The Staten Island Railroad travels through this area on an elevated trestle, from Nicholas Avenue to Richmond Terrace. The elevated concrete rail bridges allow vehicular traffic to travel underneath; however, their presence interrupts the residential neighborhoods. The railroad alignment is located very close to private residences and is a strong visual presence in the area.

The study area is densely developed with a mix of residential, commercial, and industrial uses, with industrial uses more commonly found on Richmond Terrace, near the waterfront. Due to the dense and urban development of the study area, vegetation is sparse, although there are scattered mature trees located on some streets. The elevated rail line travels over several north/south streets that are primarily residential. This residential development appears to date from the late 19th and early 20th century through the mid-20th century. Most houses are detached frame buildings, 2 to 2½ stories tall, with gabled roofs and synthetic siding on the exterior. Properties have narrow lots, with small front and rear yards, and little, if any, side yards. Port Richmond Avenue is the main commercial roadway in the area. Most commercial buildings appear to have been constructed during the early to mid-20th century. These buildings are generally two to three stories tall, with brick and synthetic siding on the exterior. The buildings have flat roofs, and some retain their original cornices.

Visual Resources. Visual resources in the study area include views of the Bayonne Bridge. The steel arch bridge crosses the Kill Van Kull between Port Richmond, Staten Island and Bayonne, New Jersey. The Bayonne Bridge has a dramatic, high arch of 266 feet that carries the roadbed for 1,675 feet without any intermediary piers. The steel arch of the bridge is silver in color. It was the longest steel arch bridge in the world when constructed.

Viewers and Duration of Views. Viewers in the study area include residents, workers, and motorists. Since the rail line is elevated and travels through densely developed residential areas, it is highly visible to residents who would experience views of long duration. Workers in the area would have views of short duration, as their views are mostly experienced while traveling to and from work and during lunch. Motorists traveling on through streets would have views of short duration as they would not be focusing on the rail line.

Segment 3

Affected Area. The Northern Staten Island Study Area, Segment 3, follows the former alignment of the Staten Island Railroad from Alaska Street east to Davis Avenue and includes the area within 150 feet of the open cut and cut and cover portions of the potential tunnel alignment. The study area is primarily located along Richmond Terrace.

Visual Context. The study area is located near the north shore of Staten Island, where it borders the Kill Van Kull. Richmond Terrace is located along the waterfront and is the primary east/west roadway in the study area. The area is densely developed, primarily with industry along Richmond Terrace, although there is some residential development as well. Markham Gardens, a public housing development, is located just outside the study area on Richmond Terrace, between Broadway and North Burgher Avenue. The Snug Harbor Cultural Center is located outside the study area, east of Davis Avenue along Richmond Terrace. It is a large complex of buildings on extensive grounds and includes a monumental group of five Greek Revival dormitory and administration buildings.

Visual Resources. Visual resources in the study area include waterfront views of the Kill Van Kull. Views of the waterfront are visible primarily from Richmond Terrace.

Viewers and Duration of Views. Viewers in the study area include residents, workers, and motorists. Residents who live along Richmond Terrace would experience views of long duration. Workers in the area would have views of short duration, as their views are mostly experienced while traveling to and from work and during lunch. Motorists traveling on Richmond Terrace would have views of short duration as they would not be focusing on the rail line.

Segment 4

Affected Area. The Northern Staten Island Study Area, Segment 4, is the bored portion of the tunnel alignment that would extend from Davis Avenue to the waterfront in the St. George Community. The tunnel alignment travels in a northwest/southeast direction. Since the tunnel alignment in this portion of the study area would be constructed using boring techniques, there would be no potential visual effects from the tunnel. However, for the potential construction of the tunnel ventilation shaft offshore in New York Harbor, a study area of 400 feet has been defined (see Figure 5-9). This study area is located along the New York Harbor shoreline just south of the waterfront esplanade and the St. George Staten Island Ferry Terminal. The potential tunnel ventilation shaft would be constructed on Pier 2 and would extend 50 to 60 feet above mean/low water level.

Visual Context. The study area primarily consists of a residential and commercial neighborhood. Bay Street is the main commercial street in the study area. Commercial buildings on Bay Street generally were constructed during the early 20th century and are brick or stone, and range from 1 to over 10 stories in height. Central Avenue is located west of Bay Street, and buildings on the street primarily are detached 2 to 2½ story frame houses. The houses appear to have been constructed during the late 19th and/or early 20th century and most houses have synthetic siding and replacement windows. A few apartment buildings are located on the north end of the street, outside the study area. East of Bay Street, near the intersection with Slosson Terrace, the topography drops down sharply. At this location, Bay Street is located on a bluff overlooking land below and the waterfront beyond. Three buildings (7 to 10 stories tall) are located along the waterfront. The northernmost building, located near the abandoned U.S. Coast Guard Base (former Staten Island lighthouse depot complex), appears to be vacant, while the other two buildings are apartments or condominiums. Portions of the land below Bay Street are overgrown

and vacant, while other areas are parking lots for the apartment buildings (see Photograph 6 of Figure 5-3). The Staten Island Railway travels east of Bay Street, at a lower grade. A public walkway is located along the waterfront in this area.

Visual Resources. Visual resources in the study area include waterfront views of New York Harbor and the Verrazano-Narrows Bridge (see Photograph 8 of Figure 5-8). Visual resources located just outside the study area include the Staten Island Borough Hall (2-10 Richard Terrace) and the Richmond County Courthouse (12-24 Richmond Terrace).

Viewers and Duration of Views. Viewers in the study area include residents, workers, and motorists. The proposed vent shaft would be visible from certain locations along Bay Street (near Slosson Terrace) and from the large apartment buildings located near the waterfront. As discussed in Section C, the vent shaft would also be visible from the public walkway. The dense development of the area obscures views from other locations. Residents in these locations would have views of long duration. Workers in the area would have views of short duration, as their views are mostly experienced while traveling to and from work and during lunch. Motorists traveling through the study area, primarily along Bay Avenue, would have views of short duration as they would not be focusing on the vent shaft.

BROOKLYN STUDY AREAS

65TH STREET YARD STUDY AREA

Affected Areas

The 65th Street Yard Study Area is the area within 50 feet of the yard and is expanded to include viewsheds from the two residential towers on 65th Street between 3rd and 4th Avenues. Multiple tracks run east-west through the graded yard and pass under 2nd Avenue and the BQE through the Bay Ridge Branch rail cut. Within the yard, there is a large plot of open land between the majority of tracks that are located in the southern portion of the yard and a small number of tracks in the northern portion. A modern float bridge is located on the shoreline at the southwest end of the yard. Deteriorated and partially submerged piers and freight loading facilities are located in the harbor.

Under the New Jersey tunnel alignment, a tunnel ventilation shaft would be built in the western portion of 65th Street Yard near the southern boundary. The ventilation shaft study area is within 400 feet of this potential location.

Visual Context

Immediately surrounding 65th Street Yard are two industrial complexes. The Brooklyn Army Terminal is located north of the yard and extends to 58th Street. It consists of 19 structures, including two 9-story concrete warehouses designed in an early modernist style and oriented parallel to the waterfront, and three 2-story, enclosed piers. The Owls Head Water Pollution Control Plant (WPCP) is located on the waterfront southwest of the yard and consists of several boxy, concrete buildings and container drums. At 2nd Avenue, the tracks enter the Bay Ridge Branch rail cut, passing under the avenue. Between 2nd and 4th Avenues, two 30-story, boxy brick residential towers are located between the rail cut and 65th Street. Serving as parking and passive open space for the two towers, a concrete plaza covers the rail cut in this location. Running above 3rd Avenue, the elevated metal BQE runs between the residential towers and the rail yard. South of the yard, the elevated BQE branches into the Shore Parkway (also elevated

south of the yard) that follows the Bay Ridge shoreline south. Landscaped medians border both sides of Shore Parkway. Owls Head Park is located south of Shore Parkway and Wakeman Place. The hilly park contains several winding paths, grassy fields, paved ball courts, and seating areas. Portions of the park have thick tree coverage, and the center of the park is a tall hill.

Visual Resources

There are no visual resources within the 65th Street Yard Study Area. Although Upper New York Harbor is visible from the yard and immediately surrounding area, there are no publicly accessible sections of the waterfront, and some views are partially blocked by intervening Brooklyn Army Terminal structures and the elevated expressways.

Viewers and Duration of Views

Viewer groups include workers at the Brooklyn Army Terminal, the Owls Head WPCP, and 65th Street Yard; motorists on Shore Parkway and 2nd Avenue; residents of the two apartment towers; and recreational park users. The duration of views is short from moving vehicles. While the duration of pedestrian views is longer, it is expected that workers in the surrounding industrial facilities are not focusing on the yard. Views of the 65th Street Yard from nearby Owls Head Park (which is outside the study area) are largely blocked by intervening WPCP buildings, the elevated parkway, and trees. Views from portions of the towers facing the waterfront are unobstructed.

BAY RIDGE BRANCH STUDY AREA

Segment 1

Affected Areas. The Bay Ridge Branch Study Area, Segment 1 includes the bored portion of the New Jersey and Staten Island tunnel alignments, the area within 400 feet of the potential ventilation shaft site at 65th Street Yard, the area within 400 feet of the potential ventilation shaft site at the seaward end of the 69th Street pier, and the area within 50 feet of the Bay Ridge Branch between 2nd Avenue where the line connects with 65th Street Yard and between 8th and 9th Avenues where the cut and cover portion of the tunnel would begin (see Figure 5-10). Since the Segment 1 proposed tunnel alignment would be below grade and not visible and would be constructed using boring techniques in this area, there would be no potential effects from the tunnel and no study area.

The 65th Street Yard ventilation shaft study area is discussed above under the 65th Street Yard Study Area. The Segment 1 study area accounts for potential work to increase clearance heights along the Bay Ridge Branch, which is within the rail cut whose depth is approximately 20 to 40 feet below grade. A combination of chain link and opaque metal fencing borders portions of the north and south sides of the cut at street level, and concrete walls border the cut where it traverses under street overpasses. Between 2nd and 8th Avenues, buildings directly abut the rail cut, and between 2nd and 4th Avenues, a concrete plaza supporting parking and seating covers the rail cut.

Visual Context. For the Staten Island tunnel alignment, a tunnel ventilation shaft would be built at the seaward end of the 69th Street pier. The waterfront within 400 feet of the potential ventilation shaft consists of several public open spaces bordered by Shore Parkway and the Owls Head WPCP. South of Bay Ridge Avenue, the Shore Promenade runs south along the waterfront. Sloping gently downward from Shore Road, which borders it on the east, the landscaped park contains open grassy areas and pedestrian paths, trees, seating areas, and

decorative lamp posts. Shore Parkway, a wide and busy expressway, separates the promenade from the waterfront. North of Mackay Place, the parkway is elevated. On the west side of the parkway, a concrete walkway and jogging/bicycle path with seating runs along the waterfront. Brick apartment buildings of four to six stories with decorative parapets and colonial-style entrance porticos and two-story brick and synthetic-siding houses with gabled roofs and enclosed porches are located along the east side of Shore Road overlooking the promenade. At Bay Ridge Avenue, the public 69th Street pier extends into the harbor (see Figure 5-4). Bay Ridge Avenue passes under Shore Parkway to end at the landside end of the pier and a driveway entrance to the pollution control plant. Benches and tables are placed on the concrete pier. North of the pier, the elevated Shore Parkway separates Owls Head Park from the Owls Head WPCP. Extending into the harbor, the pollution plant consists of low-rise, boxy concrete buildings and retaining walls, and large concrete drums.

Between 2nd and 8th Avenues, the Bay Ridge Branch runs diagonally through the street grid in an approximate east-west direction. The elevated BQE and Shore Parkway are defining visual features of the study area. Between 4th and 6th Avenues, the BQE runs above the cut, and the elevated Shore Parkway passes above the cut east of 2nd Avenue. In the study area, the Bay Ridge Branch runs through a mix of low-rise industrial, commercial, and residential neighborhoods. The manufacturing and warehouse buildings tend to consist of mid-20th century featureless, boxy brick structures of one or two stories, while the residential buildings primarily consists of late 19th century, three-story, Italianate brick rowhouses with stone details and sheet metal cornices. For most of the Bay Ridge Branch's length through the study area, it is directly bordered by generic manufacturing and warehouse buildings. On the cut's north side, these structures directly abut the cut between 5th and 8th Avenues, obscuring all views except those from where the cut passes under the avenue overpasses.

The few residential buildings in the study area tend to be located on the north-south avenues at least a block north or south of the cut. Exceptions are a row of 19th century, brick rowhouses with rounded facades located on the north side of 64th Street between 4th and 5th Avenues across the street from a late 20th century, 11-story brick apartment building with cantilevered balconies on the upper 5 floors; a few 19th century brick rowhouses on the north side of 65th Street between 2nd Avenue and the BQE; a row of mid-20th century, 2-story, boxy brick rowhouses with flush facades and narrow, second-floor balconies with decorative cast-iron railings; and two mid-20th century, 30-story, boxy brick apartment towers whose defining features are metal balconies. These two apartment towers are visible for long distances in multiple directions. The concrete plaza, mentioned above, that covers the rail cut is part of this apartment complex and lies on the south side of the towers. On 64th and 65th Streets south of the rail cut, there are multiple paved parking lots and generic, featureless, stucco, two-story boxes housing car dealerships. A mid-20th century, one-story church clad in rough-cut stone with a triangular entrance façade abuts the rail cut on the northwest corner of the intersection of 64th Street and 7th Avenue. A paved parking lot occupies the church property to the west of the building. Leif Ericsson Park is located between 66th and 67th Streets and 4th and 6th Avenues. Surrounded by chain link fences and divided by 5th Avenue, the park contains paved playgrounds and ball fields. Tall trees border the park on all sides.

Visual Resources. Visual resources within the study area for the potential Staten Island tunnel alignment ventilation shaft include Shore Promenade, Owls Head Park, and views of the harbor from the pier, promenade, and park (see Photographs 9-12 of Figures 5-11 and 5-12). These harbor views, especially from the pier, are extensive and include the Statue of Liberty, the downtown Manhattan skyline, Staten Island, and the Verrazano-Narrows Bridge. Also

periodically included within these views are large shipping tankers anchored in the harbor. There are no visual resources along the Bay Ridge Branch.

Viewers and Duration of Views. Viewer groups for the 69th Street pier ventilation shaft site include recreational users of the park and promenade; residents; workers at the water pollution control plant; and motorists on Shore Parkway. Motorists on the parkway have clear but brief views of the potential ventilation shaft site. While the duration of views from workers in the various industrial facilities are longer, it is expected that these workers are not focusing on views of the harbor. Views of the 69th Street pier site from Owls Head Park and the pier are clear and extensive (see Photograph 9 of Figure 5-5). Views from the northern portion of Shore Promenade and Shore Road are partially blocked by intervening water pollution control plant buildings and Shore Parkway. Views from the concrete path along the waterfront and Shore Promenade south of the pier are unobstructed and extensive.

Views of the Bay Ridge Branch are limited to its immediate vicinity because it is below grade. Most views of the cut are blocked by intervening buildings that abut its north and south sides. Where the Bay Ridge Branch crosses under avenues, concrete walls block views. Although views for pedestrians are of long duration, most views of the rail cut are limited. Motorists' views are of limited duration.

Segment 2

Affected Areas. The Bay Ridge Branch Study Area, Segment 2 is within 150 feet of the open cut and cut and cover portions of the potential tunnel alignment. The area is within the existing Bay Ridge Branch rail cut, extending from between 8th and 9th Avenues to between 12th and 13th Avenues. The depth of the rail cut is approximately 20 to 40 feet below grade. Tree growth lines both north and south embankments. A combination of chain link and opaque metal fencing borders the north and south sides of the cut at street level, and concrete walls border the cut where it traverses under street overpasses. Within the Bay Ridge Branch right-of-way, the Brooklyn-Manhattan Transit (BMT) Company Sea Beach (N) Line runs on a berm parallel to the Bay Ridge Branch. There are subway stations at 8th Avenue and 62nd Street, and at Fort Hamilton Parkway and 62nd Street. Both stations have two at-grade, concrete headhouses (i.e. the entrance and ticket booth buildings for the stations) at each platform end—the 8th Avenue headhouses are at 7th and 8th Avenues within the Segment 1 and 2 study areas, and the Fort Hamilton Parkway headhouses are at Fort Hamilton Parkway and 11th Avenue. These headhouses are concrete buildings with decorative paneled parapets and panels of inset terra cotta decoration.

Visual Context. Between 10th and 13th Avenues, the Bay Ridge Branch parallels the street grid in an approximate east-west direction running between 61st and 62nd Streets. In the study area, the Bay Ridge Branch runs through a mix of low-rise industrial and residential neighborhoods. Buildings in the area primarily date from the late 19th century to mid-20th century and consist of 1- to 3-story, masonry warehouses that are typically featureless, boxy structures; commercial buildings that tend to be Italianate in style; and attached residences with few details other than stone trim, a minimal cornice line, and window awnings. Other structures include generic, boxy, brick auto repair and garage facilities. Storage lots are also common. Typically, warehouses and other industrial uses border the rail cut, but do not directly abut it. Residential buildings are typically found on the streets that run perpendicular to the rail cut, but some residential buildings are found along the cut in the vicinity of Fort Hamilton Parkway. The houses on the south side of 62nd Street to the east of the parkway have small yard lots on the north side of the street, abutting the rail cut. These yards are fenced and contain small storage sheds. Commercial

buildings typically line the avenues that cross the Bay Ridge Branch on concrete bridges. Street trees are scattered through the study area, primarily along the rail cut and the residential streets perpendicular to it.

Visual Resources. There are no visual resources within the Segment 2 study area.

Viewers and Duration of Views. Views of the Bay Ridge Branch are limited to its immediate vicinity because it is below grade. Views are primarily of the boundary fencing and trees growing out of the cut. Views down into the cut are limited. Where the Bay Ridge Branch crosses under avenues, tall concrete walls block views. Views from the streets parallel to the Bay Ridge Branch are also partially obscured by a mix of chain link and opaque metal fencing. Viewer groups include residents, workers, and motorists. Pedestrians have views of long duration, but as mentioned above, most views of the rail cut are limited. Motorists' views from vehicular traffic are of limited duration.

Segment 3

Affected Areas. The Bay Ridge Branch Study Area, Segment 3 is the area within 50 feet of the below grade rail line from 13th Avenue where the potential tunnel alignment would meet grade to Albany Avenue (see Figure 5-13). The directly affected area is within a rail cut with a depth of approximately 15 to 20 feet below grade. Tree growth lines both embankments (see Photograph 13 of Figure 5-14). Various wall and fence types—concrete walls, opaque metal fencing, chain link fencing, and metal railing—border the north and south sides of the rail cut and the street overpasses. At New Utrecht Avenue, the N Line leaves the Bay Ridge Branch right-of-way. At this location, there is a subway station at 62nd Street that consists of two platforms with a headhouse at each end.

Visual Context. The street pattern in the study area consists of two grids separated by McDonald Avenue. The grid east of the avenue is oriented in a north-south direction, and the grid west of the avenue is oriented in a northwest-southeast direction. New Utrecht Avenue (in the west grid) and Flatbush Avenue (in the east grid) run against the dominating grid patterns in rough north-south directions. For most of its length, Segment 3 of the Bay Ridge Branch runs through predominately residential neighborhoods. Small industrial and commercial structures, however, border sections of the right-of way, especially at the ends of Segment 3—west of 20th Avenue and east of Flatbush Avenue. The industrial buildings in these locations tend to be one- to three-story masonry warehouses, small brick manufacturing facilities, and auto repair facilities that date from the early to mid-20th century. They range in style from loft buildings with factory-style windows, International Style structures, windowless boxes, and structures with subtle Italianate details. Storage lots and vacant lots are also located along the rail cut. At New Utrecht Avenue, there is a steel pedestrian bridge that connects the N Line station to the 62nd Street station of the elevated BMT West End (B, M) Line that runs along New Utrecht Avenue.

The middle portion of the study area is largely bordered by residential neighborhoods that have a cohesive, suburban character. Houses in these residential neighborhoods tend to be detached, two-story, single-family houses from the early to mid-20th century, although attached rowhouses and tall apartment buildings from the same construction period are found throughout the study area. The detached houses, which tend to be similar houses in Dutch Revival and pseudo-Prairie Style idioms set back from the street within small yards, are generally wood-framed structures faced in a variety of materials, including brick, stucco, synthetic siding, and wood. Hipped and gabled roofs, enclosed porches, and garages are common. The attached rowhouses tend to be structures whose only distinguishing details consist of stoops, door and window awnings, and

rooflines that vary between gabled, hipped, and parapeted. Street trees are found on all residential streets. In the Midwood section of the study area, there are many recently constructed, large, brick and stucco houses with neoclassical details. Along the right-of-way, houses abut the rail cut. Most of the narrow, one-way residential streets that run perpendicularly to the Bay Bridge Branch terminate at the rail cut. The wider, two-way avenues cross the rail cut on concrete bridges.

Brooklyn College is located north of the right-of-way between Ocean and Nostrand Avenues, and between the rail cut and Glenwood Road. The college consists of Georgian Revival buildings from the 1930s and 1940s and modernist buildings from the second half of the 20th century. Bedford Avenue is the only street through the campus. Oriented around the library and a lawn, the central campus is on the east side of the avenue. Buildings on the west side of Bedford Avenue face east, and the western portion of the campus consists of an athletic field. Flatbush Avenue, located a block east of the college, is a major commercial street through the Segment 3 study area. It is a wide, four lane, two-way, avenue that runs diagonally through the street grid. Buildings on the avenue include late 19th century, three-story, masonry Italianate rowhouses with ground-floor commercial spaces; two- to three-story, early 20th century, brick Italianate commercial buildings; generic gas stations; parking lots; and tall, mid-20th-century featureless brick apartment buildings. Several blocks east of Flatbush Avenue, the study area loses its residential character and becomes primarily industrial.

Visual Resources. There is one visual resource within the Segment 3 study area. Ocean Parkway is a New York City Scenic Landmark (see Chapter 6, "Historic Resources"). It is a wide thoroughfare that crosses the Bay Ridge Branch. Ocean Parkway consists of a central, six-lane road flanked by two landscaped malls with benches, trees, and sidewalks (see Photograph 14 of Figure 5-14). Narrow service streets parallel the central road on the opposite sides of the malls. Within the study area, buildings along the parkway consist of early to mid-20th century, single family houses and mid-20th century apartment buildings. Set back from the side streets within small yards, the houses are two-story, masonry structures with enclosed porches and hipped roofs. The apartment buildings are generic seven-story, brick buildings with few details other than balconies. Tall, modern, metal rail fencing borders the right-of-way where it passes under the parkway.

Viewers and Duration of Views. Views of the rail cut are limited to immediately adjacent streets and bordering properties, because it is below grade and bordered by fencing. Viewers include residents, workers and students at Brooklyn College, and motorists that pass over the rail cut on the avenues. Motorists' views from vehicular traffic are limited and of brief duration. Pedestrians on the avenues have limited views of the rail cut because of fencing. Residents who live on properties bordering the rail cut have the most extensive views. On Ocean Parkway, the rail cut is only clearly visible from the service streets in its immediate vicinity.

Segment 4

Affected Areas. The Bay Ridge Branch Study Area, Segment 4 is the area within 50 feet of the minimally below-grade sections of the rail line to a point east of Albany Avenue, and between a point south of Livonia Avenue and Evergreen Avenue; and it is within 150 feet of the elevated sections of the rail line between approximately Glenwood Road and a point south of Livonia Avenue, and between Evergreen Avenue and the Brooklyn-Queens border (see Figure 5-15). The directly affected area is the Bay Ridge Branch between Albany Avenue and the Brooklyn-Queens border. Between Albany Avenue and Glenwood Road, the rail line passes through a cut that is approximately 15 to 20 feet deep. At Glenwood Road, the line passes over the road on a

trestle, and continues northeast on an embankment to New Lots Avenue, where it again enters a cut that is approximately 25 feet below grade. Where the line crosses over streets, it typically crosses on a trestle. At East 83rd Street, however, the rail line crosses the street on a brick, arch bridge. At East New York Avenue, the line enters the East New York Tunnel, and, where it emerges from the tunnel around Granite Road and Evergreen Avenue, it becomes elevated on an embankment. Between New Lots Avenue and the Brooklyn-Queens border, the elevated BMT Canarsie (L) Line parallels the Bay Ridge Branch right-of-way.

Visual Context. East of Ralph Avenue, the street grid shifts to follow a northwest-southeast direction. Within the study area, the portions of the neighborhoods through which the Bay Ridge Branch passes are primarily industrial. Residential pockets, however, are located between New Lots and Pitkin Avenues. North of Atlantic Avenue, the neighborhoods bordering the right-of-way are more residential with a mix of commercial and industrial uses. Where the Bay Ridge Branch is elevated between Glenwood Road and New Lots Avenue, the industrial areas consist of one- to three-story warehouses, auto repair shops, and small manufacturing facilities. In addition, the industrial buildings are typically masonry, boxy, featureless structures that date to the early- to mid-20th century. Storage lots bordered by chain link fences are also common. Street trees are found throughout the industrial areas.

North of New Lots Avenue, the streets immediately parallel to the below grade rail line—Junius Street and Van Sinderen Avenue—are primarily industrial. One block to the west of the line—along Powell Street and the cross streets—the neighborhood is characterized by mid-20th-century housing developments that consist of tall, generic, brick apartment buildings and uniform rows of two-story, brick houses whose defining features are metal window and door awnings. These houses have small, grass yards and driveways. On the residential streets, there are also new, low-rise housing developments of attached, brick houses. Street trees are present on the residential streets. North of New Lots Avenue, the L Line parallels the below grade Bay Ridge Branch on a tall viaduct. At Livonia Avenue, the elevated Interborough Rapid Transit (IRT) Company No. 1 Line runs east-west through the study area and crosses the Bay Ridge Branch right-of-way.

At the intersection of Broadway, Jamaica Avenue, and Fulton Street, the Bay Ridge Branch passes through the East New York Tunnel. Different street grids meet at this visually confusing intersection of wide thoroughfares and elevated rail lines. East of the tunnel is the East New York Yard, an 11-acre rail yard bounded by Bushwick Avenue on the north, Conway Street on the west, Broadway on the south, and the East New York Bus Garage and Repair Shops on the east. The yard contains 41 storage tracks on three sets of elevated yards, a maintenance shop, and other related structures. The elevated BMT Jamaica (J, M, Z) Line passes over the yard, and the elevated Independent Subway (IND) System (A, C) Line passes south of the yard. The Cemetery of the Evergreens and Trinity Cemetery are located north of the rail yard and east of the Bay Ridge Branch right-of-way. The large cemetery has hilly, landscaped topography, and it is bordered by both opaque walls and cast iron fencing. The elevated L Line runs parallel to the Bay Ridge Branch right-of-way between it and the cemetery.

North of Fulton Street, the neighborhoods bordering the right-of-way are mixed-use with scattered residential buildings and commercial and industrial establishments on the large thoroughfares of Broadway, Bushwick, Jamaica, and Atlantic Avenues. Buildings tend to be two- to three-story, brick tenements, rowhouses, and commercial structures from the late-19th and early-20th centuries. Many streets have intact rows of uniform houses tied together with sheet metal cornices, stone banding, and similar window openings. A characteristic rowhouse

type in these residential areas possesses rounded bay windows that create an undulating streetwall. The A, C Line and the J, M, Z Line are both elevated through the neighborhoods bordering the Bay Ridge Branch.

Visual Resources. Although the Cemetery of the Evergreens is a visual resource, some views of it from the study area are blocked by the elevated L Line and the Bay Ridge Branch where it becomes elevated north of Evergreen Avenue (see Photograph 15 of Figure 5-16). Fences around the cemetery also partially obstruct some views. Winding roads and paths meander through the picturesque grounds covered with elaborate tombstones, monuments, and mausoleums. The cemetery is publicly accessible, and within it there are views of the surrounding neighborhoods.

Viewers and Duration of Views. Views of the Bay Ridge Branch Study Area, Segment 4 are primarily limited to the immediately adjacent streets, especially where the line is below grade between New Lots and Evergreen Avenues. The line is more visible where it is elevated on an embankment between Glenwood Road and New Lots Avenue, especially from the streets that pass under the line, but the neighborhoods bordering the elevated section are largely industrial. Throughout the study area, viewer groups include residents, workers, motorists, and riders on the various subway lines that pass over and parallel the right-of-way. The duration of views are both brief and extended. From within the cemetery, views of the elevated section of the Bay Ridge Branch north of Evergreen Avenue are blocked by the elevated L Line.

QUEENS STUDY AREAS

BAY RIDGE BRANCH (QUEENS PORTION) STUDY AREA

Affected Area

The study area for the Bay Ridge Branch in Queens is within 150 feet of this elevated section of the rail line, and is roughly bounded by Cypress Hills Street on the north, Irving Avenue and the Queens/Brooklyn border on the south, Cody Avenue, Decatur Avenue, and Shaker Avenue on the west, and Central Avenue, St. Felix Avenue, and Evergreen Park on the east. The rail line in this area runs along an embankment, in a northeasterly direction through the Ridgewood and Glendale areas of Queens to Fresh Pond Yard.

Visual Context

The area directly adjacent to the rail line is surrounded by low, small-scale industrial buildings, Evergreen Park, several cemeteries, and some residential buildings located very near the rail line along Decatur Street. The surrounding study area is more industrial near the border with Brooklyn, but is generally residential to the north. The residential nature of the area is largely defined by its long rows of cohesive, narrow, two- and three-story light brick rowhouses and tenement buildings. The buildings have brickwork patterning, bays, and other decorative details. Cumulatively, they have a strong effect on the visual quality of the area. On the east side of the study area is a wide swath of cemeteries, including Cemetery of the Evergreens and Knollwood Park Cemetery, that connect to the east with Forest Park; these are a dominant feature within the neighborhood. As several street grids intersect at different angles in this area and are overlain with a web of larger traffic corridors, views to the rail line on its embankment are generally limited. The area is also relatively hilly, which further reduces the likelihood of long view corridors.

Visual Resources

Although the area surrounding the Bay Ridge Branch in Queens is filled with interesting assemblages of residential buildings, none are prominently situated within the surrounding short view corridors. The cemeteries in the area are visual resources, providing large areas of green and open space. However, due to the street pattern of the study area, views to these resources are limited mainly to the directly adjacent streets and residences.

Viewers and Duration of Views

Views of the Bay Ridge Branch are primarily limited to the immediately adjacent streets. Viewer groups include the residents of the surrounding area and motorists, of which there are many. Views are both of long and short duration; the duration of motorists' views is short, while pedestrian views are longer. However, as described above, views to the rail line on its embankment are generally limited by surrounding buildings and the irregular street grid.

FRESH POND YARD STUDY AREA

Affected Area

The study area for Fresh Pond Yard is within 50 feet of the rail yard boundaries, and is expanded to consider potential viewsheds from surrounding residential areas (see Figure 5-17). The rail yard is divided into two areas—East Yard and West Yard. The yard extends from 71st Street at its far eastern end to Metropolitan Avenue at its far western end, and from the Montauk Branch to the north to Cypress Hill Street at its farthest southern point. East Yard consists of a below grade triangular area formed by three sets of railroad tracks, as well as additional lengths of tracks to the east and in West Yard. Where the yard can be seen, it consists of at grade railroad tracks, separated by paved sections. Tall wooden utility poles with associated utility wires extend along the paved portions. Freight rail cars are also stored along the tracks. A steel truss railroad bridge is also visible in the portion of West Yard near Mafera Park.

Visual Context

Fresh Pond Yard is visible from very few locations in the surrounding area. Much of the yard is bordered by industrial and commercial buildings and a cemetery; however, the surrounding area is primarily residential, with long rows of cohesive, two- and three-story light brick rowhouses and tenement buildings. The buildings have brickwork patterning, bays, and other decorative details. Cumulatively, they have a strong effect on the visual quality of the area. Lutheran Cemetery, a large, fenced, landscaped area on a hill, completely blocks views from the northeast. Metro Mall, a retail shopping mall located west and adjacent to the cemetery, blocks views south to the yard from Metropolitan Avenue. Along the south side of Admiral Avenue, approximately 45 attached two-story frame rowhouses create a strong streetwall. At the dead-end of the street, the tops of railroad cars in the yard are partially visible above dense fencing that runs along the northern edge of the yard. South and parallel to Admiral Avenue, a narrow rutted road slopes downward from the street, extending between the rear of the houses and the yard.

Traffic Avenue is a narrow commercial street that is lined with one-story brick warehouse buildings of utilitarian appearance. These buildings form a wall along the north side of the street, blocking all views to the yard. There is also a paved parking lot on Traffic Avenue, providing partial views of the yard, above fencing. This view is available for a short distance on tree-lined, residential Gates Avenue. From Mafera Park, a predominantly open, grassy area surrounded by a chain-link fence, only the top of the railroad bridge, described above, is visible above a tall,

densely woven metal fence that borders the yard, since this portion of the yard is at a lower grade than the park.

Otto Road, like Traffic Avenue, is a narrow street and its north side is similarly lined with one-story nondescript brick warehouses and commercial buildings, as well as areas hidden by tall opaque fencing. The yard is only visible from the area immediately surrounding the intersection of Otto Road and 68th Street, a residential street, as there is no fencing and an open paved area connects the street to the yard. The railroad tracks and stored freight cars are visible, as is the railroad bridge in the distance to the southwest.

Visual Resources

Although the area surrounding Fresh Pond Yard in Queens is filled with interesting assemblages of residential buildings, none of them are prominently situated within the surrounding short view corridors. Lutheran Cemetery, a large, fenced, landscaped area on a hill is a visual resource, a green, open area providing relief from the dense urban environment (see Photograph 16 of Figure 5-16).

Viewers and Duration of Views

Viewer groups to Fresh Pond Yard include the residents of the surrounding area and the vehicular traffic through the area, which can be heavy. Views are both of long and short duration; the duration of views from moving vehicles is short, while pedestrian views are longer. However, as described above, views to the yard are generally limited by surrounding buildings and land uses.

MONTAUK BRANCH STUDY AREA

Affected Area

The study area for the Montauk Branch is a small area between the western border of Fresh Pond Yard and the eastern border of the Maspeth Yard study area. The study area is within 50 feet of the rail line (roughly from Metropolitan Avenue to Flushing Avenue), where the rail line is below grade, and within 150 feet of the rail line where the rail line is at grade (roughly Flushing Avenue to Grand Avenue). The study area is roughly bounded by Grand Avenue on the west, Metropolitan Avenue on the east, and a number of roads, including Rust Street, to the north and south. The rail line in this area goes from being below grade with steep embankments on either side as it travels west through the neighborhood of Ridgewood to become at grade near Maspeth Yard.

Visual Context

Past Metropolitan Avenue, the area quickly evolves from a primarily residential area to a heavily industrial one as the rail line approaches the Maspeth Yard site. Views to the rail line in the study site are generally limited, as it is below grade in this area and the irregular street pattern only intersects the rail line intermittently and mainly at odd angles. Access from one side of the rail line to the other is limited. The Montauk Branch passes near the Linden Hill Cemetery, located south of the study area off Metropolitan Avenue. The residential buildings in the area are generally long rows of low-scale, narrow-lot tenements and rowhouses. Near the area of Maspeth Yard, the study area buildings are typically low-scale concrete and brick factory and warehouse-type buildings.

Visual Resources

There are no view corridors or visual resources of concern within the Montauk Branch study area.

Viewers and Duration of Views

Viewer groups include the residents and workers of the surrounding area and vehicular through traffic. Views are both of long and short duration, depending on the viewer. While pedestrian views are longer, it is expected that workers in the industrial facilities in the western portion of the study area are not focusing on the rail line as it rises to grade, and views by vehicular through traffic are generally much shorter. In general, as described above, views to the rail line in this area are generally limited by its below grade location (in some areas) and the irregular street pattern.

WEST MASPETH YARD STUDY AREA

Affected Area

The study area for West Maspeth Yard is within 400 feet of the boundary of the largest potential rail yard site (i.e., the 160-acre yard for the Double Tunnel System). The area of the largest potential rail yard is roughly bounded by Newtown Creek on the west, 56th Road on the north, Rust Street and Grand Avenue on the east, and Maspeth Avenue on the south (see Figure 5-18).

Visual Context

The study area surrounding the potential rail yard is primarily industrial. There are few roads in the area, and no discernible street pattern. Maspeth Avenue, 58th Street, Maurice Avenue, and 56th Road/Rust Street converge to the northeast of the potential yard. Many mapped roads do not exist in the area, are barely paved or are closed to public access. Patches of Belgian block paving can be seen on some streets, and power lines run overhead. There is a large amount of truck traffic going to and from the various active warehouses and businesses in the area, but few pedestrians. The Montauk Branch runs on a trestle above Grand Avenue and comes to grade quickly to the west of the avenue.

The western portion of the site, the former Phelps Dodge site, is currently vacant and is partially paved and partially overgrown with brush vegetation. Some cement foundations of former buildings remain on-site. To the east of the Phelps Dodge site and west of 49th Street are tall red brick warehouses in active use, surrounded by chain link fences topped with razor wire. Unused rail lines covered with refuse run in a north-south direction at-grade through the eastern portion of the site. The remainder of the site is mostly occupied by small-scale, nondescript warehouses, many in active use. Near Maspeth Creek on the southwest side of the site and study area is a new, New York City Department of Sanitation facility, composed of several concrete block, utilitarian buildings.

To the west of the site past the Kosciuszko Bridge are one- to four-story concrete and brick factory and warehouse-type buildings on the south side of 56th Road/Laurel Hill Boulevard. These structures, interspersed with parking lots and fenced vacant lots, effectively block views to the yard from areas to the west, except from the Kosciuszko Bridge, which is elevated high above Newtown Creek. On the north side of 56th Road/Laurel Hill Boulevard west of the bridge is Calvary Cemetery. The cemetery is surrounded by a tall rubble stone wall and a wrought iron fence. The topography of the area rises steeply upward to the north past 56th Road; therefore,

views to the north are limited. Views south to the yard from within the cemetery are limited to visitors, of which there are few.

56th Road, a wide, four-lane road that is heavily trafficked, runs along the north side of the site. Where there is no fencing around the site, it is clearly visible to passing vehicular and pedestrian traffic on the street and from properties across the road, including the large United Parcel Service (UPS) distribution center. Views south across the site are of the Brooklyn side of Newtown Creek, which is similar in its industrial appearance to the Queens side. North and east of the site, views are dominated by low-rise industrial buildings and the elevated Long Island Expressway in the distance. South of the site across Newtown Creek is a large Brooklyn Union Gas Company generating facility, which greatly limits access to the waterfront and public views to the site from Brooklyn.

At the eastern corner of the study area north of Rust Street is the only residential area within the study area. Buildings in this area include narrow two- and three-story brick rowhouses, some with wooden cornices and minimal brick detailing. Many of the rowhouses have been covered with vinyl siding, painted, or are otherwise altered. There are more street trees in this portion of the study area, and less truck traffic.

Visual Resources

The Kosciuszko Bridge/BQE above Newtown Creek is a prominent visual feature that also serves to buffer Calvary Cemetery from the industrial West Maspeth area (see Photographs 17 and 18 of Figure 5-19). There are no other visual resources in the study area. Although there are expansive views of Midtown Manhattan and the Empire State Building from portions of 56th Road and 49th Street, in general the industrial uses in the area detract from the visual quality of these views (see Photograph 19 of Figure 5-20).

Viewers and Duration of Views

Viewer groups include vehicular traffic, particularly along the Kosciuszko Bridge, 56th Road, and the Long Island Expressway (north of the study area); workers at surrounding businesses; and a small number of residents. The duration of views from moving vehicles is short. While pedestrian views are longer, it is expected that workers in the surrounding industrial facilities are not focusing on the yard, and few appear to walk in the surrounding area. Views to the site from the small residential enclave on the east side of the study area are limited by the convoluted street pattern. The rise in topography north of Rust Street serves to reduce the perceived height of buildings within the Maspeth Yard site from north of Rust Street (see Photograph 20 of Figure 5-20)

FREMONT SECONDARY STUDY AREA

Segment 1

Affected Area. The Fremont Secondary Study Area, Segment 1 is the area within 50 feet of the below grade rail line from the northern site boundary of Fresh Pond Yard to approximately Grand Avenue; past Grand Avenue to Queens Boulevard, the study area extends to 150 feet, as the rail line in this area is at grade or elevated on an embankment (see Figure 5-21). The directly affected area is the rail line between the northern site boundary of Fresh Pond Yard to Queens Boulevard.

Visual Context. The street plan in Segment 1 is a skewed grid oriented in a northwest-southeast direction south of the Long Island Expressway (LIE) and in several different directions to the north. The grid is intersected by the LIE as well as other large thoroughfares—Metropolitan Avenue, Caldwell Avenue, and Grand Avenue—that crisscross through the area. For the most part, streets terminate before the rail line or intersect the rail line at oblique angles; there are only a few instances in which a street runs parallel to the rail line. The wider streets cross over the rail line on utilitarian concrete bridges topped with chain link fencing. The rail line itself is surrounded by chain link fencing and numerous trees and vegetation. The elevated LIE is a visual barrier dividing the northern and southern portions of the study area. The short length of most streets and rolling topography of the study area preclude the formation of long view corridors. There is very little pedestrian activity throughout the study area; the limited pedestrian traffic is concentrated on the larger streets.

On the south end of the study area, the rail line is flanked by the Lutheran Cemetery and Metro Mall, a utilitarian, big-box retail center fronting onto Metropolitan Avenue. North of Metropolitan Avenue, the rail line continues through the cemetery and then passes through a quiet, small-scale residential area filled with two- and three-story semi-attached rowhouses and detached houses built in the mid 20th century, most of which are faced with red brick or vinyl siding and have small front yards and garages. Some houses have balconies, porches, or stoops; most have minimal decoration. The streets are lined with trees and overhead power lines. Adjacent to the rail line on 70th Street and 62nd Drive are one-story, long narrow houses with gabled roofs. On the east side of the rail line just south of Eliot Avenue is Juniper Valley Park, a well-utilized, large park with a variety of active play facilities.

Because the rail line is mainly below grade in this area, there are few views to it, even by residents with properties that are directly adjacent to the rail line. The rail line comes to grade between Grand Avenue and 51st Avenue and crosses 51st Avenue on a utilitarian steel trestle. Buildings along 79th Street to the east of the rail line are two-story attached brick and stucco rowhouses designed with very minimal detail, with fenced front yards. Some of the rowhouses have aluminum window and front door awnings. An alleyway leading to rear garages runs parallel to the rail line and 79th Street, and there are gardens between the alley and the rail line. On 74th Street there are tiny, one-story brick bungalows with gabled roofs, set back from the street behind fenced front yards. At the intersection of 74th Street and 51st Avenue directly adjacent to the rail line is the Long Island Mews, a small open space with benches and some children's play equipment.

North of the LIE, the area surrounding the rail line is more industrial and commercial, particularly along Grand Avenue and Queens Boulevard, which is a wide thoroughfare, separated by a median, that carries a large amount of vehicle traffic. Near the rail line, Queens Boulevard is lined with auto yards, gasoline stations and small-scale, utilitarian commercial buildings. There are also some taller apartment buildings in this portion of the study area. The rail line runs above Queens Boulevard on a concrete bridge with three arched spans, designed to appear like cut stone. A large billboard attached above the middle arch detracts from the bridge's otherwise attractive appearance.

Visual Resources. The railroad bridge spanning Queens Boulevard is a visual resource and is highly visible along this wide commercial thoroughfare (see Photograph 21 of Figure 5-22). The Lutheran Cemetery is also a visual resource, providing a large area of green and open space. The cemetery is publicly accessible, and within it there are views of the surrounding neighborhoods.

Views to the cemetery are limited mainly to directly adjacent streets and residences. Fences around the cemetery also partially obstruct some views.

Viewers and Duration of Views. Views of the rail line are limited to immediately adjacent streets and bordering properties, because the line is below grade and bordered by chain link fencing for most of the study area. Viewer groups include residents living in properties directly adjacent to the rail cut, workers, and motorists who pass over the rail cut on bridges. Motorists' views are limited and of brief duration. Pedestrians on the avenues have limited views of the rail cut because of the fencing that surrounds it. Residents who live on properties bordering the rail cut have the most extensive views.

Segment 2

Affected Area. The Fremont Secondary Study Area, Segment 2 is the area within 50 feet of the below grade rail line from north of Queens Boulevard to Roosevelt Avenue; from Roosevelt Avenue north to the intersection of the rail line with the Hell Gate Line at 28th Avenue, the study area extends to 150 feet, as the rail line in this area runs elevated and parallel to the Brooklyn Queens Expressway (BQE) (see Figure 5-23). The directly affected area is the rail line between Queens Boulevard and 28th Avenue.

Visual Context. From just south of Roosevelt Avenue to where the line intersects with the Hell Gate Line, the BQE runs nearly parallel to the rail line. As the rail line and the expressway are elevated in this area, they divide the area physically and visually to the west and east, separating the neighborhoods of Woodside and Jackson Heights. At the north end of the study area, the BQE splits to the east of the rail line; Saint Michael's Cemetery is located within the triangular area created by this splitting. The cemetery is located on a slight hill and is surrounded by a wrought iron fence. The street grid within Jackson Heights is fairly regular, oriented in a north-south direction; west of the BQE, there are several intersecting grids running in different directions. Broadway and Roosevelt Avenue cross through the area against the grid pattern, as do the rail line and the BQE. The Segment 2 study area is mainly residential, except for the area around Northern Boulevard (Route 25A), a major travel and commercial artery. Northern Boulevard, Broadway, and Roosevelt Avenue are the area's main commercial strips; along these streets there are a variety of buildings, mostly brick and concrete utilitarian buildings, some with awnings, set back from the streetline. The bridges carrying the rail line above the area are typically simple concrete arch bridges. The residential buildings in the area are mainly two-story, red brick attached rowhouses; Woodside has semi-attached two- and three-story rowhouses and some two-story detached houses. Jackson Heights also has a number of six- and seven-story apartment buildings.

Just south of Northern Boulevard and east of the BQE are two streets of three-story attached houses with mock-Tudor detail and slate gabled roofs. The buildings are located on 69th and 70th Streets between Northern Avenue and 34th Avenue. The houses are faced with brick and stucco and have heavily planted, fenced front yards; some have original multi-paned windows. The streets are lined with mature trees, and the eastern side of East 69th Street has the remains of a slate sidewalk. A below grade alleyway runs behind the houses; the rear façades of the houses show all three levels (the street façades show only the upper two); the lowest level includes enclosed garages. Near the north end of the study area on the west side of the Hell Gate Line, near its intersection with the Fremont Secondary is a six-story brick apartment complex, Boulevard Gardens. The complex is bounded by Hobart Street, 30th Avenue, 31st Avenue, 57th Street, and Stripoll Square. Boulevard Gardens is a series of 10 buildings on 11 acres of landscaped grounds with specimen trees, gardens, shaded pathways and sitting areas as well as

areas for active recreation. The buildings are oriented inward and have a modified H-plan, corner entrances and simple Neo-Georgian decoration.

Visual Resources. St. Michael's Cemetery is a visual resource, providing a large area of green and open space. However, views to the cemetery are very limited, as it is surrounded by the BQE, Astoria Boulevard and the Grand Central Parkway. The cohesive sets of mock-Tudor residential buildings along 69th and 70th Streets south of Northern Boulevard are also a visual resource; however, they are visible only from directly adjacent streets (see Photograph 22 of Figure 5-22).

Viewers and Duration of Views. Views of the rail line are combined with those of the BQE for most of the Segment 2 area. Viewer groups include residents, workers, and motorists on the BQE and in the surrounding area who pass under the rail line. Motorists' views are limited and of brief duration. Pedestrians have longer views of the rail line; however, there is little pedestrian traffic within the study area, except along major roads. Residents who live on properties bordering the rail cut have the most extensive views.

Segment 3

Affected Area. The Fremont Secondary Study Area, Segment 3 is the area within 150 feet of the elevated rail line, which runs through the neighborhoods of Astoria and Ditmars from its intersection with the Hell Gate Line to the Hell Gate Bridge at the western edge of Queens (see Figure 5-24). The Fremont Secondary and the Hell Gate Line run parallel and elevated through Segment 3. The directly affected area is the rail line between its intersection with the Hell Gate Line and the East River.

Visual Context. The northern and southern portions of the Segment 3 study area are visually and physically separated by the Grand Central Parkway (GCP) and Triborough Bridge approach, which is below grade in this area and is flanked by Astoria Boulevard at grade. The GCP cut is surrounded by concrete and chain link fencing. Because of the narrow width of Astoria Boulevard, there are no sidewalks on the sides of the roadway closest to the GCP, and little pedestrian traffic. Both roads carry a heavy amount of vehicular traffic. There is a variety of uses along the roadways, mainly residential, commercial and industrial. The buildings are primarily utilitarian brick and concrete structures, warehouses and numerous auto-related facilities. The residential buildings are typically two-story red brick semi-attached or attached houses. In general, buildings are built to the streetline throughout the study area.

The street pattern of the study area is a fairly regular grid, the angle of which is slightly skewed north of Astoria Boulevard and the GCP. The rail line cuts through the grid and is highly visible along the north-south streets north of Astoria Boulevard, which it crosses on simple concrete arch and steel bridges that increase in height from east to west. The rail line crosses 41st, 35th, 27th, 25th and Steinway Streets on steel deck truss and deck girder bridges painted the same deep rust color as the Hell Gate Bridge. The rail line is a strong visual element in surrounding views and a main characteristic of the visual environment of the area. The elevated N subway line, which runs through Astoria above 31st Street, intersects with the rail line at approximately 23rd Avenue. There is a small open space at the rail crossing on Steinway Street.

The area north of Astoria Boulevard is a quiet residential area filled with streets lined with trees and red brick attached two- and three-story rowhouses and detached houses. The buildings are typically modest and have simple brick detailing around window and door openings. Most have small front yards surrounded by low fences. There are also some small, one-story brick

bungalows with gabled or hipped roofs, and a few slightly larger apartment buildings. Some houses have been covered with vinyl siding.

The study area ends in Astoria Park at the East River, near the Hell Gate channel. Astoria Park is an approximately 66-acre park that extends from south of the Triborough Bridge to just north of the Hell Gate Bridge; its facilities include playgrounds, tennis courts, baseball diamonds, and a large pool complex. The area beneath the Hell Gate Bridge approach is a grassy field with a moderate slope downward to the river. Shore Boulevard and a pedestrian path border the park at the East River. The park and Shore Boulevard have panoramic views of the Triborough Bridge and Manhattan's Upper East Side to the south, and the Little Hell Gate Bridge, the Wards Island WPCP, and the New York City Fire Department Training Academy on Wards and Randall's Islands to the north. The islands appear somewhat unkempt from this perspective. The deep rust color of the steelwork on the bridge starkly contrasts with the light masonry towers and the surrounding vegetation of the park.

Visual Resources. There are several visual resources within the Segment 3 study area. First among these are the bridges on which the rail line passes through the area, specifically the steel deck truss and deck girder bridges spanning 41st, 35th, 27th, 25th and Steinway Streets. As described above, their dramatic coloring and solid geometric structure make them a strong visual element. Astoria Park and its surrounding views of the Hell Gate Bridge, Triborough Bridge, Wards/Randall's Island and Manhattan are also visual resources (see Photographs 23 and 24 of Figure 5-25).

Viewers and Duration of Views. The rail line is visible throughout most of the study area and beyond, as it is elevated through the area and its structure is highly visible in the surrounding streets. Viewer groups include residents, workers, park users, and vehicular traffic that passes under the rail line along the surrounding streets. Views from vehicular traffic are limited and of brief duration. However, pedestrians have long views of the elevated rail line above surrounding streets. Residents who live in the neighborhood, particularly in properties directly adjacent to the rail line, have the most extensive views.

BRONX STUDY AREAS

FREMONT SECONDARY (RANDALL'S/WARDS ISLAND PORTION) STUDY AREA

Affected Area

The Fremont Secondary (Wards/Randall's Island portion) study area is located on Wards and Randall's Islands. The study area is defined as the area within 150 feet of the elevated track, which is located on the eastern side of the island (see Figure 5-26). The directly affected area is the rail line between the Hell Gate Bridge and the Bronx Kill Bridge.

Visual Context

Most of Wards/Randall's Island (the two islands have been joined by landfill) is open parkland. The route of the elevated rail line over the island is paralleled by the Triborough Bridge elevated highway. The rail line travels above the western boundary of the New York City Department of Environmental Protection's Wards Island WPCP and the New York City Fire Department Training Academy. Large portions of the island are fenced off from public access, including the pollution control plant, the fire academy, and the Manhattan and Kirby Forensic Psychiatric Centers and the Volunteers of America's men's shelter on the west side of the island. The

psychiatric center(s) are a series of yellow brick structures with boxy massing and no ornamentation.

At ground level, the island is sparsely occupied and overgrown; there is little pedestrian or vehicular traffic, other than an occasional bus making its circuit. The active play facilities (tennis courts, play fields, etc.) are located on the northern (Randall's) portion of the island. The Triborough Bridge complex is being extensively renovated, entailing rerouting of traffic and visual disturbances in the signage and appearance of the complex. The coloration of the steel deck plate girder viaduct carrying the rail line over the island is the same as the Hell Gate Bridge and the bridges within the Fremont Secondary Study Area, Segment 3 in Queens; however, here the concrete piers have different, simpler decorative elements, culminating in rounded finials at the top of each pier.

Visual Resources

There are several visual resources within the study area. First among these is the rail line's elevated structure; the Hell Gate Bridge, the Little Hell Gate Bridge, and the viaduct carrying the rail line over the island are all highly visible from most points on the island as well as from the Triborough Bridge highway and from Astoria, Queens. They are functional, yet aesthetically appealing structures. The Bronx Kill Bridge, which carries the rail line across the Bronx Kill to the Bronx, is part of this bridge structure and is similarly appealing (see Photograph 25 of Figure 5-27). The Triborough Bridge crossing over the East River is a visual resource that is visible from the east side of the island; the highway structure on the island itself is not a visual resource. Although there are several attractive historic buildings within the boundaries of the pollution control plant, these cannot easily be seen on the island or from Queens. Similarly, the 1951 pedestrian bridge linking Wards Island to Manhattan cannot be seen from the area surrounding the rail line.

Viewers and Duration of Views

The elevated rail line is visible throughout the study area and from nearby portions of the Bronx and Queens, as it is located on the eastern edge of the island and spans the Bronx Kill and the East River. Viewer groups include the small number of residents on the island (inhabitants of the psychiatric and homeless facilities), workers, park users, boat traffic on the Bronx Kill and East River, motorists who travel parallel to the rail line along the Triborough Bridge highway, and motorists on the surface streets. Views from vehicular and boat traffic are limited and of brief duration; however, pedestrians have extended views of the rail line. Residents of the island have the most extensive views; however, there are very few residents on the island and they are housed on the western side of the island, where views of the rail line are slightly less clear.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

Under the No Action Alternative, in the New Jersey Study Areas, construction activity would be primarily trackwork associated with construction of the Waverly Loop to connect the P&H Line to the Greenville Branch; a second track along the P&H Line between North Bergen and Kearny Yards; connections from the Chemical Coast Line to the Staten Island Railroad; and a second track along the Chemical Coast Line between the Port Reading Secondary Line and Bayway

Yard and between Elizabethport and Oak Island Yard. (See Chapter 2 for a discussion of funding and implementation of these projects). In addition, Canadian Pacific (CP) is proposing to improve its intermodal facility at Oak Island Yard by constructing a food facility, a paved transfer area, and laying new track. A second bypass track will be constructed south of the yard. Roadway improvements in the area will be implemented under Portway and several port projects are planned including the development of a portion of the former Military Ocean Terminal Bayonne (MOTBY) for port development; and expansion of the Global Marine Terminal. Some increases in rail, truck and barge activities are expected to result from these projects.

In the Staten Island study areas, Howland Hook Marine Terminal will undergo an expansion and the adjacent Port Ivory Site will be redeveloped as an intermodal rail yard. Arlington Yard will be redeveloped into an intermodal facility and the Staten Island Railroad will be reactivated between the Arthur Kill Lift Bridge and Arlington Yard as part of NYCEDC's Staten Island Railroad Reactivation project. The future site of the National Lighthouse Museum is planned at the (currently abandoned) U.S. Coast Guard Base (former Staten Island lighthouse depot complex), along the shoreline in St. George. The St. George Ferry Terminal will be reconstructed and developed as a mixed-used attraction for visitors and commuters.

In the Brooklyn study areas, it is anticipated that two projects may occur by the future analysis years. The City of New York plans to sell municipal parking lots and air rights over the Bay Ridge Branch right-of-way for the development of "The Junction," a retail center and parking garage that will be located on a block bounded by Avenue H and Flatbush and Nostrand Avenues. In addition, there may be an expansion of Flatbush Terminal by extending the IRT subway line 1,200 feet alongside the Bay Ridge Branch.

Construction and operational activities related to the No Action Alternative are not part of the Cross Harbor Freight Movement Project. These activities may affect visual resources on certain project sites.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

NEW JERSEY

Greenville Yard

Two of the existing Greenville float bridges would be rehabilitated in a similar fashion to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new trackwork. Since one float bridge is in use, the increase in float bridge operation is not expected to change the visual character of the area. In addition, views of the float bridges are only available from within Greenville Yard. Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

NEW YORK

Under the TSM Alternative, there would be minor construction and operational activities at the affected New York project sites. Construction activity would primarily consist of trackwork associated with rehabilitating 65th Street Yard; and minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch. The minimal yard work and trackwork at existing yards and rail lines would not alter their visual appearance and would be in keeping with their visual character and historic and current uses. There would be a slight

increase in the number of trains using the Fremont Secondary with the TSM Alternative. The minor increase in usage is not expected to change the visual character of the surrounding areas.

Therefore, there is no potential for adverse impacts on the visual character or visual resources of the New York study areas.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

NEW JERSEY

Greenville Yard

Four Greenville float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new trackwork. In addition, approximately 16 round trip barge trips would occur each day. This construction and the increased number of barges would be in keeping with the yard's visual character and historic and current use. Since one float bridge is in use, the increase in float bridge operation is not expected to change the visual character of the area. In addition, views of the float bridges are only available from within Greenville Yard.

Other Sites

There would be a slight increase in the number of trains using the National Docks Secondary, P&H Line, Chemical Coast Line, and Greenville Branch. The minor increase in usage is not expected to change the visual character of the surrounding areas.

Therefore, there is no potential for adverse impacts on the visual character or visual resources of the New Jersey study areas.

NEW YORK

65th Street Yard

Two additional float bridges would be constructed at 65th Street Yard similar to those recently constructed. Rehabilitation at the yard would also include new trackwork. In addition, approximately 16 round trip barge trips would occur each day up from one roundtrip under the No Action Alternative. This construction and the increased number of barges trips would be in keeping with the rail yard's current visual character and historic and current use.

Other Sites

Under the Expanded Float Operations Alternative, there would be minor new construction and operational activity at the affected New York project sites similar to that of the TSM Alternative. Construction activity would primarily consist of trackwork associated with minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch; and the construction of a new rail yard in West Maspeth, Queens at the Phelps Dodge and existing West Maspeth Yard sites. The minimal yard work and trackwork at existing yards and rail lines would not alter their visual appearance and would be in keeping with their visual character and historic and current use. The creation of a new rail yard in West Maspeth, Queens would require the construction of new tracks, internal roadways, and paved areas. The work required for this alternative would change an overgrown, underutilized area into an active one, and surrounding views are already of an industrial area. There would be a slight increase in the number of trains using the Bay Ridge Branch and Fremont Secondary with the Expanded Float Operations

Alternative. However, minor increase in usage is not expected to change the visual character of the surrounding areas.

Therefore, there is no potential for adverse impacts on the visual character or visual resources of the New York study areas.

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

New Jersey

In New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur Kill Lift Bridge and additional sidings along the Chemical Coast Line.

Greenville Yard/Potential Tunnel Alignment. The New Jersey tunnel alignment would be constructed within Greenville Yard and along the Greenville Branch. From an area just east of the New Jersey Turnpike Extension, tunnel construction would begin as an open cut adjacent to the Greenville Branch. When a depth of 35 feet below existing grade is reached just west of Greenville Yard (the tunnel portal), the tunnel would be constructed using cut and cover construction through Greenville Yard to the shoreline at a depth of 65 feet where it would be connected to the immersed tube section. A tunnel ventilation shaft would be constructed at the northeast tip of the Global Marine Terminal/NEAT pier.

After construction is complete, it is not expected that the tunnel would have any effects on the visual character of the study area. The cut and cover portion would not be visible, and the open cut portion would be located along an existing rail line in an industrial area. This alternative would generate a greater amount of freight traffic; however, it is not expected that the increase in traffic would change the visual character of the largely industrial study area that contains considerable rail infrastructure. Under the Tunnel Alternative, it is anticipated that float bridge service would be eliminated and the site would be redeveloped.

The tunnel ventilation shaft at the northeast corner of the Global Marine Terminal/NEAT pier would be approximately 230 by 150 feet, and it would rise 50 to 60 feet above low to mean tide. Although the ventilation shaft may be visible in some views from Liberty State Park, it would not block any unique view corridors. The primary public view of the ventilation shaft would be from the public portion of Port Jersey Boulevard and the small wooden observation deck. The public portion of Port Jersey Boulevard does not extend to the eastern end of the pier, and as a result the potential location of the ventilation shaft is partially obscured by the industrial development and activity that takes place at the eastern end of the pier. It would not obscure unique view corridors or views of visual resources. It would not be a prominent or incompatible visual feature in the study area, since the visual character of the area is defined by the elevated cranes and industrial-looking equipment and facilities on and/or near Greenville Yard. In addition, the ventilation shaft would not block views from the public observation deck, as views of a large area beyond the potential location of the ventilation shaft would be available. Views of Upper New York Harbor, Lower Manhattan, Brooklyn and the Statue of Liberty would remain unobstructed.

Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

Chemical Coast Line. Under the Staten Island tunnel alignment, 30,000 feet of sidings would be required along this line north of its planned connection to the Staten Island Railroad. There also would be an increase in freight traffic under both the New Jersey and Staten Island tunnel alignments. The track construction and associated increased train traffic under the Staten Island and New Jersey tunnel alignments would be in keeping with the rail line's visual character and current use. The northern portion of the study area, where most of the increase in traffic is expected, is primarily industrial in nature. The Chemical Coast Line is already a functioning rail line, and the increase in usage is not expected to change the visual character of the study area. Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

Arthur Kill Lift Bridge. A second span would be constructed adjacent to the south side of the existing Arthur Kill Lift Bridge to accommodate additional rail traffic projected under the Staten Island tunnel alignment. The new span would be identical to the existing span. A viaduct would be constructed adjacent to the south side of the Staten Island Railroad to connect the new span to the Chemical Coast Line.

Since the new span across the Arthur Kill would be constructed adjacent to an existing span, and another bridge—the Goethals Bridge—is a short distance to the south, it is not expected that the new span would affect the visual character and visual resources of the study area. The bridge is located in an industrial area along the Arthur Kill, and the new bridge would not block any important view corridors. Since the new viaduct would be constructed adjacent to an existing rail line, it is not expected that the new viaduct would affect the visual character and visual resources of the study area. Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

Greenville Branch. Freight traffic along the rail line would increase substantially under the Single Tunnel System. As this is an elevated rail line within a study area that is partially residential, there would be the potential for an adverse impact on the visual character of the study area because of the increase in freight traffic. However, the increased freight traffic would not block views to visual resources. The rail line is located in an area where large highways, such as Route 440 and the New Jersey Turnpike Extension/I-78, already create a strong visual presence. The installation of new rail track for the construction of the second Waverly Loop at the junction of the P&H Line and the Greenville Branch would be consistent with surrounding land uses and would not change the visual character of this study area.

Oak Island Yard. Although there would be an increase in freight traffic using the yard, the rail yard is already active with freight traffic, and the increase in usage is not expected to change the visual character of the study area. The increased freight traffic would be in keeping with the rail yard's visual character and current use. Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

National Docks Secondary/P&H Line. Under the Single Tunnel System, there would be no connection to the National Docks Secondary and no changes are expected in this area. Freight traffic along the P&H Line would increase under both the New Jersey and Staten Island tunnel alignments. The increased train traffic along the P&H Line would be in keeping with the rail line's visual character and current use, and the increase in usage is not expected to change the

visual character of the study area. Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

New York

Staten Island Study Areas.

Arthur Kill Lift Bridge. As discussed above, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track. For the reasons discussed above under New Jersey, there is no potential for adverse impacts on the visual character or visual resources of the study area.

Arlington Yard. Track rehabilitation and construction would occur at Arlington Yard for the additional trains that would pass through the yard under the Tunnel Alternative. (With the No Action Alternative, a smaller number of trains would terminate at the yard and no trains would pass through the yard.) This new track construction and additional trains are not expected to change the visual character of the study area, as they would be in keeping with the rail yard's visual character and use under the No Action Alternative. Therefore, there is no potential for adverse impacts on the visual character or visual resources of the study area.

Northern Staten Island—Segments 1 and 2. The Staten Island Railroad would be rehabilitated between Arlington Yard and the tunnel entrance at Alaska Street. As discussed in more detail in Chapter 2, the work in Segments 1 and 2 would include track rehabilitation and a new mainline tracks to be constructed from the east end of Arlington Yard to the tunnel portal area, and an increase in clearances heights at 11 sites along the line between South Avenue and John Street. It is not expected that this work would substantially alter the visual appearance of the rail line or its relationship to the surrounding study area. The construction work would be minor and would occur within the right-of-way of the existing rail line. The rail line is in a cut in Segment 1 and the depth of the excavation would be shallow, and thus not highly visible. It is therefore not expected that the work would affect the visual character and visual resources of the study area. As part of this work, the existing right-of-way (which currently is wooded) would be cleared for a width of 40 feet through the clearance work area. Existing views of the rail line are limited due to vegetation. However, existing vegetation would remain on either side of the tracks to buffer the rail line from the residential houses that are located adjacent to it. Therefore, the project would not result in adverse impacts on visual character or resources in this portion of the study area.

Under the Staten Island tunnel alignment, this currently inactive rail line would experience a substantial increase in rail traffic. The rail line is elevated in a portion of the Segment 2 study area and is highly visible. Many residential houses are located immediately adjacent to the elevated rail line. Therefore, there would be the potential for an adverse impact on the visual character of the study area.

Northern Staten Island—Segment 3. The landside portion of the tunnel alignment in Staten Island would begin along the Staten Island Railroad right-of-way at Alaska Street. From here to Bement Avenue (the location of the tunnel portal), the tunnel would be in an open cut. Continuing along the right-of-way to Davis Avenue, the tunnel would be built of cut and cover construction. The open cut excavation would increase in depth from 0 to 35 feet below existing grade, while the cut and cover excavation would increase from 35 to 65 feet below grade.

After construction is complete, it is not expected that the tunnel would have any effect on the visual character of the study area. The cut and cover portion would not be visible, and the open cut portion would be located within the Staten Island Railroad right-of-way. The study area along the shoreline is largely industrial, and the few residential buildings are located across Richmond Terrace. Construction of the tunnel would not block any views of the waterfront, and views of the rail line would be limited to the surrounding streets.

The Staten Island tunnel alignment would involve a greater amount of freight traffic that would be visible only within the open cut portion. As this increased amount of freight traffic would not be highly visible, there would be no adverse impacts on the visual character or visual resources of the study area.

Northern Staten Island—Segment 4. From Davis Avenue southeast to the shoreline at Pier 2, the tunnel would be bored. The bored tunnel would have no impacts on the visual character or visual resources of the study area, because it would not be visible.

However, a tunnel ventilation shaft would be constructed in the harbor near the seaward end of Pier 2. The ventilation shaft's footprint would be approximately 230 by 150 feet, and it would rise 50 to 60 feet above low to mean tide. It would be visible from a public walkway along the shore and from an apartment building located along the shoreline. It is expected that the ventilation shaft would have adverse effects on views from the public walkway, since it would block views of the waterfront. It is not expected, however, that the ventilation shaft would have adverse effects on other views. Views of the waterfront would still be available from the apartment building. Views of the waterfront would be available from other locations on the public walkway and views of the Verrazano-Narrows Bridge would not be obstructed.

Brooklyn Study Areas.

65th Street Yard. 65th Street Yard would serve as a rail yard. Under the New Jersey tunnel alignment, the tunnel ventilation and construction shaft would also be located on this site. Improvements to the yard would include laying new tracks and removing existing tracks. It is not expected that yard improvements and increased activity would have adverse effects on the visual character of the yard and on the visual character and visual resources of the study area. Work within the yard would be in keeping with the site's visual character and historic and current uses as a rail yard. In addition, the study area is largely industrial, with views of the yard primarily limited to the surrounding streets and the elevated BQE and Shore Parkway. Although portions of the residential towers on 65th Street between 2nd and 4th Avenues have views of the yard, the yard improvements and increased activity would not adversely affect these views, as they are already of a functioning rail yard. In addition, the elevated BQE lies in the foreground of these views.

The ventilation and construction shaft for the New Jersey tunnel alignment would be approximately 230 feet by 150 feet and would rise 50 to 60 feet above grade. It would be visible from 2nd Avenue, the BQE, Shore Parkway, the Brooklyn Army Terminal, the Owls Head WPCP, and from the residential towers on 65th Street. It is not expected that the ventilation shaft would have adverse effects on the visual character and visual resources of the study area, as views of it would be primarily limited to adjacent industrial complexes and busy, elevated expressways. In addition, it would not be a prominent or incompatible visual feature in the study area, whose visual character is defined by elevated expressways, the large Brooklyn Army Terminal, and two 30-story residential towers.

Bay Ridge Branch—Segment 1. In Brooklyn, under both the New Jersey and Staten Island tunnel alignments, the tunnel would be bored to a location between 8th and 9th Avenues. The bored tunnel would have no impacts on the visual character or visual resources of the study area because all construction activity would occur at least 65 feet below existing grade.

The tunnel ventilation shaft for the New Jersey tunnel alignment would be located at 65th Street Yard, as described above. The ventilation shaft for the Staten Island tunnel alignment would be constructed in the harbor near the seaward end of the public 69th Street pier. The ventilation shaft's footprint would be approximately 230 by 150 feet, and it would rise 50 to 60 feet above low to mean tide. The ventilation shaft would be visible from the 69th Street pier, from within the western portion of Owls Head Park, from the Shore Promenade, and from Shore Parkway. It is expected that the ventilation shaft would have adverse effects on views from the 69th Street pier. Sited adjacent to the pier and at 50 to 60 feet above the water line, the ventilation shaft would block the expansive views west on the pier toward Staten Island, affecting the public's enjoyment of these waterfront views, and it would diminish the sense of openness experienced by pier users. It is not expected, however, that the ventilation shaft would have adverse effects on other views. Although it would be visible from a hill in the southwest portion of Owls Head Park, it would not obstruct views and distance would minimize the shaft's presence in the expansive harbor vista from this location. From Shore Promenade south of where Shore Parkway meets grade, the ventilation shaft would be clearly visible and it would obstruct northward views from certain locations. However, it is not expected that it would have adverse effects on views from Shore Promenade because it would only be visible in northward views, and from farther to the south along the promenade it would appear smaller and would be less of a visual obstruction.

The Single Tunnel System would also involve excavation to increase clearance heights, underpinning work at individual clearances, laying new track, and conducting associated utility work within the existing Bay Ridge Branch right-of-way. In Segment 1, the Bay Ridge Branch is located in a deep cut that is partially covered by a concrete plaza between 2nd and 4th Avenues. The construction work would be minor and would occur within the right-of-way of the existing rail line. Therefore, it is not expected that this work would adversely alter the visual appearance of the rail line or its relationship to the surrounding study area.

Although a greater number of trains would use this portion of the rail line, the Bay Ridge Branch is already a functioning rail line, and the increase in usage is not expected to change the visual character of the Segment 1 study area.

Bay Ridge Branch—Segment 2. From a location between 8th and 9th Avenues, the tunnel would be built of cut and cover construction to approximately 10th Avenue (the tunnel portal location) and would continue in an open cut to a location between 12th and 13th Avenues along the Bay Ridge Branch right-of-way. The cut and cover excavation would rise from 65 to 35 feet below grade, while the open cut excavation would rise from 35 to 0 feet below grade within the existing cut.

Although most of the study area bordering the existing right-of-way consists of industrial and warehouse buildings, there are residential blocks within the study area, such as 62nd Street east of Fort Hamilton Parkway. After construction is complete, it is not expected that the tunnel would have any effects on the visual character of the study area. The cut and cover portion would not be visible, and the open cut portion would be located within the existing, below-grade right-of-way, to which views are limited.

The Single Tunnel System would also involve increasing vertical and horizontal clearance heights, laying new track, and conducting associated utility work within the existing Bay Ridge Branch right-of-way. The construction work would be minor and would occur within the right-of-way of the existing rail line, which is located in a deep cut. Therefore, it is not expected that this work would adversely alter the visual appearance of the rail line or its relationship to the surrounding study area.

Although a greater number of trains would use this portion of the rail line, the trains would travel in a deep open cut. The Bay Ridge Branch is already a functioning rail line, and the increase in usage is not expected to change the visual character of the Segment 2 study area.

Bay Ridge Branch—Segment 3. The Single Tunnel System would involve increasing clearance heights, laying new track, and conducting associated utility work within the existing Bay Ridge Branch right-of-way. To increase clearance heights, the project would excavate a trench within the right-of-way between 14th Avenue and Albany Avenue, would use underpinning work at individual clearances, and would reconstruct or raise overpasses at several clearance locations where either the potential to excavate is limited due to underground utilities or lateral clearance is insufficient for doublestack service.

It is not expected that this work would adversely alter the visual appearance of the rail line or its relationship to the surrounding study area. The construction work would be minor and would occur within the right-of-way of the existing rail line, which is in a cut through the Segment 3 study area. In addition, most views of the Bay Ridge Branch are blocked by fencing and walls, and by the fact that the rail line is below grade. Reconstruction of the overpasses is also not expected to result in adverse visual impacts. However, depending on the form and final design height of the new Ocean Parkway overpass and the replacement walls and fencing, this alternative could adversely affect Ocean Parkway by altering sight lines along the parkway. To avoid adverse impacts on the Ocean Parkway visual resource, the design of the reconstructed overpass would be developed in consultation with the New York State Historic Preservation Office (NYSHPO).

A greater number of trains would use the rail line following construction. However, the Bay Ridge Branch is already a functioning rail line located in a deep cut, and the increase in usage is not expected to change the visual character of the Segment 3 study area.

Bay Ridge Branch—Segment 4. In Segment 4, the Single Tunnel System would involve increasing clearance heights between New Lots Avenue and Liberty Avenue, laying two mainline tracks, conducting associated utility work within the existing Bay Ridge Branch right-of-way, and constructing two sidings of up to 10,000 feet in length on either side of the two mainline tracks at a location between East 43rd and East 98th Streets. It is not expected that this work would substantially alter the visual appearance of the rail line or its relationship to the surrounding study area. The construction work would be minor and would occur within the right-of-way of the existing rail line.

Although a considerably greater number of trains would utilize the rail line following construction, the increase in usage is not expected to change the visual character of the Segment 4 study area. The Bay Ridge Branch is already a functioning rail line and much of it is below grade in this study area. While several portions of the right-of-way are elevated, the study area currently experiences frequent train activity along the elevated IRT, BMT, and IND subway lines that both parallel and cross over the Bay Ridge Branch.

It is not expected that the Single Tunnel System would have adverse effects on the Cemetery of the Evergreens visual resource or on views from within the cemetery, since many views of both the cemetery and from within it are blocked by fences, intervening buildings, and the elevated L Line.

Queens Study Areas.

Bay Bridge Branch (Queens Portion). The minor trackwork required under the Single Tunnel System for rehabilitation of the Bay Ridge Branch (Queens Portion) would occur within the right-of-way of the existing rail line and would not substantially alter its visual appearance. Although a much greater number of trains would use the rail line following construction, the rail line is already in use and views to the rail line are generally limited to the immediately adjacent streets. The area immediately surrounding the rail line is largely industrial closer to Brooklyn; however, there are also some residential buildings directly adjacent to the rail line. Therefore, some residents will have a view of the rail line, but the duration of these views while trains are passing would be brief. Therefore, the increase in usage is not expected to change the visual character of the area, and there would be no adverse impacts to visual resources from this alternative.

Fresh Pond Yard. The Single Tunnel System would require construction work to provide adequate clearances at two bridges and the installation of new through tracks from the Bay Ridge Branch to the Montauk Branch. The clearance work would require underpinning, excavation of a trench, and reconstruction of overpasses. Substantial increases in train traffic would be expected at Fresh Pond Yard, requiring many more interchanges than are currently handled today. The yard improvements and increased activities would take place within the boundaries of the yard and would be in keeping with the site's visual character and historic and current use. Views to the yard are generally limited by surrounding buildings and land uses (including Lutheran Cemetery). Therefore, there would be no potential adverse impacts to visual resources from this alternative.

Montauk Branch. As with the Bay Ridge Branch, clearance heights along the Montauk Branch would be increased at five clearances and would involve underpinning at clearances and the excavation of a trench within the right-of-way between Fresh Pond Yard and the Welbilt Stove Overbuild near Flushing Avenue. In addition, two bridges at Fresh Pond Road and the BMT overpass would need to be reconstructed. Two new main line tracks would be placed along the length of the line.

It is not expected that this work would substantially alter the visual appearance of the rail line or its relationship to the surrounding study area. The construction work would be minor and would occur within the right-of-way of the existing rail line, a large portion of which is below grade.

Although a much greater number of trains would use the rail line following construction, the rail line is already in active use, and views to the rail line in this area are generally limited by its below grade location and the irregular street pattern. The increased activity would be in keeping with the site's visual character and historic and current use. Therefore, no potential adverse impacts to visual resources are expected with this alternative.

West Maspeth Yard. Under the Single Tunnel System, the existing rail yard in West Maspeth, Queens would be expanded to a 108-acre intermodal rail yard . The required work would consist of demolishing a number of warehouses and other commercial and industrial buildings, and laying new track. The facility would bring more activity to the study area, which is already quite busy with truck traffic. However, the facility would be located in a primarily industrial area, and

the few resources (the Kosciusko Bridge and Calvary Cemetery) in the area already exist within a mixed visual environment. Expansion of West Maspeth Yard for the Single Tunnel System would not block views to visual resources. Therefore, no potential adverse impacts to visual resources are expected with this alternative.

Fremont Secondary (Segments 1 through 3). There would be a slight increase in the number of trains using the Fremont Secondary with the Single Tunnel System. The increase in rail line utilization would be most noticeable in those areas where the rail line is at grade or elevated and views to the rail line are more extensive. However, in most portions of the study area where the rail line is elevated, it is surrounded by other active transportation uses, such as the Brooklyn-Queens Expressway or elevated subway lines. In addition, the rail line is already in active use and the increased activity would be in keeping with the site's visual character and historic and current use. Therefore, the increase in usage is not expected to change the visual character of the surrounding areas, and no potential adverse impacts to visual resources are expected.

Bronx Study Areas.

Fremont Secondary (Randall's/Wards Island Portion). There would be a moderate increase in rail line utilization with the Single Tunnel System. However, as described above, the rail line is already in use and is surrounded by other active transportation uses. Therefore, there would be no potential adverse impacts to visual resources.

Harlem River Yard/Oak Point Yard. No capital improvements are proposed for these sites under the Single Tunnel System. However, the tunnel would likely generate some additional traffic at these yards. This activity would take place within the boundaries of the yard and would be in keeping with the sites' visual character and historic and current uses. In addition, the yards are in primarily industrial areas with few, if any visual resources. Therefore, there would be no potential adverse impacts to visual resources from this alternative.

DOUBLE TUNNEL SYSTEM

Impacts under the Double Tunnel System would be the same or similar to impacts under the Single Tunnel System, except in the following areas.

Number of Trains

The Double Tunnel System would generate a considerable increase in train trips throughout the study areas (see Chapter 2, "Project Alternatives"). Under either tunnel alignment, approximately 64 trains (i.e., 32 round-trip trains) would travel the tunnel each day. In addition to the intermodal and merchandise trains, the Double Tunnel System would be expected to receive through trains. These through trains would continue from the portal along the Bay Ridge Branch and Fremont Secondary to connect with northbound and eastbound rail lines in the Bronx.

It is not expected that the additional number of trains would result in adverse visual impacts other than those discussed above under the Single Tunnel System.

The Tunnel and Related Infrastructure Improvements

The Double Tunnel System would require additional capital improvements beyond those presented under the Single Tunnel System, including the completion of a second harbor crossing, a direct connection to National Docks Secondary, and the expansion of West Maspeth

Yard and the creation of a rail storage facility at this location. The potential for these additional improvements to affect visual resources is assessed below.

Tunnel Alignment and Construction. As the second harbor crossing would be located entirely under water, there would be no potential for adverse impacts on visual resources.

Maspeth Yard. To accommodate the additional trains, West Maspeth Yard would be expanded to 160 acres, and an intermodal freight facility would be built at the center of the site. As explained in Chapter 2, "Project Alternatives," the proposed structure has not yet been designed; however, based on preliminary conceptual plans, the building is estimated to have a footprint 1,300 feet long and 1,600 feet wide. Estimates of the height of the building range from 130 to 220 feet. For the purposes of this visual analysis, the building is estimated to be 165 feet tall. Construction of the yard would require filling in Maspeth Creek and a portion of Newtown Creek. Additional buildings would be demolished for the larger West Maspeth Yard.

The intermodal freight facility at West Maspeth Yard would be a large complex and would be much taller and somewhat bulkier than most of the existing buildings within the surrounding area. Figure 5-29 provides a key map to illustrative renderings of views to the proposed facility. The proposed facility would be visible from as far north as the New Calvary Cemetery, beyond the elevated Long Island Expressway (see Figure 5-30). It also would be visible along the north-south streets north of the project site, although the rise in topography north of Rust Street would serve to reduce somewhat the perceived height of the proposed facility from these locations (see Figure 5-31, compared to existing conditions as shown in Photograph 20 of Figure 5-20). The visibility of the facility from these locations would not constitute an adverse impact, as the visual quality of these views is already attenuated by the surrounding industrial uses.

Portions of the expansive views to Midtown Manhattan from 56th Road and 49th Street would be blocked by the proposed facility (see Figure 5-32, compared to existing conditions as shown in Photograph 27 of Figure 5-28); however, these views would still be accessible from other portions of roadways within the study area, particularly west of the Kosciuszko Bridge (see Photograph 26 of Figure 5-27). The proposed facility would not block views to Calvary Cemetery, as views to this visual resource are primarily from motorists on the Kosciuszko Bridge; neither would the facility diminish these views, as the resource already exists within a mixed visual environment.

The height of the proposed intermodal freight facility (approximately 165 feet) and its proximity to the Kosciuszko Bridge (the height of which is approximately 124.5 feet to the bottom of the span, and another 40 feet to the top of the bridge) could serve to block some views of and diminish the visual prominence of this visual resource. In particular, the visibility of the bridge would be lessened from the eastern portion of the study area. The proposed facility also would be visible beneath the bridge in views east along Review Street (see Figures 5-33 and 34, compared to existing conditions as shown in Photograph 18 of Figure 5-19). The somewhat diminished visual prominence of the Kosciuszko Bridge in the Double Tunnel System Alternative would not constitute an adverse impact. However, if the footprint of the proposed facility were to be reduced, the height of the facility would increase and would further diminish views to and the visual prominence of the bridge. If the height of the proposed facility were to reach the estimated maximum height of 220 feet, the facility would be considered to have an adverse effect on views of the Kosciuszko Bridge.

National Docks Secondary. Under the New Jersey alignment of the Double Tunnel System, a connection to the National Docks Secondary would be constructed, and freight traffic would

increase; however, the increased train traffic would be in keeping with the rail line's visual character and current use, and the increase in usage is not expected to change the visual character of the study area. Therefore, no adverse visual impacts are expected.

D. MITIGATION MEASURES

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

New Jersey

With the New Jersey tunnel alignment, there would be a greater amount of freight traffic on the Greenville Branch following construction. The elevated rail line travels through a residential neighborhood, and the substantial increases in traffic would create the potential for an adverse impact. To reduce or mitigate this impact, additional vegetation (trees and/or bushes) could be added to buffer views of the increased freight traffic. In addition, if noise barriers are constructed in this area, the barriers will also buffer views of the rail traffic.

New York

In the Segment 2 study area, the Staten Island Railroad is elevated and visible as it travels through residential neighborhoods. The substantial increase in rail traffic would result in a potential adverse impact along this portion of the rail line under the Staten Island tunnel alignment. In Segment 1, a wooded area of approximately 15 feet on either side of the tracks would remain to buffer view of the rail line.

The ventilation shafts for the Staten Island tunnel alignment would result in the potential for adverse impacts on views from the 69th Street pier and the public walkway near Pier 2. Planned for construction in the harbor at the seaward end of the piers, the large structures would affect the public's enjoyment of waterfront views and would diminish the sense of openness experienced by users. These adverse effects may be partially avoided at the 69th Street pier by relocating the vent shafts on the eastern end of the pier. However, because the vent shafts must be located along the tunnel alignment near the shoreline, there are limited options for their relocation as there are other visual resources in the area (such as Owls Head Park). Partial mitigation or reduction of the impacts could also include an attractive design for the structure, as well as enhancements to the piers.

DOUBLE TUNNEL SYSTEM

With the same or similar impacts as the Single Tunnel System, potential mitigation measures would be the same as those discussed previously. ✷

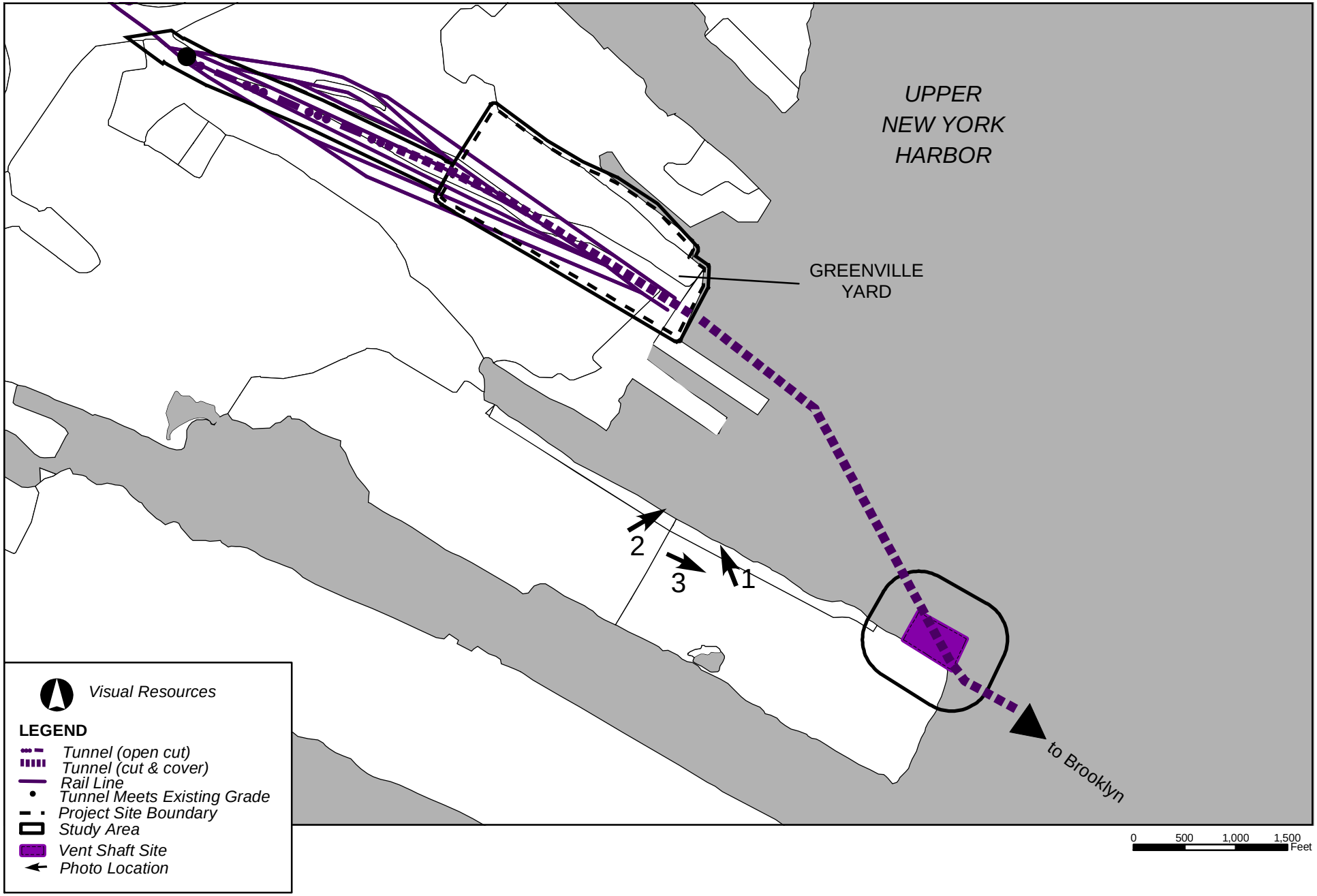
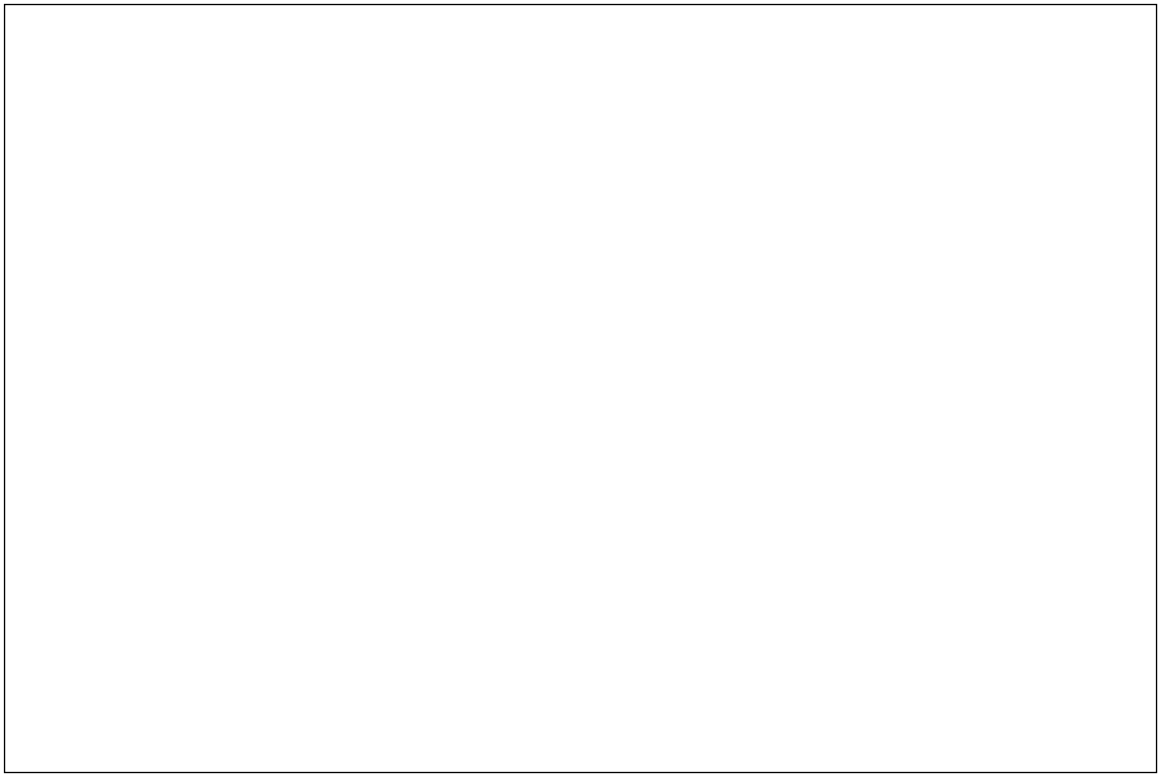
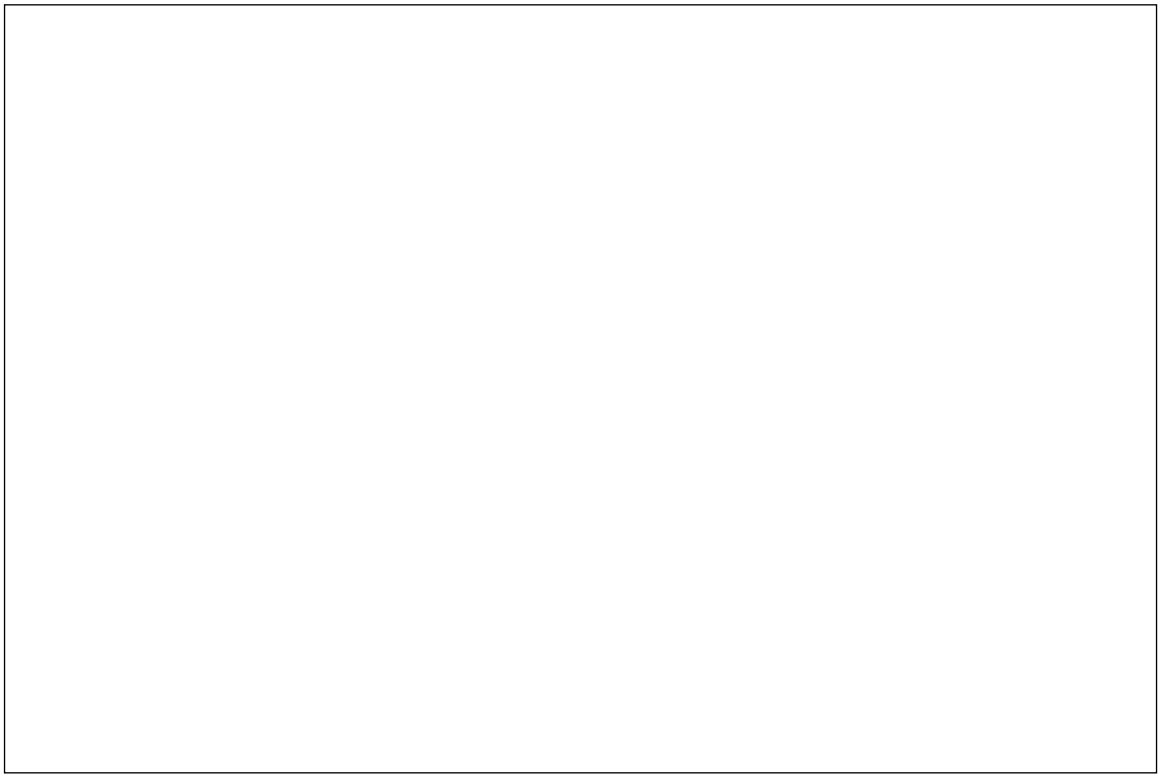


Figure 5-1
Greenville Yard/Potential Tunnel Alignment Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT



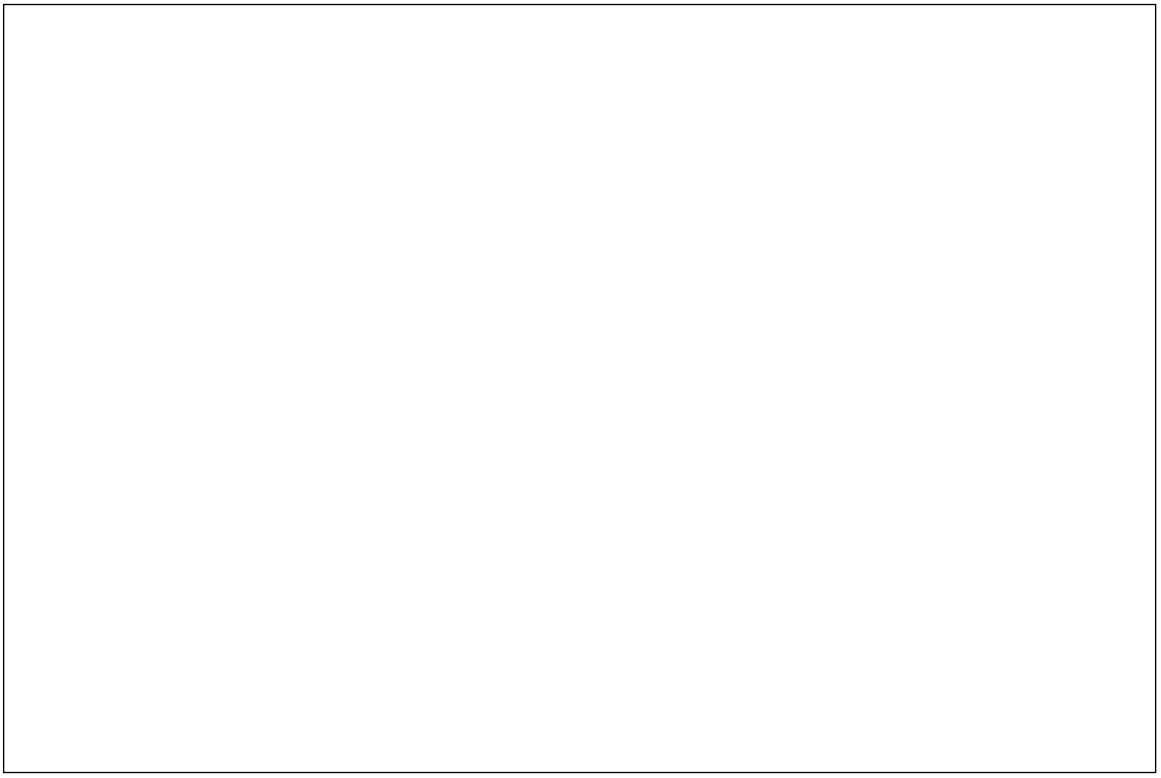
Greenville Yard: View northwest of the Greenville Yard Study area, as seen from a public roadway **1**



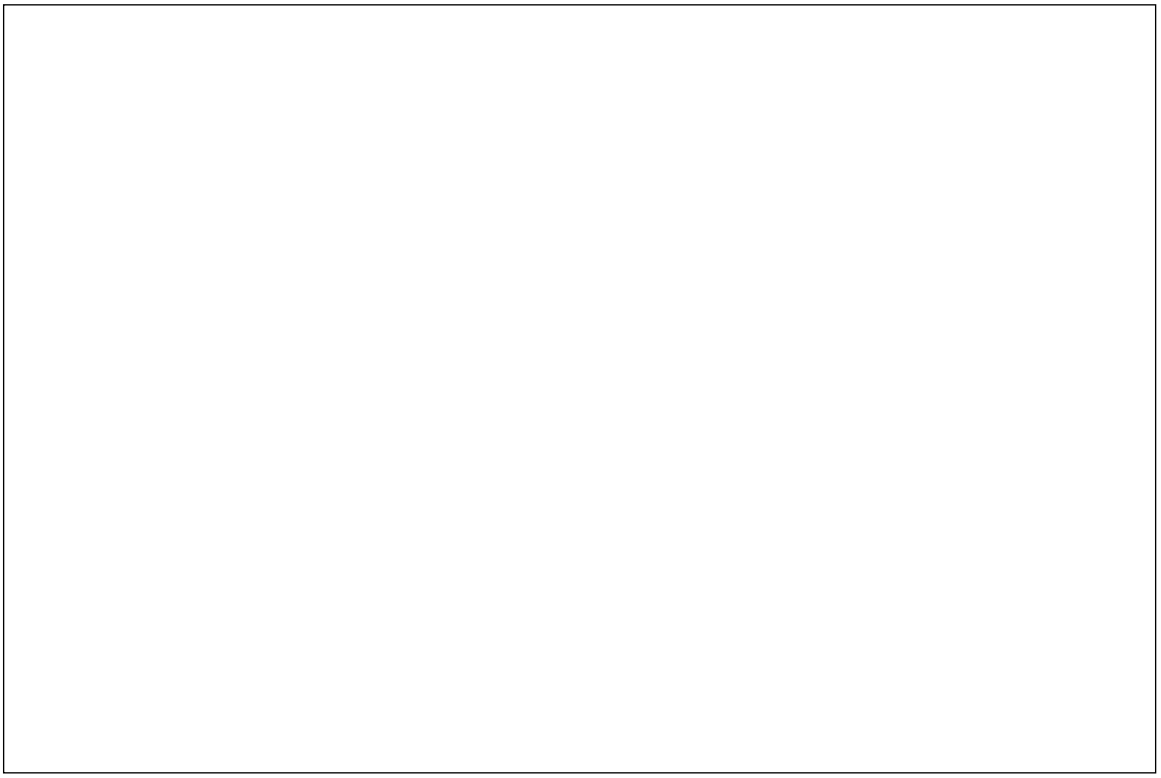
Greenville Yard: View northeast of Upper New York Harbor, as seen from a public roadway **2**

Figure 5-2
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

11•03



Greenville Yard: View southeast of a public roadway along Port Jersey Boulevard, looking towards the proposed location of the tunnel ventilation shaft **3**



National Docks Secondary Study Area - Segment 2: View northwest of an elevated portion of the rail line as seen from 10th Street. The New Jersey Turnpike Extension/I-78 travels overhead, while William Dickinson High School is visible in the background **4**

Figure 5-3
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

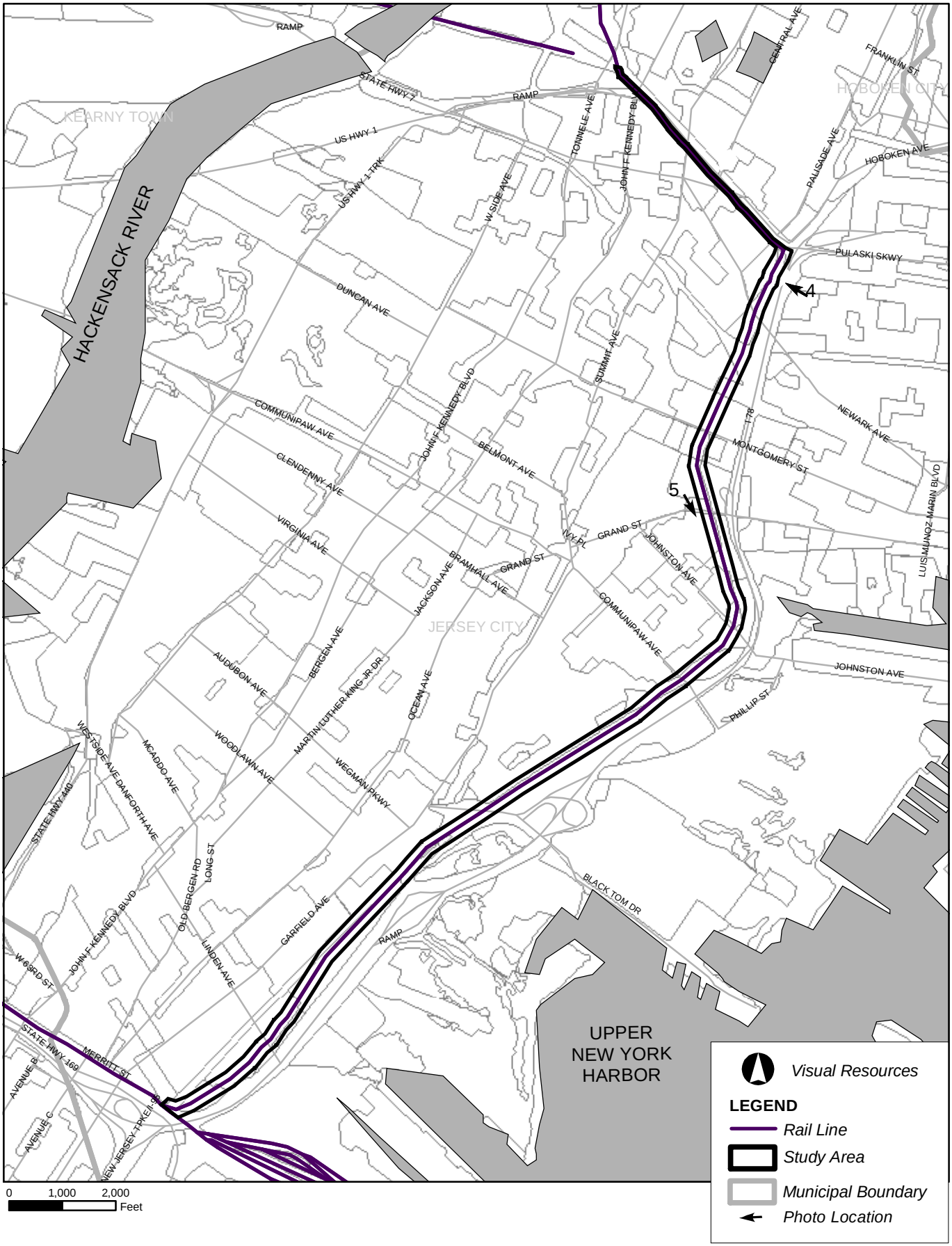
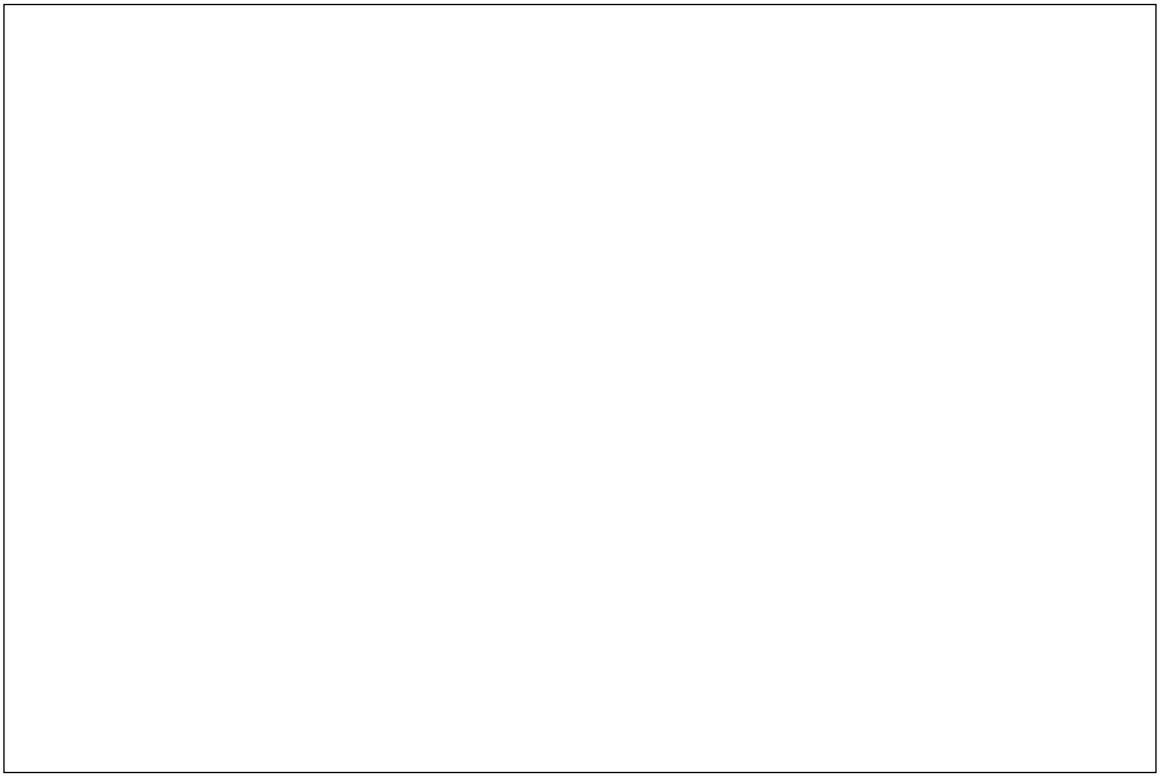
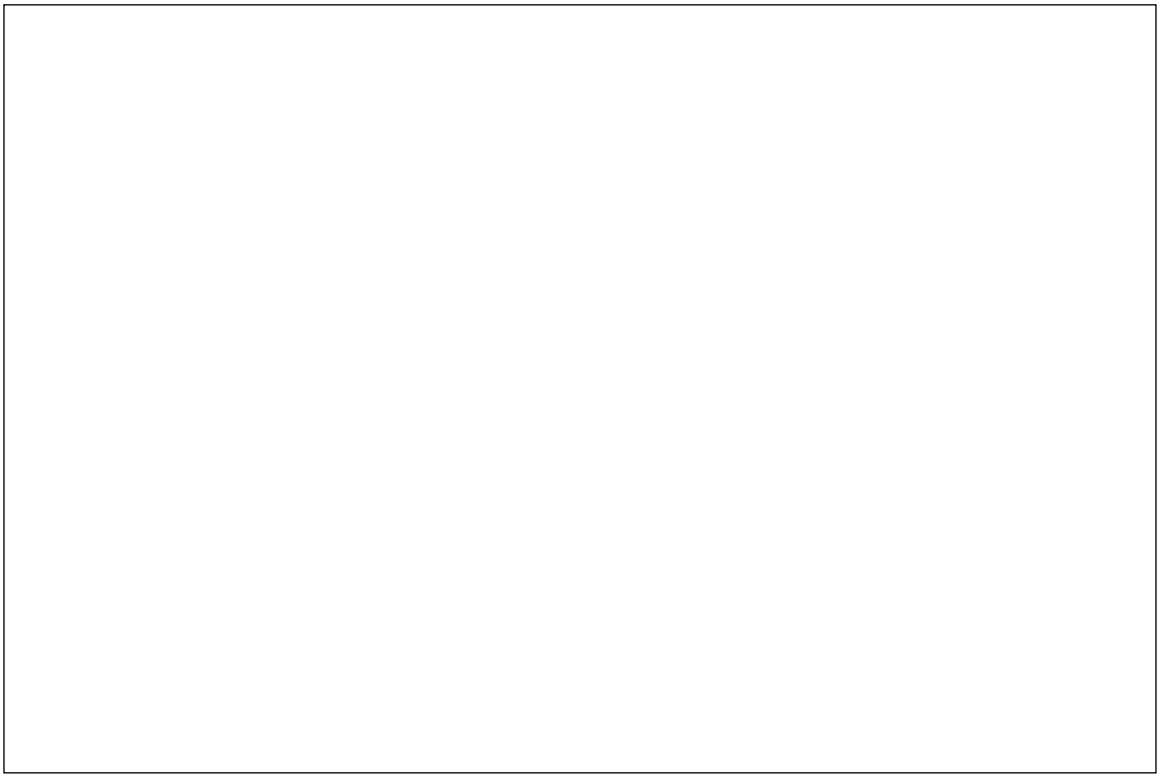


Figure 5-4
National Docks Secondary Study Area-Segment 2
CROSS HARBOR FREIGHT MOVEMENT PROJECT



National Docks Secondary Study Area - Segment 2: View southeast of the rail line as it travels near Barbara Place. The Conrail National Docks Railroad Bridge is visible, and Lafayette Gardens is partially visible on the right. Modern Housing along Pacific Avenue is visible in the background **5**



Arthur Kill Lift Bridge Study Area: View southeast of the elevated railroad near the Arthur Kill Lift Bridge **6**

Figure 5-5
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

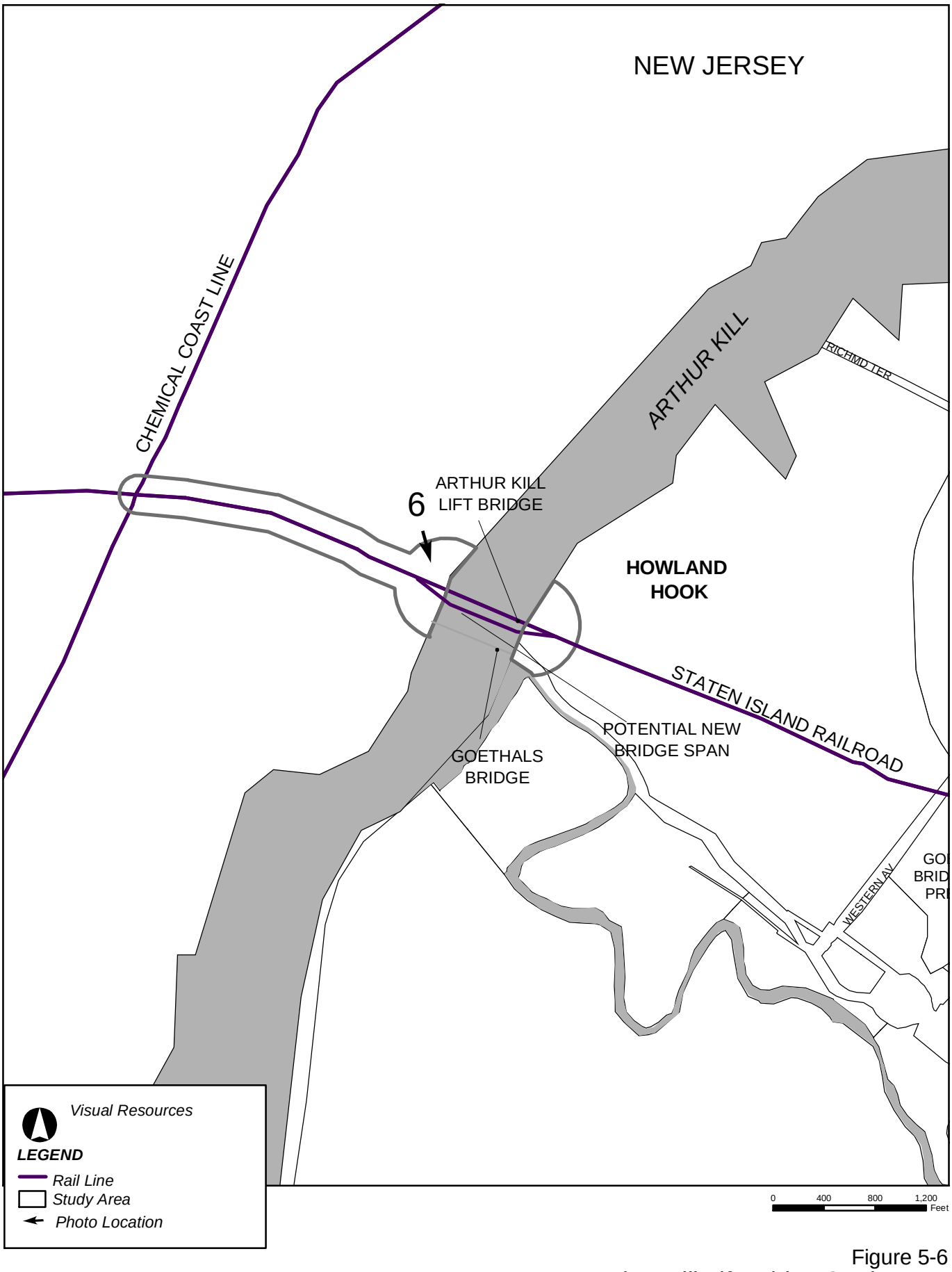


Figure 5-6
Arthur Kill Lift Bridge Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

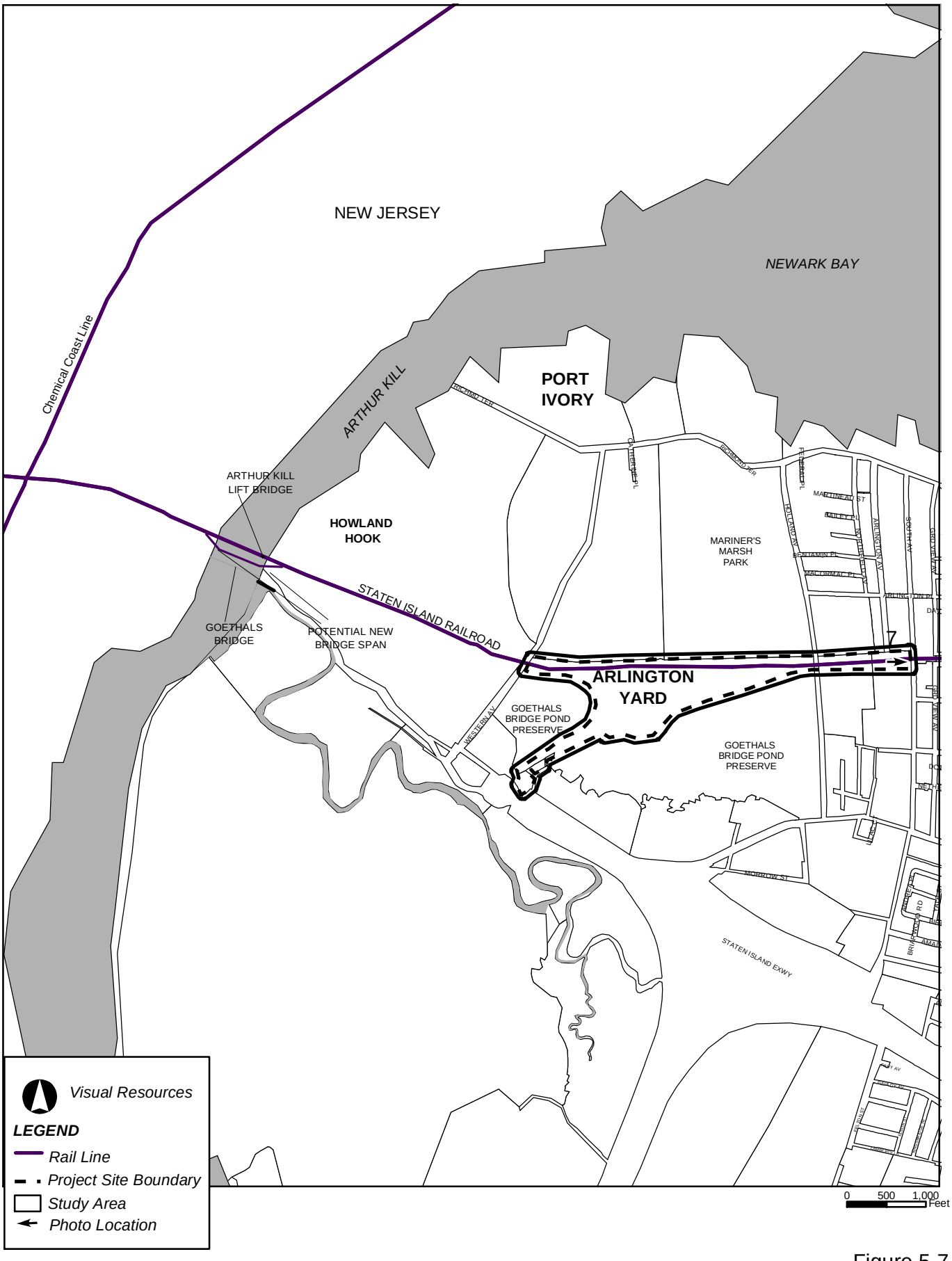
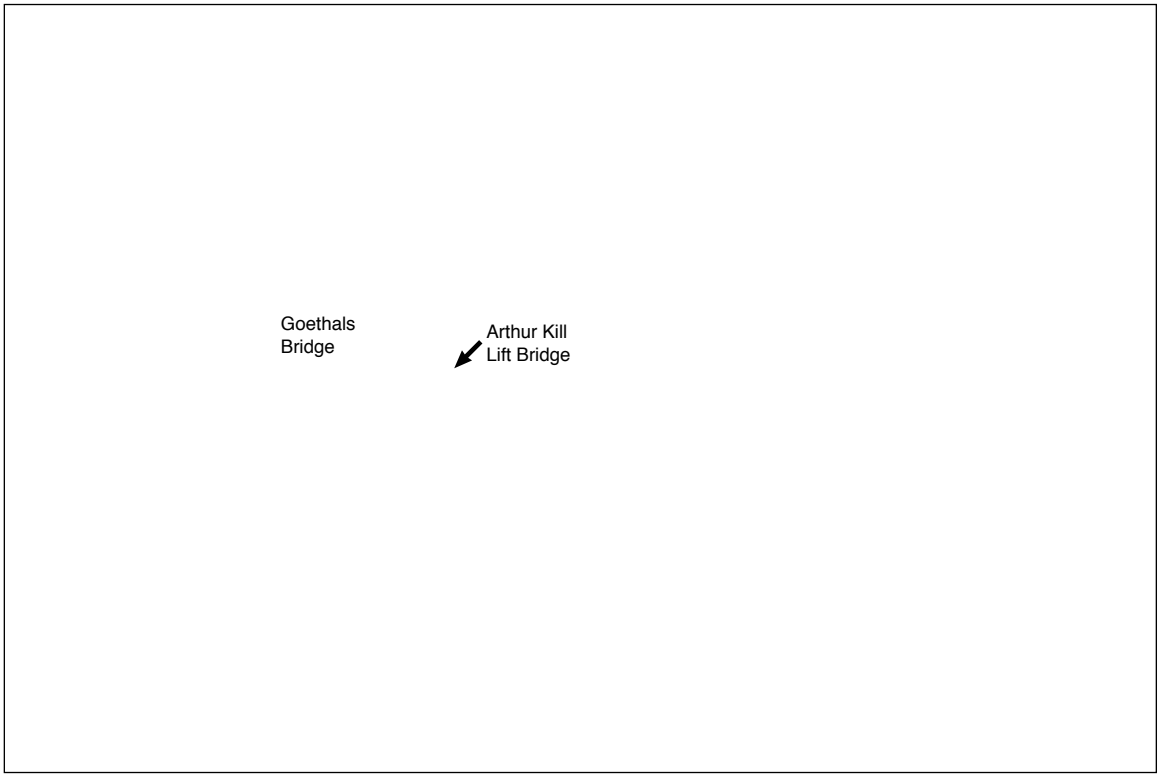
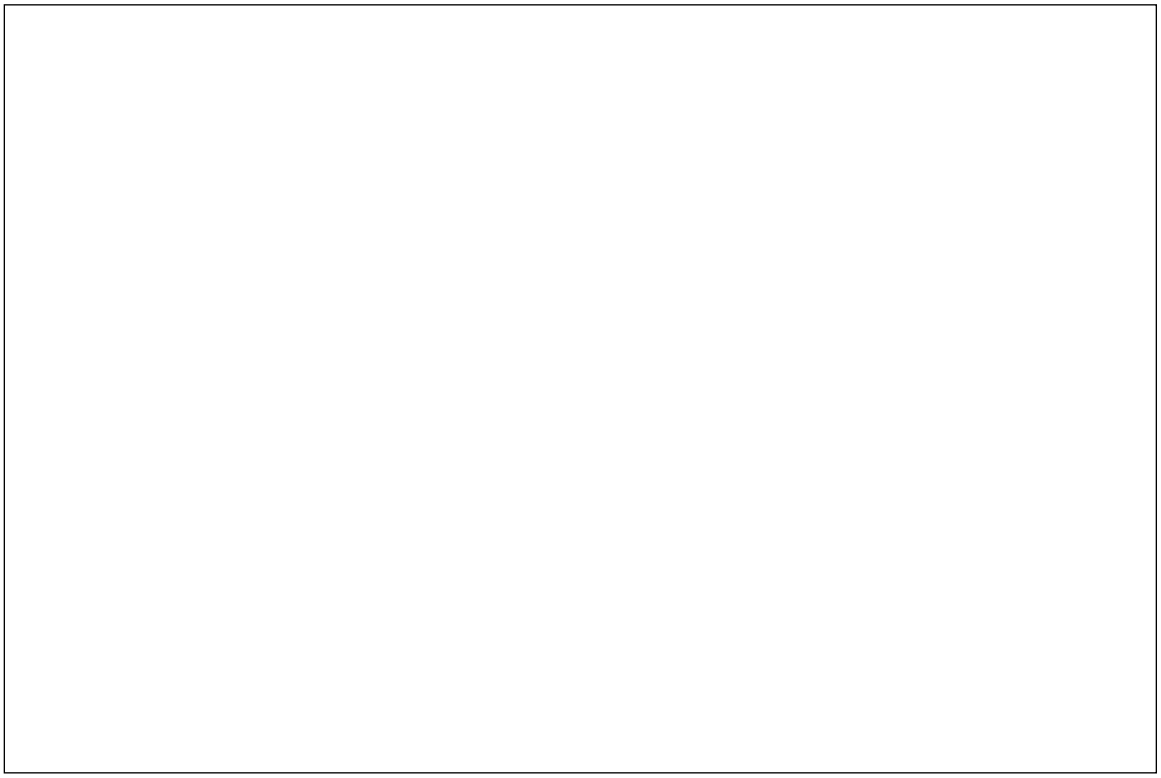


Figure 5-7
Arlington Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Arlington Yard Study Area: View northwest from Arlington Yard. The Goethals Bridge and the Arthur Kill Lift Bridge are visible in the distance **7**



Northern Staten Island Study Area - Segment 4: View of east of Pier 2, the proposed location of the tunnel ventilation shaft **8**

Figure 5-8
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

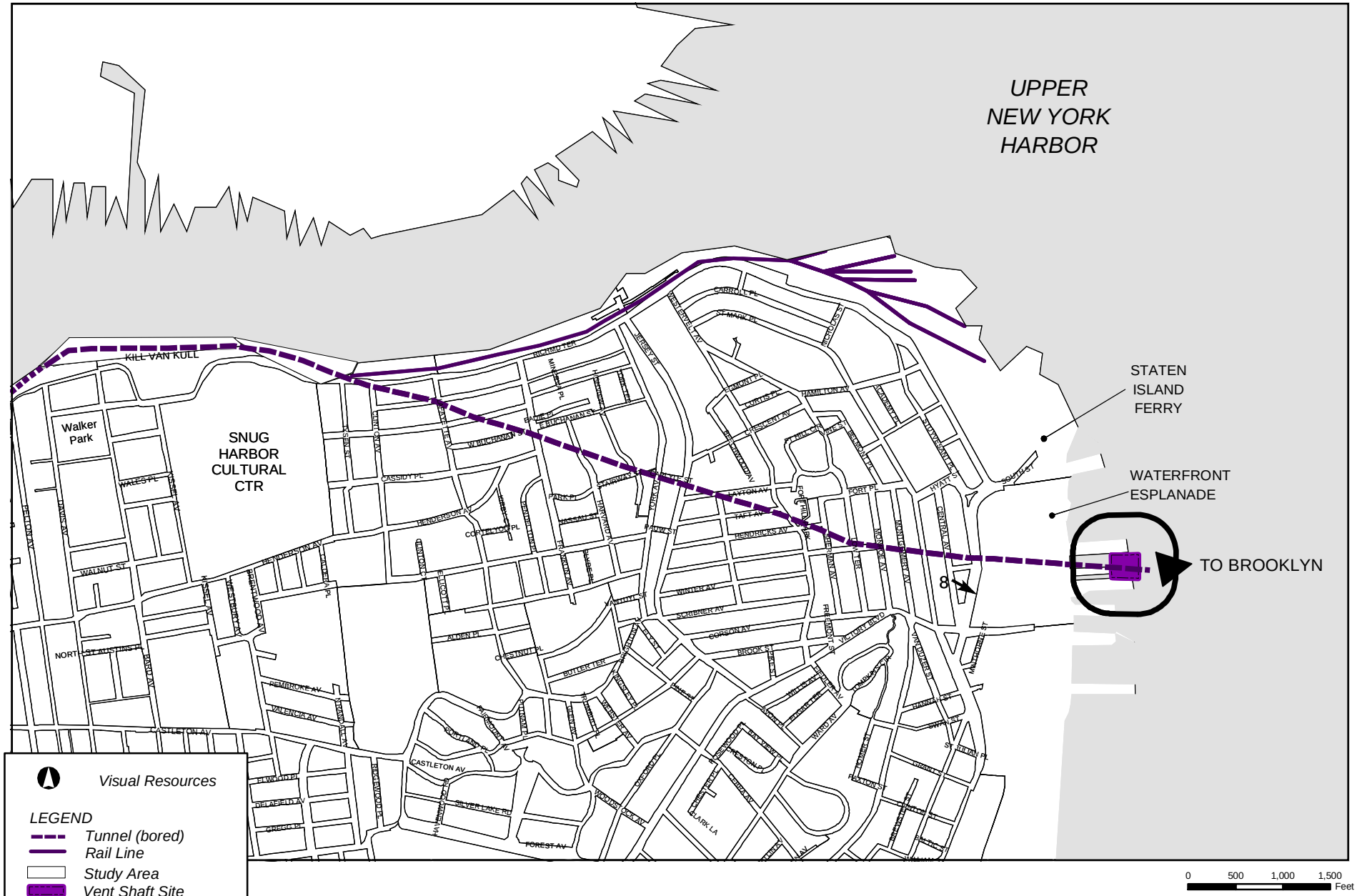


Figure 5-9
Northern Staten Island Study Area-Segment 4

CROSS HARBOR FREIGHT MOVEMENT PROJECT

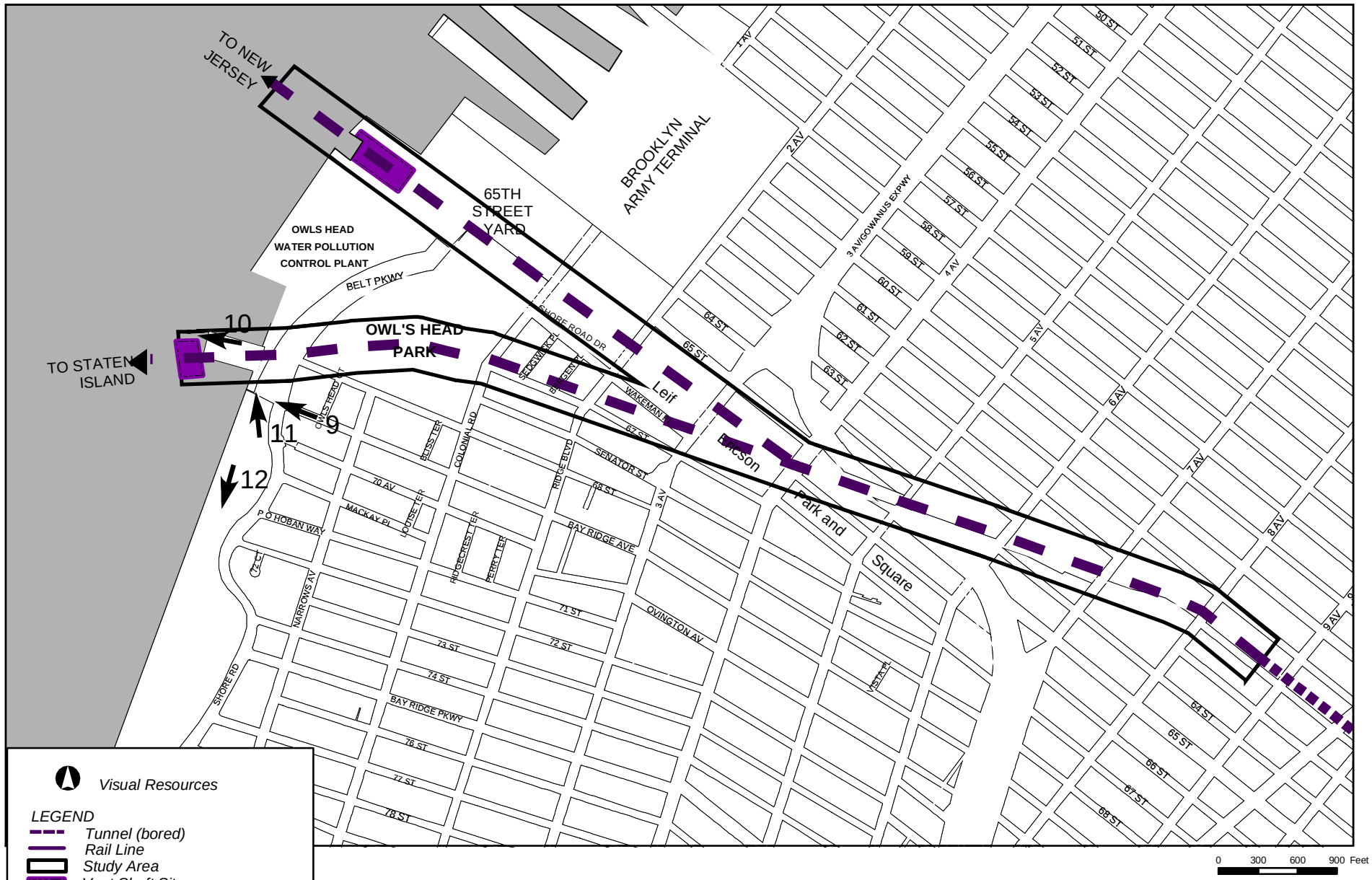
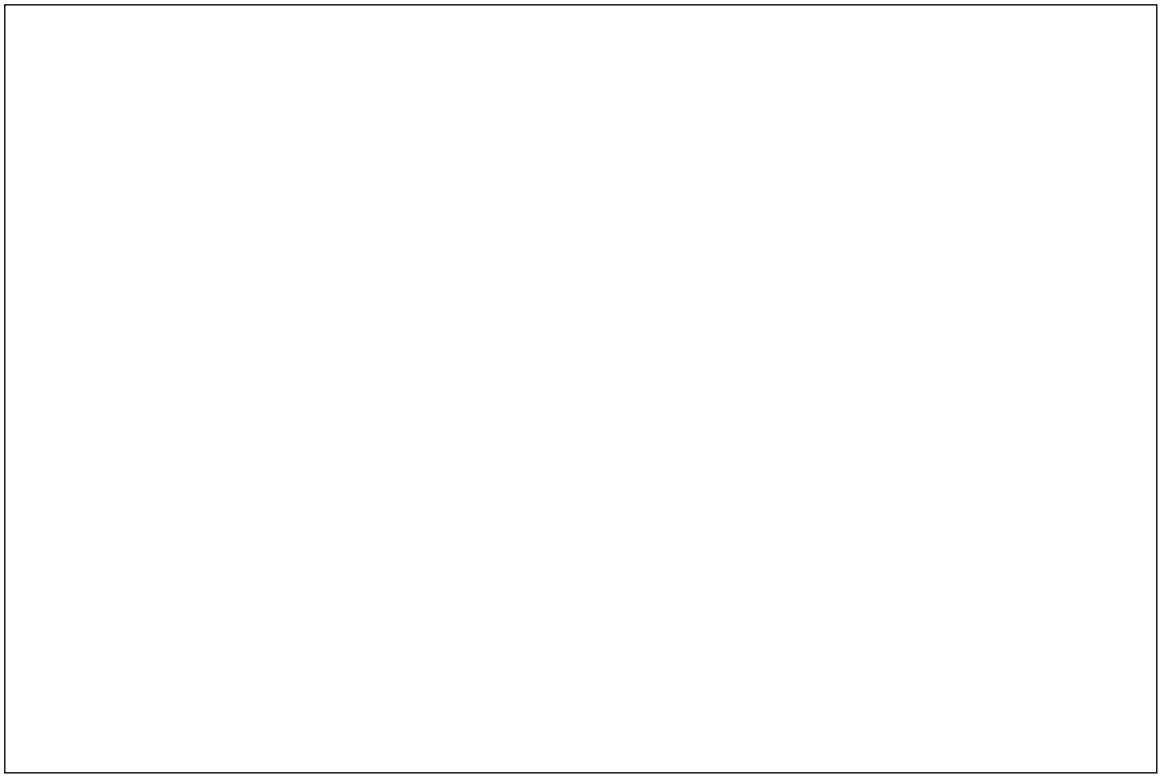


Figure 5-10
Bay Ridge Branch Study Area-Segment 1
CROSS HARBOR FREIGHT MOVEMENT PROJECT



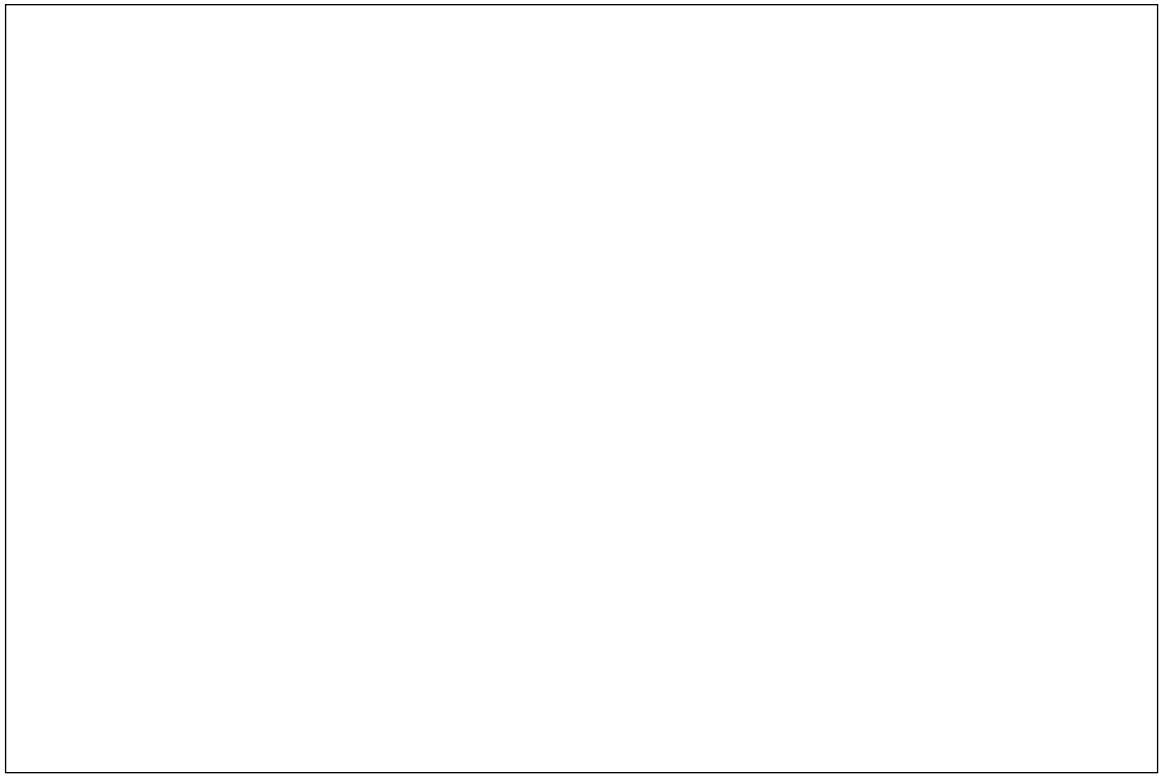
Bay Ridge Branch Study Area - Segment 1: 69th Street pier. View west on Bay Ridge Avenue **9**



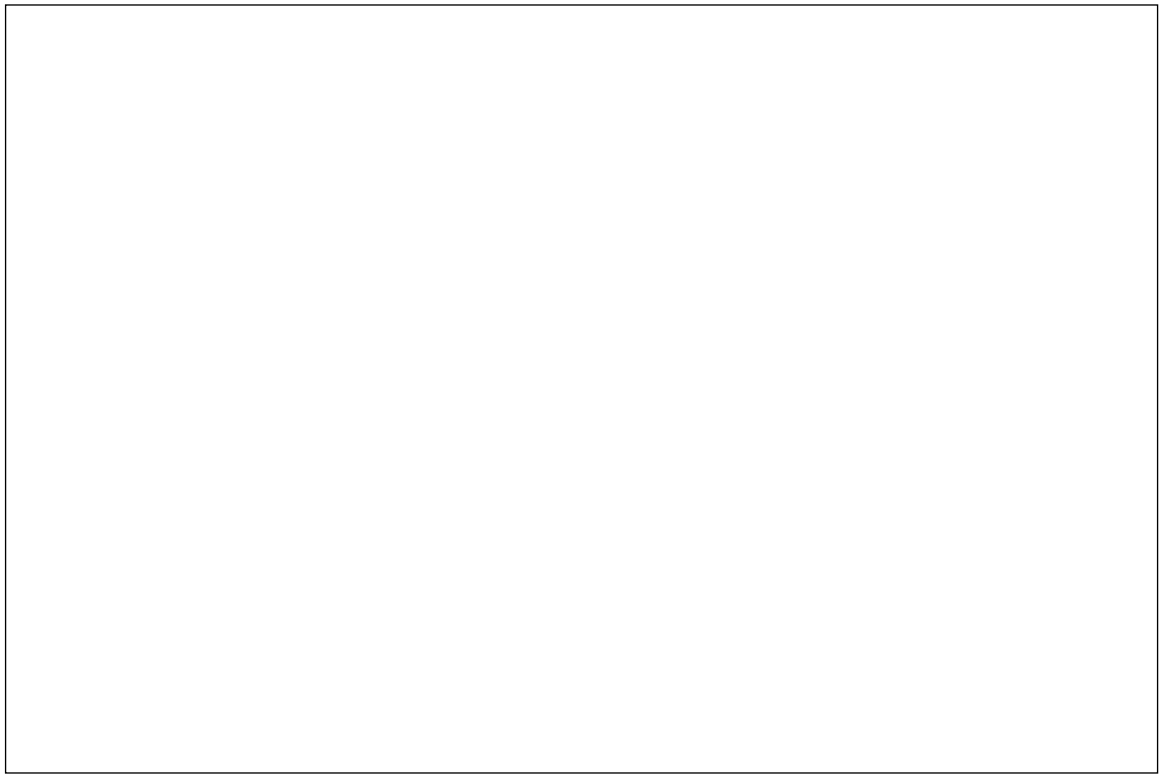
Bay Ridge Branch Study Area - Segment 1: View west on 69th Street pier **10**

Figure 5-11
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

11•03



Bay Ridge Branch Study Area - Segment 1: View of the 69th Street pier from Owls Head Park **11**



Bay Ridge Branch Study Area - Segment 1: Shore Promenade. View south from approximately Bay Ridge Avenue **12**

Figure 5-12
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

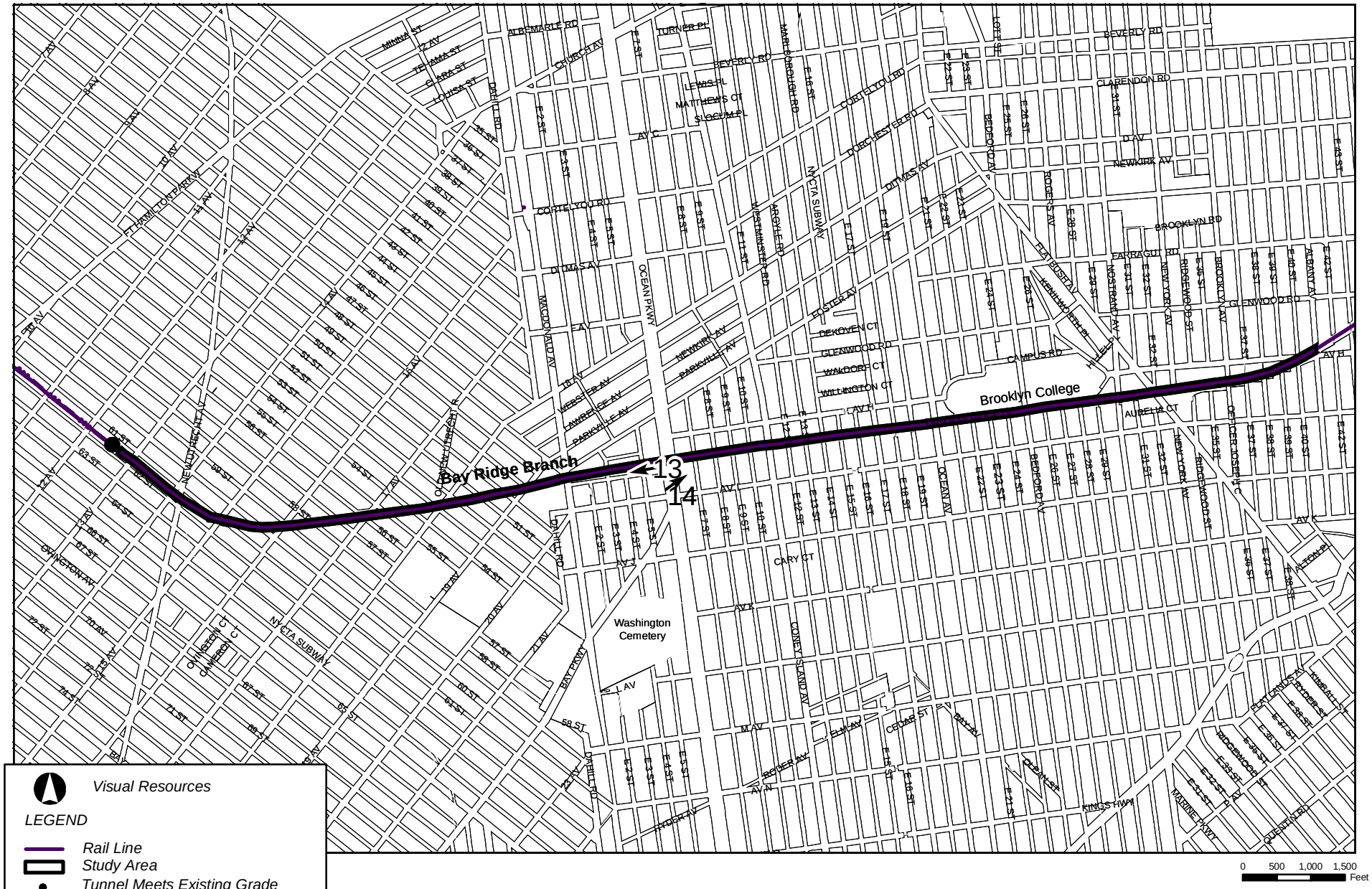
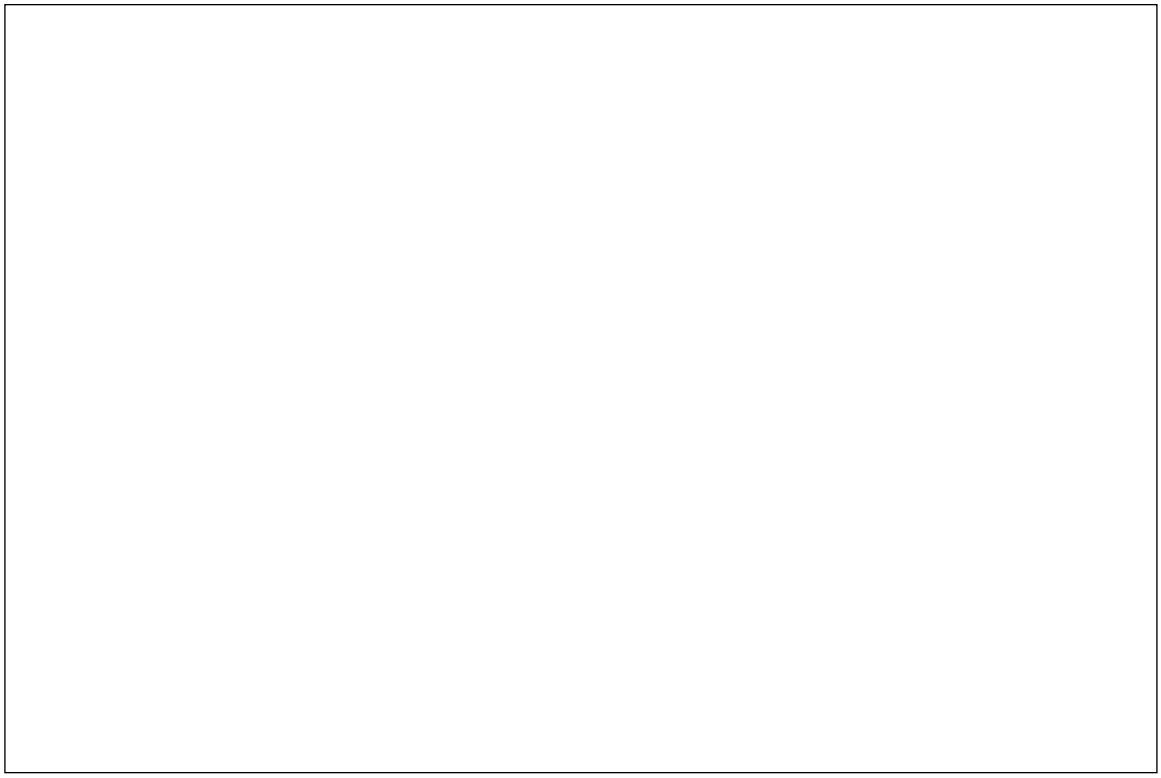


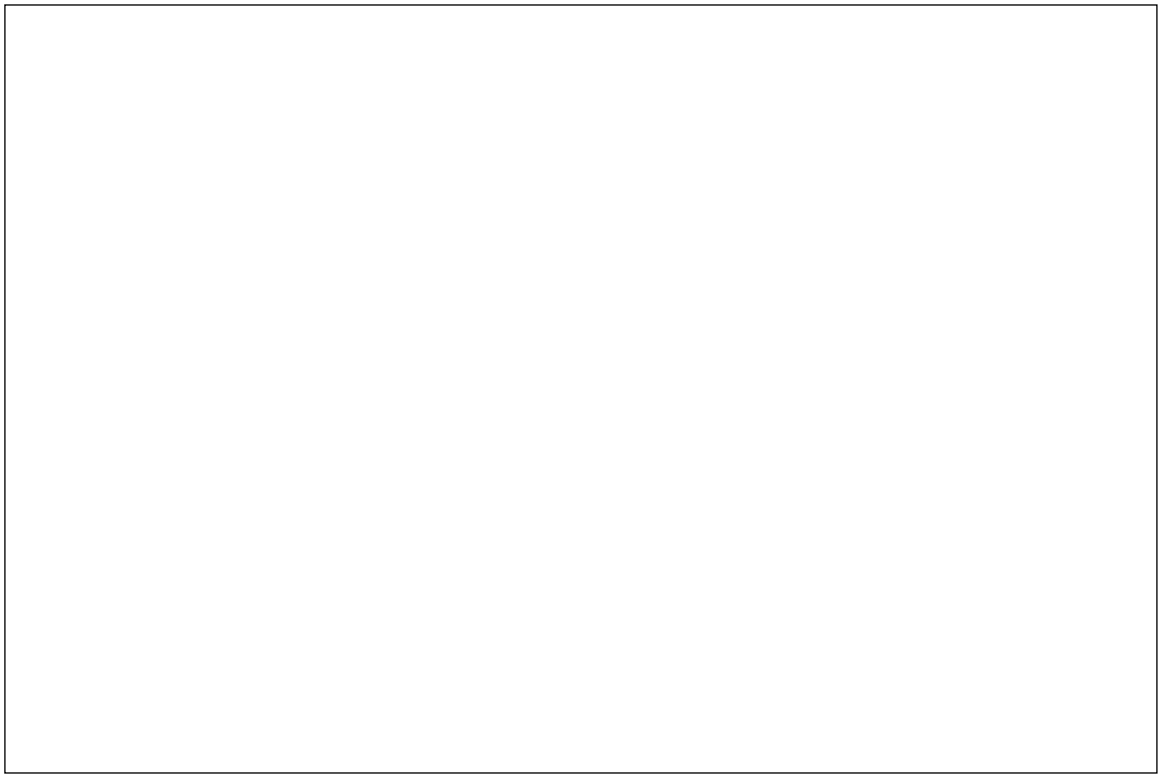
Figure 5-13

Bay Ridge Branch Study Area-Segment 3

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Bay Ridge Branch Study Area - Segment 3: Bay Ridge Branch rail cut. View west from Ocean Parkway **13**

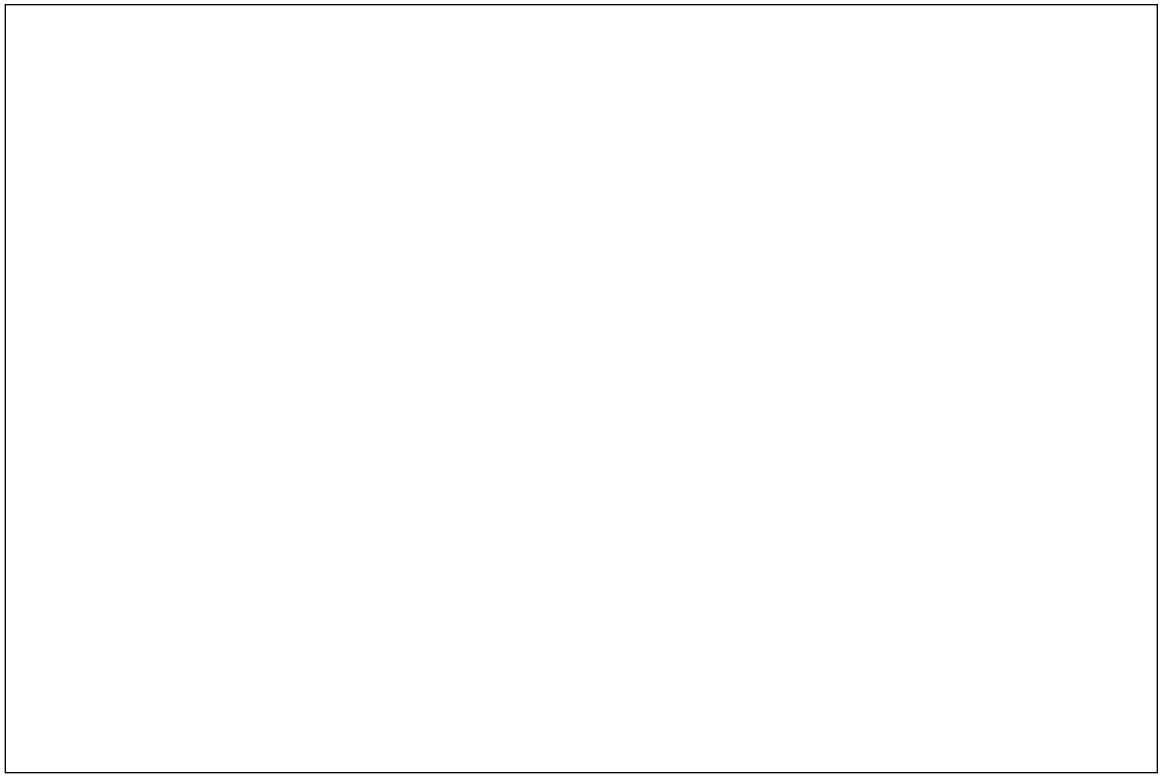


Bay Ridge Branch Study Area - Segment 3: Ocean Parkway. View northeast from proximity of rail cut (visible on right side) **14**

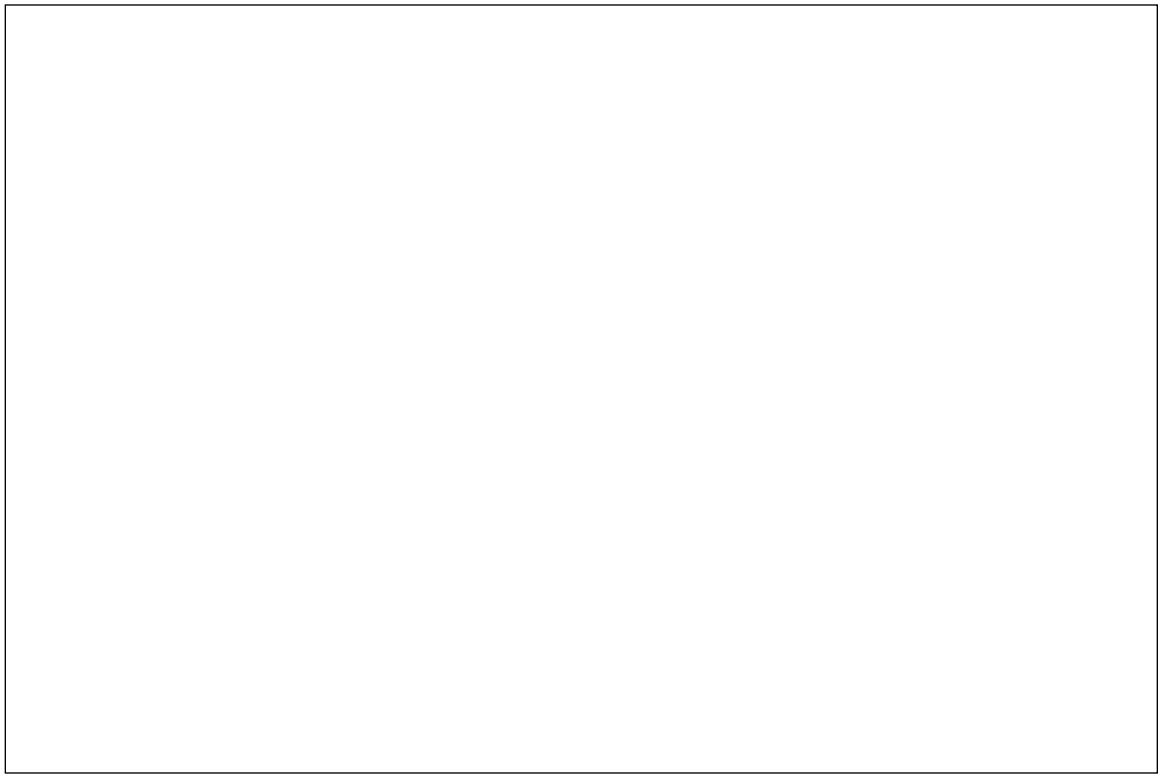
Figure 5-14
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 5-15
Bay Ridge Branch Study Area-Segment 4
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Bay Ridge Branch Study Area - Segment 4: Cemetery of the Evergreens. View north from the intersection of Conway Street and Bushwick Avenue **15**



Fresh Pond Yard Study Area: View south from Lutheran Cemetery **16**

Figure 5-16
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

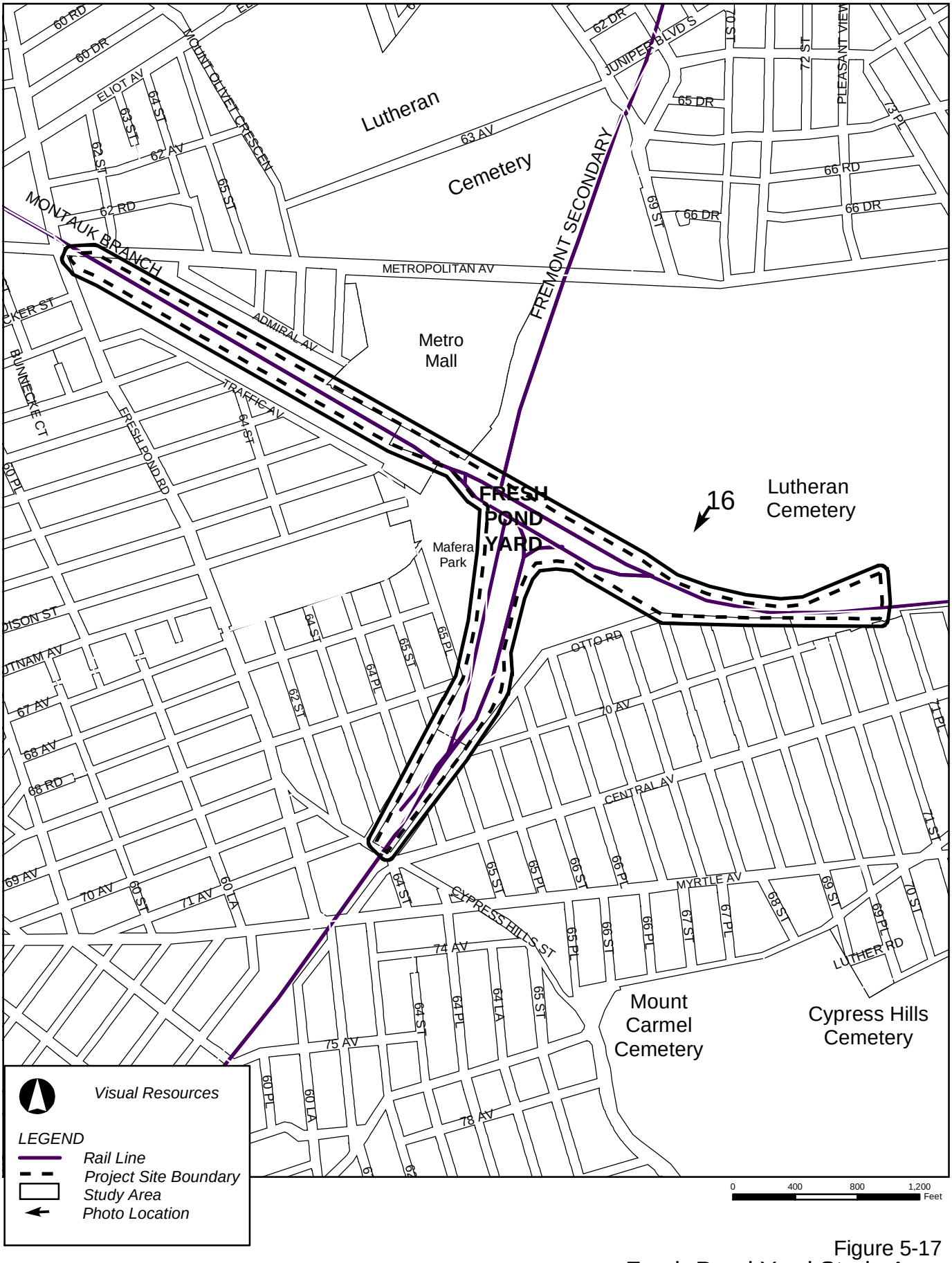


Figure 5-17
Fresh Pond Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

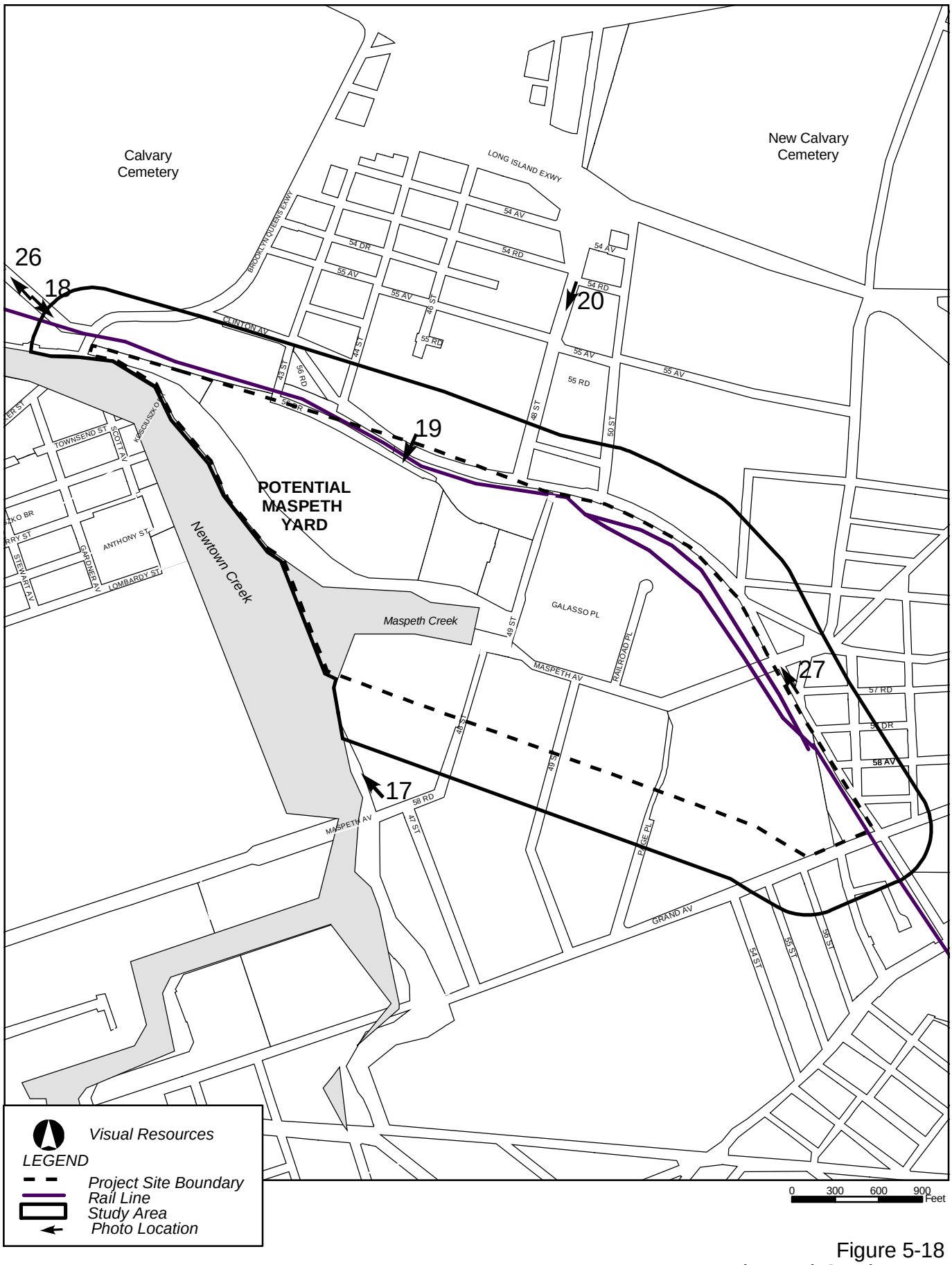
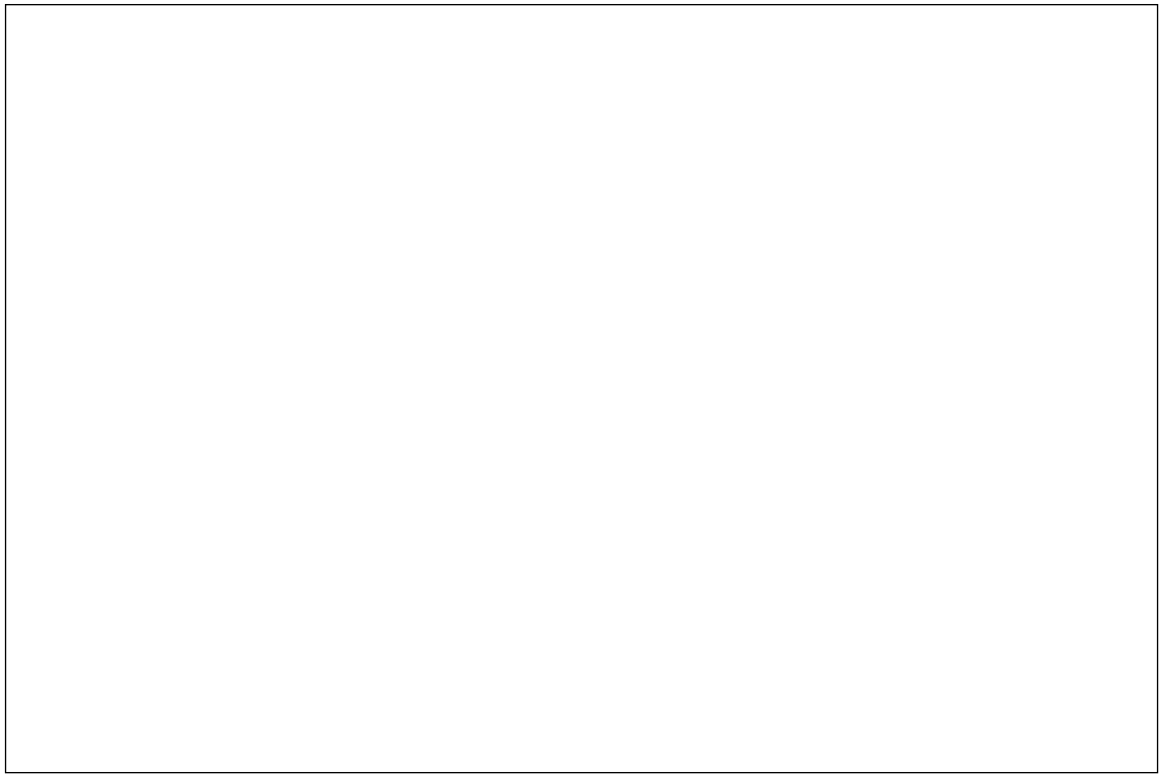
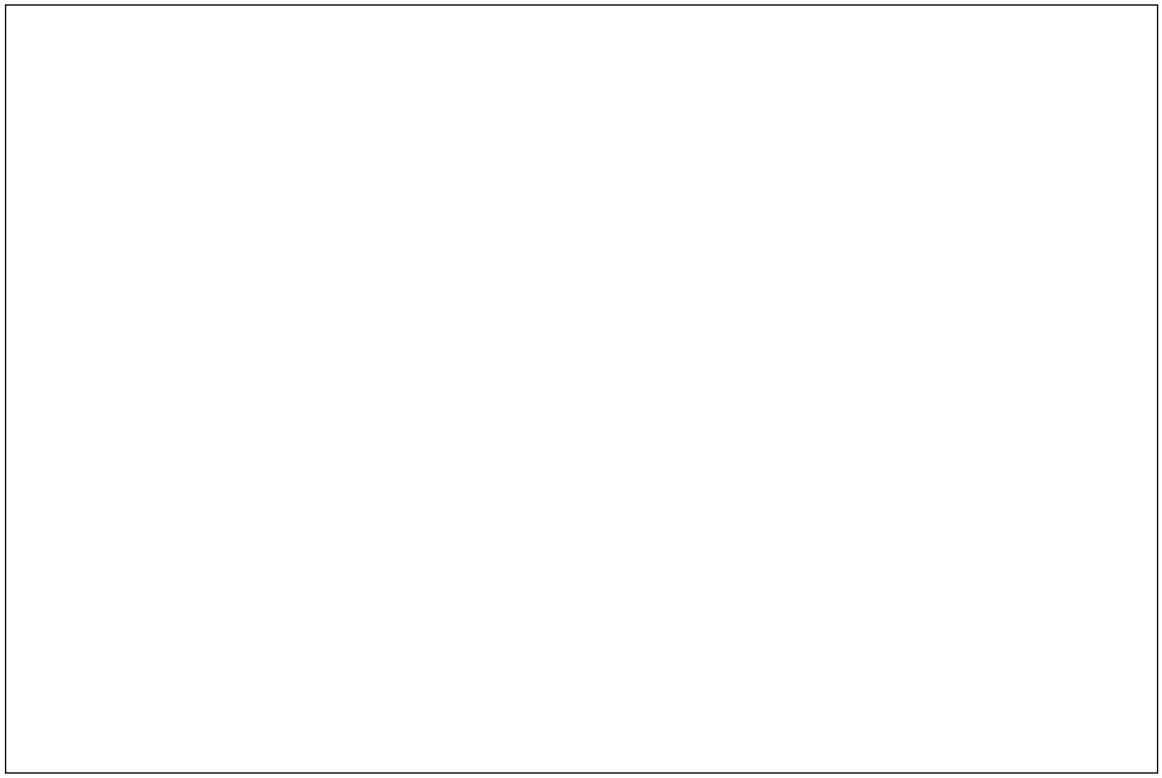


Figure 5-18
West Maspeth Yard Study Area

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Maspeth Yard Study Area: View northwest of Newtown Creek and Kosciuszko Bridge from 58th Road **17**



Maspeth Yard Study Area: View east on Review Street **18**

Figure 5-19
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Maspeth Yard Study Area: View toward project site from 56th Road, with views to Midtown Manhattan in the distance **19**



Maspeth Yard Study Area: View south on 48th Street **20**

Figure 5-20
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

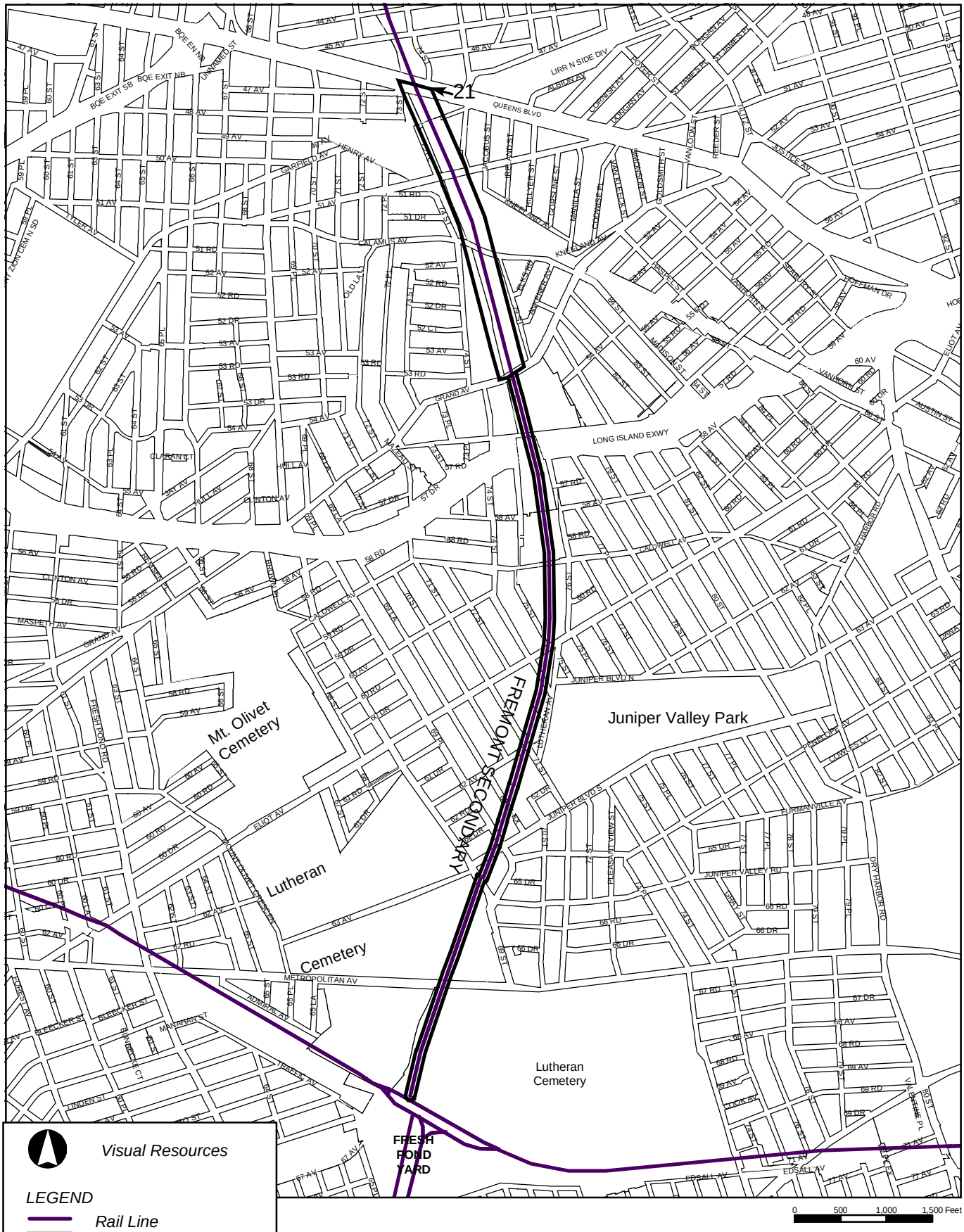
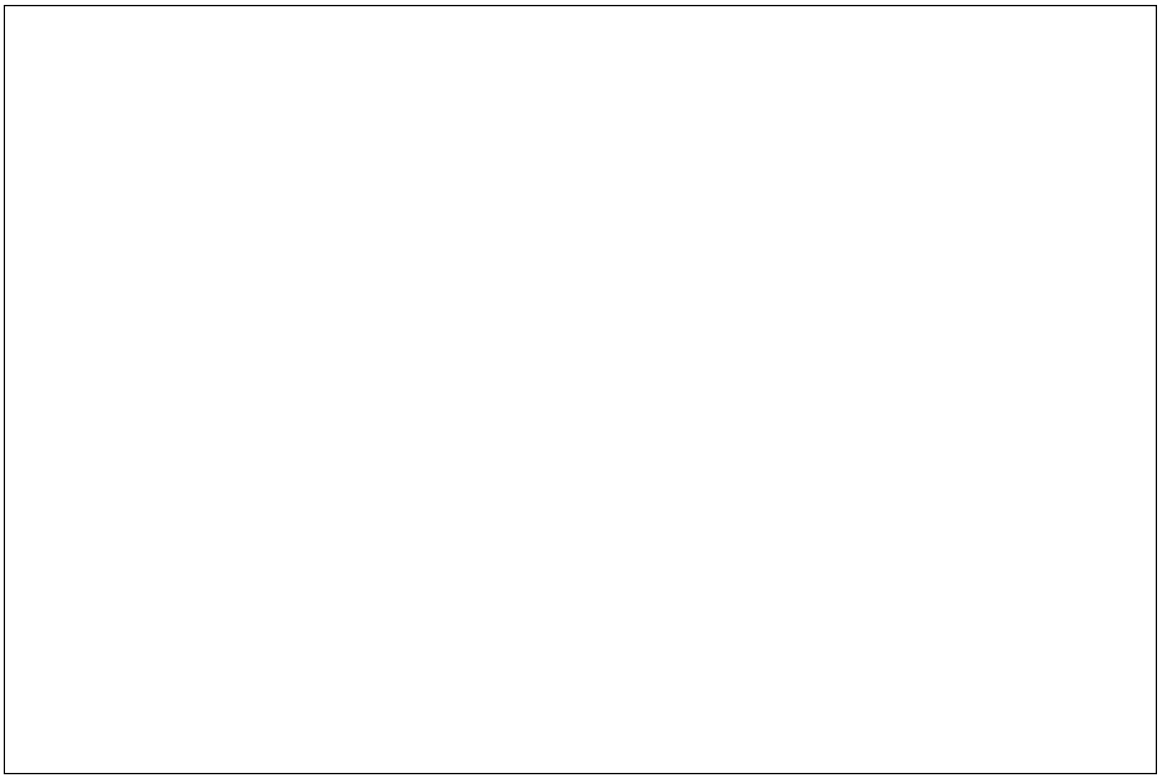
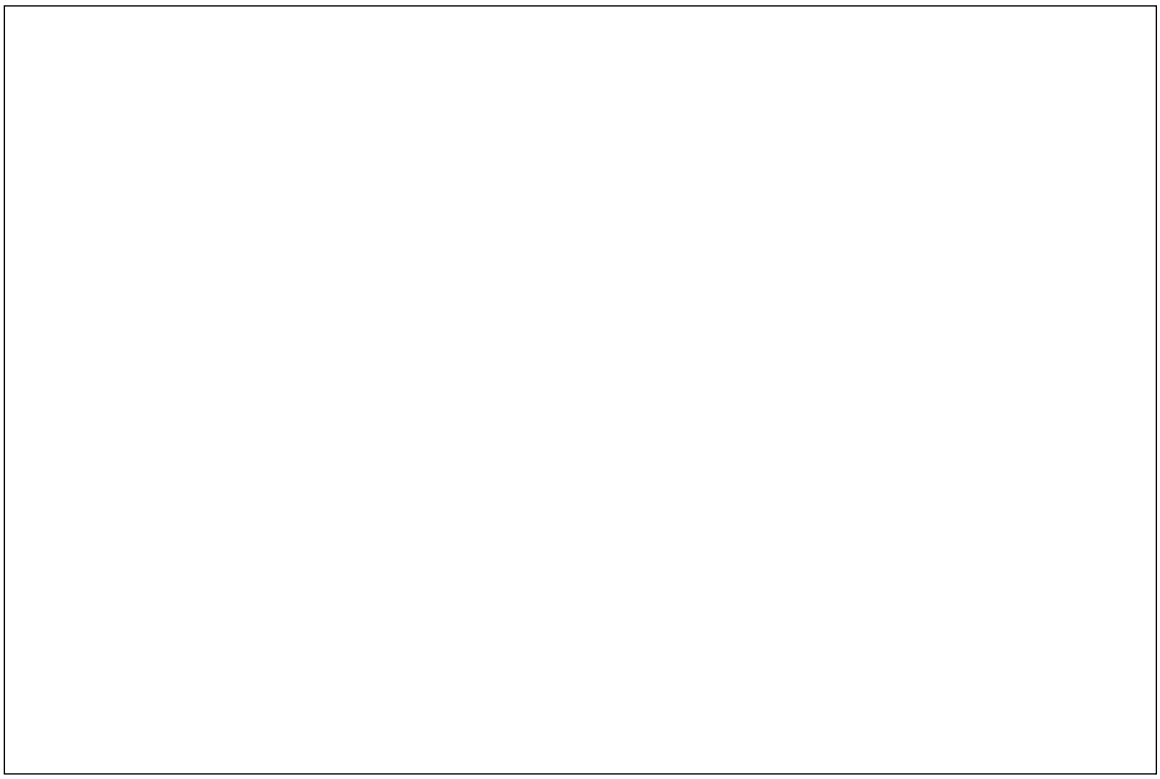


Figure 5-21
Fremont Secondary Study Area-Segment 1
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Fremont Secondary Study Area - Segment 1: View west of rail line above Queens Boulevard **21**



Fremont Secondary Study Area - Segment 2: View south on 70th Street from Northern Boulevard **22**

Figure 5-22
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT



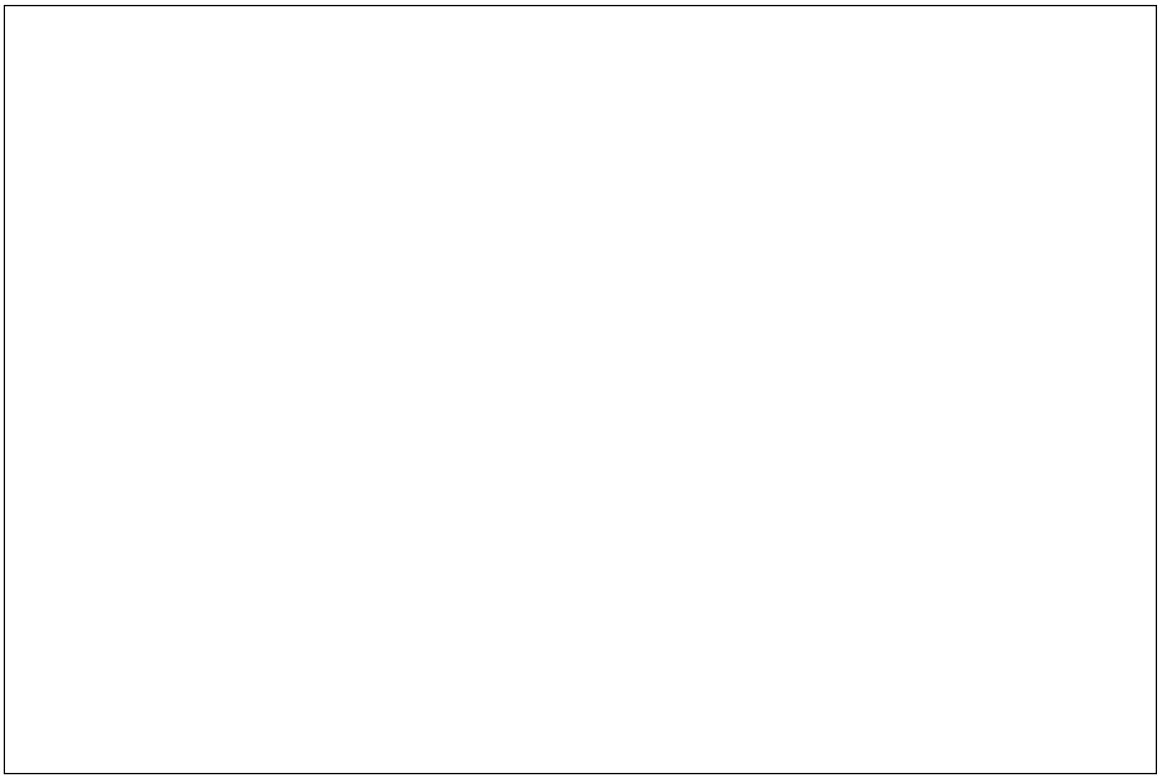
Figure 5-23
Fremont Secondary Study Area-Segment 2

CROSS HARBOR FREIGHT MOVEMENT PROJECT

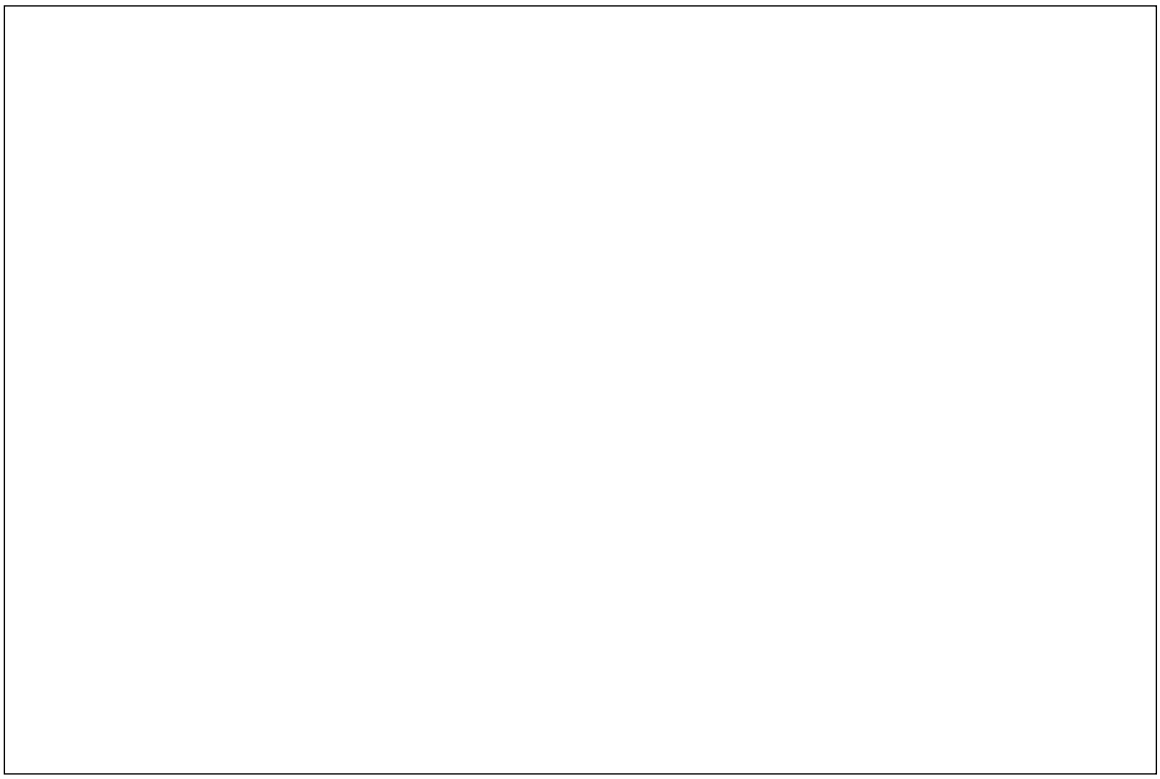


Figure 5-24
Fremont Secondary Study Area-Segment 3

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Fremont Secondary Study Area - Segment 3: View of Hell Gate Bridge from Astoria Park **23**



Fremont Secondary Study Area - Segment 3: View of Triborough Bridge from Shore Boulevard **24**

Figure 5-25
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

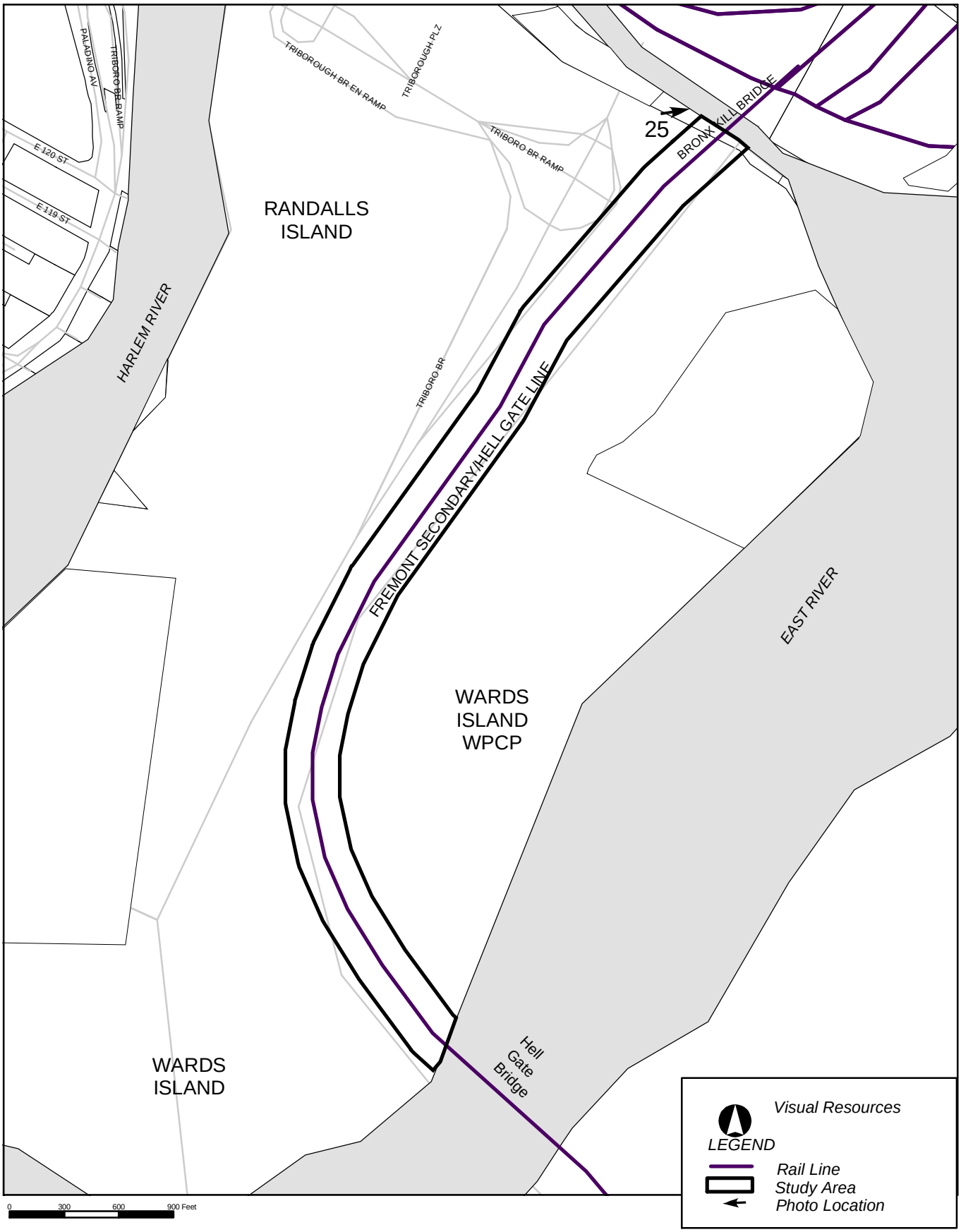
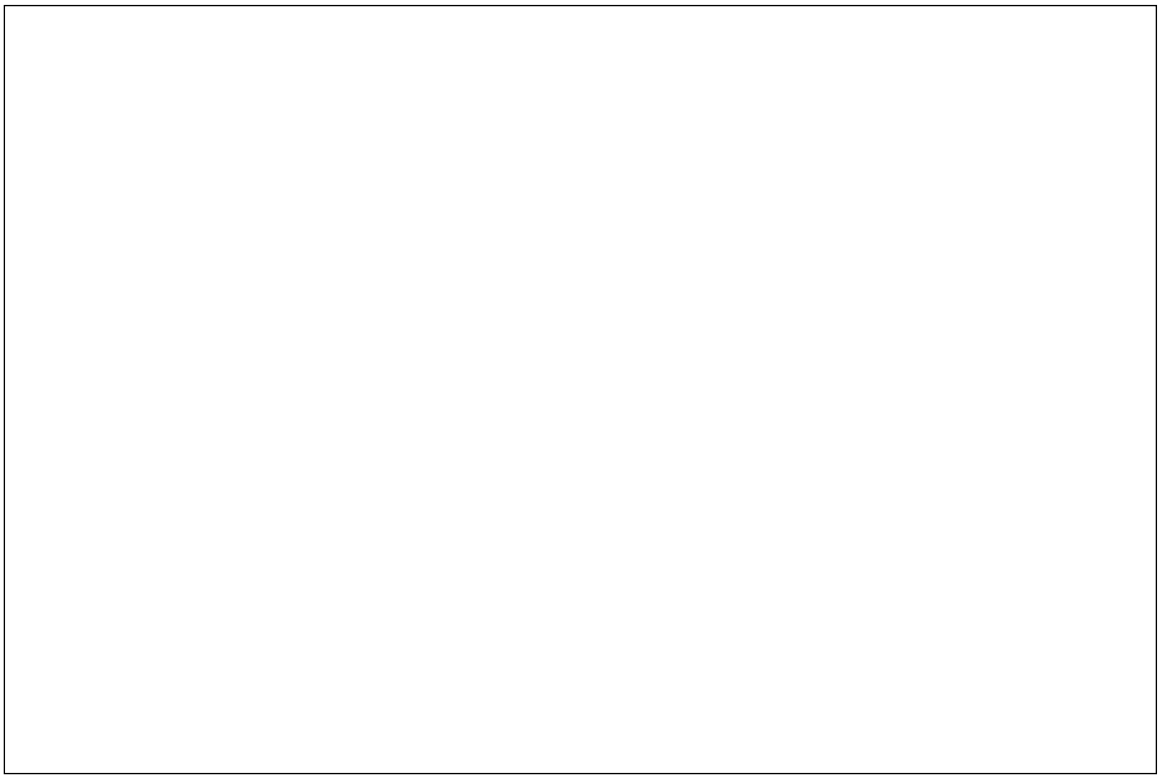


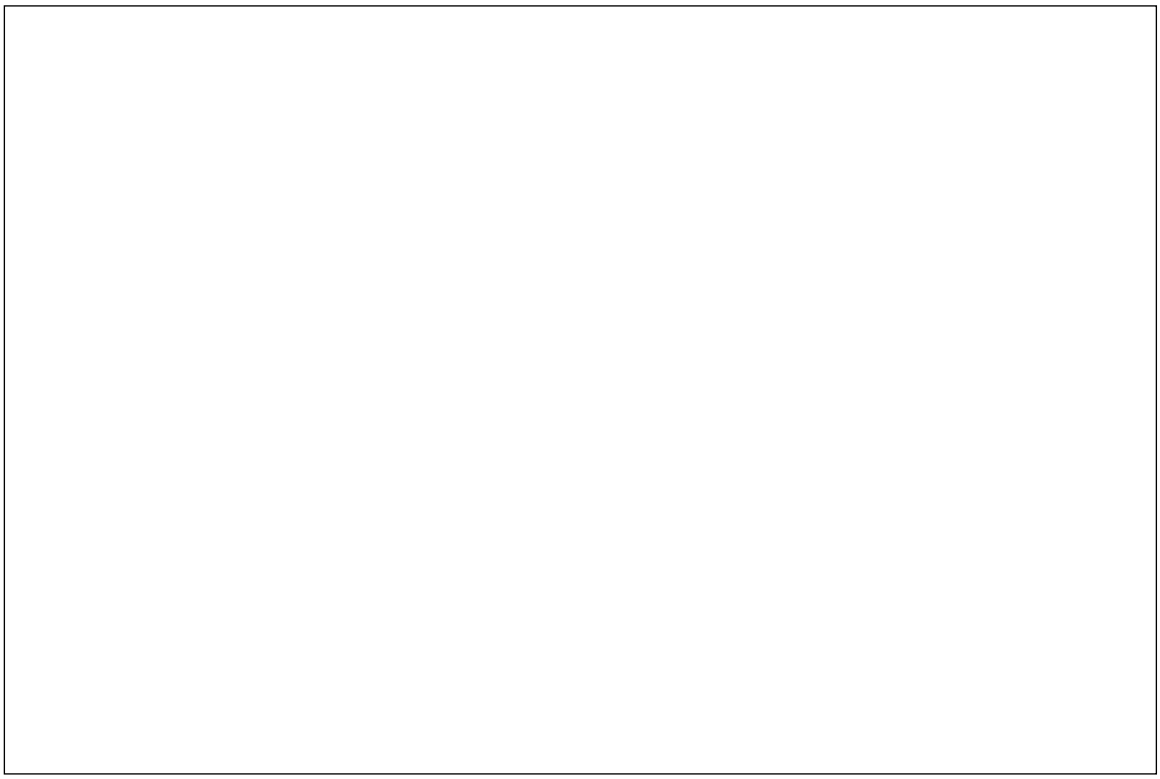
Figure 5-26
Fremont Secondary Study Area(Randalls/Wards Island Portion)

CROSS HARBOR FREIGHT MOVEMENT PROJECT

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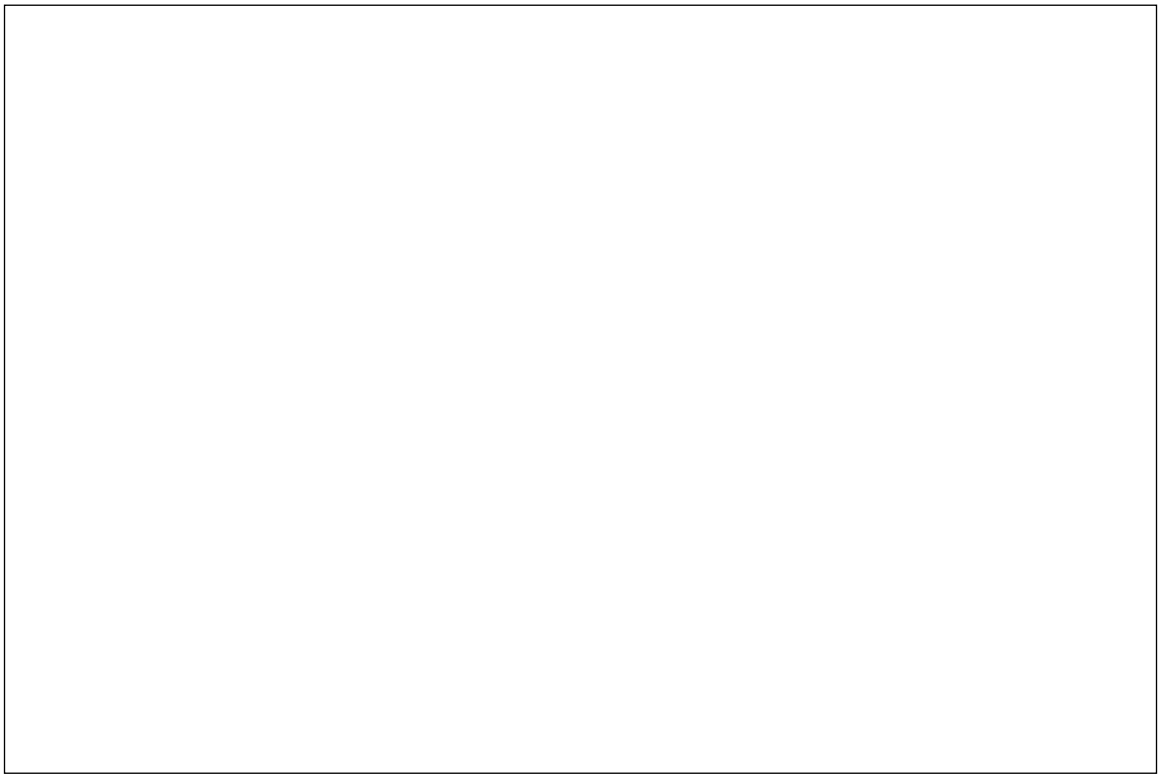


Fremont Secondary Study Area (Randalls/Wards Island Portion): View east of Bronx Kill Bridge and Randalls Island playing fields **25**



Maspeth Yard Study Area: View west on Review Street, with views of Midtown Manhattan in the distance **26**

Figure 5-27
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Maspeth Yard Study Area: View west to project site from Rust Street **27**

Figure 5-28
Views of the Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 5-29
Key Map to Illustrative Renderings

CROSS HARBOR FREIGHT MOVEMENT PROJECT



View south to proposed facility from New Calvary Cemetery (View 6 on Key Map)

Figure 5-30
Illustrative Rendering of Proposed Intermodal Freight Facility

CROSS HARBOR FREIGHT MOVEMENT PROJECT



View south to proposed facility from 48th Road (View 5 on Key Map)

Figure 5-31
Illustrative Rendering of Proposed Intermodal Freight Facility

CROSS HARBOR FREIGHT MOVEMENT PROJECT



View west of proposed facility from Rust Street (View 4 on Key Map)

Figure 5-32
Illustrative Rendering of Proposed Intermodal Freight Facility

CROSS HARBOR FREIGHT MOVEMENT PROJECT

11•03



View east of proposed facility from Review Street (View 1 on Key Map)

Figure 5-33

Illustrative Rendering of Proposed Intermodal Freight Facility

CROSS HARBOR FREIGHT MOVEMENT PROJECT



View east of proposed facility (View 2 on Key Map)

Figure 5-34
Illustrative Rendering of Proposed Intermodal Freight Facility

CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 6: Historic Resources

A. INTRODUCTION AND METHODOLOGY

This chapter assesses the potential effects to historic resources as a result of construction and/or operation of the project alternatives. Because construction-related effects to historic structures could be permanent, they are addressed below and in more detail in Chapter 16, "Construction and Construction Impacts."

REGULATORY CONTEXT

Potential effects on historic resources are analyzed in conformance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), Section 4(f) of the United States Department of Transportation Act of 1966 (Section 4[f]), the New York State Historic Preservation Act of 1980 (SHPA), and the New Jersey Register of Historic Places Act of 1970 (NJSA). A description of these regulations is provided in Appendix 1, "Visual and Cultural Resources."

METHODOLOGY

In general, potential effects on historic or architectural resources can include both direct physical impacts—demolition, alteration, or damage from construction on nearby sites—and indirect, contextual impacts, such as the isolation of a property from its surrounding environment, or the introduction of visual, audible, or atmospheric elements that are out of character with a property or that alter its setting. In addition, Section 106 requires consideration of reasonably foreseeable effects that may occur later in time, be further removed in distance, or be cumulative. Portions of the TSM Alternative and Expanded Float Operations Alterative that require construction—including rehabilitation of existing and construction of new float bridges and new rail yard construction—and elements of the Tunnel Alternative—including a new freight tunnel, increase in clearance heights, as well as rehabilitation/creation of rail yards—may affect historic structures. The No Action Alternative does not involve actions that are part of the Cross Harbor Freight Movement Project. Therefore, the No Action Alternative does not require analysis, except as it affects future conditions under the project alternatives.

To assess the potential effects of the TSM, Expanded Float Operations, and Tunnel Alternatives, an inventory of historic resources in areas that could be affected by the project was compiled. This chapter includes discussions of the methodology used to prepare the inventory (including definition of the areas of potential effect [APE]), a description of the known historic resources and properties for which the New York State Historic Preservation Office (NY SHPO) and the New York City Landmarks Preservation Commission (NYCLPC) made determinations of eligibility specifically for the project, and an assessment of the potential project effects. As stated above, this work was prepared in accordance with NHPA, SHPA, NJSA, and National Environmental Policy Act (NEPA). A brief background history of the affected areas is provided in Appendix 1, "Visual and Cultural Resources."

DEFINITION OF THE AREA OF POTENTIAL EFFECT

APEs for the alternatives were identified in consultation with NY SHPO, the New Jersey State Historic Preservation Office (NJ SHPO), NYCLPC and relevant New Jersey agencies. They are described below and mapped for each applicable project site within the individual APE discussions below in section B, "Existing Conditions." APEs include sites that may potentially be affected by construction or that may experience effects once construction is completed and the new system is operational. The project area, including each of these project sites, is shown on the project context map, Chapter 2, Figure 2-1. Figures 6-1 through 6-26 depict each study area, the APE, and the location of known and potential historic resources. Photographs of the known and potential historic resources are provided in Appendix 1.

The APEs defined for the three project alternatives are as follows:

- For depressed portions of the rail lines, the APE for construction and operational effects is the area within 50 feet. This also includes visually non-intrusive construction activities.

- Where potential physical effects of construction may extend farther, as when open cut and cut and cover construction would be employed, the APE is the area within 150 feet from construction activity boundaries. The APE of 150 feet also encompasses some of the more potentially visible project components, including at grade and elevated sections of the rail line where rail traffic would be substantially increased.

- An APE of 400 feet has been identified for the potential new rail bridge across the Arthur Kill as well as around the proposed ventilation structures for tunnels under New York Harbor that would be located off shore adjacent to New Jersey, Staten Island, and Brooklyn. An APE of 400 feet has also been defined around the expanded rail yard in West Maspeth, Queens. This takes into consideration the larger areas potentially affected by these larger and more visually prominent structures.

- For rail yards in industrial areas, the APE was defined as the area within 50 feet of the rail yard. For rail yards with adjacent residential uses or public open spaces, the APE was expanded to consider potential viewsheds from those uses.

Once the project is completed and operational, there would be no difference in the visual characteristics above-grade for the bored and cut and cover sections of the tunnels. Therefore, no APE for operations has been defined for this type of construction. In addition, no APE has been defined for construction effects for the bored portion of the tunnels. As described in detail in Chapter 10, "Noise and Vibration," vibrations due to construction and/or operation of the project would not be expected to result in any effects to historic structures in the areas near the bored portion of the tunnels. Thus, overall there is no APE for the bored portions of the tunnel.

IDENTIFICATION OF HISTORIC PROPERTIES/STRUCTURES WITHIN THE APES

Once the APEs were determined, a list of officially recognized historic resources within the APEs was compiled. This includes properties or districts listed on the NR, New York and New Jersey SRs, or determined eligible for such listing; National Historic Landmarks (NHL); New York City Landmarks and Historic Districts (NYCL), properties that have been considered for designation ("heard") by NYCLPC at a public hearing or calendared for consideration at such a hearing (these are "pending" NYCLs); properties or districts designated by the Newark Landmark and Historic Preservation Commission; and properties or districts designated by the Jersey City Historic Preservation Commission.

A list of potential historic resources within the APEs was also compiled. These were identified based on field surveys of the APEs and by using sources listed in Appendix 1, "Visual and Cultural Resources." Potential historic resources comprise properties that may be eligible for listing on the NR, New York and New Jersey SRs, and/or designation as NYCLs and as local landmarks by municipalities in New Jersey with historic preservation ordinances.

Potential resources were identified based on the criteria for listing on the NR, described in Appendix 1, "Visual and Cultural Resources." In addition, NYCLPC, the Jersey City Historic Preservation Commission, and Newark Landmark and Historic Preservation Commission designate properties as local landmarks based on separate, though comparable sets of criteria. These are also described in Appendix 1.

Historic Resource Inventory Forms ("Blue Forms") were then prepared for the potential historic resources and submitted to NY SHPO for evaluation and eligibility determination. These forms were also submitted to NYCLPC, and NYCLPC also identified resources that may warrant designation as NYCLs.

Officially recognized historic resources as well as properties identified as potential resources and for which NY SHPO and NYCLPC made determinations of eligibility are identified and described below in section B, "Existing Conditions." Additional descriptions of several of the resources are provided in Appendix 1.

EVALUATION OF POTENTIAL IMPACTS ON HISTORIC RESOURCES

Once the historic resources in the APEs were identified, the effects of the project on those resources were assessed. As described above, project effects on historic resources may include both physical impacts and contextual impacts. Direct effects could include physical destruction, demolition, damage, or alteration of a historic resource. In addition, visual effects, such as changes in the appearance of a historic resource or in its setting—including introduction of incompatible visual, audible, or atmospheric elements to a resource's setting, or elimination of publicly accessible views to the resource—are also considered. The various project alternatives were considered for their potential to create adverse, noise-related contextual effects on historic resources. While noise levels would rise compared to existing conditions in various portions of the project alignment, the historic resources within the various study areas already exist within a context that is at least partially defined by its proximity to rail lines, many of which are active. In addition, many of the identified historic resources were built after or concurrent with the rail lines, and thus the two uses have coexisted for most, if not all, of their history. Therefore, increases in noise levels were not considered to be a contextual efffect on historic resources. As indicated in Chapter 10, "Noise and Vibration," vibration levels would not nearly be high enough to cause cosmetic or structural damage to historic structures.

Project-related effects, including impacts during construction and impacts during operation once the project is completed, are described below for each APE in section C, "Probable Impacts of the No Action and Project Alternatives."

B. EXISTING CONDITIONS

NEW JERSEY AREAS OF POTENTIAL EFFECT (APES)

A summary of the known historic resources located in the New Jersey APEs is presented in Table 6-1. No potential historic resources were identified in the New Jersey APEs.

Table 6-1
Historic Resources Within the New Jersey Project Study Areas

Ref. No.	Name	Address/Location	S/NR	S/NR-eligible
Oak Island Yard APE (refers to Figure 6-1)				
1	Lehigh Valley Railroad Oak Island Yard Historic District	East and west of Doremus Avenue within the former Newark meadow, Newark		X
2	Lehigh Valley Railroad Historic District	Main line between Phillipsburg and Perth Amboy; main line in South Plainfield to Roselle		X
3	Central Railroad of NJ, Newark and Elizabeth Branch	5.45 miles between Brills Junction and Elizabethport		X
Greenville Yard APE (refers to Figure 6-2)				
4	Greenville Yard Historic District	Upper New York Bay, Jersey City		X
5	Greenville Yard Piers	South of Claremont Terminal channel on Upper New York Bay, Jersey City		X
Greenville Branch APE (refers to Figure 6-3)				
6	Lehigh Valley Railroad Historic District	See above		X
7	Morris Canal (Jersey City Portion)	Buried, along the shores of Upper New York Bay to the Bayonne border and the shores of Newark Bay from the Bayonne border to Communipaw Avenue, Jersey City	X	
National Docks Secondary (Segment 1) APE (refers to Figure 6-4)				
8	Pels Factory-Book Mart Press	2001 42nd Street, North Bergen Township		X
9	Pennsylvania Railroad New York Extension Historic District	Extends from milepost 8.0 in Harris Town to the 10th Avenue portal in New York City		X
10	Roben Company Office Building	725 Tonnelle Avenue, Hudson County		X
11	Erie Railroad Marion Main Line Historic District	Right-of-way from Coles Street east of the eastern end of the Bergen Arches westward to an undetermined location		X
12	St. Peter's Cemetery	Bounded by Utice and Tonnelle Avenues and railroad tracks, Jersey City		X
National Docks Secondary (Segment 2) APE (refers to Figure 6-5)				
13	West End Through Truss Bridges	Located at mile post 1.89 on the NJ Transit Morristown Line		X
14	Old Main Delaware Lackawanna & Western Railroad Historic District	Roughly bounded by Hoboken Terminal and Washington		X
15	Erie Railroad Marion Main Line Historic District	See above		X
16	U.S. Routes 1 and 9 Historic District	Area 6.25 miles long from the mouth of the Holland Tunnel		X
17	William L. Dickerson High School	2 Palisade Avenue, Jersey City	X	
18	Lafayette Gardens	Bounded by Pacific Avenue, Barbara Place, Grand, Woodward, Carbon and Ash Streets, Jersey City		X
19	Conrail National Docks Railroad Bridge	Spans Pacific Avenue in Jersey City		X
20	Conrail Bridge 2.77	Spans the former CNJ Railroad Mainline		X
Chemical Coast Line (Segment 1) APE (refers to Figure 6-6)				
21	Central Railroad of NJ, Newark and Elizabeth Branch	See above		X
22	Central Railroad of NJ, Perth Amboy and Elizabethport Branch	12.06 miles between Elizabethport and Perth Amboy		X
23	Central Railroad of NJ, Main Line Historic District	Phillipsburg to Elizabeth		X
24	Trumbull Street Sewer	Division Street to the Arthur Kill, Elizabeth City		X
25	Elizabeth River Bridge	Spans Elizabeth River, Elizabeth City		X

Table 6-1 (cont'd)
Historic Resources Within the New Jersey Project Study Areas

Ref. No.	Name	Address/Location	S/NR	S/NR-eligible
Chemical Coast Line (Segment 2) APE (refers to Figure 6-7)				
26	Staten Island Railroad Historic District (NJ portion)	Arthur Kill Life Bridge to Crawford Junction		X
27	Central Railroad of NJ, Perth Amboy and Elizabethport Branch	12.06 miles between Elizabethport and Perth Amboy		X
28	Inch Lines Linear Multistate Historic District	Lambertville to Linden		X
29	Rahway River Bridge	Spans Rahway River, Woodbridge Township		X
30	Port Reading Railroad Historic District	Approximately 20 miles between Bound Brook and Port Reading		X
Arthur Kill Lift Bridge APE (refers to Figure 6-8)				
31	Staten Island Railroad Historic District (NJ Portion)	See above		X
32	Staten Island Railway Lift Truss Bridge (Arthur Kill Lift Bridge)	Crosses Arthur Kill between Arlington, Staten Island, NY and Elizabeth, NJ		X
33	Goethals Bridge	Spans the Arthur Kill between Howland Hook, Staten Island, NY and Elizabeth, NJ		X

Notes:
There are no National Historic Landmarks located in the New Jersey areas of potential effect.
S/NR: Listed on State and National Registers
S/NR-Eligible: Eligible for listing on the State and National Registers of Historic Places
No potential architectural resources were identified in the Oak Island Yard APE, Greenville Yard APE, Greenville Branch APE.
Segments 1 and 2 of the National Docks Secondary APE, Segments 1 and 2 of the Chemical Coast Line APE, or the Arthur Kill Lift Bridge APE.

OAK ISLAND YARD APE

Since the Oak Island Yard is located in an industrial area, the APE is the area within 50 feet of the rail yard (see Figure 6-1).

There are three historic resources located within the APE. These resources are described below.

Lehigh Valley Railroad Oak Island Yard Historic District

The Lehigh Valley Railroad Oak Island Yard Historic District is located on Newark Bay, Newark, Essex County. NJ SHPO determined the district to be eligible for listing on the National Register because it is a surviving example of a freight classification and storage yard associated with the railroad transportation system in the New Jersey-New York metropolitan area, especially the New Jersey ports of Newark, Jersey City, and Hoboken.

Railroad yards that were constructed for other major railroads during the 19th century have largely disappeared, leaving the Oak Island Yard as perhaps the sole surviving example of a major railroad freight classification yard. In combination with the former Pennsylvania Railroad Garden Yard, the Oak Island Yard Historic District conveys the scale and intensity of the historically significant railroad freight operations that once dominated the transportation network that served the industrial and port facilities of the metropolitan area.

Lehigh Valley Railroad Historic District

The Lehigh Valley Railroad Historic District travels from Phillipsburg, in Warren County to Jersey City, in Hudson County. The NJ SHPO determined the railroad to be eligible for listing on the National Register for its role in providing access to New York markets, including the Ports of New York and New Jersey for the LVRR. The Lehigh Valley Railroad was a major inter-state carrier of anthracite coal. The LVRR also contributed to the industrial development of

communities in New Jersey, particularly in Middlesex County. The Lehigh Valley Oak Island Yard Historic District (NR-eligible) contributes to and is considered part of the Lehigh Valley Railroad Historic District.

Central Railroad of New Jersey Newark and Elizabeth Branch

Please refer to the Chemical Coast Line APE, Segment 1, section for a description of this resource.

GREENVILLE YARD/POTENTIAL TUNNEL ALIGNMENT APE

The Greenville Yard/Potential Tunnel Alignment is located in an industrial area; therefore, the APE is the area within 50 feet of the rail yard and is extended to 150 feet near the cut and cover and open cut portions of the potential tunnel alignment (see Figure 6-2). The cut and cover portion would be located mainly within Greenville Yard; therefore, the APE for the rail yard includes the APE for this portion of the tunnel. The open cut portion is along the Greenville Branch, extending from Greenville Yard to a point just east of the New Jersey Turnpike Extension. The APE also includes the area within 400 feet of the potential tunnel ventilation shaft to be located adjacent to the northeast corner of the Global Marine Terminal/Northeast Auto Terminal (NEAT) pier in New York Harbor.

Two historic resources are located within the APE—the Greenville Yard Historic District and the Greenville Yard Piers. Both resources were determined to be eligible for listing on the National Register by the NJ SHPO. The Greenville Yard Transfer Bridge System was recorded according to Historic American Engineering Record (HAER) standards in December 1996.

The Greenville Yard Historic District and the Greenville Yard Piers were found to be significant as an integral part of a single facility that formed a critical link in both local and regional rail systems, which eventually eclipsed the nearby Oak Island Yard in size and pre-eminence.

GREENVILLE BRANCH APE

The Greenville Branch APE includes the railroad right-of-way that runs between the New Jersey Turnpike Extension and the Oak Island Yard (see Figure 6-3). The line crosses Newark Bay via the Lehigh Valley Drawbridge. The eastern portion of the rail line is on an embankment, while the western portion is elevated. The APE for the Greenville Branch is the area within 150 feet of the rail line.

There are two historic resources located within the APE: the Lehigh Valley Railroad Historic District (see the Oak Island Yard APE section for a description of this resource) and the Morris Canal (S/NR), which is a 106-mile former waterway that started in Phillipsburg, NJ, and had its terminus near the Lafayette section of Jersey City. The former bed of the canal is now filled and buried. The boundaries of this historic resource include portions of 28 municipalities in six counties in New Jersey. The Lehigh Valley rail line (Greenville Branch) crosses the former bed of the canal in two locations in Jersey City, west of Greenville Yards.

NATIONAL DOCKS SECONDARY APE

The National Docks Secondary APE extends from 49th Street to the north to the Greenville Branch to the south. The boundaries of the APE vary from 50 to 150 feet from the rail line, depending on whether the rail line is below grade, at grade or elevated. For analysis purposes, the APE has been divided into Segments 1 and 2, described below.

Segment 1

The Segment 1 APE includes a portion of the National Docks Secondary that extends from North Bergen Yard to the north, to Tonnelle Avenue (U.S. Routes 1 and 9), south of Croxton Yards, in Jersey City, to the south. The majority of the rail line in Segment 1 is at grade, except at County Road where it is elevated. Thus, the APE extends 150 feet on either side of the rail line (see Figure 6-4).

Five historic resource are located in the National Docks Secondary APE, Segment 1. These resources are described below.

Pels Factory-Book Mart Press. Pels Factory-Book Mart Press is located at 2001 42nd Street, in North Bergen Township, Hudson County. NJ SHPO determined the factory to be eligible for listing on the NR for its association to the silk industry in North Bergen Township and because it demonstrates distinctive characteristics of late 19th and early 20th century factory design and construction.

Pennsylvania Railroad New York Extension Historic District. The Pennsylvania Railroad New York Extension Historic District, Amtrak Northeast Corridor Line, extends from milepost 8.0 in Harrison Town, Hudson County to the 10th Avenue portal in New York City. The New York Extension was determined to be eligible for listing on the National Register by NJ SHPO as a collection of intact and significant early 20th century railroad engineering structures (ca. 1910).

Roben Company Office Building. The former Roben Company Office Building is located at 725 Tonnelle Avenue (aka 737 Tonnelle Avenue). The building is currently known as Kennedy Tile, Inc. The building was determined to be eligible for listing on the National Register by NJ SHPO. The building was constructed after 1934 and is an excellent example of Art Moderne architecture.

Erie Railroad Marion Main Line Historic District. The Erie Railroad Marion Main Line Historic District includes the right-of-way of the New York & Erie Railroad line, the Erie Tunnel and the Bergen Arches. The railroad right-of-way included in the district begins approximately at Coles Street, east of the eastern end of the Bergen Arches, and continues westward to an undetermined location. NJ SHPO determined the railroad to be eligible for listing on the National Register.

St. Peter's Cemetery. St. Peter's Cemetery is bounded by Utica Avenue to the north, Tonnelle Avenue to the east, and railroad tracks to the south and west. NJ SHPO determined the cemetery to be eligible for listing on the National Register due to its association with the movement of Irish Catholics into Jersey City and Hudson County in the 1800s.

Segment 2

The Segment 2 APE includes the portion of the National Docks Secondary that extends from Tonnelle Avenue (U.S. Routes 1 and 9) south of Croxton Yards to the Greenville Branch. Portions of the rail line in Segment 2 are below grade, and the APE extends 50 feet on either side of the rail line in these areas (see Figure 6-5). The rail line also is elevated and at grade in various areas, and the APE extends 150 feet on either side of the rail line at these locations.

Eight historic resource are located in the National Docks Secondary APE, Segment 2. These resources are described below.

West End Through Truss Bridges. The West End Through Truss Bridges, located at milepost 1.89 on the New Jersey Transit Morristown Line, were determined to be eligible for listing on

the National Register by NJ SHPO because they are intact examples of early 20th-century through truss railroad bridges and are the last remaining truss bridges on the Morristown Line. The bridges are also located within and contribute to the Old Main Delaware Lackawanna & Western Railroad Historic District (NR-eligible). The bridges were constructed in 1908 by the American Bridge Company for the Delaware Lackawanna & Western Railroad.

Old Main Delaware Lackawanna & Western Railroad Historic District. The Old Main Delaware Lackawanna & Western (DL&W) Railroad Historic District extends from its eastern terminus at Hoboken Terminal along NJ Transit's Morristown Line (the historic route of the Morris & Essex Railroad) to Washington, where it follows the historic route of the Warren Railroad to its western terminus at the Delaware River. NJ SHPO determined the railroad to be eligible for listing on the National Register for its associations with suburbanization, commuter and passenger traffic, freight traffic, engineering and architecture.

Erie Railroad Marion Main Line Historic District. Please refer to the National Docks Secondary APE, Segment 1, section for a description of this resource.

U.S. Routes 1 and 9 Historic District. NJ SHPO determined the U.S. Routes 1 and 9 Historic District to be eligible for listing on the National Register. The eligible historic district is 6.25 miles long, extending from the mouth of the Holland Tunnel to Station 351+35 and includes the Pulaski Skyway. The Pulaski Skyway extends for over three miles from Newark to Jersey City.

William Dickerson High School. The William Dickerson High School (S/NR), originally known as the Jersey City High School, is located at 2 Palisade Avenue, Jersey City. It was built in 1906 and later enlarged in 1911. The school was sited along the brow of the highest elevation in Jersey City, overlooking New York City. The school was designed by John T. Rowland, Jr., who was the leading architect in Jersey City during the first half of the 20th century. He designed several important private and public buildings throughout the city.

Lafayette Gardens. Lafayette Gardens is a public housing community comprised of 13 brick apartment buildings and one community center. The complex is located on a 12-acre super block and is bound by Pacific Avenue, Barbara Place, Grand Street, Woodward Street, Carbon Street, and Ash Street in Jersey City. The NJ SHPO determined the complex to be eligible for listing on the National Register because it is significant for its association with politics and government of the 1930s and 1940s. It is also significant for its architecture and its design by a prominent Jersey City architect.

Conrail National Docks Railroad Bridge. The Conrail National Docks Railroad Bridge is located at milepost 2.32 and spans Pacific Avenue in Jersey City. NJ SHPO determined the bridge to be a contributing structure to the Morris Canal Historic District (S/NR) and also to be individually eligible for listing on the National Register. The bridge is an excellent intact example of a Pratt riveted through truss railroad bridge.

Conrail Bridge 2.77. The Conrail Bridge 2.77 is located at milepost 2.77 and spans the former Central New Jersey (CNJ) Railroad Mainline. The bridge was determined to be eligible for listing on the National Register by the NJ SHPO as an intact example of a riveted truss railroad bridge. Although once a common bridge, only a few survive today.

CHEMICAL COAST LINE AREA OF POTENTIAL EFFECT

The Chemical Coast Line APE extends from Oak Island Yard in Newark, Essex County to the north to the Port Reading Secondary Line, Woodbridge Township, Middlesex County to the

south. The rail line is either at grade or elevated throughout this APE, and thus the APE is the area within 150 feet of the rail line. For analysis purposes, the APE has been divided into Segments 1 and 2, described below.

Segment 1

Segment 1 of the Chemical Coast Line APE is defined as an area located within 150 feet of the rail line between Oak Island Yard to the north and the Union County Central Railroad to the south (see Figure 6-6). The New Jersey Turnpike/I-95 parallels the active rail line to the west for the entire length of the rail line.

Five historic resources are located in the Chemical Coast Line APE, Segment 1. These resources are described below.

Central Railroad of New Jersey Newark and Elizabeth Branch. The Newark and Elizabeth Branch of the CRRNJ travels 5.45 miles between Brills Junction (the connection with the Newark and New York Railroad) and Elizabethport. The NJ SHPO determined the railroad to be eligible for listing on the National Register for its role in the regional transport of passengers and freight.

Central Railroad of New Jersey Perth Amboy and Elizabethport Branch. The Perth Amboy and Elizabethport Branch of the CRRNJ travels 12.06 miles between the CRRNJ Main Line at Elizabethport and Perth Amboy (on the north side of the Raritan Bay). The rail line linked the CRRNJ Main Line with New Jersey shore communities (via the New York and Long Branch Railroad) and the Southern Division of the CRRNJ. The New Jersey SHPO determined the railroad to be eligible for listing on the National Register for its history of transporting passengers to vacation and excursion destinations along the New York and Long Branch Railroad in Monmouth and Ocean counties, vacation and excursion passengers traveling to Atlantic City, commuters to Newark and New York from Monmouth and Ocean counties, as well as the transport of labor from Elizabethport to southern New Jersey. Freight shipments on the rail line included agricultural, industrial, and manufactured goods moving between northern and southern New Jersey. Substantial volumes of glass and construction sand that originated in southern New Jersey also were shipped north on the rail line.

Central Railroad of New Jersey Main Line Historic District. The CRRNJ Main Line Historic District extends from Phillipsburg to Elizabeth. The district received a Determination of Eligibility from the Keeper of the National Register. The CRRNJ is eligible due to its historical significance in the development of transportation and commerce in New Jersey and for its architectural and engineering importance as a linear historic district associated with important transportation trends in the 19th and 20th centuries. The CRRNJ played an important role in the industrial and commercial development of New Jersey.

The Trumbull Street Sewer. The Trumbull Street Sewer is 6,200 feet in length, located below Trumbull Street and extending from Division Street to the Arthur Kill in Elizabeth City, Union County. The NJ SHPO determined the sewer to be eligible for listing on the National Register. The brick sewer was constructed during the 19th century and is egg-shaped in cross-section. The sewer is representative of a distinctive style of sewer installed in cities in the Northeastern Unites States during the mid-to late 19th century.

Elizabeth River Bridge. The Elizabeth River Bridge is a Scherzer-type bascule bridge constructed ca. 1912 to carry the Central Railroad of New Jersey over the Elizabeth River in

Elizabeth City, Union County. The bridge was determined to be eligible for listing on the National Register by NJ SHPO.

Segment 2

Segment 2 of the Chemical Coast Line APE is defined as the area within 150 feet of the rail line between the Union County Central Railroad to the north and the Port Reading Secondary Line to the south (see Figure 6-7). The New Jersey Turnpike/I-95 parallels the rail line to the west and the Rahway River bisects the line.

Five historic resources are located in the Chemical Coast Line APE, Segment 2. These resources are described below.

Staten Island Railroad Historic District. Please refer to the Arthur Kill Lift Bridge APE section for a description of this resource.

Central Railroad of New Jersey Perth Amboy and Elizabethport Branch. Please refer to the Chemical Coast Line APE, Segment 1, section for a description of this resource.

Inch Lines Linear Multistate Historic District. The historic district transects New Jersey from Lambertville to Linden and consists of Texas Eastern's natural gas pipeline facilities known as Line 1 (Big Inch) and Line 2 (Little Big Inch). The district was determined to be eligible for listing on the National Register by the NJ SHPO.

The Rahway River Bridge. The Rahway River Bridge is a Scherzer-type bascule bridge constructed ca. 1921 to carry the Central Railroad of New Jersey over the Rahway River in Woodbridge Township, Middlesex County. The bridge was determined to be eligible for listing on the National Register by NJ SHPO.

Port Reading Railroad Historic District. The Port Reading Railroad Historic District travels for approximately 20 miles between Bound Brook, in Somerset County and Port Reading, Woodbridge Township, in Middlesex County. NJ SHPO determined the railroad to be eligible for listing on the National Register at the state and local levels of significance because the construction and operation of the railroad represents the aggressive efforts of railroads (e.g., Reading Railroad) to obtain access to New York markets and the Port of New York and New Jersey. The Port Reading Railroad provided the Reading Railroad, its parent railroad and a major inter-state carrier of anthracite coal, with access to New York Harbor and an instrument of railroad expansion, acquisition, and consolidation during the late 19th and early 20th centuries. The railroad maintained a substantial railroad yard and coal terminal facility in Port Reading on the Arthur Kill.

ARTHUR KILL LIFT BRIDGE APE

The Arthur Kill Lift Bridge APE is defined as the area within 150 feet of the Staten Island Railroad between the Chemical Coast Line and the Arthur Kill Lift Bridge, and an area of 400 feet from the location of the proposed new rail bridge across the Arthur Kill (see Figure 6-8). The study area is located in Elizabeth City, Union County. The rail line is elevated on a trestle in the far eastern portion of the study area, near where it crosses the Arthur Kill Lift Bridge to Staten Island.

Staten Island Railroad Historic District (New Jersey Portion)

The New Jersey portion of the Staten Island Railroad traveled from the vertical lift bridge over the Arthur Kill to Cranford Junction, NJ was determined to be eligible for listing on the National

Register by NJ SHPO. The vertical lift bridge is considered to be a key contributing resource to the historic district. The boundaries of the historic district are the right-of-way and include: the rail line itself, rail bridges, a clerical office/communications shed, a diner, and a concrete telephone booth as well as other associated features of structures. A portion of the Staten Island Railroad Historic District lies within the APE, from the Arthur Kill Lift Bridge to the Chemical Coast Line.

One bridge located within the APE along the New Jersey portion of the Staten Island Railroad is individually eligible for listing on the National Register. The Staten Island Railway Lift Truss Bridge, known today as the Arthur Kill Lift Bridge, crosses the Arthur Kill between Arlington, Staten Island, NY, and Elizabeth, NJ. The bridge was constructed in 1959 and was the longest vertical lift span in the world at the time of its construction.

Goethals Bridge

The Goethals Bridge was designed by the engineer Alexander Waddel and was constructed in 1928. The bridge was determined to be eligible for listing on the National Register of Historic Places by the NJ SHPO. It is a steel cantilevered bridge that spans the Arthur Kill between Howland Hook, Staten Island and Elizabeth, NJ. The bridge opened the same day (June 29, 1928) as the Outerbridge Crossing, and both bridges provided the first crossings for motor vehicles between Staten Island and the mainland. The bridge has a span of 672 feet and a total length of 7,109 feet.

STATEN ISLAND AREAS OF POTENTIAL EFFECT (APES)

A summary of the known historic resources located in the New York APEs is presented in Table 6-2. Table 6-3 presents properties that were identified as potential historic resources but that were subsequently determined by NY SHPO to not meet NR eligibility criteria and by LPC to not meet NYCL eligibility criteria.

ARTHUR KILL LIFT BRIDGE/ARLINGTON YARD APES

The APE for the Arthur Kill Lift Bridge includes a radius of 400 feet around the potential new rail bridge across the Arthur Kill. The new bridge would be located adjacent and south of the existing Arthur Kill Lift Bridge. The Arlington Yard APE is the area within 50 feet of Arlington Yard, since the site is located in an industrial area and is surrounded by wooded areas and thick vegetation. (see Figure 6-9)

The Arthur Kill Lift Bridge and the Goethals Bridge are two historic resources, both located within the Arthur Kill Lift Bridge APE. (See the Arthur Kill Lift Bridge APE under the New Jersey section for information about these resources.) No historic resources are located in the Arlington Yard APE.

NORTHERN STATEN ISLAND APE

Segment 1

The Northern Staten Island APE, Segment 1, follows the alignment of the Staten Island Railroad from South Avenue east to Nicholas Avenue. The rail line right-of-way is below grade (depressed) throughout Segment 1, and the APE includes the area within 50 feet of the rail line (see Figure 6-10).

Table 6-2
Historic Resources Within the New York Project Study Areas

Ref. No.	Name	Address/Location	NYCL	NYCSL	NHL	S/NR	S/NR-eligible	NYCL-eligible
Arthur Kill Lift Bridge/Arlington Yard (refers to Figure 6-9)								
1	Arthur Kill Lift Bridge	Spans Arthur Kill between Arlington, Staten Island, NY and Elizabeth, NJ					X	
2	Goethals Bridge	Spans Arthur Kill between Howland Hook, Staten Island, NY and Elizabeth, NJ					X	
Northern Staten Island (Segment 1) APE (refers to Figure 6-10)								
3[1,2]	Summerfield United Methodist Church	104 Harbor Road					X	X
4[1]	Two-story industrial building	137 Lake Avenue					X	
Northern Staten Island (Segment 2) APE (refers to Figure 6-11)								
5[1,2]	Staten Island Reformed Church	54 Port Richmond Avenue					X	X
Northern Staten Island (Segment 3, 4) APE (refers to Figures 6-12 and 6-13)								
6	Cornelius Cruser House	1262 Richmond Terrace	X			X		
7	Office Building and U.S. Light House Depot Complex	1 Bay Street	X			X		
65th Street Yard APE (refers to Figure 6-14)								
8[2]	Brooklyn Army Terminal (U.S. Army Military Ocean Terminal)	West of Second Avenue between 58th and 64th Streets				X		X
Bay Ridge Branch (Segments 1, 3, 4) APE (refers to Figures 6-15 through 6-18)								
9	Sunset Park Historic District	Between 39th and 64th Streets and Fourth and Seventh Avenues				X		
10	New Utrecht Avenue Station	62nd Street between New Utrecht Avenue and 15th Street					X	
11	Ocean Parkway	Between Avenues H and I within the APE		X		X		
12	Wilson Avenue Station	Wilson Avenue at Moffat Street					X	
Bay Ridge Branch (Queens) (refers to Figure 6-19)								
13	Summerfield Street Row Historic District of Ridgewood Multiple Resource Area	Summerfield Street between Myrtle and Forest Avenues				X		
Fresh Pond Yard and Montauk Branch APEs (refers to Figures 6-20 and 6-21)								
14	Central Avenue Historic District of the Ridgewood Multiple Resource Area	Between 70th and Myrtle Avenues and 65th Street and 66th Place				X		
15	Fresh Pond-Traffic Historic District	Between Traffic Avenue, Fresh Pond Road, Grove and Woodbine Streets				X		
West Maspeth Yard APE (refers to Figure 6-22)								
16	P.S. 9 (Walter Reed School)	58-74 57th Street					X	
Fremont Secondary (Segment 2) APE (refers to Figure 6-24)								
17[1]	New York Connecting Railroad Bridge	Crosses above Queens Boulevard					X	
Fremont Secondary (Segment 3) APE (refers to Figure 6-25)								
18[2]	Engine Company 263/Hook & Ladder 117	42-06 Astoria Boulevard					X	X
Fremont Secondary (Randall's Island/Wards Island Portion) APE (refers to Figure 6-26)								
19	Hell Gate Bridge (New York Connection Railroad Bridge)	Spans the Hell Gate Channel between Randall's/Wards Island and Astoria, Queens					X	
20	Wards Island Viaduct	Traverses Wards Island					X	
21	Randall's Island Viaduct	Traverses Randall's Island					X	
22	Bronx Kill Bridge	Spans the Bronx Kills between Randall's Island and the Bronx					X	
23	Little Hell Gate Bridge	Connects Wards and Randall's Islands					X	

Notes:

[1] S/NR eligibility determinations made by NY SHPO November 2003.

[2] NYCL eligibility determinations made by NYCLPC January 2004.

NYCL: New York City Landmark

NYCSL: New York City Scenic Landmark

S/NR: Listed on State and National Registers of Historic Places

S/NR-Eligible: Eligible for listing on the State and National Registers of Historic Places

NYCL-Eligible: Eligible for designation as a New York City Landmark.

Table 6-3
Potential Historic Resources Identified Within the New York Project Study Areas and Determined Not Eligible for S/NR and NYCL designation

Name	Address/Location
Northern Staten Island (Segment 1) APE	
Factory building	125 Lake Avenue
Bay Ridge Branch (Segment 3) APE	
3-story Factory	6223-6201 15th Avenue
3-story House	221 Elmwood Avenue
West Maspeth Yard APE	
Star Corrugated Box Company	55-15 Grand Avenue
2-story Commercial Building	56-70 58th Street
Fremont Secondary (Segment 1) APE	
Mathews Company Rowhouses	79th Street between Grand and Calamus Avenues
Note: Determinations of non-S/NR eligibility made by NY SHPO November 2003. Determinations of non-NYCL eligibility made by NYCLPC January 2004. These resources are not mapped.	

Two historic resources are located in the Northern Staten Island APE, Segment 1—the Summerfield United Methodist Church and a two-story industrial building located at 137 Lake Avenue. The church, which is located at 104 Harbor Road, was built in 1869 and is a frame building with Classical details. The industrial building at 137 Lake Avenue is a circa 1930–40 building that is an intact example of the Art Moderne style. These properties were determined by NY SHPO in November 2003 to meet eligibility criteria for listing on the NR based on Historic Resource Inventory Forms prepared and submitted for NY SHPO's review as part of the proposed project. The Summerfield United Methodist Church was also determined to meet NYCL eligibility criteria by NYCLPC in January 2004.

Segment 2

The Northern Staten Island APE, Segment 2, follows the alignment of the Staten Island Railroad from Nicholas Avenue east to Alaska Street. The APE is the area within 150 feet of the rail line and is larger for this segment since the rail line is either at grade or elevated (see Figure 6-11).

One historic resource is located in the Northern Staten Island APE, Segment 2. The Staten Island Reformed Church, located at 54 Port Richmond Avenue, is a Georgian Revival church built in 1844. The Sunday School, designed by Oscar S. Teale, was built in 1898. The church is located on the site of the first religious congregation on Staten Island, organized in 1663. The current church replaced three earlier churches that were located on the site. This property was determined by NY SHPO in November 2003 to meet eligibility criteria for listing on the NR based on a Historic Resource Inventory Form prepared and submitted for NY SHPO's review as part of the proposed project. It was also determined by NYCLPC to meet NYCL eligibility criteria in January 2004.

Segment 3

The Northern Staten Island APE, Segment 3, follows the alignment of the Staten Island Railroad from Alaska Street east to Davis Avenue and includes the area within 150 feet of the open cut and cut and cover portions of the potential tunnel alignment (see Figure 6-12). The APE is primarily located along Richmond Terrace.

One historic resource is located in the Northern Staten Island APE, Segment 3. The Cornelius Cruser House (S/NR, NYCL) (also known as the Kreuzer-Pelton House) is located at 1262 Richmond Terrace.

Segment 4

The Northern Staten Island APE, Segment 4, is the bored portion of the tunnel alignment which would extend from Davis Avenue to the waterfront in the St. George Community. The tunnel alignment travels in a northwest/southeast direction. Since the tunnel alignment in this portion of the APE would be constructed using boring techniques, there would be no potential visual effects from the tunnel. However, for the potential construction of the tunnel ventilation shaft offshore in New York Harbor, an APE of 400 feet has been defined. This APE is located in the communities of New Brighton and St. George, along the New York Harbor shoreline just south of the waterfront esplanade and the St. George Staten Island Ferry Terminal (see Figure 6-13). The potential tunnel ventilation shaft would be constructed on Pier 2 and would extend 50 to 60 feet above mean/low water level. This proposed location is east of the intersection of Slosson Terrace and Bay Street.

No historic resources are located in the APE. The Office Building and United States Light-House Depot Complex (S/NR, NYCL) is located outside the APE at 1 Bay Street. The granite and red brick French Second Empire administration building (1868-71) was designed by Alfred B. Mullett. The complex was used as an experimental station in the development of lighthouse technology.

BROOKLYN AREAS OF POTENTIAL EFFECT (APEs)

65TH STREET YARD APE

65th Street Yard APE

The APE for 65th Street Yard is the area within 50 feet of the rail yard (see Figure 6-14).

There are no historic resources located within the 65th Street Yard APE. Although it is located outside of the APE, the U.S. Army Military Ocean Terminal (S/NR-eligible, NYCL-eligible), also known as the Brooklyn Army Terminal, abuts the rail yard to the north. The terminal is significant for the modernistic design of its architecture, its engineering features, and its role in the country's military and transportation history.

Tunnel Ventilation Shaft APEs

Ventilation shafts would be built on either side of the in-harbor portion of the tunnel, a short distance off shore. Off of the Brooklyn waterfront, there are two alternative locations for the potential ventilation shafts that correspond to the two alternative tunnel alignments—either landside within 65th Street Yard or within Upper New York Harbor adjacent to the seaward end of the 69th Street pier. The ventilation shaft APEs are within 400 feet of these potential locations.

The Brooklyn Army Terminal (S/NR) discussed above, is within the APE for the potential ventilation shaft located within 65th Street Yard.

There are no known historic resources within the APE for the potential ventilation shaft located at the seaward end of the 69th Street pier.

BAY RIDGE BRANCH APE

Segment 1

The Bay Ridge Branch APE, Segment 1 is the area within 50 feet of the depressed rail line between 2nd Avenue where the line connects with 65th Street Yard and between 8th and 9th Avenues where the cut and cover portion of the tunnel would begin (see Figure 6-15). Although the bored portion of the tunnel alignment is located within the Segment 1 APE, the directly affected area is within the rail cut whose depth is approximately 20 to 40 feet below-grade. Since the Segment 1 proposed tunnel alignment would be constructed using boring techniques in this area, there would be no potential affects on historic resources from the tunnel and no APE. The Segment 1 APE accounts for potential work to increase heights along the Bay Ridge Branch.

There is one historic resource in the vicinity of the APE. The Sunset Park Historic District (S/NR) is roughly bounded by 39th and 64th Streets and 4th and 7th Avenues. Although none of the district lies within the 50-foot APE, its most southern portion—most immediately the north side of 64th Street between 4th and 5th Avenues, 5th Avenue north from approximately 63rd Street, and the south side of 62nd Street between 5th and 6th Avenues—lies approximately 150 to 200 feet from the APE.

Segment 2

The Bay Ridge Branch APE, Segment 2, is the area within 150 feet of the proposed open cut and cut and cover portion of the potential tunnel alignment that would run from between 8th and 9th Avenues to between 12th and 13th Avenues where the tunnel would meet grade (see Figure 6-16). There are no historic resources within the Segment 2 APE.

Segment 3

The Bay Ridge Branch APE, Segment 3, is the area within 50 feet of the depressed rail line from between 12th and 13th Avenues where the potential tunnel alignment would meet grade to Albany Avenue (see Figure 6-17).

There are two historic resources within the 50-foot APE. The New Utrecht Avenue Station (S/NR-eligible) is located on the BMT Sea Beach (N) Line at 62nd Street between New Utrecht Avenue and 15th Street. Built in 1915, the New Utrecht Avenue Station was part of the Dual System, approved by the city and the state public service commission in 1913 that expanded the subway lines controlled by the Interborough Rapid Transit (IRT) Company and the BRT, which became the BMT in 1923. The Sea Beach Line right-of-way was originally part of the 1879 New York & Sea Beach Railroad that linked Bay Ridge with Coney Island.

Ocean Parkway (New York City Scenic Landmark, S/NR) traverses the depressed section of the rail line between Avenues H and I. Designed by Frederick Law Olmsted and Calvert Vaux and built between 1874 and 1876, Ocean Parkway was planned as part of a parkway system that would integrate Brooklyn and Manhattan by connecting Prospect Park and Central Park with landscaped, municipal boulevards. Olmsted and Vaux envisioned the parkway system as a means of fostering suburban development.

Segment 4

The Bay Ridge Branch APE, Segment 4 is the area within 50 feet of the minimally depressed sections of the rail line to a point east of Albany Avenue, and between a point south of Livonia Avenue and Evergreen Avenue; and it is within 150 feet of the elevated sections of the rail line

between Glenwood Road and a point south of Livonia Avenue, and between Evergreen Avenue and the Brooklyn-Queens border (see Figure 6-18).

There is one historic resource located within the 150-foot portion of the APE between Evergreen Avenue and the Brooklyn-Queens border. The Wilson Avenue Station (S/NR-eligible) is located on the BMT Canarsie (L) Line at Wilson Avenue and Moffat Street between Holy Trinity Cemetery and the Bay Ridge Branch right-of-way.

QUEENS AREAS OF POTENTIAL EFFECT (APEs)

BAY RIDGE BRANCH (QUEENS PORTION) APE

The APE for the Bay Ridge Branch in Queens is within 150 feet of this elevated section of the rail line (see Figure 6-19). Although the S/NR-listed Ridgewood Multiple Resource Area is located near the rail line, its resources are outside the area of potential effect. The closest resource is the Summerfield Street Row Historic District, which is approximately 300 feet from the rail line. The rail line itself contains no known or potential historic resources.

FRESH POND YARD APE

The APE for Fresh Pond Yard is within 50 feet of the rail yard boundaries and is expanded to consider potential views from surrounding residential areas (see Figure 6-20). The rail yard does not contain any officially recognized resources or potential resources. Although the Ridgewood Multiple Resource Area (S/NR-listed) is located along both sides of the rail yard, its resources are all outside the APE. The closest resource, the Central Avenue Historic District, is about 300 feet from the edge of the rail yard. The northern boundary of the Fresh Pond-Traffic Historic District is contiguous with the APE along Traffic Avenue.

MONTAUK BRANCH APE

The APE for the Montauk Branch is the area within 50 feet of the rail line where the rail line is depressed and within 150 feet of the rail line where the rail line is at-grade (see Figure 6-21). Although the S/NR-listed Ridgewood Multiple Resource Area is located near the rail line, its resources are outside the area of potential effect. The closest resource is the Fresh Pond-Traffic Historic District, which is approximately 165 feet from the rail line. The rail line itself contains no known or potential historic resources.

WEST MASPETH YARD APE

The APE for West Maspeth Yard is within 400 feet of the boundary of the largest proposed project site (i.e., the 160-acre yard for the Double Tunnel System) (see Figure 6-22). A portion of the project site formerly contained the Laurel Hill Works of the Phelps Dodge Refining Co., of which several buildings have previously been identified as potential historic resources.[*] The refinery was one of the only remaining, relatively complete copper refining complexes in the

[*] New York City Department of Environmental Protection, Bureau of Clean Water. *New York City Sludge Management Plan, Long Range Plan, Final Generic Environmental Impact Statement III, May 1992, Volume 1*. Prepared by Stone & Webster Engineering Corp and Allee King Rosen & Fleming, Inc. In December 1993, the New York State Historic Preservation Office determined that the Laurel Hill Works was no longer eligible for listing on the state or national registers.

country dating from the early 1890s, and was also the only remaining plant that used the "series method." The complex included what may have been the first electrolytic tank house and possibly the only such surviving structure in the country from the earliest period of electrolytic refining. However, the buildings of the refinery complex were demolished sometime after 1992.

The West Maspeth Yard APE contains one historic resource. P.S. 9 (S/NR-eligible), now the Walter Reed School, is located at 58-74 57th Street, between 58th Drive and 59th Avenue. The building was constructed in 1906.

FREMONT SECONDARY APE

Segment 1

Segment 1 of the Fremont Secondary APE is the area within 50 feet of the depressed rail line from the northern site boundary of Fresh Pond Yard to approximately Grand Avenue. Past Grand Avenue to Queens Boulevard, the APE extends to 150 feet, as the rail line in this area is at-grade or elevated on an embankment and runs above streets on trestles (see Figure 6-23).

The APE for this segment contains no historic resources. The nearest known historic resource is the Fresh Pond-Traffic Historic District (S/NR-listed), part of the Ridgewood Multiple Resource Area, which is more than 1,000 feet away from the rail line.

Segment 2

The Segment 2 APE is the area within 50 feet of the rail line from Queens Boulevard to Broadway and the area within 150 feet of the rail line from Broadway to the intersection of the rail line with the Hell Gate Line at 28th Avenue (see Figure 6-24). The rail line runs above Queens Boulevard and continues depressed north of Queens Boulevard to Broadway; from Broadway to the northern end of Segment 2, the rail line is elevated. The BQE abuts the rail line through most of Segment 2.

There is one historic resources within Segment 2—the New York Connecting Railroad bridge over Queens Boulevard. The bridge may have been designed by Gustav Lindenthal, who designed the bridges and viaducts further north along the NYCRR rail line (see discussion under Bronx APEs). It was determined by NY SHPO in November 2003 to meet eligibility criteria for listing on the NR based on a Historic Resource Inventory Form prepared and submitted for NY SHPO's review as part of the proposed project.

The next closest historic resource is the Jackson Heights Historic District (NYCL, S/NR-listed), which is more than a third of a mile east of the rail line.

Segment 3

The Segment 3 APE is the area within 150 feet of the rail line, from its intersection with the Hell Gate Line to the Hell Gate Bridge at the northern end of Queens (see Figure 6-25). In Segment 3, the Fremont Secondary is elevated and runs parallel to the Hell Gate Line.

The Fremont Secondary runs through the neighborhoods on a series of simple concrete arch and steel bridges that span the north-south streets. These bridges were considered for state and national register eligibility during the Federal Railroad Administration's Northeast corridor improvement project, but ultimately were not included in the determination of eligibility for the New York Connecting Railroad Hell Gate Bridge and approach viaducts and bridges (discussed below).

There is one historic resource within Segment 3. Engine Company 263/Hook & Ladder 117 (S/NR-eligible, NYCL-eligible) is located at 42-06 Astoria Boulevard. The three-story building was built in 1910 and designed in a neo-Renaissance style by Alexander Stevens, Superintendent of Buildings for the New York City Fire Department. The firehouse was one of the first to be designed in-house by the fire department.

BRONX AREAS OF POTENTIAL EFFECT (APEs)

FREMONT SECONDARY (RANDALL'S/WARDS ISLAND PORTION) APE

The APE for the Fremont Secondary (Randall's/Wards Island Portion) is located on Wards and Randall's Islands. The APE is defined as the area within 150 feet of the elevated track, which is located on the eastern side of the island (see Figure 6-26).

There are five historic resources within the APE. The Hell Gate Bridge (S/NR-eligible), also known as the New York Connecting Railroad Bridge, spans the Hell Gate Channel between Randall's/Wards Island and Astoria, Queens. The Hell Gate Bridge is a two-hinged framed arch bridge, 1,017 feet long between two 250-foot-tall concrete towers. At the time of its completion in 1917 it was the longest steel bridge in the world, and it is still the heaviest structure of its kind. The steel components of the bridge are painted a deep rust color that contrasts sharply with the concrete towers. The bridge is part of a series of bridges, overpasses, and viaducts 2.5 miles long that was designed by Gustav Lindenthal for the New York Connecting Railroad. Several other components of the bridge complex are also S/NR-eligible and are discussed briefly below.

The Wards Island Viaduct is a 30-span deck plate girder viaduct traversing Wards Island. Little Hell Gate Bridge is a 1,200-foot, four-span bridge of inverted bowstring arch trusses, connecting Wards and Randall's Islands (which have since been connected by fill). The arch trusses are separated by arched concrete piers. The two concrete towers at each end of the bridge are 155 feet in height and feature decorative orbs. The Randall's Island Viaduct is a series of 24 deck plate girder spans, varying in length from 80 to 87 feet, supported on concrete piers. The Bronx Kill Bridge is a 350-foot-long bridge spanning the Bronx Kills between Randall's Island and the Bronx. It comprises two separate Warren through trusses with lateral joining at a center pier.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

Under the No Action Alternative, in the New Jersey study areas, construction activity would be primarily trackwork associated with construction of the Waverly Loop to connect the P&H Line to the Greenville Branch; a second track along the P&H Line between North Bergen and Kearny Yards; connections from the Chemical Coast Line to the Staten Island Railroad; and a second track along the Chemical Coast Line between the Port Reading Secondary Line and Bayway Yard and between Elizabethport and Oak Island Yard. (See Chapter 2 for a discussion of funding and implementation of these projects.) In addition, Canadian Pacific (CP) is proposing to improve its intermodal facility at Oak Island Yard by constructing a food facility, a paved transfer area, and laying new track. A second bypass track will be constructed south of the yard. Roadway improvements in the area will be implemented under Portway and several port projects are planned including the development of a portion of the former MOTBY for port development;

and expansion of the Global Marine Terminal. Some increases in rail, truck and barge activities are expected to result from these projects.

In the Staten Island Study Areas, Arlington Yard will be redeveloped into an intermodal facility and the Staten Island Railroad will be reactivated between the Arthur Kill Lift Bridge and Arlington Yard as part of NYCEDC's Staten Island Railroad Reactivation project. Howland Hook Marine Terminal will undergo an expansion, including the creation of an intermodal rail yard. The future site of the National Lighthouse Museum is planned at the (currently abandoned) U.S. Coast Guard Base (former Staten Island lighthouse depot complex), along the shoreline in St. George. The St. George Ferry Terminal will be reconstructed and developed as a mixed-used attraction for visitors and commuters.

In the Brooklyn study areas, it is anticipated that two projects may occur by the future analysis years. The City of New York will sell municipal parking lots and air rights over the Bay Ridge Branch right-of-way for the development of "The Junction," a retail center and parking garage that will be located on a block bounded by Avenue H and Flatbush and Nostrand Avenues. In addition, there may be an expansion of Flatbush Terminal by extending the IRT subway line 1,200 feet alongside the Bay Ridge Branch.

Construction and operational activities related to the No Action Alternative are not part of the Cross Harbor Freight Movement Project. These activities may affect historic resources on certain project sites.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNAITVE

NEW JERSEY

Greenville Yard

Depending on the work required to rehabilitate the float bridges at the Greenville Yard, there may be an adverse effect on the historic Greenville Yard Transfer Bridge System. To avoid adverse physical effects on this resource, a plan for the rehabilitation work would be developed in consultation with NJ SHPO (see "Mitigation Measures" below).

NEW YORK

The minimal yard work and trackwork at existing yards and rail lines under the TSM Alternative would not alter their visual appearance and would be in keeping with their historic and current uses. This work would not be expected to have visual and contextual effects on the Brooklyn Army Terminal adjacent to 65th Street Yard. There would be a slight increase in the number of trains using the Fremont Secondary with the TSM Alternative. The operational activity would be in keeping with the rail line's visual character and historic use.

Therefore, there is no potential for adverse effects on the historic resources of the New York study areas.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

NEW JERSEY

Greenville Yard

Similar to the TSM Alternative, there may be an adverse effect on the historic Greenville Yard Transfer Bridge System. To avoid adverse physical effects on this resource, a plan for the rehabilitation and construction work would be developed in consultation with NJ SHPO (see "Mitigation Measures" below). The increased number of barges would be in keeping with the yard's historic use, and would not result in an adverse effect on historic resources.

Other Sites

There would be a slight increase in the number of trains using the National Docks Secondary, P&H Line, Chemical Coast Line and Greenville Branch. The minor increase in usage would be in keeping with the rail lines' current visual character and historic and current use. Therefore, there is no potential for adverse effects on historic resources of the New Jersey study areas.

NEW YORK

65th Street Yard

Construction at 65th Street Yard and the increased number of barge trips would be in keeping with the rail yard's current visual character and historic and current use. It is not expected that this work would have physical, visual, or contextual effects on the Brooklyn Army Terminal due to the minor construction activity involved and distance from the terminal buildings. Therefore, this work would not result in the potential for adverse effects on historic resources in the 65th Street Yard APE.

Other Sites

Under the Expanded Float Operations Alternative, there would be minor new construction and operational activity at the affected New York project sites similar to that of the TSM Alternative. Construction activity would primarily consist of trackwork associated with minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch; and the expansion of a rail yard in West Maspeth, Queens at the Phelps Dodge and existing West Maspeth Yard sites. The rail yard in West Maspeth, Queens would require the construction of new tracks, internal roadways, and paved areas. The rail lines' APEs and the rail yard APE contain no historic resources. The minimal yard work and trackwork at rail lines would not alter their visual appearance and would be in keeping with their visual character and historic and current use. Therefore, there would be no adverse effects to historic resources from this alternative. There would be a slight increase in the number of trains using the Bay Ridge Branch and Fremont Secondary with the Expanded Float Operations Alternative. The minor increase in usage would be in keeping with the rail lines' current visual character and historic and current use. Therefore, there is no potential for adverse effects on the historic resources of the New York study areas.

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

New Jersey

In New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur Kill Lift Bridge and additional sidings along the Chemical Coast Line.

Greenville Yard/Potential Tunnel Alignment. The New Jersey tunnel alignment would be constructed within Greenville Yard and along the Greenville Branch. From an area just east of the New Jersey Turnpike Extension, tunnel construction would begin as an open cut adjacent to the Greenville Branch. When a depth of 35 feet below existing grade is reached just west of Greenville Yard (the tunnel portal), the tunnel would be constructed using cut and cover construction through Greenville Yard to the shoreline at a depth of 65 feet where it would be connected to the immersed tube section. A tunnel ventilation shaft would be constructed at the northeast tip of the Global Marine Terminal/NEAT pier.

The construction of the open cut, and cut and cover portions of the tunnel would have physical effects on the Greenville Yard Historic District, since the work would be taking place within the boundary of the historic district. Under the Tunnel Alternative, the float bridges, known as the Greenville Yard Transfer Bridge System, may be removed. Their removal would result in a potential adverse affect on historic resources. If they remain, ground-borne construction period vibrations could potentially damage the remaining float bridges. To avoid adverse physical effects on this resource if they remain, a construction protection plan covering the float bridges would be developed in consultation with NJ SHPO (see Chapter 16, "Construction and Construction Impacts").

After construction is complete, it is not expected that the tunnel would have any effects on the historic resources of the APE. The cut and cover portion would not be visible, and the open cut portion would be located along an existing rail line in an industrial area. This alternative would generate a greater amount of freight traffic; however, it is not expected that the increase in traffic would change the visual or historic character of the yard that already contains significant rail infrastructure. The increase in freight traffic would be in keeping with the rail yard's current visual character and historic and current use, and would, therefore, not be expected to have visual and contextual effects on the Greenville Yard Historic District.

The tunnel ventilation shaft would be constructed at the northeast corner of the Global Marine Terminal/NEAT pier. There are no known or potential historic resources within this APE; the Greenville Yard Historic District is located outside this APE. Therefore, it is not expected that the ventilation shaft would have adverse visual or contextual effects on historic resources.

Chemical Coast Line. Under the Staten Island tunnel alignment, 30,000 feet of sidings would be required along this line north of its planned connection to the Staten Island Railroad. There would also be an increase in rail freight traffic. The rail line is already active with freight traffic and the increased usage is not expected to change the historic character of the rail line. The minor track construction and associated increased freight traffic would be in keeping with the rail line's current visual character and historic and current use, and would, therefore, not be expected to have visual and contextual effects on historic resources.

National Docks,Greenville Branch, P&H Line, Oak Island Yard APEs. Although there would be an increase in freight traffic along the National Docks Secondary, Greenville Branch, P&H Line, and at Oak Island Yard, these rail lines and yard are already active with freight traffic and the increased usage is not expected to change their historic character. The increased freight traffic would be in keeping with the rail lines' and yard's current visual character and historic and current use, and would, therefore, not be expected to have visual and contextual effects on historic resources associated with them including the Lehigh Valley Railroad Oak Island Yard Historic District and the Lehigh Valley Railroad Historic District. Similarly, the construction of the second Waverly Loop would be consistent with the surrounding land uses. Therefore, there is no potential for adverse effects on the historic resources of the study area.

Arthur Kill Lift Bridge. A second span would be constructed adjacent to the south side of the existing Arthur Kill Lift Bridge. The new span would be identical to the existing span. A viaduct would be constructed adjacent to the south side of the Staten Island Railroad to connect the new span to the Chemical Coast Line.

The new bridge would be located between two historic resources—the Arthur Kill Lift Bridge and the Goethals Bridge. Since both bridges already exist in close proximity to each other in an industrial area along the Arthur Kill, it is not expected that the new span would have visual and contextual effects on these historic resources as long as it was designed in keeping with these resources. Construction activities associated with the construction of the new span may have physical effects on these historic resources due to their close proximity. To avoid adverse physical and visual effects on these resources, a plan for the construction work and design would be developed in consultation with NJ and NY SHPO.

New York

Staten Island Study Areas.

Arthur Kill Lift Bridge. As discussed above, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track. For the reasons discussed above under New Jersey, construction of the new span may have physical effects on the Arthur Kill Lift Bridge and the Goethals Bridge due to their close proximity. To avoid adverse physical effects on these resources, a plan for the construction work would be developed in consultation with NJ and NY SHPO.

Arlington Yard. Two new main line tracks would be added at Arlington Yard for the additional trains that would pass through the yard.. This new track construction and additional trains would be in keeping with the rail yard's visual character and historic and current use. Therefore, there is no potential for adverse effects on historic resources.

Northern Staten Island—Segments 1 and 2. The Staten Island Railroad would be rehabilitated between Arlington Yard and the tunnel entrance at Alaska Street. As discussed in more detail in Chapter 2, rehabilitation of Segments 1 and 2 would require two new mainline tracks to be constructed from the east end of Arlington Yard to the tunnel portal area, and an increase in clearances heights at 11 sites along the line between South Avenue and John Street.

Three historic resources are located within this APE—the Summerfield United Methodist Church, an industrial building at 137 Lake Avenue, and the Staten Island Reformed Church. It is not expected that work associated with increasing clearance heights and laying track would have physical effects on these resources due to the minor construction activity involved. Although the

rail line runs within 150 feet of these resources, the churches were built around the same time as the railroad, and the industrial building built after the railroad. Therefore, the churches and industrial building's historic context would not be adversely altered by an increase in rail activity. Therefore, there is no potential for adverse effects on historic resources.

Northern Staten Island—Segment 3. The landside portion of the tunnel alignment in Staten Island would begin along the Staten Island Railroad right-of-way at Alaska Street. From here to Bement Avenue (the location of the tunnel portal), the tunnel would be in an open cut. Continuing along the right-of-way to Davis Avenue, the tunnel would be built of cut and cover construction. The open cut excavation would increase in depth from 0 to 35 feet below existing grade, while the cut and cover excavation would increase from 35 to 65 feet below grade.

The construction of the open cut, and cut and cover portions of the tunnel may have physical effects on the Cornelius Cruser House, which is located within 150 feet of the potential construction activity. Ground-borne construction period vibrations could potentially damage this historic resource. To avoid adverse physical effects on this resource, a construction protection plan covering the Cornelius Cruser House would be developed in consultation with NY SHPO (see Chapter 16, "Construction and Construction Impacts").

After construction is complete, it is not expected that the tunnel would have any visual or contextual effects on historic resources located within the APE. The cut and cover portion would not be visible, and the open cut portion would be located within the Staten Island Railroad right-of-way. The Staten Island tunnel alignment also would involve a greater amount of freight traffic that would be visible only within the open cut portion. As this increased amount of freight traffic would not be highly visible, there would be no adverse effects to historic resources.

Northern Staten Island—Segment 4. From Davis Avenue southeast to the shoreline at Pier 2, the tunnel would be bored. The tunnel alignment travels directly beneath the Office Building and United States Light-House Depot Complex (S/NR, NYCL) and its historic buildings, wharf, and subterranean vaults. To avoid adverse physical effects on this resource, a construction protection plan covering the Office Building and United States Light-House Depot Complex would be developed in consultation with NY SHPO (see Chapter 16, "Construction and Construction Impacts"). The bored tunnel would have no effects on other historic resources located in the study area, because it would be at least 65 feet below grade and no vibration effects from construction or operation of the project would be expected (see Chapter 10, "Noise and Vibration" and Chapter 16, "Construction and Construction Impacts").

A tunnel ventilation shaft would be constructed in the harbor near the seaward end of Pier 2. As there are no known or potential resources within the APE, there would be no adverse effects to historic resources.

Brooklyn Study Areas.

65th Street Yard. 65th Street Yard would serve as a rail yard. Under the New Jersey tunnel alignment, the tunnel ventilation and construction shaft would also be located on this site. Improvements to the yard would include laying new tracks and removing existing tracks. It is not expected that the yard work would have physical effects on the Brooklyn Army Terminal due to the minor construction activity involved. In addition, the yard work and increased operational activity under the Single Tunnel System would be in keeping with the rail yard's current visual character and historic and current use, and would, therefore, not be expected to have visual and contextual effects on the Brooklyn Army Terminal.

The ventilation and construction shaft for the New Jersey tunnel alignment would be approximately 230 feet by 150 feet and would rise 50 to 60 feet above grade. It is not expected that construction of the ventilation shaft would have adverse physical effects on the Brooklyn Army Terminal, as it would be located at least 100 feet from the terminal buildings, beyond the area where ground-borne construction period vibrations would be expected to have an adverse effect. In addition, it is not expected that the ventilation shaft would have adverse visual or contextual effects on the Brooklyn Army Terminal. The ventilation shaft would be another industrial structure located in an industrial area of the waterfront, and it would be a much smaller structure than the monumental Brooklyn Army Terminal complex. Therefore, there would be no adverse effects to historic resources.

Bay Ridge Branch of the LIRR—Segment 1. In Brooklyn, under both the New Jersey and Staten Island alignments, the tunnel would be bored to a location between 8th and 9th Avenues. The bored tunnel would have no effects on historic resources of the study area, including Sunset Park Historic District, because all construction activity would occur at least 65 feet below existing grade and no vibration effects from construction or operation of the project would be expected (see Chapter 10, "Noise and Vibration" and Chapter 16, "Construction and Construction Impacts").

The tunnel ventilation shaft for the New Jersey tunnel alignment would be located at 65th Street Yard, as described above. The ventilation shaft for the Staten Island tunnel alignment would be constructed in the harbor near the seaward end of the public 69th Street pier. As there are no known or potential historic resources within the ventilation shaft APEs, there would be no adverse effects to historic resources.

The Single Tunnel System would also involve excavation to increase clearance heights, underpinning work at individual clearances, laying two mainline tracks, and conducting associated utility work within the existing Bay Ridge Branch right-of-way. In Segment 1, the Bay Ridge Branch is located in a deep cut that is partially covered by a concrete plaza between 2nd and 4th Avenues. The construction work would be minor and would occur within the right-of-way of the existing rail line. It is not expected that this work would have adverse effects on the Sunset Park Historic District. Undercutting and shoring work would occur at the concrete plaza between 2nd and 4th Avenues, but the plaza is located beyond the area where ground-borne, construction period vibrations would be expected to have an adverse physical effect on the Sunset Park Historic District. Therefore, there would be no adverse physical effect to the historic resource. It is not expected that there would be adverse visual or contextual effects on the Sunset Park Historic District. The work would not significantly alter the visual appearance of the rail line, and, in any case, most views of the rail line from within the historic district are blocked due to intervening buildings, fences, and the fact that the rail line is in an existing cut. Although a greater number of trains would use the rail line following construction, the Bay Ridge Branch is already a functioning rail line, and the increase in usage is not expected to alter the context of the Sunset Park Historic District. In addition, in the vicinity of the historic district, the busy Brooklyn-Queens Expressway parallels and passes over the Bay Ridge Branch.

Bay Ridge Branch of the LIRR—Segment 2. Bay Ridge Branch, Segment 2 would be the location of the open cut and cut and cover sections of the potential tunnel alignment. As there are no known or potential historic resources within the Segment 2 APE, there would be no adverse effects to historic resources.

Bay Ridge Branch of the LIRR—Segment 3. The Single Tunnel System would involve increasing clearance heights, laying two mainline tracks, and conducting associated utility work

within the existing Bay Ridge Branch right-of-way. To increase clearance heights, the project would include excavating a trench within the right-of-way between 8th Avenue and Albany Avenue and use underpinning work at individual clearances, and/or reconstruct or raise overpasses.

Although most construction work would be minor, there is the potential for adverse physical effects on one historic resource. The Ocean Parkway overpass would be reconstructed as part of the work to increase clearance heights. Depending on the form and height of the new overpass and the replacement walls and fencing, reconstruction of the overpass could adversely affect Ocean Parkway by altering sight lines along the parkway or causing it to become a different visual entity. Ground-borne construction period vibrations could also potentially damage the structures lining Ocean Parkway in this location. To avoid adverse physical effects on this historic resource, a construction protection plan covering the parkway and the design of the Ocean Parkway overpass would be developed in consultation with NY SHPO.

It is not expected that there would be adverse physical effects on the New Utrecht Avenue Station because it is located more than 100 feet from any potential construction activity. It is also not expected that there would be any adverse visual or contextual effects on the New Utrecht Avenue Station. Occurring within the existing Bay Ridge Branch right-of-way, which is in a cut through the Segment 3 APE, construction work is not expected to significantly alter the visual appearance of the rail line or its relationship to the resource and the surrounding study area. Although a greater number of trains would use the rail line following construction, the Bay Ridge Branch is already a functioning rail line, and the increase in usage is not expected to change the context of the subway station.

Bay Ridge Branch of the LIRR—Segment 4. In Segment 4, the Single Tunnel System would involve increasing clearance heights between New Lots Avenue and Liberty Avenue, laying two mainline tracks, conducting associated utility work within the existing Bay Ridge Branch right-of-way, and constructing two sidings of up to 10,000 feet in length on either side of the two mainline tracks at a location between East 43rd and East 98th Streets. Construction work would be minor in the vicinity of the Wilson Avenue Station. Therefore, there would be no physical effects on the historic resource. Following construction, a greater number of trains would use the rail line. However, it is not expected that the Single Tunnel System would have adverse visual or contextual effects on the Wilson Avenue Station, as the increase in usage on the adjacent Bay Ridge Branch would not affect the visual character of the subway station.

Queens Study Areas.

Bay Bridge Branch (Queens Portion, Fresh Pond Yard, and Montauk Branch. While these study areas would experience some trackwork and other construction work, there are no historic resources within the APEs, and there would be no adverse effects to historic resources.

Expanded West Maspeth Yard. With this alternative, an approximately 108-acre intermodal rail yard would be constructed at West Maspeth, Queens. The required work consists of demolishing a number of warehouses and other commercial and industrial buildings, laying new track, and constructing buildings for storage and maintenance. Under the Single Tunnel System, no historic resource would be demolished, nor would construction activities affect the resource identified in the APE, P.S. 9. Therefore, there would be no adverse effects to historic resources from the Single Tunnel System.

Fremont Secondary (Segments 1 through 3). Although there would be a modest increase in freight traffic along the Fremont Secondary, this rail line is already active with freight traffic and

the increased usage is not expected to change its historic character. The increase in rail line utilization would be most noticeable in those areas where the rail line is at grade or elevated and views to the rail line are more extensive. However, in most portions of the APE where the rail line is elevated, it is surrounded by other active transportation uses (such as the Brooklyn Queens Expressway or elevated subway lines). The increased freight traffic would be in keeping with the rail line's and yards' current visual character and historic and current use, and would, therefore, not be expected to have visual and contextual effects on historic resources in the study area. Therefore, there is no potential for adverse effects on the historic resources of the study area.

Bronx Study Areas.

Fremont Secondary (Randall's/Wards Island Portion)/Harlem River Yard/Oak Point Yard. Although there would be a modest increase in freight traffic along the Fremont Secondary and at Harlem River Yard and Oak Point Yard, this rail line and yards are already active with freight traffic, and the increased usage is not expected to change their historic character. The increased freight traffic would be in keeping with the rail line's and yards' current visual character and historic and current use, and would, therefore, not be expected to have visual and contextual effects on historic resources in the study area. Therefore, there is no potential for adverse effects on the historic resources of the study area.

DOUBLE TUNNEL SYSTEM

Effects under the Double Tunnel System would be the same as effects under the Single Tunnel System, except in the following areas.

Number of Trains

The Double Tunnel System would generate a significant increase in train trips throughout the study areas (see Chapter 2, "Project Alternatives"). However, it is not expected that the additional number of trains would result in adverse effects on the visual context of any of the identified historic and potentially historic resources.

National Docks Secondary

Under the New Jersey alignment of the Double Tunnel System, a connection to the National Docks Secondary would be constructed, and freight traffic along this line would increase; however, the increased train traffic would be in keeping with the rail line's visual character and historic use, and the increase in usage is not expected to change the visual character of the study area. Therefore, no adverse effects are expected on historic resources.

West Maspeth Yard

The Double Tunnel System would require an expanded West Maspeth Yard to accommodate the additional trains; therefore, under this alternative, West Maspeth Yard would be expanded to 160 acres. A storage facility would be built at the center of the site. Construction of the yard would require filling in Maspeth Creek and a portion of Newtown Creek. Additional buildings would be demolished for the larger Maspeth Yard, though no historic resources would be demolished.

The intermodal freight facility would be a large complex and would be relatively tall in comparison to many of the existing buildings within the surrounding area. However, the facility would be located in an industrial area, and its height and bulk would not create a dramatic

change in the already mixed visual context. Therefore, there would be no adverse effects to P.S. 9 from the Double Tunnel System.

D. MITIGATION MEASURES

As mandated by Section 106 of the NHPA of 1966, FHWA and FRA are participating in an ongoing consultation process with the New Jersey and New York SHPOs and the Federal Advisory Council on Historic Preservation with respect to potential effects on historic resources. As part of this consultation process, future steps to be taken and any mitigation measures to be developed in consultation with the SHPOs will be included in a Programmatic Agreement executed by the New Jersey and New York SHPOs, FHWA, and FRA.

In order to avoid construction-related effects on adjacent resources, a construction-protection plan would be developed in consultation with LPC and OPRHP. This plan would follow the New York City Department of Buildings (DOB) *Technical Policy and Procedure Notice #10/88*, regarding procedures for the avoidance of damage to historic structures resulting from adjacent construction. Developed by independent structural and foundation engineers, the construction protection plan would describe in detail the construction procedures of the proposed project. It would also provide for the inspection and reporting of existing conditions at the adjacent architectural resources; establish protection procedures; establish a monitoring program to measure vertical and lateral movement and vibration; establish and monitor construction methods to limit vibrations; and establish methods and materials to be used for any repairs. The independent engineers would be empowered to issue "stop work" orders to prevent any damage to adjacent architectural resources, and any recommencement of work would require approval by LPC. Once developed, it would be implemented to minimize the potential for adverse effects to architectural resources during construction.

NEW JERSEY

Under the TSM and Expanded Float Operations Alternatives, float bridges within Greenville Yard would be rehabilitated or reconstructed. Depending on the work required, there may be an effect on the historic Greenville Yard Transfer Bridge System. To avoid adverse physical effects on this resource, a plan for the rehabilitation and construction work would be developed in consultation with NJ SHPO.

Under the New Jersey alignment of the Single Tunnel System or the Double Tunnel System, construction of the open cut and cut and cover portions of the tunnel are planned within Greenville Yard and along the Greenville Branch. The construction of these portions of the tunnel would have physical effects on the Greenville Yard Historic District, since the work would be taking place within the boundary of the historic district. Ground-borne construction period vibrations could potentially damage the remaining float bridges, known as the Greenville Yard Transfer Bridge System. To avoid adverse physical effects on this resource, a construction protection plan covering the float bridges would be developed in consultation with NJ SHPO (see Chapter 16, "Construction and Construction Impacts"). Under the New Jersey tunnel alignment, the float bridges at Greenville Yard may be demolished, thus creating an adverse effect. This would be an unavoidable adverse effect. A mitigation plan would be developed in consultation with NJ SHPO. As the Greenville Yard Transfer Bridge System already has been documented according to HAER standards, additional documentation and/or salvage of the float bridges could be included.

Under the Staten Island alignment of the Single or Double Tunnel System, a second span of the Arthur Kill Lift Bridge would be constructed south of the existing span and a viaduct would be constructed adjacent to the Staten Island Railroad from the Chemical Coast Line to the Arthur Kill Lift Bridge. Construction activities associated with the construction of the new span and viaduct may have physical effects on the Goethals Bridge, Arthur Kill Lift Bridge, and the Staten Island Railroad Historic District due to their close proximity. To avoid adverse physical effects on these historic resources, a construction protection plan covering these resources would be developed in consultation with NJ and NY SHPOs (see Chapter 16, "Construction and Construction Impacts"). To avoid adverse visual effects on these historic resources, the design of the new span and viaduct would also be developed in consultation with NJ and NY SHPOs.

STATEN ISLAND

For mitigation related to the Arthur Kill Lift Bridge, see New Jersey above.

Under the Staten Island alignment of the Single or Double Tunnel System, construction of the open cut and cut and cover portions of the tunnel may have physical effects on the Cornelius Cruser House, which is located within 150 feet of the construction activity. The bored portion of the tunnel alignment travels directly beneath the Office Building and United States Light-House Depot Complex (S/NR, NYCL) and its historic buildings, wharf, and subterranean vaults. Ground-borne construction period vibrations could potentially damage these historic resources. To avoid adverse physical effects on these resources, a construction protection plan covering the Cornelius Cruser House and the Office Building and United States Light-House Depot Complex would be developed in consultation with NY SHPO (see Chapter 16, "Construction and Construction Impacts").

BROOKLYN

In Brooklyn, the Ocean Parkway overpass would be reconstructed as part of the work to increase clearance heights under the Single or Double Tunnel System. This work would physically alter the Ocean Parkway historic resource, and, depending on the form and height of the new overpass and the replacement walls and fencing, reconstruction of the overpass could adversely affect Ocean Parkway by altering sight lines along the parkway, causing it to become a different visual entity. To avoid adverse physical effects on this historic resource, a construction protection plan covering the parkway would be developed in consultation with NY SHPO, (see Chapter 16, "Construction and Construction Impacts"). To avoid adverse visual effects on this historic resource, the design of the Ocean Parkway overpass would also be developed in consultation with NY SHPO.

The Single or Double Tunnel System could also result in construction-related effects to one resource located in the Bay Ridge Branch, Segment 3 APE. Ground-borne construction period vibrations from reconstructing the Ocean Parkway overpass could potentially damage the structures lining Ocean Parkway in this location. To avoid potential physical effects to this resource, it would be included in the design specifications and construction protection plan to be approved by NY SHPO prior to the start of construction (see Chapter 16, "Construction and Construction Impacts"). ✷

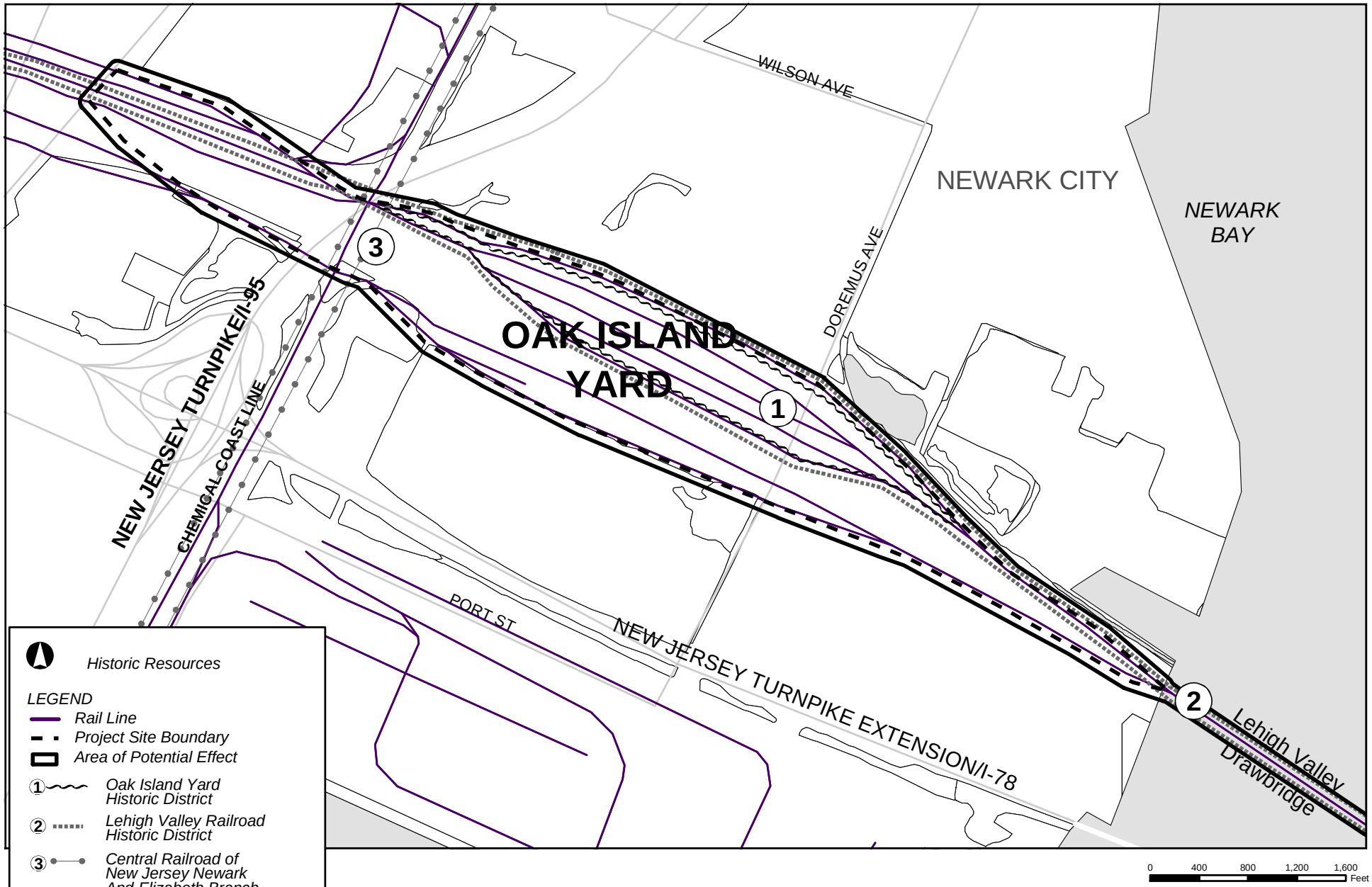


Figure 6-1
Oak Island Yard Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

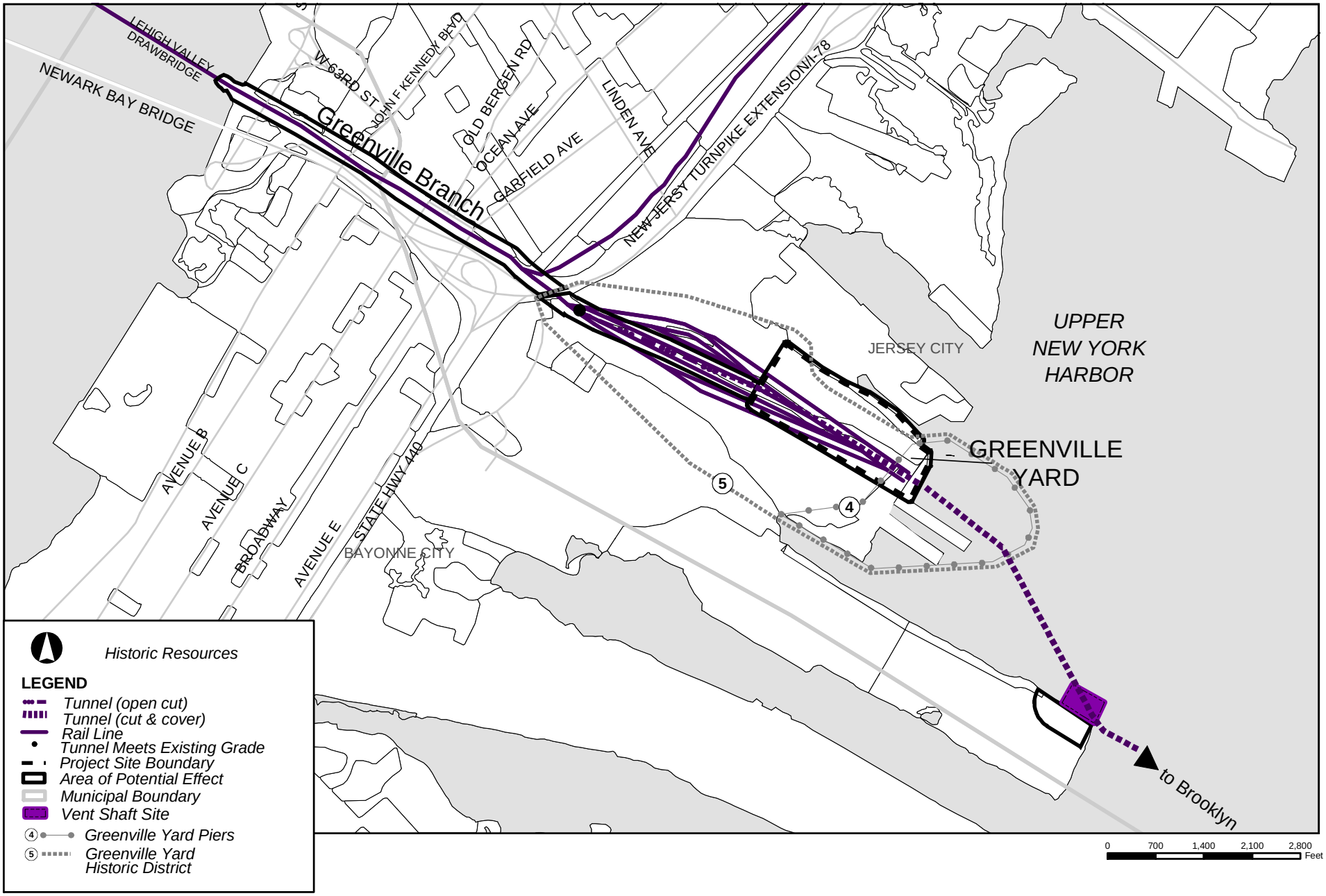


Figure 6-2

Greenville Yard/Potential Tunnel Alignment and Greenville Branch Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

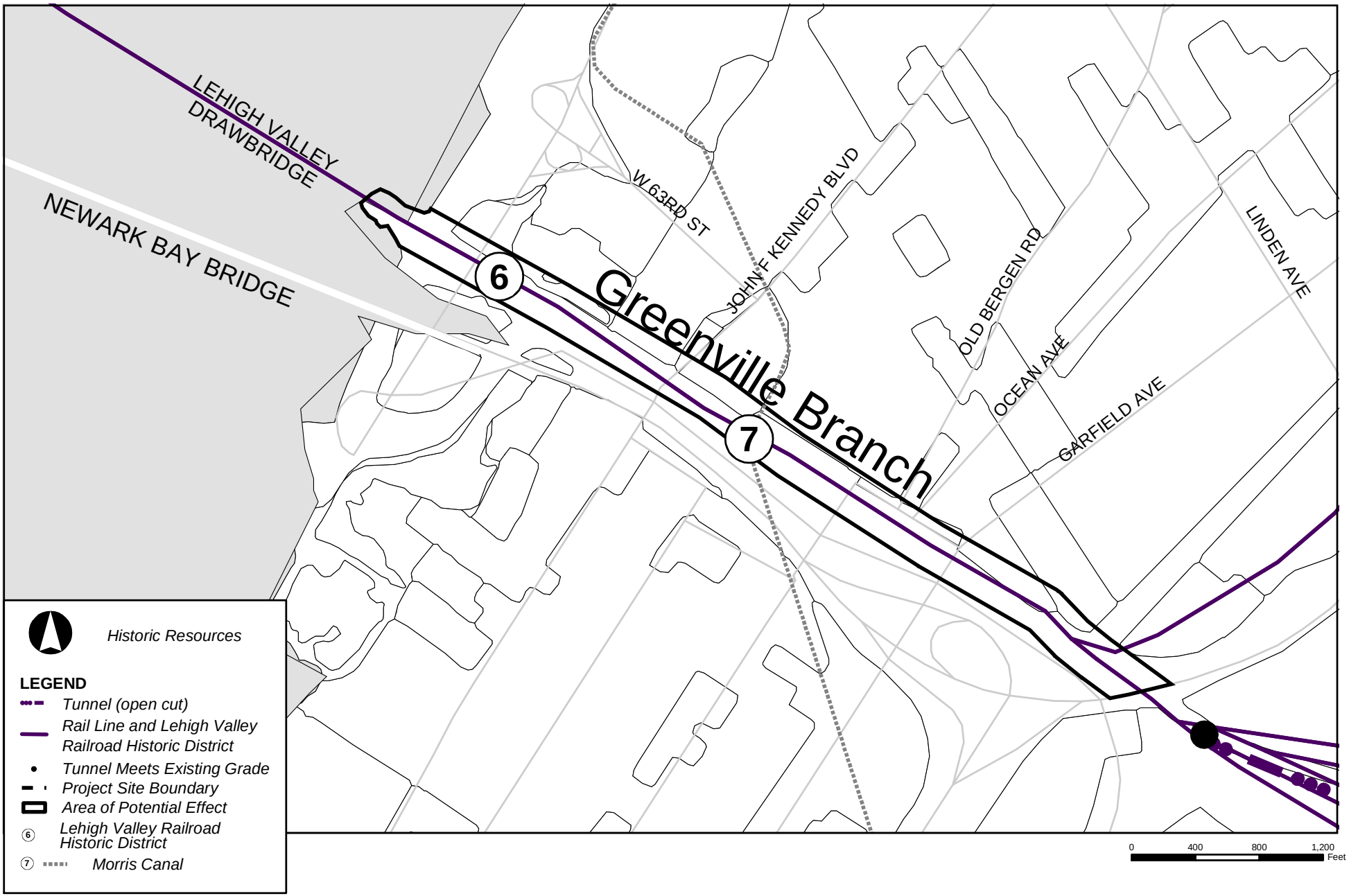


Figure 6-3
Greenville Branch Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

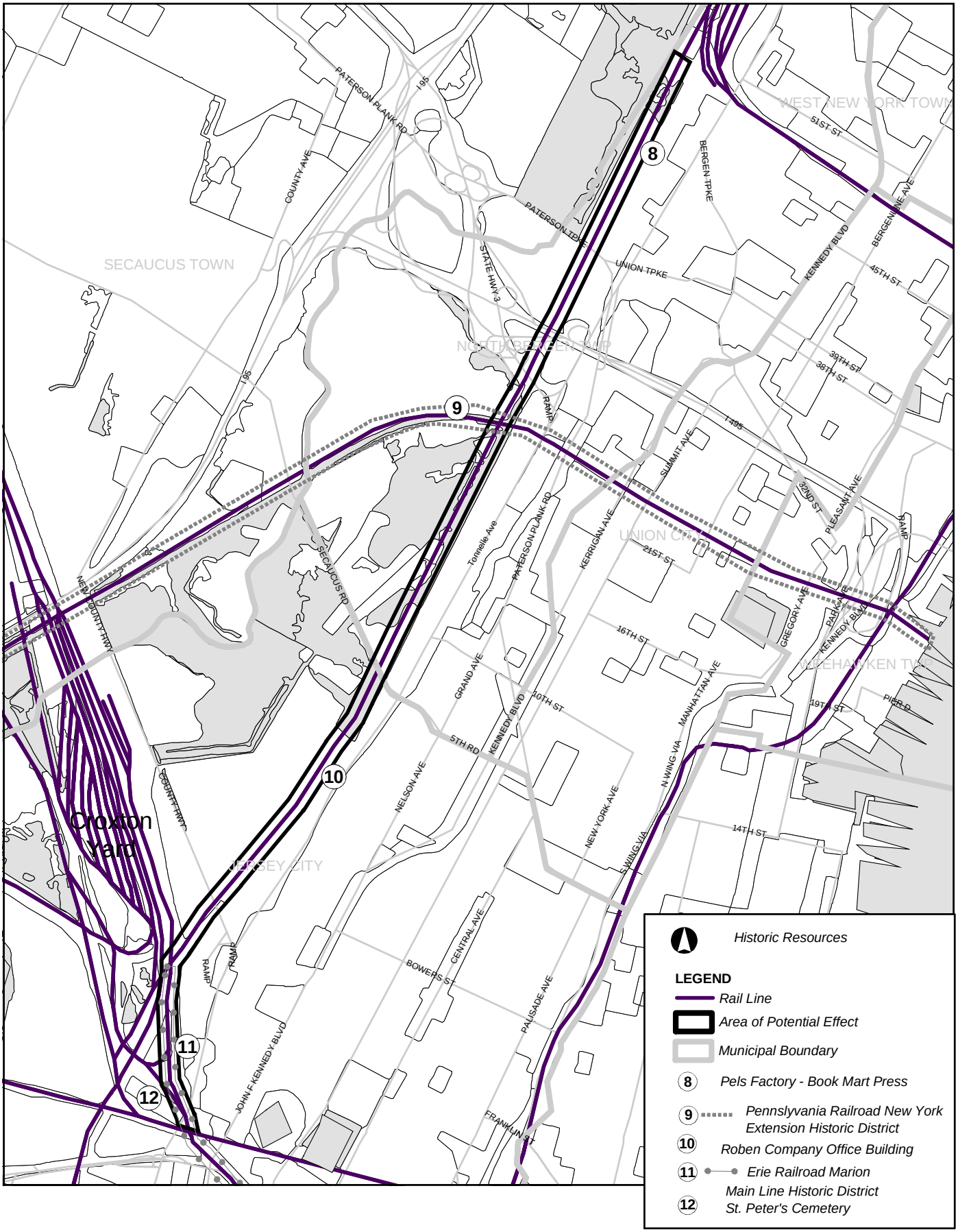


Figure 6-4
National Docks Secondary (Segment 1)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

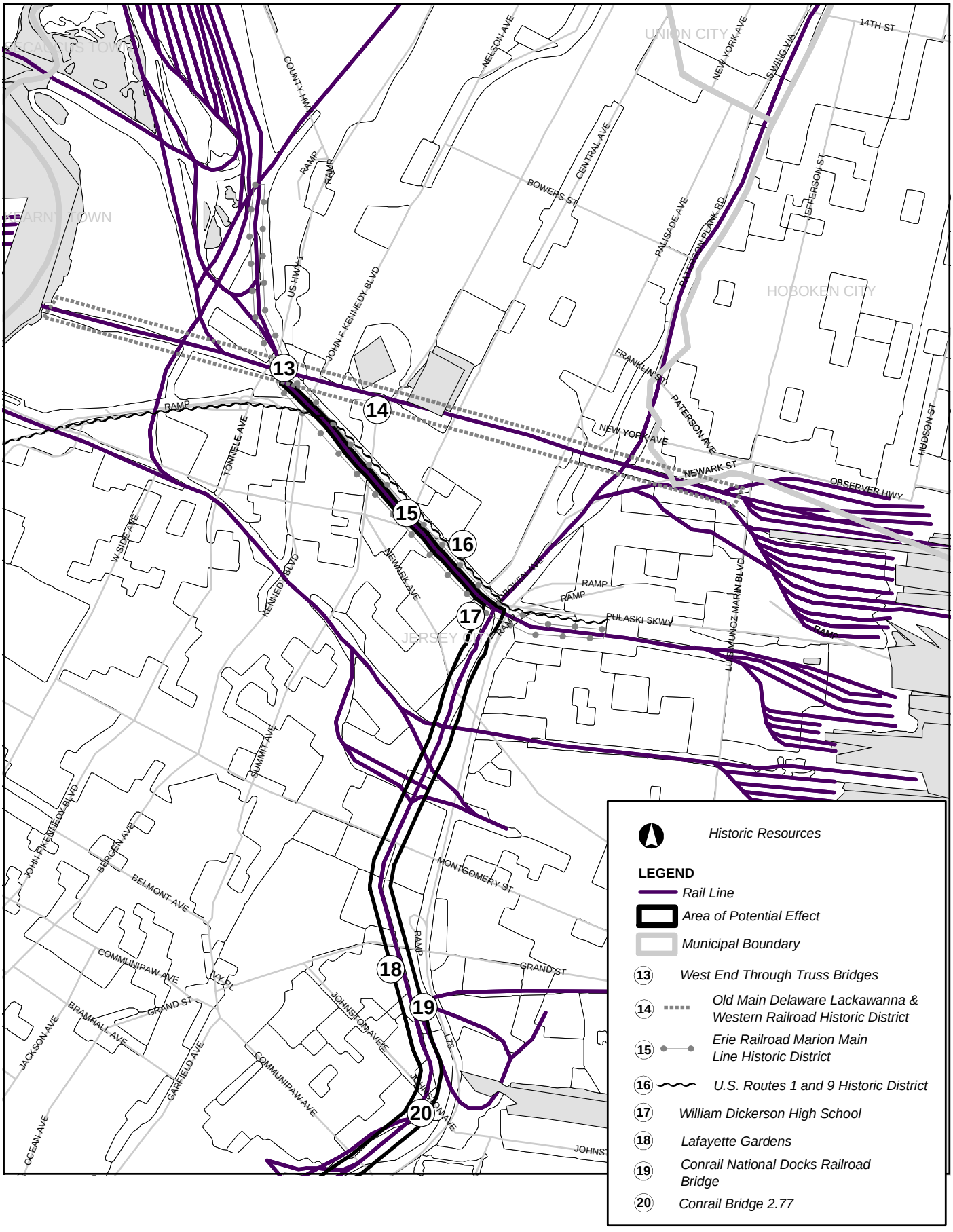


Figure 6-5
National Docks Secondary (Segment 2)-Area of Potential Effect
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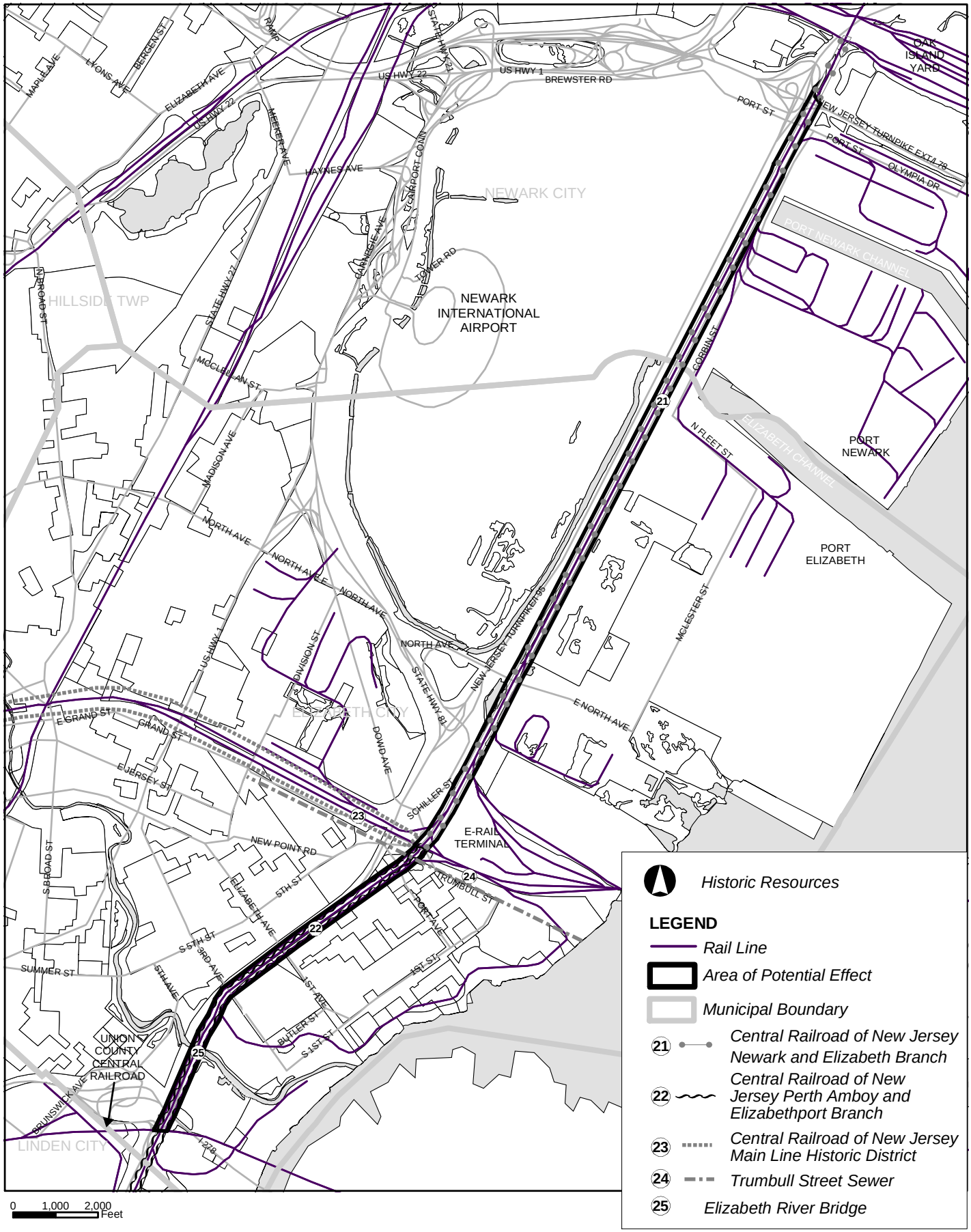


Figure 6-6
Chemical Coast Line (Segment 1)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

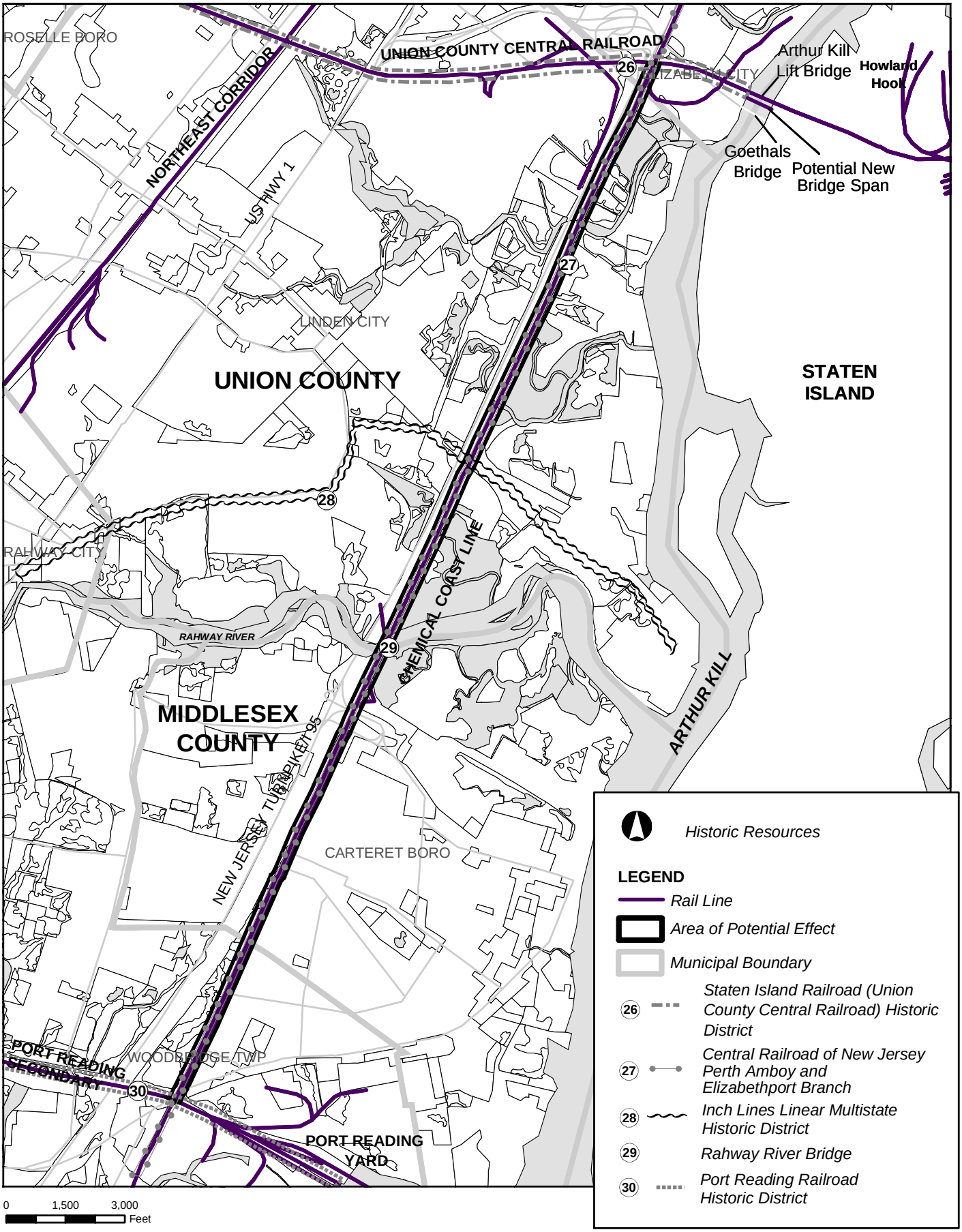


Figure 6-7
Chemical Coast Line (Segment 2)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

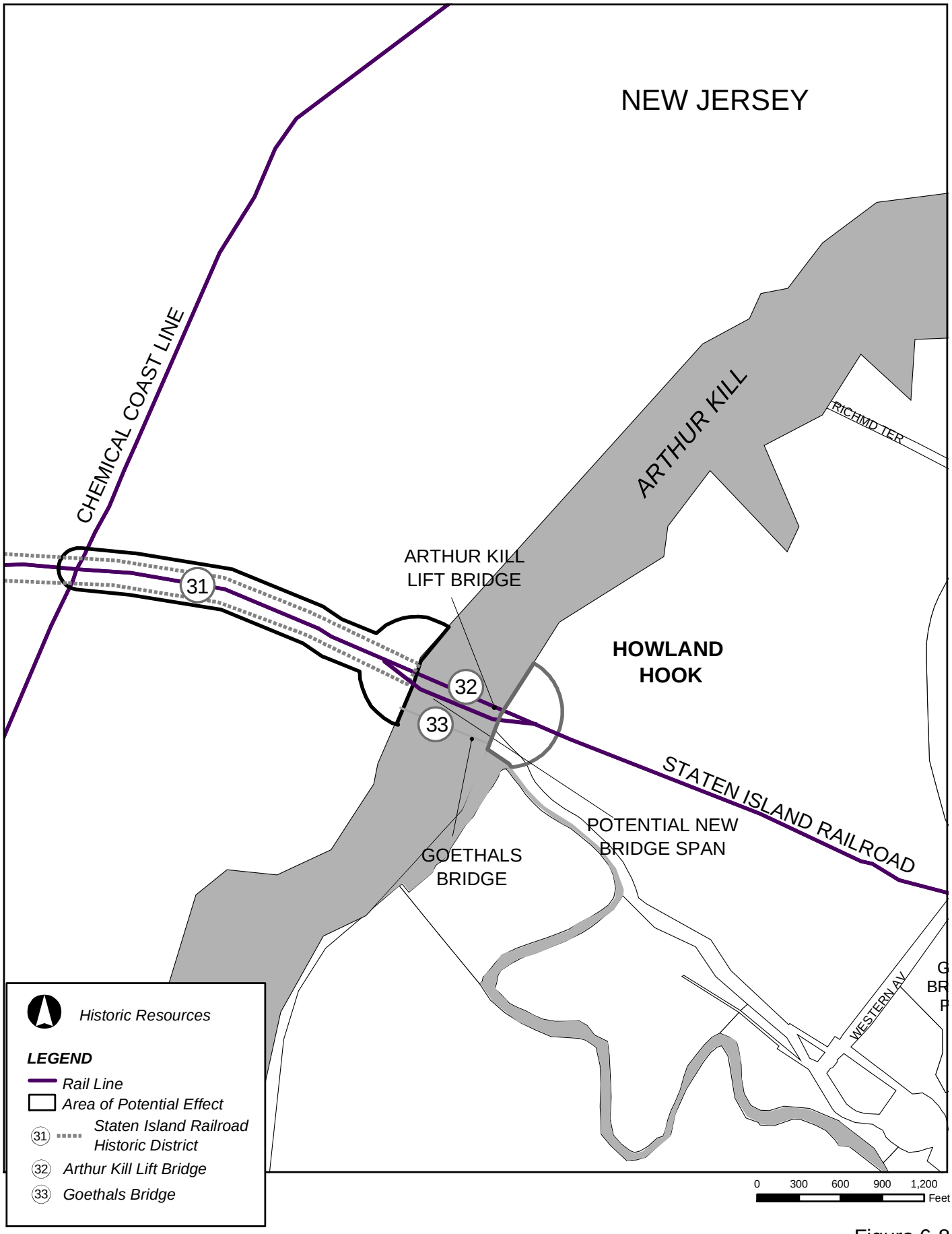


Figure 6-8
Arthur Kill Lift Bridge Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

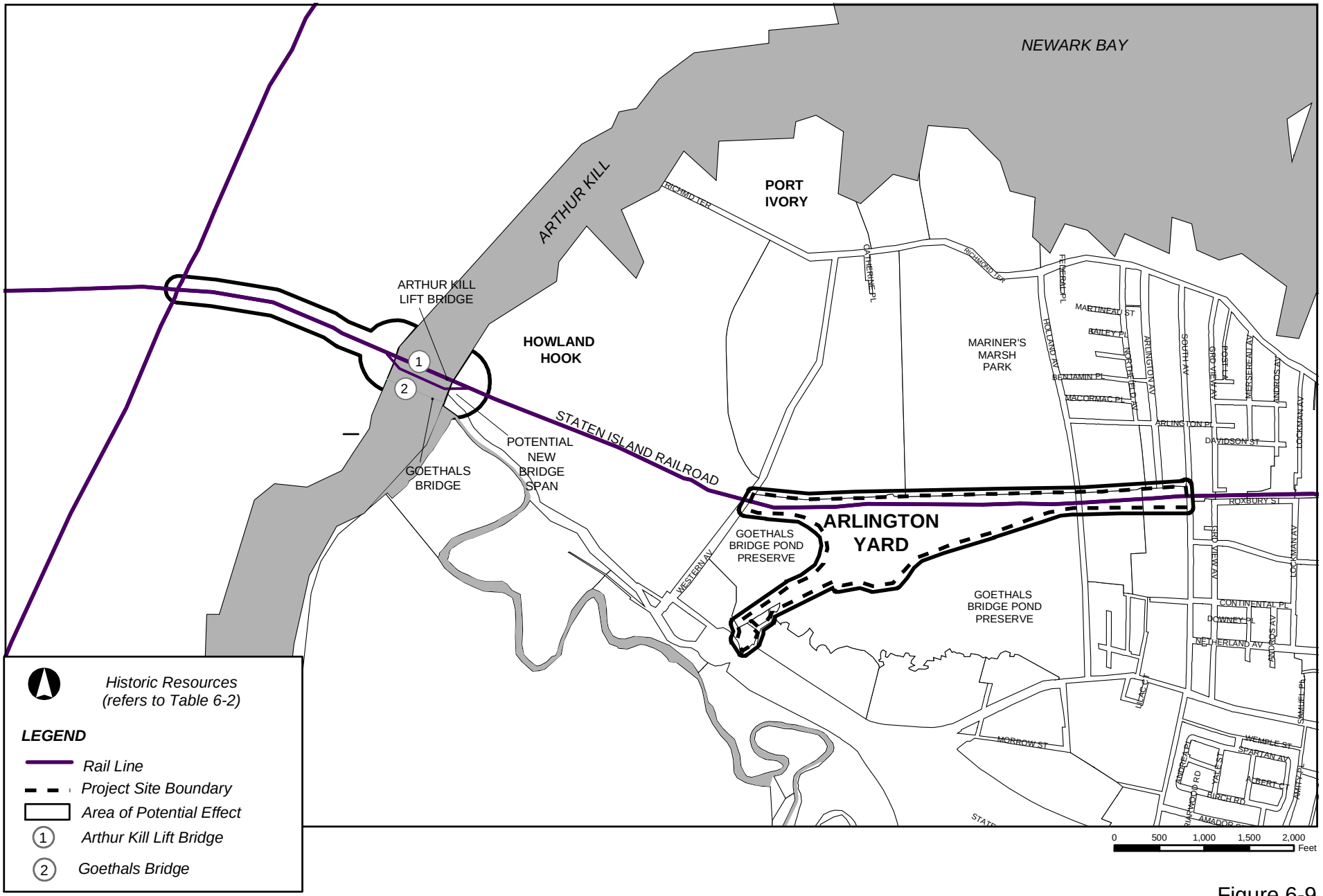


Figure 6-9

Arthur Kill Lift Bridge/Arlington Yard Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 6-10
Northern Staten Island (Segment 1)-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

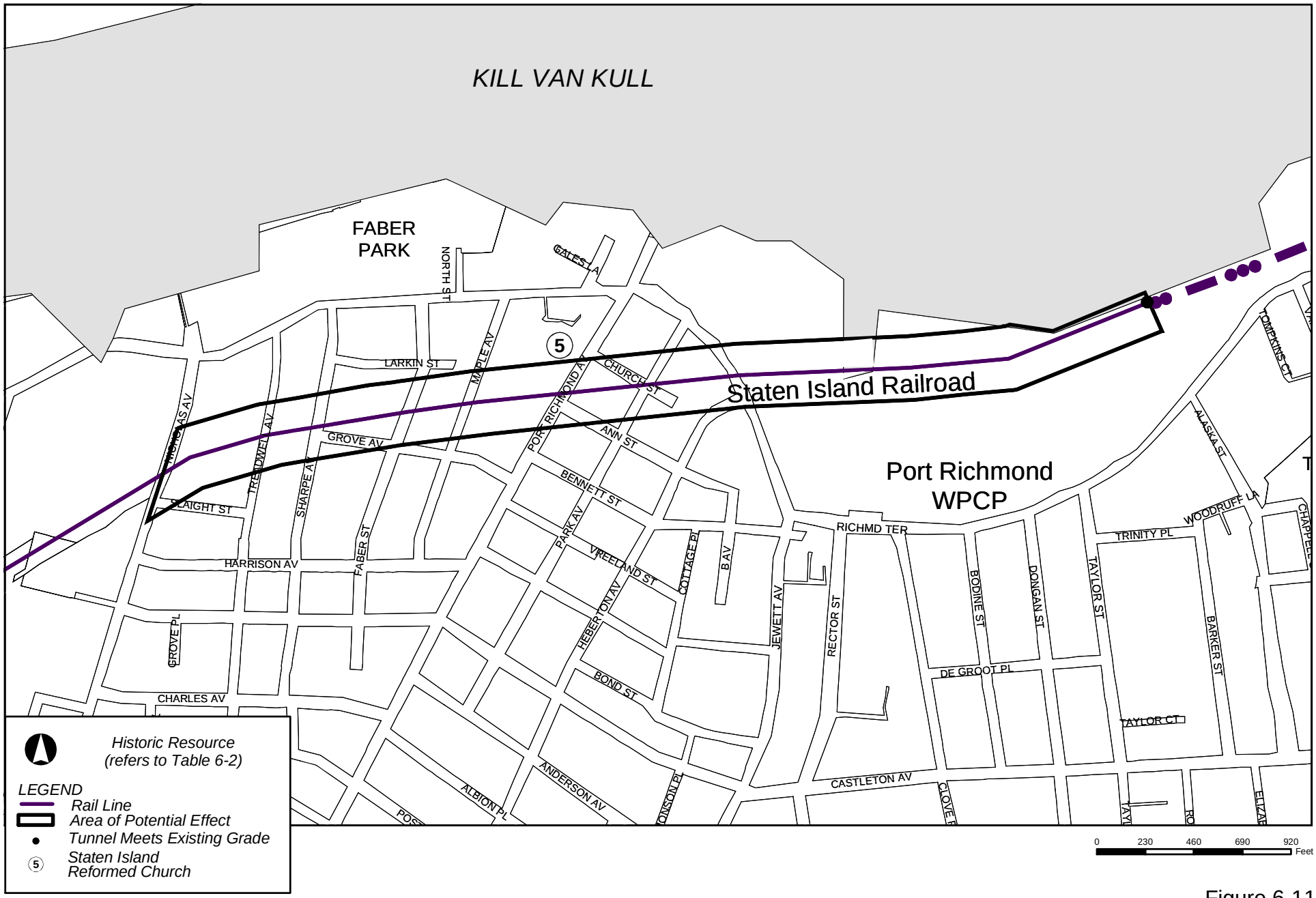


Figure 6-11

Northern Staten Island (Segment 2)-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

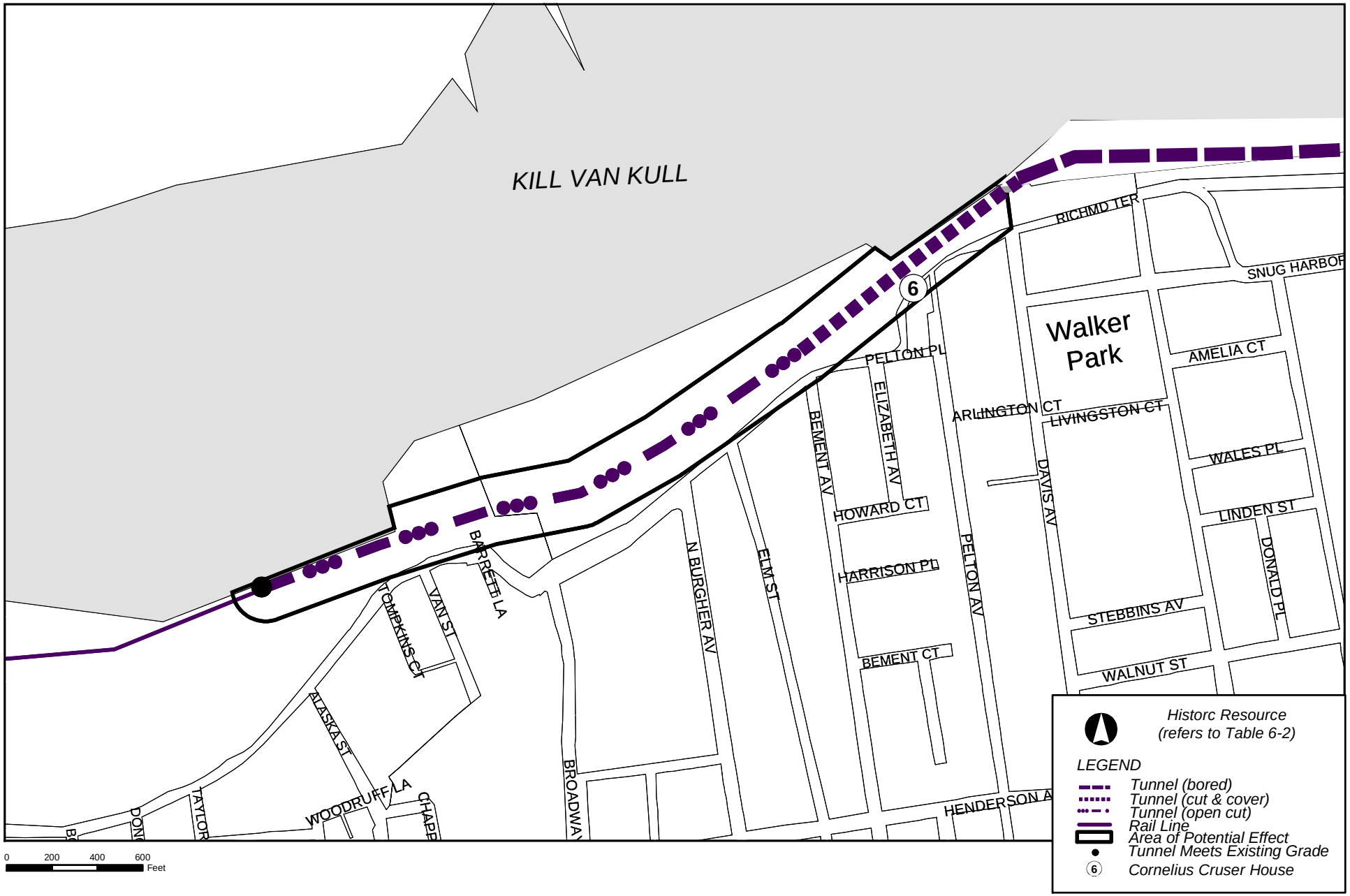


Figure 6-12
Northern Staten Island (Segment 3)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

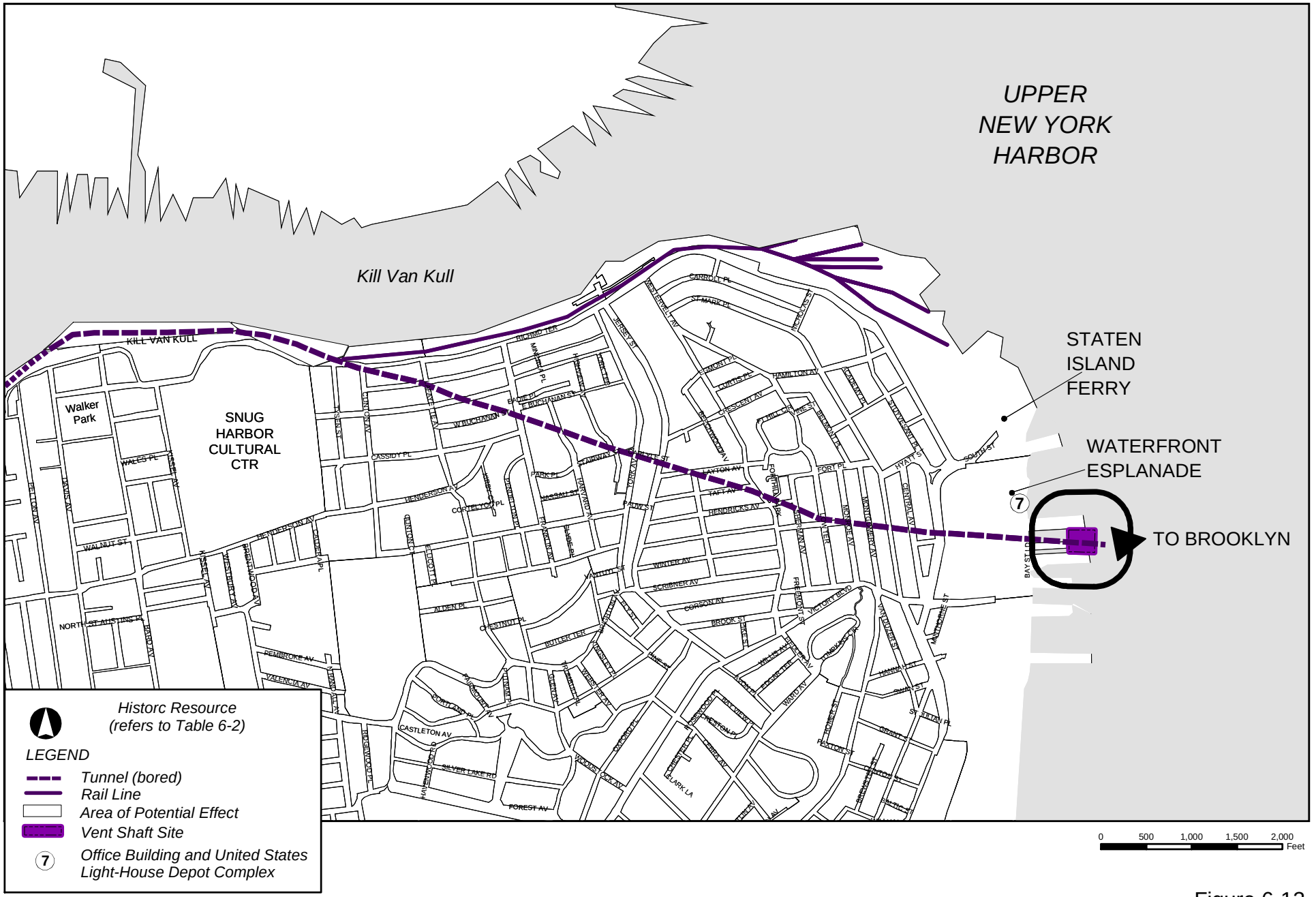


Figure 6-13
Northern Staten Island (Segment 4)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 6-14
65th Street Yard-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

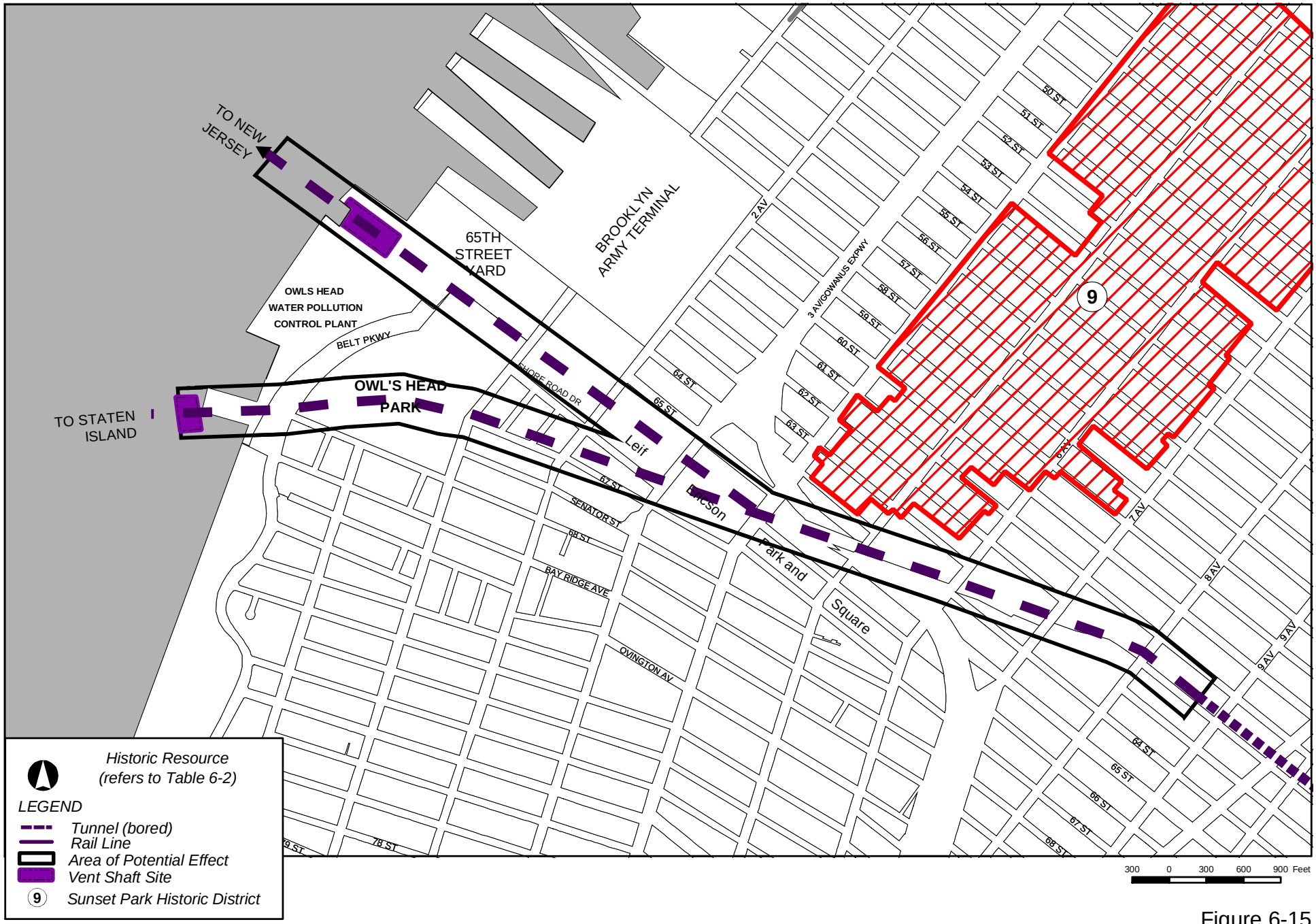


Figure 6-15
Bay Ridge Branch (Segment 1)-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

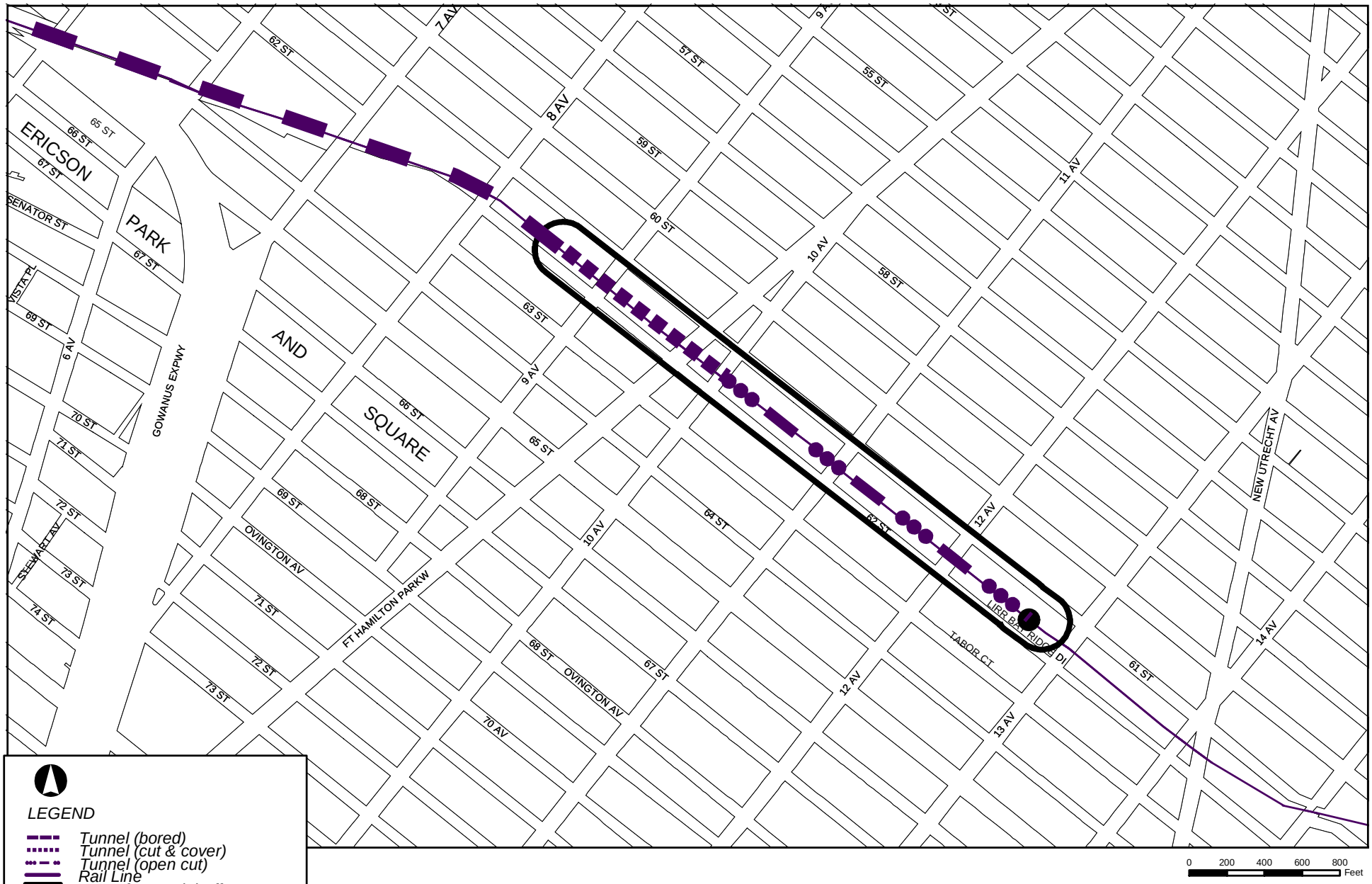


Figure 6-16
Bay Ridge Branch (Segment 2)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

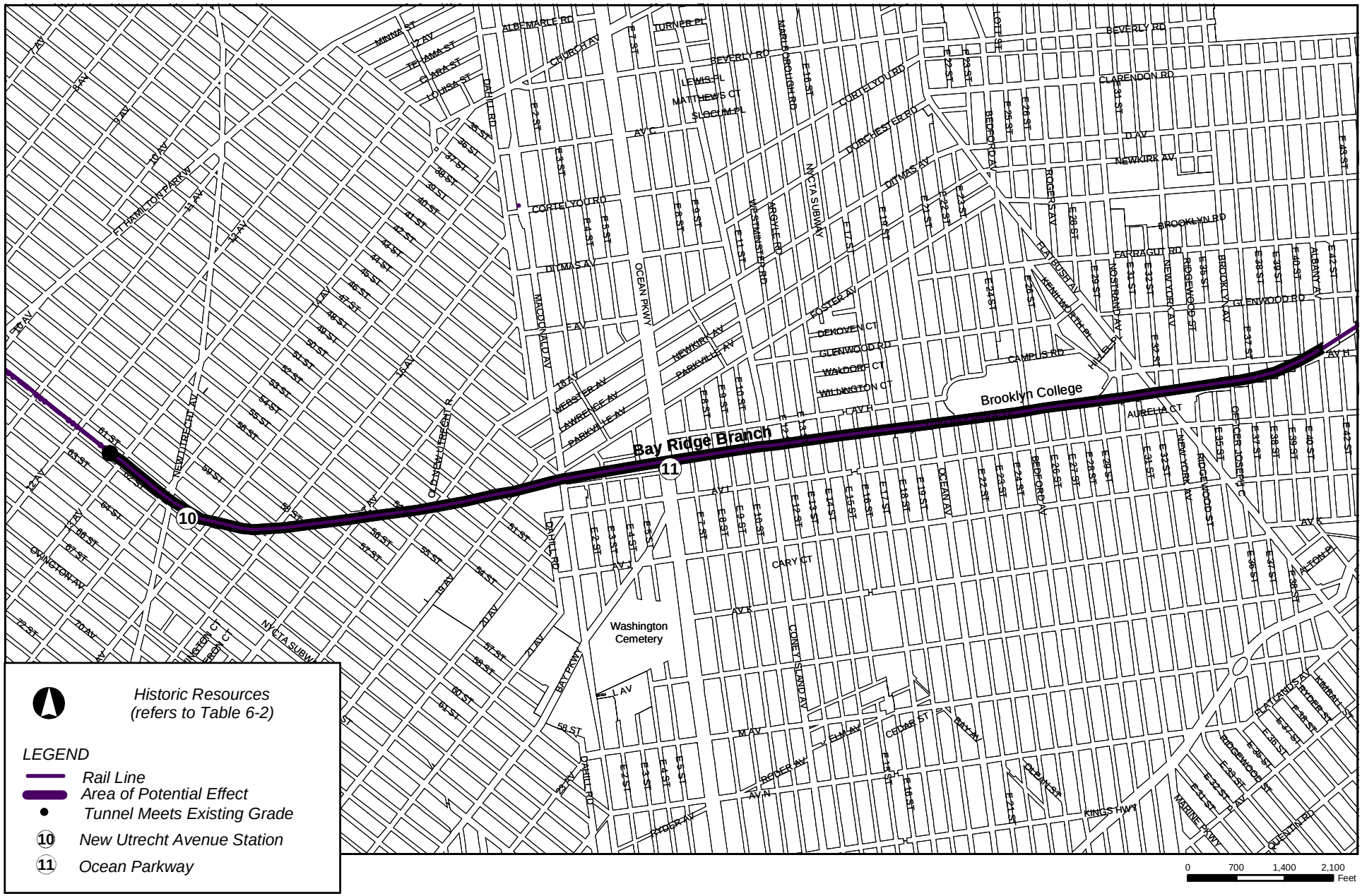


Figure 6-17
Bay Ridge Branch (Segment 3)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

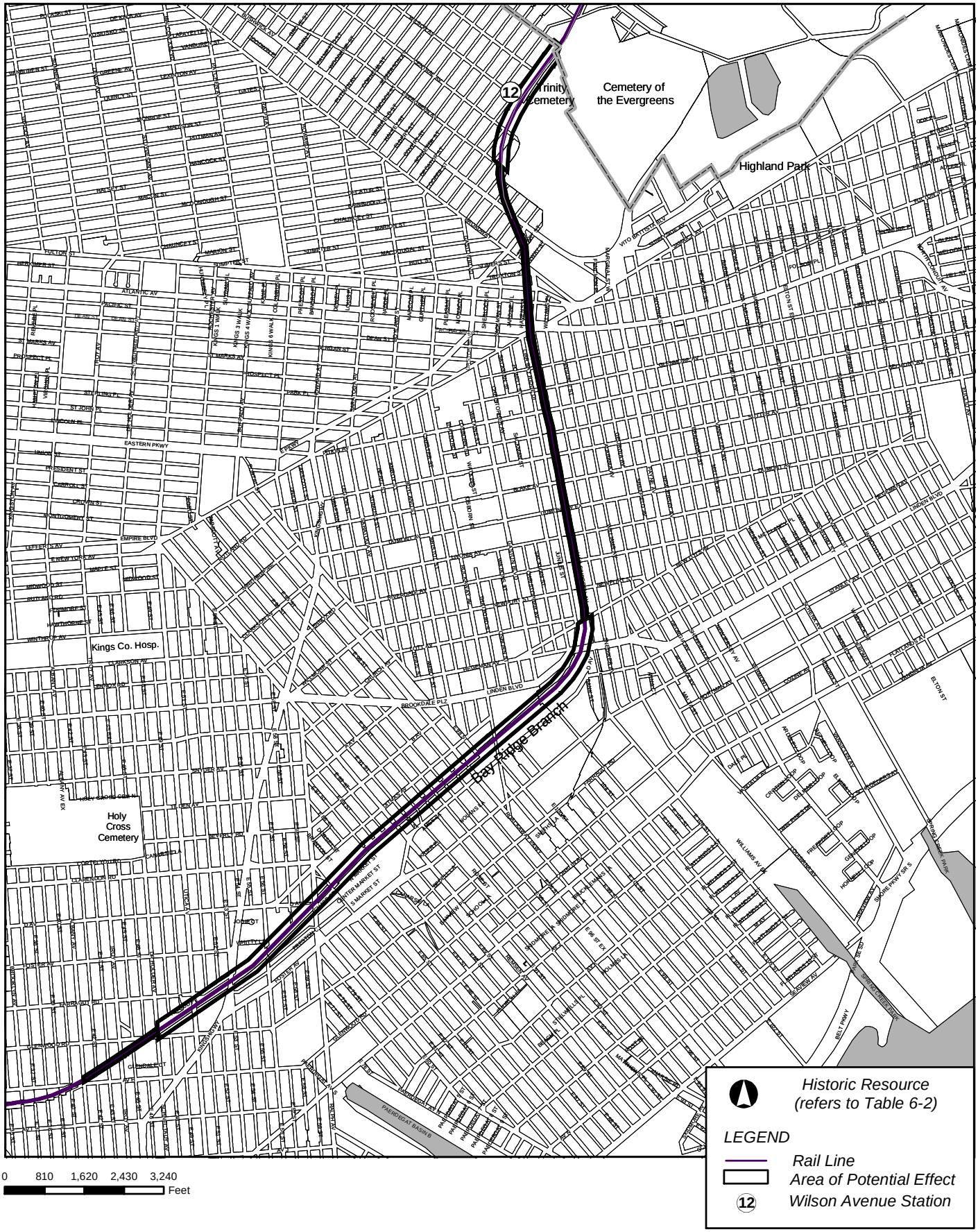


Figure 6-18
Bay Ridge Branch (Segment 4)-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

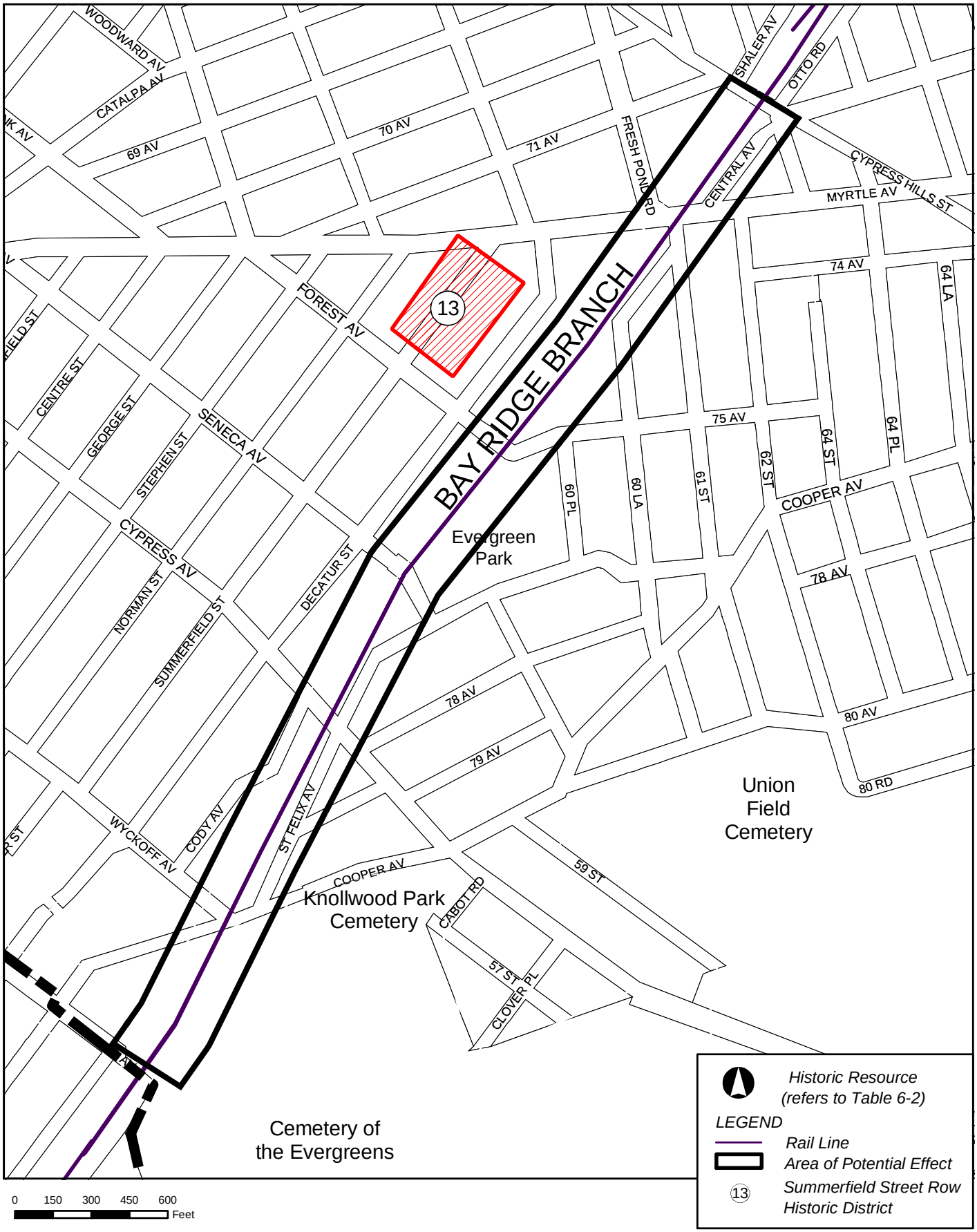


Figure 6-19
Bay Ridge Branch (Queens Portion)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

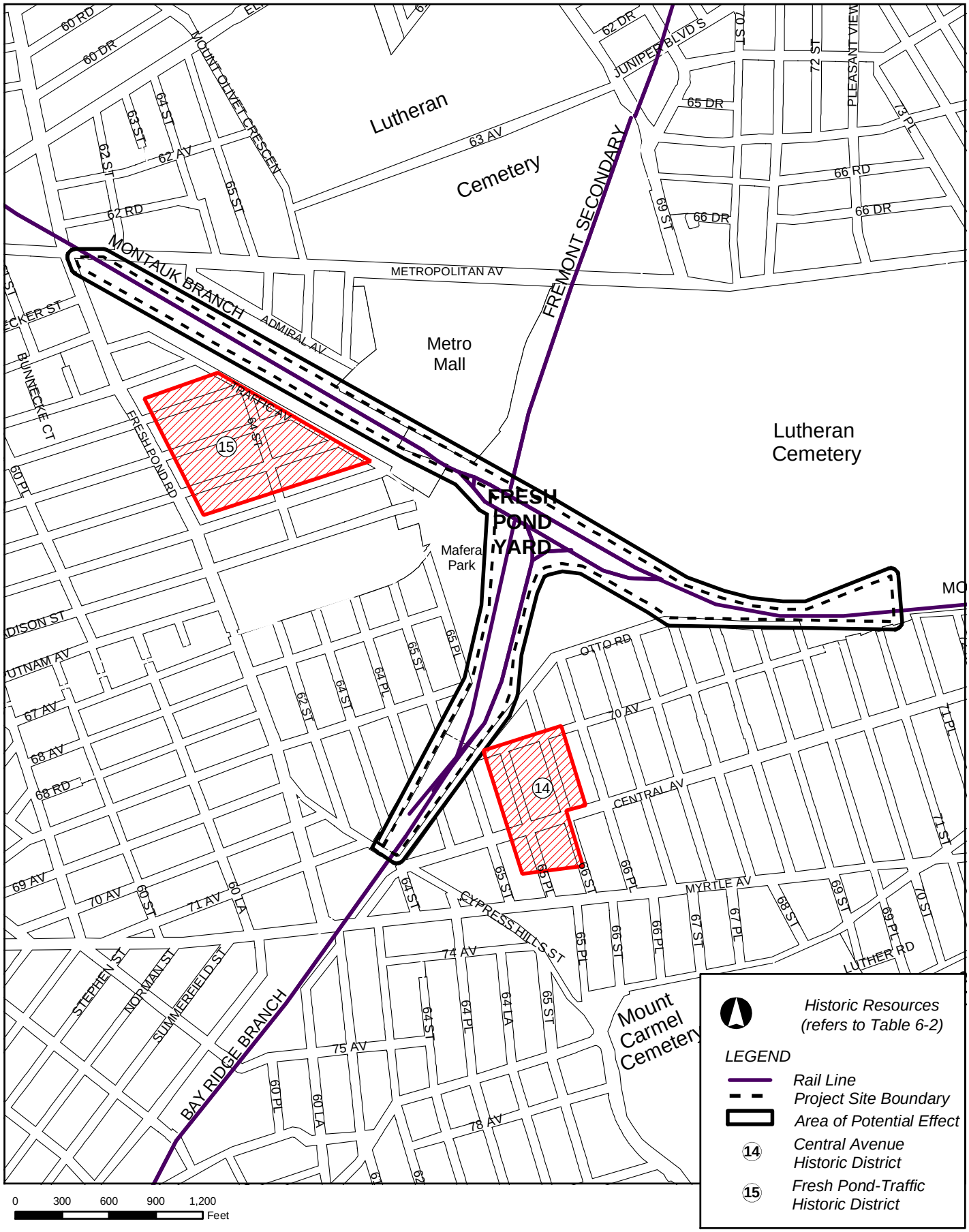


Figure 6-20
Fresh Pond Yard-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

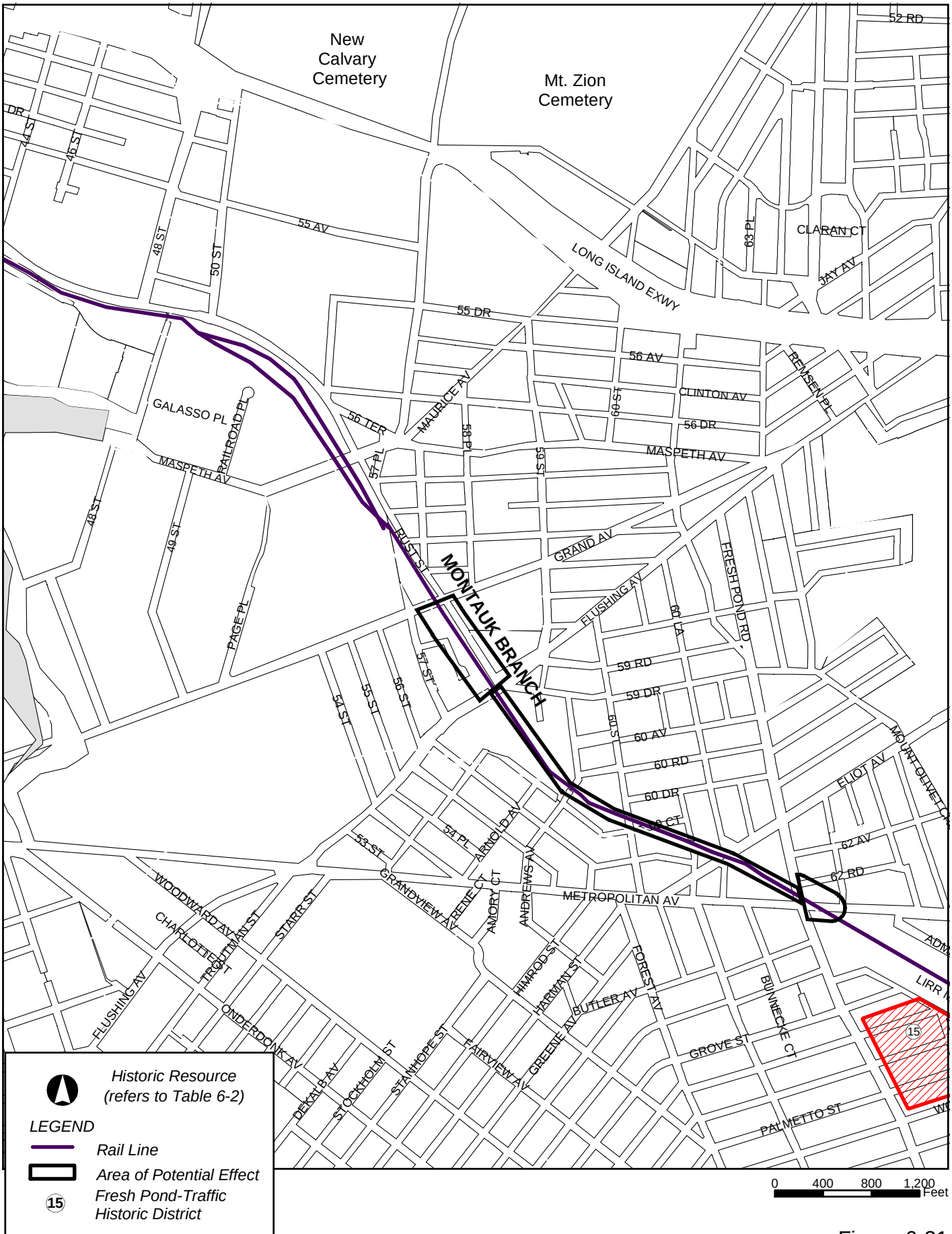


Figure 6-21
Montauk Branch-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

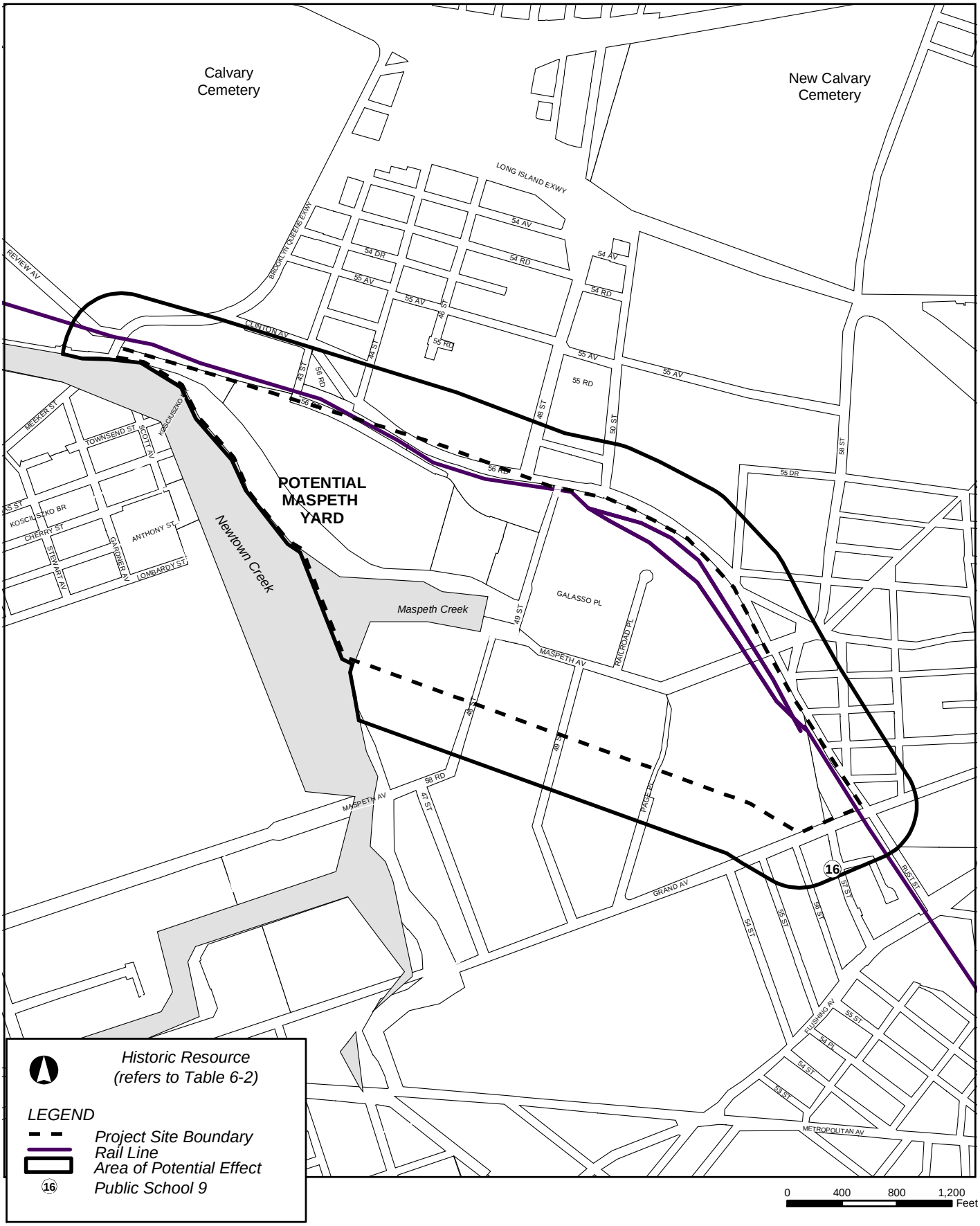


Figure 6-22
West Maspeth Yard-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

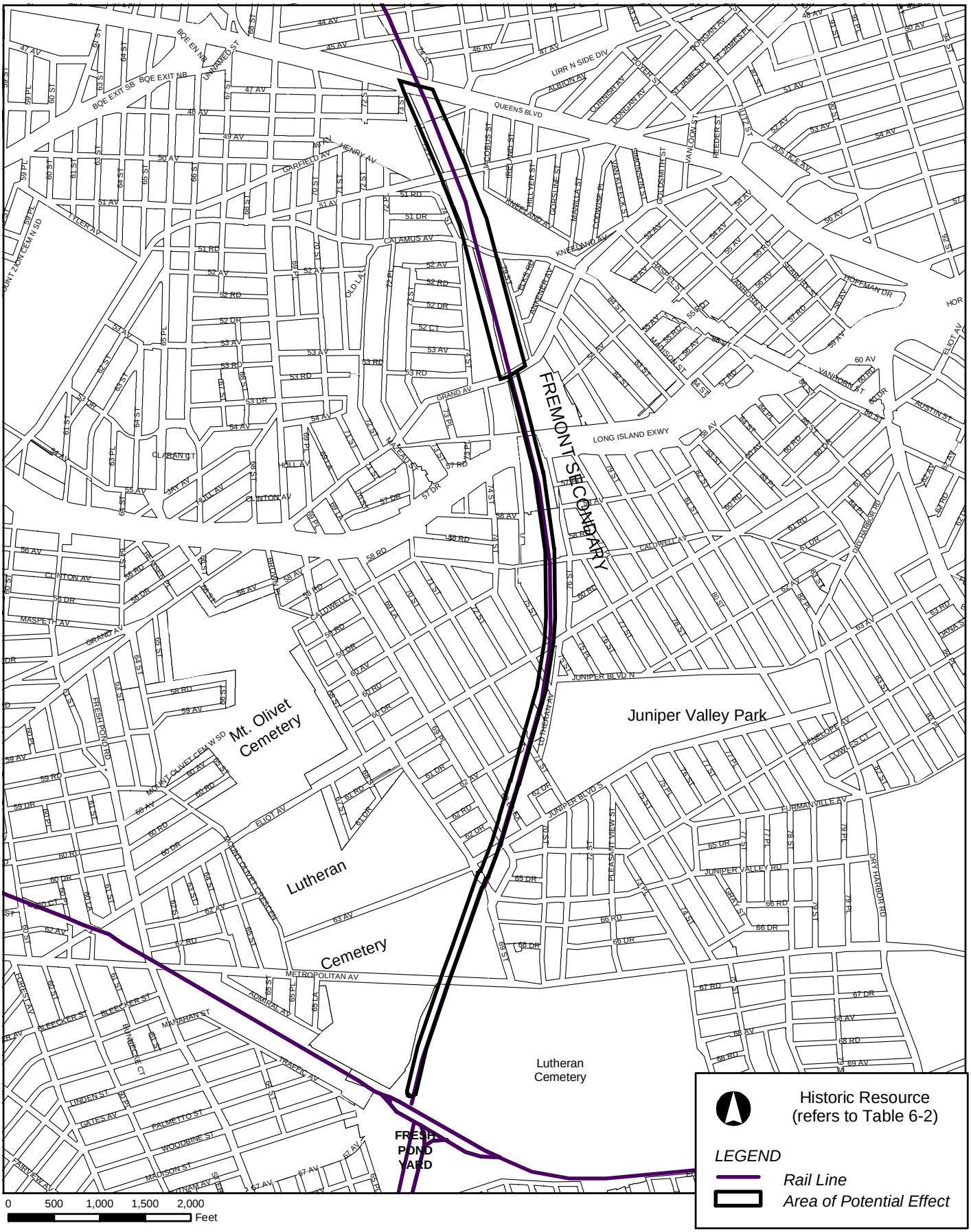


Figure 6-23
Fremont Secondary (Segment 1)-Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 6-24
Fremont Secondary (Segment 2)-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 6-25

Fremont Secondary (Segment 3)-Area of Potential Effect

CROSS HARBOR FREIGHT MOVEMENT PROJECT

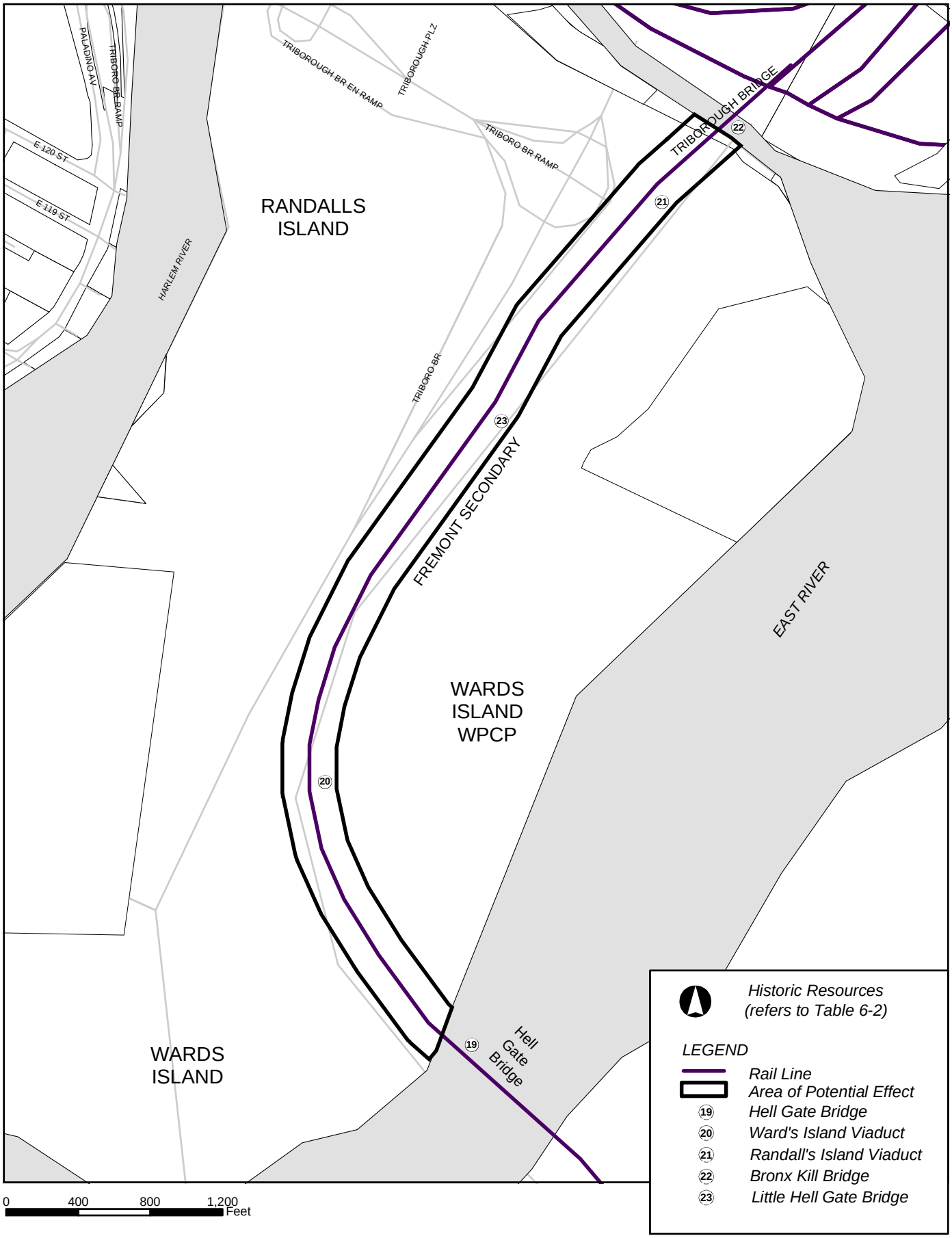


Figure 6-26
Fremont Secondary (Randall's/Wards Island Portion) Area of Potential Effect
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 7: Archaeological Resources

A. INTRODUCTION AND METHODOLOGY

Assessed in this chapter are the potential effects of the project on archaeological resources. Each area where a project alternative would require in-ground disturbance—for example, by excavation or grading—is assessed. For each of those areas, the analysis considers the likelihood that archaeological resources may be buried there. Then considered are the alternatives' effects on those potential resources, should they be present. Because any archaeological resources present would be affected by construction rather than operation of the project alternatives, this chapter includes a detailed evaluation of construction effects.

REGULATORY CONTEXT

Potential effects on archaeological resources are analyzed in conformance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), Section 4(f) of the United States Department of Transportation Act of 1966 (Section 4[f]), the New York State Historic Preservation Act of 1980 (SHPA), and the New Jersey Register of Historic Act of 1970 (NJSA). Consistent with these regulations (described in more detail in Appendix 1, "Visual and Cultural Resources,") the analysis of the Cross Harbor Freight Movement Project's effects on archaeological resources is being conducted in coordination with the New York and New Jersey State Historic Preservation Officers (SHPOs) and Advisory Council on Historic Preservation (ACHP). The New York City Landmarks Preservation Commission (NYCLPC) also participated in the process. Copies of correspondence with these agencies are included in Appendix 1, "Visual and Cultural Resources," of this Environmental Impact Statement (EIS).

TYPES OF ARCHAEOLOGICAL RESOURCES

Archaeological resources are physical remains, usually buried, of past activities on a site. They can include remains from prehistoric (Native American) people who used or occupied a site—including tools, refuse from tool-making activities, habitation sites, etc. They can also include remains from activities that occurred during the historic period (beginning with European colonization of the New York area), such as battle sites, foundations, wells, privies, and shipwrecks. A more detailed discussion of types of archaeological resources is provided in Appendix 1, "Visual and Cultural Resources."

Archaeological sites containing buried features, artifacts, and architectural remains can remain in locations that were once used for prehistoric or historic-period activities. However, on sites where later development occurred, archaeological resources at many of these locations have since been disturbed or destroyed by later grading, excavation, installation of utilities, construction of subway lines, and other development activities.

EVALUATION METHODOLOGY

Documentary research was undertaken by professional archaeologists to determine the project's potential to affect archaeological resources. A complete list of the archaeological evaluations and a copy of each report is provided in Appendix 1, "Visual and Cultural Resources." These reports are summarized in this chapter. As detailed below, the archaeological study conducted to date encompassed five steps:

- Definition of the Area of Potential Effect (APE). This is the area where project activities could disturb the ground enough so that if any archaeological resources are present, they could be affected. The APE is the study area for archaeological resources.
- Preliminary identification of the possibility of archaeological resources being present within the APEs. Documentary research was conducted to identify areas where important prehistoric or historic-period activities may have occurred that could have resulted in archaeological resources.
- Documentation of disturbance and identification of potential undisturbed resources. For each area where research indicated that prehistoric or historic-period activities may have left archaeological resources, the site history was studied to identify construction activities and other ground disturbances that occurred later on the site. The objective of this assessment was to identify locations where any archaeological resources, if originally present, may have survived. This assessment resulted in an inventory of potential archaeological resources that may remain in the APE.
- Assessment of effect. The project alternatives' effects on the potential archaeological resources identified were then assessed. Any archaeological resources present would be affected by construction rather than operation of the project alternatives.
- Identification of mitigation. For all potential adverse effects identified, mitigation measures were identified.

Each of these steps is described in more detail below.

DEFINITION OF THE AREA OF POTENTIAL EFFECT (APE)

The first step in the assessment was to identify the APEs or study areas to be evaluated for archaeological resources. The APEs were identified in consultation with New York and New Jersey SHPOs, and NYCLPC. The APEs for the analysis of the three project alternatives are described below. No APEs have been identified for the No Action Alternative, since the No Action Alternative does not involve actions that are part of the Cross Harbor Freight Movement Project.

Project elements involving in-ground disturbance have the potential to affect archaeological resources through construction activities, such as excavation and grading. Definitions of APEs are described below and range from no potential effect (no APE) to areas where in-ground disturbance in the form of new excavation or other subsurface disturbance may affect potential archaeological resources.

NO APE

Some components of the proposed project would not cause effects to any archaeological resources since they are either 1) within new tunnels to be dug through bedrock via tunnel

boring machines; or 2) involve shallow construction within existing railroad trackbeds in rights-of-way that have been previously disturbed. Areas of no effect include the following:

- Portions of the tunnels to be bored through bedrock. There is no potential for archaeological resources within bedrock and therefore bedrock possesses no archaeological sensitivity.
- Areas that have been previously disturbed by railroad right-of-way construction and where shallow construction would occur. This includes the reconfiguration or replacement of existing tracks and laying of new tracks within trackbeds in existing railroad rights-of-way along the Bay Ridge Branch of the Long Island Rail Road (LIRR) in Brooklyn, Staten Island Railroad in Staten Island, and Montauk Branch of the LIRR in Queens. It also includes minor adjustments to rail line clearance heights with excavation depths of less than 1.5 feet. This work would involve shallow excavation that would not extend beneath existing trackbeds.

AREAS OF POTENTIAL EFFECT

Effects to archaeological resources could occur where construction would cause disturbance from the ground surface down into potentially sensitive strata, including constructing new or improving existing rail yards, increasing track clearances more than three feet, reconstructing clearances, and constructing the open cut and cut and cover portions of the new tunnels. Effects to archaeological resources could also occur where boring machines would go through potentially sensitive strata to construct new tunnels. APEs are described below:

Tunnel Construction

Construction in the Harbor. The APE for the construction of the tunnel in the Harbor is the tunnel alignment where the tunnel would be bored or immersed. Of concern is the potential for any submerged ships in the harbor. The potential for submerged prehistoric and/or historic-period resources are addressed in the APEs for the landside construction, described below.

Landside Construction. The APEs for the construction of the tunnel in New Jersey, Staten Island, and Brooklyn are as follows:

- New Jersey: The New Jersey tunnel alignment would be built within Greenville Yard and along the Greenville Branch. There would also be improvements made to Greenville Yard as a result of the project, described below under "Rail Yard Improvements." Therefore, the APE has been defined as the entire Greenville Yard and the Greenville Branch to the point at which the tunnel would meet existing grade, just east of the New Jersey Turnpike Extension. This APE accounts for potential variations in the tunnel alignment as project engineering proceeds. The APE extends in the water beyond the existing shoreline to encompass areas that may have been previously inhabited or utilized prehistorically or historically but are presently submerged.
- Staten Island: The APE for the Staten Island tunnel alignment includes the anticipated area of effect for the tunnel alignment as well as the area located within one block on either side of the tunnel alignment. This APE accounts for potential variations in the tunnel alignment as project engineering proceeds. The APE for the tunnel alignment extends into the water beyond the existing shoreline to encompass areas that may have been previously inhabited or utilized prehistorically or historically but are presently submerged.

- Brooklyn: Two tunnel options are under consideration for Brooklyn. The tunnel may enter Brooklyn at the shoreline at 65th Street Yard (New Jersey tunnel alignment) or it may enter at the shoreline near Owls Head Park (Staten Island tunnel alignment). The APEs for the bored portion of the tunnel alignments include the anticipated area of effect for the tunnel alignments, the locations of the potential tunnel ventilation shafts—either within 65th Street Yard or at the seaward end of the 69th Street pier—and the area located within one block on either side of the tunnel alignments. This APE accounts for potential variations in the tunnel alignments as project engineering proceeds. For the New Jersey and Staten Island tunnel alignments, the APE for the open cut and cut and cover sections (from between 8th and 9th Avenues to between 12th and 13th Avenues), is the anticipated area of effect along the Bay Ridge Branch right-of-way. The APEs for the tunnel alignments also extend into the water beyond the existing shoreline to encompass areas that may have been previously inhabited or utilized prehistorically or historically but are presently submerged.

Rail Yard Improvements. The APE for excavation associated with rail yard improvements at the Greenville Yard in New Jersey, Arlington Yard and Port Ivory Yard in Staten Island, 65th Street Yard in Brooklyn, and Fresh Pond Yard and West Maspeth Yard in Queens is the entirety of each yard. This APE may be reduced as definitive construction impact areas at each rail yard are identified.

Rail Line Clearances. The APE for excavation associated with increasing clearance heights along existing rail lines to accommodate doublestack service will encompass the anticipated area of effect, which is estimated to extend five feet vertically. All clearance work would occur within the existing rights-of-way of the Staten Island Railroad and Bay Ridge Branch and Montauk Branch of the LIRR as follows:

- Under both the Single and Double Tunnel Systems, excavation of an up to 5-foot-deep and 40-foot-wide trench between Arlington Avenue and John Street along the Staten Island Railroad.
- Under both the Single and Double Tunnel Systems, excavation of a 5-foot-deep and 40-foot-wide trench on the Bay Ridge Branch of the LIRR; and
- Under both the Single and Double Tunnel Systems, excavation of an up to 5-foot-deep and 40-foot-long trench beginning at Fresh Pond Yard and continuing west to Flushing Avenue on the Montauk Branch of the LIRR.

Where the reconstruction of overpasses is required, the APE is defined as the area of potential construction impacts.

Arthur Kill Lift Bridge. The APE for excavation associated with construction of a new span across the Arthur Kill and to the south of the existing Arthur Kill Lift Bridge encompasses the anticipated area of effect.

PRELIMINARY IDENTIFICATION OF THE POSSIBILITY OF ARCHAEOLOGICAL RESOURCES BEING PRESENT WITHIN THE APES

After defining the APEs for archaeological resources, the next step in the analysis was to identify locations that may have been used during the prehistoric period or during the historic period and that might, therefore, have left archaeological evidence behind in the soils. This involved documentary research to identify already known archaeological sites and areas that have the potential to contain archaeological resources, based on original topography (for prehistoric

resources) or site development history (for historic-period resources). A list of sources is provided in Appendix 1, "Visual and Cultural Resources."

As noted earlier, prehistoric sites tend to be located near bodies of water and atop hills. Documentary research was used to determine the likelihood that prehistoric (Native American) archaeological resources were deposited within each APE. To help ensure that no possible sites are missed, any project locations that had appropriate topographical features before development and any locations noted in historic sources as former sites of native American camps, villages, middens (refuse piles, such as shell heaps), etc., were considered potential prehistoric sites unless later activities have disturbed them.

The cartographic and documentary research was also used to reconstruct the historic development of each APE. In each area, a development history was compiled, and historic structures and landforms were noted. This information was used to determine the likelihood that archaeological resources from historic-period uses could have been deposited within each APE. Following completion of the background research, field visits were undertaken at each APE. At this time, obvious signs of disturbance were recorded and historical features were noted.

For both prehistoric and historic studies, contextual overviews were created based on the background research. These provide a framework in which to interpret potential prehistoric and historic resources and to understand the development history of each APE.

Based on information gathered from documentary and cartographic research and site visits, a preliminary evaluation of the likelihood of encountering archaeological resources was rated as low, moderate, or high for each APE**.** The results of this research are summarized below under "Existing Conditions."

DOCUMENTATION OF DISTURBANCE AND IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

In conjunction with identifying areas where known archaeological sites are located or where archaeological resources may have been deposited, documentary and cartographic research was used to identify areas where late 19th century and 20th century development activities appear to have disturbed any archaeological resources that may once have been present. Activities such as excavation, grading, landscaping, utility installation, and other similar activities that could have disturbed buried resources were documented. Where available, existing boring logs were reviewed to understand grading and filling activities that may have occurred, and topographic maps were compared to current elevations to determine what changes to the landscape have occurred through grading and/or filling. This information about disturbance was used to adjust the rating of each APE's potential to contain archaeological resources. After reviewing the disturbance record, sites were considered to have a low, moderate, or high probability of having buried archaeological resources. Sites with a high probability were those that once had topography that would have been conducive to prehistoric use, or those that once had historic-period uses that could have resulted in significant archaeological resources, at which later development activities may not have disturbed those resources. These sites therefore have the potential to contain intact archaeological resources. Such sites are referred to as potentially archaeologically "sensitive." Sites rated as moderate may have a lesser probability of prehistoric use or potential to yield significant archaeological resources from the historic period, or may have experienced some degree of disturbance. These are also considered as potentially archaeologically sensitive. The results of this research and the potentially archaeologically sensitive areas in the APEs are described below in "Existing Conditions."

ASSESSMENT OF PROJECT IMPACTS AND IDENTIFICATION OF MITIGATION

For each area that was identified as archaeologically sensitive, the project alternatives' potential for adverse effects to those possible archaeological resources were assessed. The future steps required to avoid adverse effects were then outlined. The results of these steps are described in Section C, "Probable Impacts of the No Action and Project Alternatives," and Section D, "Mitigation Measures."

B. EXISTING CONDITIONS

There are no archaeological sites listed on the S/NR located within the APEs, though the APE for Greenville Yard in New Jersey falls within an NJSR/NR-eligible historic district and the Morris Canal, listed on the NJSR and NR is located within that APE; and the former Procter and Gamble Manufacturing Co. Port Ivory Plant on the west side of Western Avenue in the Port Ivory Yard APE has been previously determined eligible for listing within the NYSR/NR. Possible archaeological sites, inventoried by the New York State Museum (NYSM) and the New Jersey State Museum (NJSM) or otherwise identified by archaeologists have been identified in the vicinity of the APEs, described below. The NYSM's and NJSM's identification of archaeological sites and their locations is based on a variety of old documents, which themselves may be unclear or contain conflicting information and, therefore, merely serve as indicators as to the potential archaeological sensitivity of the APEs.

The APEs have been assessed for their potential to contain prehistoric and historic-period archaeological resources, and the archaeological sensitivity of each APE has been rated low, moderate, or high. Areas with moderate and high ratings are considered to have the potential for archaeological sensitivity; in those locations, disturbance by project-related work could result in adverse effects. Areas with no or low sensitivity are not considered to have the potential for adverse effects. Summaries of the archaeological assessments for each APE are provided below.

NEW JERSEY

GREENVILLE YARD/POTENTIAL TUNNEL ALIGNMENT

Prehistoric and Historic-Period Overview

Greenville Yard and the potential tunnel alignment are located in a heavily industrialized region of Jersey City immediately adjacent to New York Harbor, and are bounded by shipping piers, shipping container transfer lots, manufacturing facilities warehouses, and other transportation and industrial uses.

No prehistoric archaeological sites have been recorded in the APE (see Figure 7-1). One prehistoric archaeological site is recorded in the vicinity of the APE, NJSM Site 28-Hd-3. This site, identified as containing ceramic shards dating from 700-500 AD, is located approximately 500 feet north of the APE's northern boundary.

No historic-period archaeological resources have been identified in the APE, although Greenville Yard, including its extant float bridges, has been determined by NJSHPO to be NR-eligible, and the Morris Canal, listed on the NJSR and NR, is located at the northwest corner of the APE (see Figure 7-1). As early as 1630, the Dutch had established small trading posts on the western side of Hudson, with some of the earliest settlements established in Jersey City. From its initial settlement, Jersey City and surrounding area remained relatively rural until the early 19th

century, despite the construction of a major stagecoach road in 1764. By 1830, the Morris Canal had been built, attracting industry, which continued to grow as the railroads along the waterfront expanded. Greenville Township was created in 1863, and the opening of rail lines by the Central Railroad of New Jersey along its western and northern borders in the 1870s helped stimulate growth. However, the Greenville area of Jersey City grew slowly in the late 19th and early 20th centuries because of a lack of transportation routes into downtown Jersey City.

The southern portion of Jersey City's shore remained relatively unchanged through the late 19th century. The only industrial development in the area was the construction of the Morris Canal in 1838, with rail lines first constructed in the Greenville area in the 1870s. Greenville Yard was developed in 1900 by the Pennsylvania Railroad as part of a larger expansion of freight transportation in the Port of New York. Greenville Yard was constructed on landfill, created by filling shallow tidal marsh. Rock coming from the excavation of the North River Tunnel and excavations in Manhattan for Pennsylvania Station and its related rail yards were used as landfill. Almost all the land on which the yard was built was five or six feet under water. The construction of the yard was complete by 1912. There have been no modifications to the man-made shoreline since that date.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

The majority of the APE consists of a dirt lot, with rail lines at the southern portion of the yard and along the potential tunnel alignment APE. The Greenville Yard Transfer Bridges are extant at the eastern edge of Greenville Yard on Upper New York Harbor. Over 90 percent of the Greenville Yard is located on landfill, situated east of the original shoreline. As described above, the landfill was deposited in the early 20th century for the construction of Greenville Yard. The remaining area is west of the original shoreline. The entire land portion of the APE has been thoroughly disturbed by historic and recent construction activities. Cartographic evidence suggests that various submerged locations near the shore have been the sites of episodic pier construction and removal since the construction of the yard. Because the APE is situated on either imported fill or mechanically displaced sediments, the APE has a low sensitivity for prehistoric and historic-period archaeological resources.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As described above, the APE has a very low potential for prehistoric resources. The substantial mechanical disturbance on land would have obliterated any relatively shallow archaeological resources that may have been present. There is a very low potential for the presence of any intact submerged prehistoric archaeological resources near the shore portions of the harbor. These would not only be submerged, but also deeply buried under sediments.

The APE also has a very low potential for historic-period archaeological resources. The APE was constructed on imported fill, and any archaeological resources that may be present were brought in from somewhere else, were thoroughly mechanically disturbed on-site, or were so deeply buried under the fill that they are practically inaccessible. There is no indication that any shore facilities were built within the APE prior to the construction of Greenville Yard. One historic feature, a portion of the Morris Canal (NJSR, NR), may be extant in the extreme western end of the APE, though no traces of the canal are apparent on the surface of the APE. However, due to the extensive disturbance that has occurred, this feature, if it exists, likely possesses low integrity, and the probability of finding intact remains associated with the canal that would provide new information on this well-documented feature is very low. While it is likely that the

remains of several piers that have been constructed and demolished during the 20th century may be present, they have been well-documented on maps. Because of the extensive documentation of their original forms and functions, such remains, if any, do not have the potential to yield new historical information.

Therefore, the APE has a low archaeological sensitivity for prehistoric resources. It also possesses a low historic-period sensitivity for the Morris Canal. No further investigation for archaeological resources in the Greenville Yard/Potential Tunnel Alignment APE is warranted.

ARTHUR KILL LIFT BRIDGE

Prehistoric and Historic-Period Overview

The site is located adjacent to the south of the existing Arthur Kill Lift Bridge and encompasses Arthur Kill and both its New Jersey and Staten Island shores. The APE is shown in Figure 7-2.

In Staten Island, there is one documented prehistoric site located adjacent to the APE. The "Old Place" prehistoric site occupies a large area running along the north side of Old Place Creek, just south of the Staten Island Railroad. Prior studies conducted in the area indicate that areas near the mouth of Old Place Creek may contain prehistoric sites that were not inundated and were on dry land. Inundation of these areas due to the rise in sea level suggests that Native American sites dating to the Paleo-Indian period (prior to circa 8,000 BC) may exist in the vicinity. Paleo-Indian sites have been found at other locations in Staten Island (such as Port Mobil) and demonstrate that the island was occupied during this period and suggest that such early sites could be preserved below the present sea level.

Documented historic-period archaeological resources also exist in the vicinity of the APE. The earliest settlement in the area took place on the north side of Old Place Creek around 1680. A Revolutionary War Skirmish took place in the vicinity of Old Place and casualties were buried near the site. In 1986, archaeological investigations were carried out at the Howland Hook Marine Terminal north of the APE that yielded archaeological resources, including abandoned wooden vessels in the vicinity of Port Ivory.

Further documentary research will be conducted to determine the relation of the APE to the boundaries of the archaeological sites mentioned above and the presence of additional documented prehistoric and historic-period archaeological sites within and adjacent to the APE. Until completion of these investigations, the site is considered to be sensitive for prehistoric and historic-period archaeological resources.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

The extent of disturbance in the APE is not known, although it is expected that areas to the north and south of the existing Arthur Kill Lift Bridge may have experienced extensive disturbance. Further documentary research will be conducted to determine the extent of disturbance in the APE.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As mentioned above, the APE may be sensitive for the presence of the "Old Place" prehistoric-period archaeological site, and it may be sensitive for the presence of other prehistoric-period archaeological resources along both the Staten Island and New Jersey shores of the Arthur Kill. The presence of documented historic-period archaeological resources in the vicinity of the APE

suggests that the APE is also sensitive for the presence of such resources. Further documentary research will be conducted to determine whether the APE is, in fact, sensitive for archaeological resources. Until completion of these investigations, the site is considered to be sensitive for prehistoric and historic-period archaeological resources.

STATEN ISLAND

ARLINGTON YARD

Prehistoric and Historic-Period Overview

The APE for the former Arlington Yard extends from Western Avenue on the west, South Avenue on the east, the A&A landfill to the south, Mariner's Marsh Park on the north, and includes a portion of the Travis Branch of the former B&O Railroad Company (see Figure 7-3). The project site is part of what was once a larger site that included the parcel to the south. The southern parcel contained structures associated with the yard, such as a station house and other buildings.

There are no previously recorded prehistoric or historic-period archaeological sites located within the APE. As described in the discussion for the Arthur Kill Lift Bridge, there are a number of previously recorded prehistoric and historic-period archaeological sites in the vicinity. Some of these are located within one mile of the Arlington Yard APE and include the precontact site "Old Place" and a large village and cemetery, called the Bowman's Brook site, located north of Arlington Yard near Richmond Terrace. It is possible that the Native American sites dating to the Paleo-Indian period may exist in the vicinity of the site in areas that were once dry land and are now inundated. There are also a number of previously recorded historic-period archaeological sites in the vicinity of the APE.

An 1850 map indicates that Arlington Yard, up to the mid-19th century, remained undeveloped as woodland, with the exception of a structure associated with the Van Pelt family that falls within the APE and others associated with the same surname indicated in the vicinity of the APE. An 1859 map shows that the area of Arlington Yard remained vacant land with the exception of the Van Pelt structure, with the western portion of the area shown as marshy. The Staten Island Rapid Transit Railroad was built in the 1880s and Arlington Yard was constructed at the end of the 19th century. The Travis Branch of the B&O Railroad Company was constructed in the 1950s. Other than the rail lines, the examination of historical maps shows very little development within the APE.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

The former Arlington Yard consists of unused tracks along the northern portion of the yard, with other portions occupied by large mounds of soil, some approximately 20 feet high. A large wooded area is located between the northern tracks and the Travis Branch, and there is evidence of dumping having occurred in this area. The southern portion of the Travis Branch traverses a large marsh.

Although the full extent of prior disturbance associated with the construction of Arlington Yard is not known, it is assumed that some grading was required for the construction of the yard, and it is possible that intact soils may exist beneath the rail lines. Disturbance has occurred in portions of the yard as evidenced by the large spoils piles present within the yard.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As described above, there are a large number of precontact sites located in the vicinity of the APE. A mid-19th century structure associated with the Van Pelt family was also located within the APE. Since previous surveys conducted in the vicinity of Old Place, including the 1986 survey for the Howland Hook Marine Terminal, have indicated that precontact and early historic-period archaeological resources have survived historical development in the vicinity, the APE is considered highly sensitive for precontact resources. For similar reasons, the southernmost portion of the APE containing the Travis Branch is moderately to highly sensitive for early historic-period archaeological resources associated with the Van Pelt property.

NORTHERN STATEN ISLAND

The Northern Staten Island Study Area has been divided into four segments. No construction activities, other than placing track along the existing right-of-way, would occur in Segment 2. Therefore, an APE for Segment 2 was not defined and no analysis is required.

Segment 1

Prehistoric and Historic-Period Overview. The Segment 1 APE is located along the alignment of the Staten Island Railroad from approximately Arlington Avenue to Nicholas Avenue. There are 11 bridge crossings within the study area. From west to east the bridge crossings are located at the following streets: South Avenue, Harbor Road, Union Avenue, De Hart Avenue, Van Pelt Avenue, Van Name Avenue, Simonson Avenue, Lake Avenue, Granite Avenue, Morningstar Boulevard, and John Street. In the Segment 1 APE, the rail line runs below grade in a cut section.

Numerous reported archaeological resources are located along the north shore of Staten Island. In fields located at Mariners Harbor, beginning about ½ mile south of the Mariners Harbor and running north to Bowman's Point, traces of prolonged occupation, fire-cracked stones, flint chips, potsherds and the like were found. The former location of a sandy knoll was also documented (predominantly gone by 1909) on South Avenue opposite the Arlington Station of the former Staten Island Rapid Transit Railroad (acquired by the B&O Railroad Company in 1899).

During the 19th and 20th centuries the north shore developed into several villages or neighborhoods containing residential, industrial, and maritime uses. As discussed above, the Staten Island Rapid Transit Railroad (incorporated in 1880) was constructed in the 1880s, and prior to this the area consisted of lightly developed residential areas. In 1884 the rail line is shown extending from South Avenue to Bowman's Point. Three years later, the rail line was completed, and is shown extending westward to Arthur Kill along an alignment more similar to the existing line. After the construction of the railroad, increased development took place. In 1925, the line was electrified with a third rail, and during the first half of the 20th century, grade crossings were eliminated because of the frequency of accidents at the crossing. With the advent of automobiles and bus lines, the popularity of the rail line lessened, and the last run was made on the Arlington Line in 1953. Freight service ended with the closing of the Procter and Gamble Port Ivory Plant in 1991.

A review of historic maps dating from the last quarter of the 19th century to the mid 20th century indicates the level of development along the rail line. In 1874, prior to the construction of the railroad, its approximate trajectory and crossing are indicated across lightly developed

residential areas, although several structures are shown near the alignment on Harbor Road, and Van Pelt and Simonson Avenues. In 1898, the railroad is shown as crossing through a more developed area, with many lots indicated on the map although not all are developed with structures. Stations are indicated near South Avenue, Van Pelt Avenue, and Morningstar Boulevard. In 1917, the Arlington Station near South Avenue is indicated on the south side of the tracks, and both the Mariners Harbor Station east of Van Pelt Avenue and Elm Park Station east of Morningstar Boulevard are shown with platforms on both side of the tracks. The roadway bridges at the crossings were built in 1934. By 1950, the Arlington Station is shown to be in the center of the tracks, and the Mariners Harbor Station and Elm Park Station are indicated as having platforms in the center of the tracks. Also by the mid-20th century, two additional stations—at Harbor Road and Lake Avenue—have been added. The John Street Pedestrian Bridge was built between 1937 and 1950. Between 1983 and 1984 most of the bridges were reconstructed and rehabilitated, with the exception of the ones at South Avenue, Morningstar Boulevard, and John Street.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

The conditions at the railroad clearances are of overgrown vegetation. The rail line in this area is located in a cut with the difference in grade along the tracks and the adjoining areas varying from approximately 10 to 25 feet. It appears that the rail line was cut into the landscape at the time the grade crossings were eliminated—possibly in 1934 when the railroad bridges were constructed. The remains of platforms of the former passenger stations are located near Van Pelt and Simonson Avenues, and east of Morningstar Boulevard. All the bridges have underground utilities beneath them, including sewers, water lines, and vitrified pipes.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

Although site file review indicated documented precontact resources in the immediate vicinity of the APE, the prior disturbance associated with the removal of grade crossings, likely accomplished by excavating the rail line to its current grade of 10 to 25 feet below adjacent grades; as well as the installation of utilities, eliminates the possibility that intact precontact archaeological resources are located within the railroad right-of-way at the clearance sites.

Historical maps indicate that prior to the construction of the Staten Island Rapid Transit Railroad in the 1880s, the area in the vicinity of the clearances was lightly developed. Because of the disturbance that has occurred as described above, it is unlikely that early historic-period resources associated with any map-documented structures would have survived.

While the remains of some of the former Staten Island Rapid Transit Railroad stations exist in the APE, it is unlikely that such features would provide significant or informative historical information about the operation of the Staten Island Rapid Transit Railroad that is not available through documentary sources.

Therefore, the Segment 1 APE involving the proposed clearance work, is overall not sensitive for precontact or historic-period resources and no further archaeological study is warranted.

Segment 3

Prehistoric and Historic-Period Overview. The Segment 3 APE is located along the alignment of the Staten Island Railroad and extends from Alaska Street to Davis Avenue (see Figure 7-4).

It includes the open cut and cut and cover portion of the proposed tunnel alignment and the area located within one block on either side of the tunnel alignment.

As described above in the discussion for the Arthur Kill Lift Bridge, Arlington Yard, and Segment 1 APE, there are a number of documented prehistoric resources located along the north shore of Staten Island. In the vicinity of West New Brighton, prior studies indicate finds near Upper or Pelton's Cove between Livingston and West New Brighton. Burials were encountered when the Shore Road (part of later Richmond Terrace) was cut through this area. A village site was also reported at West New Brighton. Burials, shells and artifacts, such as stone axes, were found in 1903 during construction of the parish house of the Church of the Ascension. There are also a number of documented historic-period sites in the vicinity of the APE. However, no such historic-period resources have been identified within the APE.

Maps dating from the mid-19th century to the mid-20th century show that the northeastern section of Staten Island (in the vicinity of New Brighton) was well developed by the mid-19th century with areas identified as Factoryville or Castleton and Elliotsville. An 1874 map shows Richmond Terrace and a horse car railroad on the northernmost part of the shore, along the proposed open cut and cut and cover portions of the tunnel. An 1887 map shows the Staten Island Rapid Transit Railroad running along the north shore of Staten Island, and it appears that the rail line may have run along a causeway. Several structures, including a boathouse, were indicated in the vicinity of the potential portal between the open cut and cut and cover portions of the tunnel. The 1917, 1937, and 1950 maps indicate that there was an increase in the amount of industrial development in the area of the potential open cut and cut and cover portions of the tunnel.

Documentation of Disturbance and Identification of Potential Undisturbed Resources. The open cut and cut and cover portions of the potential tunnel alignment are located in a heavily industrial area along the north shore of Staten Island roughly between Alaska Street and Davis Avenue. Examination of historical maps shows that Richmond Terrace ran along the northern shoreline and that the alignment of the railroad was built on fill north of the road and within the Kill Van Kull. By the early 20th century, the area between the railroad and Richmond Terrace had been filled. Soil borings conducted in the vicinity indicate fill to depths of 8 to 13.5 feet. Other than a sash and blind factory near Bement Avenue and a store and dwelling near Davis Avenue, little development occurred in the area between the railroad and Richmond Terrace. To the north of the railroad along the eastern half of the open cut area, however, were dry docks, piers, and buildings associated with ship yards and machine shops. The industrial use of this area continued into the mid-20th century. Near the eastern end of the cut and cover section was the Staten Island Edison Co. located in the block bounded by Davis and Bard Avenues, Richmond Terrace, and the railroad. This block was previously occupied by three buildings. The only other map-documented development in the vicinity of the cut and cover portion of the APE was the Livingston Passenger station located along the railroad just east of Bard Avenue and the Sailors Snug Harbor boat house and dock located on the Kill Van Kull near the Sailors Snug Harbor complex.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas. As described above, there are several documented precontact sites along the northern portion of Staten Island in the vicinity of the open cut and cut and cover portions of the proposed tunnel. These include reported village, cemetery, and camp sites located in the vicinity of Port Richmond and near Bement Avenue. Therefore, the shoreline areas in the vicinity of the open cut and cut and cover portions of the APE to a depth of 0 to 20 feet may be sensitive for

precontact archaeological resources that are now submerged but which would have been above sea level in precontact periods. Because of the docks, piers, and buildings associated with ship yard and machine shops and located along the eastern half of the open cut area, the open cut portion of the APE to a depth of 0 to 20 feet is considered archaeologically sensitive for deposits and structures associated with the early 20th century shipbuilding industry in this area. The cut and cover portion may contain limited archaeological deposits associated with the power station. It may also contain deposits associated with the train station. However, as described above in the discussion for the Segment 1 APE, it is unlikely that this feature would provide significant or informative historical information about the operation of the Staten Island Rapid Transit Railroad that is not available through documentary sources. Therefore, this portion of the APE also possesses historic-period archaeological sensitivity.

Subsequent to the completion of the Phase 1A Archaeological Investigation, the boundaries of the open cut and cut and cover portion of the tunnel alignment shifted west. Further Phase 1A documentary research will be conducted to determine the presence of additional documented and potential archeological resources within the modified Segment 3 APE. The additional Phase 1A investigation will also determine the modified APE's potential sensitivity for archaeological resources. The fact that most portions of the APE possess archaeological sensitivity suggests that the uninvestigated western portions may also possess archaeological sensitivity. Until completion of these investigations, the site is considered to be sensitive for prehistoric and historic-period archaeological resources.

Segment 4

Prehistoric and Historic-Period Overview. The Segment 4 APE extends east/southeast from Davis Avenue to the New York Harbor beyond the existing shoreline (see Figure 7-5). It includes the proposed bored portion of the tunnel alignment and the area located within one block on either side of the tunnel alignment.

As described above for Segments 1, 2, and 3, documented prehistoric and historic-period archaeological resources are located along the north shore of Staten Island. Within the Segment 4 APE, map-documented development includes the Livingston Passenger station located along the railroad just east of Bard Avenue and the Sailors Snug Harbor boat house and dock located on the Kill Van Kull near the Sailors Snug Harbor complex.

Maps from the mid-19th century to the mid 20th century show that the northeastern section of Staten Island (in the vicinity of New Brighton, Tompkinsville, and St. George) was well developed by the mid-19th century with areas identified as Elliotsville and New Brighton.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas. While there are documented prehistoric and historic-period archaeological sites in the vicinity of the proposed tunnel alignment, there is no potential for precontact resources to be located to the depth of the proposed bored portion of the tunnel (65 feet or more below grade). Therefore, the APE at this depth is not sensitive for precontact resources.

There is no potential for historic-period archaeological resources to be located to the depth of the proposed bored portion of the tunnel. Therefore, using this form of construction, the Segment 4 APE is not sensitive for historic-period resources.

However, the construction of the tunnel includes the construction of a ventilation shaft off the seaward end of Pier 2. This would also be the location of a shaft site during construction when a coffer dam would be built at the site. Soil borings taken within New York Harbor in the vicinity

of the tunnel indicate fill to a depth of 15 feet just west of the piers. Blocks and cobbles were found at depths of 12 to 14 feet, and may be interpreted as possibly an old sea wall structure indicating this area consists of made land in previously submerged areas. A soil boring taken near the pierhead line indicated that the depth of water extends to 24 feet. Below the water is organic silty clay with a trace of shell and vegetation at depths of 50 to 55 feet.

Over the past thousands of years, natural fluctuations in sea level have at times dramatically altered water levels in streams, rivers, and lakes, thus changing the locations of shorelines over time. This area near the present shoreline may contain precontact deposits in areas that are now submerged but which would have been above sea level in precontact periods. The potential for encountering precontact resources deeper within the harbor would depend upon the location of shorelines during early precontact times. Underwater strata may contain evidence of early human occupation along earlier shorelines.

Except for some landings and piers, the examination of historical maps shows limited development along the Staten Island shoreline in the vicinity of the tunnel during the mid-19th century. The late 19th and early to mid-20th century maps show extensive warehouses west of the piers. The historic-period archaeological sensitivity of the northeast shore of Staten Island in the area of the potential tunnel alignment is limited to the potential presence of waterfront related features such as piers, bulkheads and seawalls (see soil boring discussed above that shows the possible presence of an old sea wall structure). Overall, the site of the ventilation shaft is potentially sensitive for prehistoric and historic-period archaeological resources.

BROOKLYN

65TH STREET YARD

Prehistoric and Historic-Period Overview

65th Street Yard is located at a lower elevation than the rest of the surrounding topography, with the elevation of the eastern end of the yard approximately 25 feet lower than that of the original topography of the existing ridge.

There are no previously recorded prehistoric or historic-period sites located within 65th Street Yard. Four previously recorded prehistoric archaeological sites and five historic-period archaeological sites have been identified within 5 miles of 65th Street Yard. The closest prehistoric site, NYSM site #3606, is located approximately 1,900 feet north of 65th Street Yard, along Flatbush Avenue north of Prospect Park. This site is identified as a Native American village or camp that was reportedly excavated in 1826. The closest recorded historic-period sites are located within the Fort Hamilton Military Reservation, located approximately 1,150 feet south of 65th Street Yard. These consist of OPRHP Site A04701.000423 (Building 117 Site), a mid-19th century homelot, and OPRHP Site A04701.00424 (Parade Ground Site), a late 19th to early 20th century domestic site.

Research indicates that sea levels were once considerably lower than at present. It is therefore possible that large tracts of the continental shelf were once exposed as dry land, and that it is possible that prehistoric archaeological sites may be located in offshore (presently underwater) areas adjacent to 65th Street Yard. However, the channels along the Brooklyn waterfront have been subject to repeated dredging and maintenance during the 19th and 20th centuries, and construction of piers and bulkheads along the waterfront also frequently involved dredging and deposition of large quantities of landfill. Due to the expected extent of disturbance associated

with these actions, it is unlikely that any undisturbed prehistoric archaeological resources are present under the bulkheads or immediate off-shore areas of 65th Street Yard.

In 1872, the New York & Hempstead Railroad Company purchased a 110-acre farm, including 1,100 feet of shoreline at 65th Street. Work to construct a depot yard on the waterfront and excavation of a rail cut through Bay Ridge began immediately. The original depot was laid out on a five-acre parcel of land, and in 1873, work began on a deepwater dock. That next year, the New York & Hempstead Railroad Company went bankrupt, and under the management of the New York, Jamaica, and Manhattan Beach Railroad, work resumed on 65th Street Yard in 1876. Spoils removed by the continued excavation of the Bay Ridge rail line cut were used to fill and grade the waterfront for the proposed rail yard. Between 1876 and 1877, a number of structures were built within the yard, including a ferry house and depot; in 1882, the newly constructed rail depot was destroyed by fire. The yard was rebuilt and augmented with new structures between 1883 and 1887, although maps from this period do not depict the placement of the buildings within the yard. Filling episodes continued extending the shoreline eastward and by 1890, the depot yard and its associated docks extended 1,000 feet from the original shoreline.

65th Street Yard was expanded in the 1890s to its present size, including additional filling episodes. The Brooklyn Grade Crossing Elimination Project in the 1900s and 1910s allowed the Long Island Rail Road to develop and increase its dock and yard facilities, which included the closing of 64th and 65th Streets between Second Avenue and Upper New York Bay. The improvements to 65th Street Yard provided for increased freight handling facilities and qualified the Bay Ridge route as a through freight line in connection with the New York Connecting Railroad. During the 1910s, new construction at 65th Street Yard included a carfloat terminal as a principal component of the New York Connecting Railroad, four suspended-type transfer bridges, a 500-foot long pile fender tack for carfloat tie-up, and an expanded wooden deck pier to accommodate new tracks for storing and switching freight cars.

Presently, 65th Street Yard contains a new float bridge for transferring cars and/or freight from barges located at the west end of the tracks along the shore. Partially remaining submerged elements of the late 19th and 20th century piers, wharves, and freight loading facilities are present. However, a 1985 cultural resource evaluation of these elements concluded that these features are not historically significant due to their deteriorated condition as well as comparison with better-preserved and documented examples of similar facilities at other locations.

NYCLPC previously identified 65th Street Yard as an archaeologically sensitive area for late 19th century transportation-related or industrial sites. These could include historical archaeological deposits associated with the original 1870s depot structures and subsequent 1880s rebuilding campaign at the Yard, including architectural foundations, rail segments, and other archaeological features associated with these two phases of rail yard construction, which may be present within the fill that underlays the yard. However, in comments dated September 25, 2003, NYCLPC indicated that they no longer consider 65th Street Yard to be sensitive for these resources. On November 3, 2003, NYSHPO concurred with NYCLPC's determination.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

The site is presently covered by a modern surface cover or crushed stone and by railroad tracks. Soil borings indicate that 65th Street Yard is underlaid by a fill layer of up to 6 to 8 feet in depth.

Any potential prehistoric resources that may be present at 65th Street Yard would be located in the upper portions of the natural soils directly below the artificial fill deposits that range from 6 to 8 feet in depth and cover the entire surface of the yard. Due to the extensive disturbance

caused by the repeated episodes of yard construction and reconfiguration, it is unlikely that any undisturbed prehistoric resources are present beneath this fill at 65th Street Yard. In addition, dredging episodes associated with the maintenance of the shipping channels and construction of the rail docks would have disturbed any potential prehistoric resources that may have been present in the presently submerged areas along the waterfront, in areas that may have once been inhabited or utilized by Native Americans when sea levels were lower and the land was exposed and dry.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As described above, 65th Street Yard and its waterfront are not sensitive for undisturbed prehistoric resources as a result of the extensive disturbance that has occurred in these areas.

As described above, NYSHPO and NYCLPC determined that 65th Street Yard is not sensitive for historic-period artifacts. Therefore, the APE overall does not possess archaeological sensitivity.

BAY RIDGE BRANCH

The Bay Ridge Branch APE has been divided into four segments.

Segments 1 and 2

The Segment 1 APE consists of the bored portions of the New Jersey and Staten Island tunnel alignments from the Brooklyn waterfront to between 8th and 9th Avenues, to a depth of 65 feet or more; the potential tunnel ventilation shaft locations either within 65th Street Yard or at the seaward end of the 69th Street pier; and the below-grade Bay Ridge Branch right-of-way from 2nd Avenue to between 8th and 9th Avenues (see Figure 7-6). The Segment 2 APE is located along the Bay Ridge Branch right-of-way from between 8th and 9th Avenues to between 12th and 13th Avenues where the potential tunnel alignment would meet grade. It includes the open cut and cut and cover portions of the potential tunnel alignment.

Prehistoric and Historic-Period Overview. There are no previously recorded prehistoric or historic-period sites located within the APE for the proposed Segment 1 or Segment 2 of the Bay Ridge Branch. As described in the above discussion for 65th Street Yard, the closest documented prehistoric and historic-period sites are located approximately 1,150 and 1,900 feet, respectively, from the Bay Ridge Branch and the potential tunnel alignments.

The Bay Ridge Branch is an 11½-mile single-track freight line that runs from 65th Street Yard on the Brooklyn waterfront to Fresh Pond Yard in Queens. As described above in the discussion for 65th Street Yard, construction of the Bay Ridge Branch commenced in concert with that of 65th Street Yard in the late 19th century. Part of the present Bay Ridge Branch is formed by the New York, Brooklyn and Manhattan Beach Rail Road line, which was built in 1876 and at one time also included Greenpoint, Manhattan Beach, and Kings County Central divisions. By the end of that year, the Bay Ridge Branch was completed as far as New Utrecht Avenue and 62nd Street, where it connected to the Brooklyn, Bath and Coney Island Railroad (now the B train). The Bay Ridge Branch was later extended west to New Lots Road, where it connected to the New York and Manhattan Beach's rail lines that ran from Green Point to Sheepshead Bay and Manhattan Beach. In 1883, LIRR constructed the Long Island City and Manhattan Beach Railroad from Fresh Pond Junction to Cooper Street, where it connected with the existing Manhattan Beach lines. During this period of construction the rail lines of the entire Manhattan

Beach system were also widened to standard gauge and connected to the LIRR's Atlantic Avenue and Montauk Branches. The three Manhattan Beach lines were consolidated in 1885 into the New York, Brooklyn, and Manhattan Beach Rail Road and leased to the LIRR.

The suburban development of Brooklyn and industrialization of its waterfront was accelerated in the late 19th century by the construction of railroad and subway lines through the area. The Brooklyn Grade Elimination Project—which created grade separations on the Bay Ridge Branch, the Manhattan Beach line of the LIRR, and the Brooklyn Rapid Transit Corporation (BRT)'s Brighton Beach line—was completed in 1918. This project included the depression or elevation of the railroad tracks along various parts of the right-of-way.

Documentation of Disturbance and Identification of Potential Undisturbed Resources. Since the bored tunnel portions of Segment 1 would occur at least 65 feet below grade, there is no potential for prehistoric and/or historic-period archaeological resources to be located at this depth. The Segment 1 APE and the Segment 2 APE for the Bay Ridge Branch follow existing rail lines that were constructed within a deep cut originally excavated in the 1870s. Up to 30 feet of soil was removed in the original excavation of the cut through Bay Ridge. Additional disturbances in the APEs occurred during the construction of the Sea Beach rail lines. The Bay Ridge Branch was further depressed during the circa 1903-1918 Brooklyn Grade Crossing Elimination Project. As discussed above, extensive disturbance caused by construction and reconfiguration of 65th Street Yard would have disturbed any potential prehistoric resources that may have been present beneath the fill at the tunnel ventilation shaft site located within 65th Street Yard. In addition, dredging episodes associated with the maintenance of the shipping channels and construction of the 69th Street pier would have disturbed any prehistoric resources that may have been present in the area of the 69th Street pier tunnel ventilation shaft site, which may have once been inhabited by Native Americans when sea levels were lower and the land was exposed and dry. The degree of previous disturbance within the APEs precludes the possibility that prehistoric archaeological resources exist within the Segment 1 and Segment 2 APEs.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas. As described above, there is no potential for prehistoric or historic-period resources to be located in the Segment 1 APE at a depth of 65 feet or more. There is potential for historic-period archaeological resources to be located at the site of the 65th Street Yard tunnel ventilation shaft, but there is no potential for archaeological resources to be located at the site of the 69th Street pier tunnel ventilation shaft. The Bay Ridge Branch in Segment 1 and Segment 2 has been reconfigured and expanded numerous times since its original construction in the 1870s. It is possible that remnants of earlier rail lines, or archaeological features associated with these lines, may be present within the fill that underlies the current tracks. However, the various reconfigurations and phases of construction for each of these rail lines has been extensively documented in historic and cartographic sources. Therefore, it is unlikely that any remains of the earlier rail lines, if extant, would provide significant historical information concerning these rail lines that is not otherwise available in historical or cartographic sources.

Overall, the 65th Street Yard tunnel ventilation shaft site is sensitive for historic-period archaeological resources, but the majority of the Segment 1 APE and the entirety of the Segment 2 APE are neither sensitive for prehistoric nor historic-period archaeological resources.

Segments 3 and 4

The Segment 3 APE is located along the Bay Ridge Branch right-of-way from approximately 12th Avenue to Albany Avenue. This portion of the rail line is below grade in a cut; however, the rail line becomes at grade just east of Albany Avenue. The Segment 4 APE is located along the Bay Ridge Branch right-of-way from Albany Avenue to the Brooklyn-Queens border. This portion of the rail line is both below grade in a cut and elevated on embankments and viaducts.

Prehistoric and Historic-Period Overview. There are a number of previously recorded prehistoric archaeological sites within a 2 mile area of the proposed area of work. These include (from west to east): a cache of stone and flint blades approximately 1.5 miles southwest, and a shell middens approximately 1.15 miles south of the rail line between 2nd and 6th Avenues; a shell middens within Prospect Park, approximately 2 miles north of the rail line between East 14th Street and Ocean Avenue; Woodland or Contact Period burials and shell middens approximately 1.5 to 2 miles south/southeast, and large shell heaps approximately 2 miles east of the Glenwood Road viaduct; and a village site and a shell middens approximately 1.5 miles southeast, and a camp approximately 2 miles south/southeast of the Livonia Avenue clearance.

There are also a number of previously recorded historic-period archaeological sites within a 2 mile area of the proposed work. These include the historic-period sites on the Fort Hamilton Military Reservation approximately 2 miles south of the rail line between 2nd and 6th Avenues. Archaeological deposits are also known to exist in association with the standing structure at the Pieter Claesen Wyckoff House Site (NHL, NYCL), located approximately 1 mile northeast of the Glenwood Road viaduct. Finally, the Van Wicklen Cottage and Mill Site, the King's Bayview House Site, and the Schneck House Site are all located within the Gateway National Recreation area, approximately 1.5 to 2 miles southeast of the Glenwood Road viaduct.

Documentation of Disturbance and Identification of Potential Undisturbed Resources. The original construction of the Bay Ridge Branch in the Bay Ridge area of Brooklyn required excavations to an average depth of approximately 30 feet (up to 43 feet at 5th Avenue). The rail line in this area was depressed an additional 4 feet to over 8 feet in the 1900s and 1910s during the Brooklyn Grade Elimination Project. Currently, the rail line in this area runs through an open cut that varies in depth from approximately at grade at Albany Avenue to over 40 feet below current grade.

The original construction of the Bay Ridge Branch in the Borough Park area required excavations to depths of up to 30 feet between 7th Avenue and Fort Hamilton Avenue. East of Fort Hamilton Avenue, the railroad originally ran at street grade. The entire Borough Park portion of the Bay Ridge Branch was depressed at least 16 feet at all crossing locations in the 1900s during the Brooklyn Grade Elimination Project. At present, the rail line in this area runs through an open cut that varies in depth from approximately 15 feet to 20 feet below current grade.

In the Flatbush area, the Bay Ridge Branch originally ran at street grade. The Bay Ridge Branch was depressed in this area in the 1900s during the Brooklyn Grade Elimination Project to a point just east of Albany Avenue. The rail line rose to grade and was elevated on a raised embankment as it continued further east of this point. At present, the rail line in Flatbush west of Albany Avenue runs through an open cut that varies in depth from approximately 15 feet to 20 feet below current grade.

In the Brownsville area, the Bay Ridge Branch originally ran at street grade. The Brooklyn Grade Elimination project in the 1900s included the construction and enlargement of freight

yards in East New York, depression of the rail line between a point south of Livonia Avenue and the entrance to the East New York Tunnel, construction of the East New York Tunnel north of Liberty Avenue, and elevation of the rail line from around Glenwood Road toward New Lots Avenue. At present, the open cut between approximately south of Livonia Avenue and the East New York Tunnel has a depth of around 25 feet below current grade.

The documented extent of disturbance along the Bay Ridge Branch in Brooklyn makes it highly unlikely that undisturbed archaeological deposits may be present in the vicinity of railroad clearances in this area.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas. As described above, the extent of previous disturbance associated with the original construction and/or depression of the Bay Ridge Branch during the Brooklyn Grade Elimination Project makes it highly unlikely that undisturbed prehistoric and historic-period archaeological deposits are located within the railroad right-of-way. Therefore, the Segment 3 and Segment 4 APEs are not considered sensitive for archaeological resources.

QUEENS

FRESH POND YARD

Prehistoric and Historic-Period Overview

An archaeological evaluation of Fresh Pond Yard was prepared for a previous project and is summarized below. NYSHPO concurred with the findings in comments dated January 12, 2000 and November 17, 2000.

Fresh Pond Yard is located at the junction of the Montauk Branch of the LIRR, the Bay Ridge Branch of the LIRR, and the Fremont Secondary Line. The yard is divided into two smaller yard areas—East Yard and West Yard. Until the 20th century, prior to historic development on the site, the area of Fresh Pond Yard appears to have been relatively level and wooded. Historic maps indicate that the area was once swampy and dotted with fresh water ponds, but the yard site itself was dry and included a knoll that could have been attractive to Native Americans. In 1930, elevations at the yard site varied between 85 and 100 feet above sea level, cresting at the northeastern section of the yard. Therefore, the yard's prehistoric topographical features and its proximity to a fresh water source could have made it possible that the site was utilized by Native Americans in some capacity

Through the 19th century, the yard encompassed the back acreage of large farms that bordered Fresh Pond Road, one of the early transportation routes in this part of Queens. The farm structures, which typically included the farmhouse, barn, privy, and other outbuildings, fronted onto Fresh Pond Road, far from the yard. Mid-19th century maps show that the area of the yard was undeveloped woodland. Since it is unlikely that any significant features relating to the agricultural/domestic history of the site would have been located so far from the active farm compounds, the yard has no potential resources relating to these homesteads.

Starting in the late 19th century, the area of the yard was used exclusively by the railroad. Railroad-related resources indicated on historic maps, including tracks, switching and signaling boxes, and towers, are not considered to have archaeological importance since they would have been upgraded and their mechanisms removed as technology advanced. Therefore, the yard is not sensitive for railroad-related, historic-period archaeological resources.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

Borings taken at Fresh Pond Yard in May and June 2000 indicate that fill extends to at least 4 to 12 feet below the surface. The borings further indicate that there is no evidence of potentially habitable prehistoric living surfaces present at the site. Therefore, Fresh Pond Yard does not possess sensitivity for prehistoric archaeological resources that would be worthy of inclusion on the NR.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As described above, soil borings taken at the site indicate that the site is not sensitive for prehistoric resources. It is also not sensitive for historic-period resources. Overall, the APE has no archaeological sensitivity.

MONTAUK BRANCH

The Montauk Branch APE is located along the Montauk Branch right-of-way from Metropolitan Avenue at the boundary of Fresh Pond Yard to the Welbilt Stove overbuild near Flushing Avenue, the area where excavation would be needed to increase clearance heights. No assessment was performed for the remainder of the Montauk Branch because no construction activities other than the placement of tracks along the existing right-of-way would occur in this area.

Prehistoric and Historic-Period Overview

The Montauk Branch APE is located in an area of high sensitivity for prehistoric and Contact Period Native American archaeological resources. Five previously recorded Native American sites are located in the vicinity, including two Contact Period (and possibly earlier) village and shell midden sites located less than ½-mile from Andrews Avenue/59th Place (one to the east-southeast and one to the northeast). There is also a Contact Period village site at the head of Newtown Creek, immediately west of Mt. Olivet Cemetery; an Archaic and Woodland Period site located north of the LIRR tracks along 59th Street, near the head of Maspeth Creek; and another site in approximately the same vicinity. In addition, the S/NR-listed Vander-Ende-Onderdonk House Site is located ¾ miles southwest of the Montauk Branch in Maspeth. The site consists of buried structural-foundation remains and archaeological deposits. However, there are no previously recorded historic archaeological sites in the immediate vicinity of the project site.

Maspeth was the site of the first English colony in Queens County, established in 1642. The colony was settled at the head of Newtown Creek, the traditional territory of the Mespat Indians. English migrants from Brooklyn and Long Island City settled the Maspeth area in the 18th century. Residential and industrial development of Maspeth began in earnest in the middle 19th century; in 1852 Mt. Olivet Cemetery was opened, and real estate developers purchased two large farms and subdivided them into streets and lots, laying out a residential community from 59th Place to 69th Street, and from 55th Drive to Grand Avenue. After the Civil War, industrial development, in the form of fertilizer works, lumber yards, linoleum factories, and rope walks occurred, and the largely English Quaker population began to be replaced by German im-migrants.

The Montauk Branch of the LIRR began as a competitor to the growing late 19th century monopoly of the LIRR over passenger traffic from New York to Long Island. During the mid-19th century, the LIRR considered plans to extend train lines to the South Shore of Long Island

to provide service to South Shore residents located as far as 3 to 4 miles from LIRR stations. None of the plans were realized, resulting in the chartering of a new railroad company, the South Side Railroad Company of Long Island in 1860, which commenced construction of a new rail line running east from Jamaica in 1867.

The LIRR provided passenger service on the western end of the Montauk Branch from 1883 to 1924. Historical sources indicated that a number of passenger stations were previously located along the Montauk Branch in the Maspeth area, including the Penny Bridge Station at Laurel Hill Boulevard; the Haberman Station on 50th Street, which opened in 1892; and the Maspeth Station on 58th Avenue and Creek Street, which opened as a Rapid Transit stop in 1895. The Maspeth Station building was demolished in 1924. The LIRR also reportedly built a wooden frame depot at Bushwick Junction, probably located at Andrews Avenue and 59th Street, in 1886. In 1895 a new railroad station was built on Metropolitan Avenue and the name of the stop changed to Fresh Pond. The new building was demolished during grade elimination work in 1915. However, mid-19th century atlases of Queens do not depict any such structures, and, therefore, their original placement in relation to the proposed clearance work is unknown. While it is possible that foundations of previously existing structures may be present along the Montauk Branch right-of-way, and perhaps within the APE, these remains, if extant, would not be expected to yield significant or informative historical information about the operation of the LIRR that is not available in documentary sources, and therefore, the APE would be considered to have a low archaeological sensitivity.

Documentation of Disturbance and Identification of Potential Undisturbed Resources

Within the project area, the Montauk Branch runs in an open cut that is depressed between 15-feet and 25-feet below grade. The extent of previous disturbance associated with the construction and/or depression of this open cut makes it highly unlikely that undisturbed prehistoric archaeological deposits are located within the Montauk Branch APE.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As described above, the extent of previous disturbance associated with the construction and/or depression of the Montauk Branch open cut makes it highly unlikely that undisturbed prehistoric archaeological deposits are located within the railroad right-of-way. Therefore, the site is not considered sensitive for prehistoric resources.

While it is possible that structural remains, foundations, or other features associated with the former passenger stations and related facilities may be located in the APE, these features, if extant, possess a low potential of yielding significant historical information about the operation of the LIRR that is not available in documentary sources. Therefore, the APE overall is not sensitive for prehistoric or historic-period archaeological resources.

WEST MASPETH YARD

Prehistoric and Historic-Period Overview

The size of the West Maspeth Yard site would vary depending on the alternative. Following is a discussion of existing conditions at the largest potential site. Under the Double Tunnel System, West Maspeth Yard would occupy an approximately 150-acre area of land (roughly bounded by Newtown Creek on the west, 56th Road on the north, Rust Street and Grand Avenue on the east,

and a line south of Maspeth Avenue on the south) and 8 to 9 acres of Maspeth and Newtown Creeks under the Double Tunnel System. The APE is shown on Figure 7-7.

There is at least one previously recorded prehistoric-period archaeological site located within West Maspeth Yard APE. Several sites indicated in various sources may refer to the same site. Located south of the LIRR tracks, north of Maspeth Avenue and east of 49th Street, NYCLPC Site #13, which is described as a Woodland and Contact Period habitation site, may be the same site as NYSM Site #9447 that is described as a Woodland or Contact Period village with shell middens. In the 1930s, Archaic and Woodland Period archaeological finds were discovered within the APE on elevated landforms near the confluence of Maspeth and Newtown Creeks. In addition, several previously recorded prehistoric-period archaeological sites are documented in the immediate vicinity of the APE. These include NYSM Site #4536, a village site located at the head of Newtown Creek southeast of the APE, and NYCLPC Site #69, an Archaic or Woodland Period site located east of 59th Street and north of Maspeth Avenue. The closest recorded historic period site is located approximately 3,000 feet south of the APE on Flushing Avenue. OPRHP Site A081.01.0108, the Wyckoff Onderdonk House and site (S/NR), was the site of a house built around 1660 where deposits associated with various occupational periods have been found.

Through the 19th century, the West Maspeth Yard APE was sparsely settled. The earliest historic-period settlements in the area were European farmsteads established in the 1640s and 1650s. Until the mid-19th century the area remained largely rural. 19th-century residences located within the APE include the mansion of Judge Garritt Furman built around 1819 and located on Maspeth Avenue south of the head of Maspeth Creek, and the mansion of Judge William Maurice, built around 1841 on the south side of Maspeth Avenue to the west of the Furman house. Both residences were occupied until the 1880s. Another early residence is the 18th-century Way-Mott farmhouse and small family cemetery that were located on the Furman property. The Way-Mott house was demolished in 1928. Records indicate that in 1950, 13 graves were disinterred from the cemetery and relocated to Prospect Park Cemetery in Brooklyn. It is unclear whether other unmarked graves were present in the cemetery.

Initiated by the construction of Maspeth Avenue and a toll bridge over Newtown Creek in 1836, industrial development transformed the area after the Civil War. Pre-Civil War industrial and commercial sites include the Maspeth Avenue Toll House (1836-1866) located south of the APE on Maspeth Avenue; the Myer Bone Works and fertilizer factory (1852-1909) located on Furman's Island, which was bounded on the north by Maspeth Creek, on the west by Newtown Creek, and on the east by Shanty Creek and which disappeared by 1929 due to silting; and William Furman's "Shanty Creek Trout Pond" (1860-1885) a man-made hatchery that was located within the APE to the south of Maspeth Avenue. Heavy industrial development and significant landfilling of Newtown and Maspeth Creeks began in 1861 with the construction of the Laurel Hill Chemical Works (later the Nichols Copper Works) Newtown Creek north of Maspeth Creek, and continued through the 1940s.

In 1920 the Phelps Dodge Refining Company bought the copper works and began an expansion of the facilities and of the shoreline. When operations ceased in 1983, the Phelps Dodge site was bounded by 56th Road and the Montauk Branch to the north, a warehouse to the east, vacant land to the west, and Maspeth and Newtown Creeks to the south. After the buildings were demolished in 1992, NYSHPO determined that the site no longer met NR-eligibility criteria. Since there are no longer any standing structures on the site (although there may be portions of foundations remaining), it is not likely that the site has the potential to yield new information in

the history of copper refining. Therefore, the demolition of the copper refinery structures has negated the potential for the site to possess sensitivity for industrial archaeological resources, and the site no longer possesses historic-period archaeological sensitivity.

In addition, according to the National Ocean and Atmospheric Administration (NOAA) Coast Survey Map, Chart No. 12338 Newtown Creek, East River, there are two areas potentially sensitive for shipwrecks in Maspeth Creek. These are an area of multiple wreckage near the end of Maspeth Creek and a single wreck site toward Newtown Creek (see Figure 7-7). Research through The Office of Coast Survey, an office within NOAA, revealed that the area of wreckage appears on navigation charts as early as 1950, but the single wreck site does not appear earlier than the 1990 NOAA Chart. No additional information concerning these wreck sites has been obtained. In addition, it is also possible that other uncharted wrecks may be located in Maspeth Creek.

Documentation of Disturbance

The site is currently occupied by active commercial and light industrial uses, paved streets, and active LIRR rail lines that are located on the site's west and north boundaries and that follows the 1870s South Side Railroad right-of-way. The former Phelps Dodge site is capped by gravel and concrete and is surrounded by chain link fencing. Small portions of vacant land associated with some of the commercial facilities are found throughout the site. A comparison of existing conditions with late 19th and early 20th century topographical maps, combined with geo-technical boring data from previous cultural resources assessments, indicate that landfill (typically between 10 and 27 feet deep) underlies the existing ground surface over the entire APE, though a previous archaeological study indicates that some areas immediately adjacent to Maspeth Avenue may contain as little as two feet of fill. These areas encompass the former locations of the 18th century Way-Mott farmhouse and associated 19th century cemetery and the 19th century Furman Mansion. Although previous cultural resource assessments of selected lots within the APE concluded that disturbance from 20th century construction and landfilling activities make it unlikely that undisturbed prehistoric-period resources are located within the site, it is possible that prehistoric and historic-period archaeological resources may be located beneath the fill. In addition, it is not possible, given existing information, to determine the extent to which disturbance from 20th century landfill and construction activities have disturbed or destroyed potential archaeological resources.

Identification of the Possibility of Archaeological Resources Being Present in Undisturbed Areas

As described above, archaeological resources may be present beneath the fill (that typically covers the site to a depth of between 10 and 27 feet, though some areas adjacent to Maspeth Avenue may contain less than two feet of fill) and the entire site is, therefore, considered sensitive for archaeological resources. These include potential prehistoric resources, the 18th century Way-Mott farmhouse and its associated 19th century cemetery, 19th century residences including the Furman and Maurice mansions, the commercial and industrial resources. In addition, since no detailed information concerning potential sites of wreckage has yet been found, Maspeth Creek is also considered to be potentially sensitive for maritime archaeological resources.

UPPER NEW YORK HARBOR

To determine preliminarily the potential for shipwrecks to be located within and adjacent to the proposed tunnel alignments in Upper New York Harbor, cartographic research was undertaken using NOAA Coast Survey Maps. Chart No. 12334—New York Harbor, Upper Bay and Narrows—was used in conjunction with the *Nautical Chart User's Manual* published in 1997 by the U.S. Department of Commerce. In addition, information was obtained from the National Ocean Service's Automated Wreck and Obstruction Information System (AWOIS).

Research indicates that there are no known shipwrecks located in the middle of the harbor or along the Brooklyn waterfront in the vicinity of the potential tunnel alignments. According to Chart No. 12334, there is a shipwreck located off the Staten Island shoreline north of the potential tunnel alignment—roughly southeast of the Staten Island Ferry Terminal—in approximately 37 to 41 feet of water. The position of this wreck is approximate. Off the New Jersey shoreline, there are three areas that are potentially sensitive for shipwrecks in the vicinity of the tunnel alignment. To the northeast of Greenville Yard, close to the shoreline within 4 to 10 feet of water, there is an area of wreckage—areas of numerous or scattered wrecks—and a single shipwreck. Further from the shoreline, an area of wreckage is located in 7 to 12 feet of water. North of the potential tunnel alignment adjacent to Caven Point, there are several more single wrecks and areas of wreckage. These approximate locations are considered to be sensitive for archaeological resources (see Figure 7-8). In addition, it is also possible that other uncharted wrecks may be located in the vicinity of the tunnel alignments.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

Under the No Action Alternative, on the Staten Island project sites, Arlington Yard will be redeveloped into an intermodal facility and the Staten Island Railroad will be reactivated between the Arthur Kill Lift Bridge and Arlington Yard as part of the New York City Economic Development Corporation's Staten Island Railroad Reactivation project. On the Brooklyn project sites, there may be an expansion of Flatbush Terminal by extending the IRT subway line 1,200 feet alongside the Bay Ridge Branch.

Construction and excavation activities related to the No Action Alternative are not part of the Cross Harbor Freight Movement Project. These developments may disturb potential prehistoric and historic-period archaeological resources on certain project sites.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNAITVE

NEW JERSEY

Greenville Yard

Two of the existing Greenville float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new trackwork. The construction would require subsurface excavation. In any case, Greenville Yard was determined to possess low sensitivity for potential prehistoric archaeological resources and a low sensitivity for the presence of the NJSR and NR-listed Morris Canal.

However, as described above, NOAA maps and AWOIS indicate that there are three areas (of approximate locations) that are potentially sensitive for shipwrecks in the harbor off Greenville Yard. It is also possible that other uncharted wreck(s) may be located in this area. Therefore, if the float bridge rehabilitation and possible associated dredging work were to extend into the harbor, the TSM Alternative may adversely affect resources associated with potential shipwreck sites.

NEW YORK

Under the TSM Alternative, there would be minor construction activity at the affected New York project sites. This activity would primarily include trackwork associated with rehabilitating 65th Street Yard; and minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch. These activities would only involve minimal disturbance and the Bay Ridge Branch and Montauk Branch have been determined not sensitive for archaeological resources.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

NEW JERSEY

Greenville Yard

Four Greenville Yard float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new trackwork, and construction would require subsurface excavation. In any case, Greenville Yard was determined to possess low sensitivity for potential prehistoric archaeological resources and a low sensitivity for the presence of the NJSR and NR-listed Morris Canal.

However, as described above, NOAA maps and AWOIS indicate that there are three areas (of approximate locations) that are potentially sensitive for shipwrecks in the harbor off Greenville Yard. It is also possible that other uncharted wreck(s) may be located in this area. Therefore, if the float bridge rehabilitation and possible associated dredging work were to extend into the harbor, the Expanded Float Operations Alternative may adversely affect resources associated with potential shipwreck sites.

NEW YORK

Under the Expanded Float Operations Alternative, there would be minor construction activity at the affected New York project sites similar to that of the TSM Alternative. This activity would primarily include trackwork associated with minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch; and the construction of a new rail yard in West Maspeth, Queens at the Phelps Dodge and existing West Maspeth Yard sites. These activities would only involve minimal disturbance and the Bay Ridge Branch and Montauk Branch have been determined not sensitive for archaeological resources.

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

New Jersey

In New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur Kill Lift Bridge and additional sidings along the Chemical Coast Line. Either alignment would require the construction of the second Waverly Loop, however, this would require only shallow excavation.

Greenville Yard/Potential Tunnel Alignment. The New Jersey tunnel alignment would be constructed through the Greenville Yard APE. From an area just east of the New Jersey Turnpike Extension, tunnel construction would begin as an open cut adjacent to the Greenville Branch. When a depth of 35 feet below existing grade is reached just west of Greenville Yard (the tunnel portal), the tunnel would be constructed using cut and cover construction through Greenville Yard to the shoreline at a depth of 65 feet where it would be connected to the immersed tube section. The tunnel alignment would require substantial excavation. Between the shoreline and a point near the end of Global Marine Terminal/NEAT Pier, the tunnel would be constructed with an immersed tube method. A tunnel ventilation shaft would be constructed off the end of Global Marine Terminal/NEAT Pier.

The tunnel entrance would be located adjacent to the right-of-way location of the NJSR and NR-listed Morris Canal. Although the canal, if it exists, most likely possesses low integrity, this alternative may have an adverse affect on the resource. Once an alternative is selected, and the specific area of effect is defined, further archaeological investigations and/or potential mitigation measures would be developed in consultation with the New Jersey SHPO (see "Mitigation Measures" below).

Three areas charted as potentially containing shipwrecks are located off Greenville Yard in the vicinity of the New Jersey tunnel alignment. Depending on the exact location of the potential shipwreck sites, the immersed tube tunnel portion of the New Jersey tunnel alignment could adversely affect these potential resources. In addition, it is also possible that uncharted wreck(s) may be located in this area. Therefore, once an alternative is selected and more fully designed, and the specific area of effect is defined, additional investigations would be undertaken in consultation with the New Jersey and New York SHPOs. These may involve further cartographic research and/or remote testing to determine if shipwrecks are in fact present, as well as further study of any resources identified to in fact be present to determine their potential eligibility for listing on the National Register. Where this future work confirms the presence of significant archaeological resources (i.e., resources that are eligible for listing on the NR) in locations that would be adversely affected by the proposed project, mitigation measures will be developed and implemented as part of the Section 106 process (see "Mitigation Measures" below).

Arthur Kill Lift Bridge. A second span would be constructed adjacent to the south side of the existing Arthur Kill Lift Bridge. The new span would be identical to the existing span. A viaduct would connect the new span to the Chemical Coast Line. The construction would involve extensive subsurface excavation for the bridge foundations. Since the Arthur Kill Lift Bridge APE is considered sensitive for prehistoric and historic-period archaeological resources, this alternative may have an adverse effect on archaeological resources.

New York

Staten Island.

Arthur Kill Lift Bridge. As discussed above, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track. Since the Arthur Kill Lift Bridge APE is considered sensitive for prehistoric and historic-period archaeological resources, this alternative may have an adverse effect on archaeological resources.

Arlington Yard. Two new mainline tracks would be added at Arlington Yard for the additional trains that would pass through the yard. This trackwork would not result in the excavation of large amounts of potentially contaminated soil. It is expected that the tracks would be laid on the existing gravel base and there would be no subsurface excavation within the right-of way. There would, therefore, be no adverse effects to potential prehistoric-period archaeological resources. However, if excavation were to occur below the existing gravel base, this alternative could potentially have an adverse affect on archaeological resources.

Northern Staten Island—Segment 1. The Staten Island Railroad would be rehabilitated between Arlington Yard and the tunnel entrance at Alaska Street. Two mainline tracks would be constructed. In addition, clearances heights would be increased at 11 sites along the line between South Avenue and John Street. Increased heights at all clearances with the exception of the John Street Pedestrian Bridge, would be obtained by underpinning work at individual clearances and the excavation of a trench along the length of the right-of-way. At the John Street Pedestrian Bridge, the superstructure would be raised to increase the clearance height, requiring minimal subsurface excavation.

Although this work would involve subsurface excavation, the Segment 1 APE has been determined not sensitive for prehistoric and historic-period archaeological resources. Therefore, no effects to archaeological resources are expected.

Northern Staten Island—Segment 3. The landside portion of the tunnel alignment in Staten Island would begin along the Staten Island Railroad right-of-way at Alaska Street. From here to Bement Avenue (the location of the tunnel portal), the tunnel would be in an open cut. Continuing along the right-of-way to Davis Avenue, the tunnel would be built by cut and cover construction. The open cut excavation would increase in depth from 0 to 35 feet below existing grade, while the cut and cover excavation would increase from 35 to 65 feet below grade. The tunnel alignment would require substantial excavation. As the Segment 3 APE is sensitive for potential prehistoric and historic-period archaeological resources, the Staten Island tunnel alignment may have adverse effects on archaeological resources.

Northern Staten Island—Segment 4. From Davis Avenue southeast to the shoreline at Pier 2, the tunnel would be bored. This portion of the tunnel would be 100 feet wide and would extend from 65 feet below grade at Davis Avenue to approximately 100 feet below grade at the shoreline. There is no possibility for prehistoric and historic period-archaeological resources to

be located at the depth of the potential bored tunnel, and, therefore, construction of the landside portion of the bored tunnel would not adversely affect archaeological resources.

However, a tunnel ventilation shaft would be constructed in the harbor near the seaward end of Pier 2. As the shoreline may be sensitive for prehistoric-period archaeological resources on submerged land that would have been above sea level in the precontact period and for historic-period archaeological resources associated with waterfront-related features, construction of the tunnel ventilation shaft may adversely affect potential archaeological resources. In addition, there is one area charted as potentially containing a shipwreck off the Staten Island shoreline in the vicinity of the Staten Island tunnel alignment. Since the harbor portion of the Staten Island tunnel alignment would be constructed with the bored method, it is not expected that it would adversely affect the potential shipwreck site, as the bored tunnel would be located at least 35 feet below the bottom of the harbor. However, construction of the tunnel ventilation shaft in the harbor could adversely affect the potential shipwreck, depending on its exact location, and the extent of the area of construction impact. In addition, there may be other uncharted wreck(s) that could be affected by the proposed project. Therefore, once an alternative is selected and more fully designed, and the specific area of effect is defined, additional investigations would be undertaken in consultation with the New Jersey and New York SHPOs. These may involve further cartographic research and/or remote testing to determine if shipwrecks are in fact present, as well as further study of any resources identified to in fact be present to determine their potential eligibility for listing on the National Register. Where this future work confirms the presence of significant archaeological resources (i.e., resources that are eligible for listing on the NR) in locations that would be adversely affected by the proposed project, mitigation measures will be developed and implemented as part of the Section 106 process (see "Mitigation Measures" below).

Brooklyn.

65th Street Yard. Under the New Jersey and Staten Island tunnel alignments, 65th Street Yard would serve as a rail yard. Improvements that would be required for the yard include laying new tracks and removing existing tracks. In addition, under the New Jersey tunnel alignment, the yard would require substantial excavation for a ventilation and construction shaft that would be approximately 230 feet by 150 feet, and would require substantial excavation to a depth of 75 feet. Since the yard is not sensitive for archaeological resources, construction in 65th Street Yard would not adversely affect archaeological resources.

Bay Ridge Branch of the LIRR—Segments 1 and 2. In Brooklyn, the landside portion of the New Jersey tunnel alignment would begin near the shoreline at 65th Street Yard. The tunnel would be bored from this location under the Bay Ridge Branch to a location between 8th and 9th Avenues. From this point the tunnel would be built of cut and cover construction to approximately 10th Avenue (the tunnel portal location). It would continue in an open cut to a location between 12th and 13th Avenues along the Bay Ridge Branch right-of-way. As discussed above, a tunnel ventilation shaft would be constructed within the 65th Street Yard APE.

The landside portion of the Staten Island tunnel alignment in Brooklyn would begin at the shoreline near the 69th Street pier, the location of a potential tunnel ventilation shaft. The tunnel would be bored from this location, under Owls Head Park, parts of the Bay Ridge community, and the Bay Ridge Branch to a location between 8th and 9th Avenues. From this point, the tunnel would be identical to the New Jersey tunnel alignment.

The tunnel alignments would require substantial excavation. The open cut excavation would increase in depth from 0 to 35 feet below existing grade, while the cut and cover excavation would increase from 35 to 65 feet below existing grade. In addition, there would be some excavation required to increase vertical and horizontal clearances along the Bay Ridge Branch right-of-way between 12th Avenue and 2nd Avenue in these segments.

There is no possibility for prehistoric and historic period-archaeological resources to be located at the depth (between 100 and 65 feet below grade) of either of the potential bored tunnel alignments; therefore, construction of the bored tunnels would not adversely affect archaeological resources. Although construction of the open cut and cut and cover portions of the tunnel would involve extensive subsurface excavation, the Segment 1 and Segment 2 APEs are not considered sensitive for archaeological resources. In addition, the site of the 69th Street pier tunnel ventilation shaft is not considered sensitive for archaeological resources. However, as described above, the 65th Street Yard tunnel ventilation shaft site is sensitive for historic period-archaeological resources.

Bay Ridge Branch of the LIRR—Segments 3 and 4. Two new mainline tracks would be placed along the length of both segments. As discussed in Chapter 2, "Project Alternatives," clearance heights along the Bay Ridge Branch would need to be increased to 22 feet, 6 inches. Increased heights would be obtained through underpinning work at individual clearances and the excavation of trenches within the right-of-way between 8th and Albany Avenues and between New Lots and Liberty Avenues. In addition, at approximately 18 locations overpasses would be reconstructed and raised to achieve the required clearance. The East New York Tunnel would also be reconfigured to accommodate two tracks at the proposed clearance heights. Finally, two sidings of up to 10,000 feet in length would be placed on either side of the two main line tracks at a location between East 43rd and East 98th Streets.

Although this work would involve subsurface excavation, these APEs are not considered sensitive for prehistoric and historic-period archaeological resources, and therefore, no effects to archaeological resources are expected.

Queens.

Fresh Pond Yard. To connect the Bay Ridge Branch and the Montauk Branch, two through-tracks would be reconstructed in West Yard. In addition, heights would be increased at two overhead clearances in the yard to allow for doublestack service: the Fremont Secondary Line and the BMT Overhead (M line train). The clearance work would require underpinning, excavation of a trench, and reconstruction of the overpasses. Although this work would involve subsurface excavation, the Fresh Pond Yard APE is not sensitive for archaeological resources.

Montauk Branch of the LIRR. As with the Bay Ridge Branch, clearance heights would be increased at five clearances along the line. This would involve underpinning work at individual clearances and the excavation of a trench within the right-of-way between Fresh Pond Yard and the Welbuilt Stove Overbuild near Flushing Avenue. In addition, one of these overpasses, at Fresh Pond Road, would need to be reconstructed. Two new mainline tracks would be placed along the length of the line. Although this work would involve subsurface excavation, the Montauk Branch APE is not considered sensitive for archaeological resources.

West Maspeth Yard. An approximately 108-acre intermodal rail yard would be sited at West Maspeth, Queens. The work planned for the expanded West Maspeth Yard includes demolishing a number of warehouses and other commercial and industrial buildings and laying new track. The yard is still in the design phase, so construction methods are still unknown. As described

above, the APE may be sensitive for potential prehistoric and historic-period archaeological resources including a 19th century cemetery. Therefore, construction at the rail yard may adversely affect potential archaeological resources located within the West Maspeth Yard APE.

DOUBLE TUNNEL SYSTEM

Effects under the Double Tunnel System would be the same or similar to effects under the Single Tunnel System, except in the following areas.

The Tunnel and Related Infrastructure Improvements

The Double Tunnel System would require additional capital improvements beyond those presented under the Single Tunnel System, including the completion of a second harbor crossing, and the expansion of West Maspeth Yard. The potential for these additional improvements to affect archaeological resources is assessed below.

Tunnel Alignment and Construction. As discussed above, several shipwrecks are located in Upper New York Harbor, and these approximate locations are considered to be sensitive for archaeological resources. As with the Single Tunnel System, the immersed tunnel portion of the New Jersey tunnel alignment under the Double Tunnel System could have the potential to adversely affect these resources.

West Maspeth Yard. To accommodate the additional trains, West Maspeth Yard would be expanded to 160 acres. A storage facility would be built at the center of the site, as described in Chapter 2. Construction of the yard would require filling in Maspeth Creek and a portion of Newtown Creek. Additional buildings would be demolished for the larger West Maspeth Yard.

The work planned for the expanded West Maspeth Yard includes demolishing a number of warehouses and other commercial and industrial buildings, laying new track, and constructing buildings for storage and maintenance. The yard is still in the design phase, so construction methods are still unknown, but structures would likely be built on 50-foot deep piles driven throughout the yard. As described above, the APE may be sensitive for potential prehistoric and historic-period archaeological resources, as well as archaeological resources associated with two charted potential sites of wreckage. Therefore, construction of the intermodal freight facility may adversely affect potential archaeological resources located within the West Maspeth Yard APE.

National Docks Secondary. Under the New Jersey alignment of the Double Tunnel System, a connection to the National Docks Secondary would be constructed just west of the tunnel. This would require mostly shallow excavation for installation of rail track. As described in Chapter 16, "Construction," the new track would be below grade where it crosses the Tropicana rail line. This work would occur within the vicinity of the NJSR and NR-listed Morris Canal. As described above under "Greenville Yard," the canal, if it exists, most likely possesses low integrity. After an alternative is selected and construction plans are finalized, any necessary mitigation measures would be developed in consultation with the New Jersey SHPO.

D. MITIGATION MEASURES

The investigation of archaeological resources identified numerous locations where the project alternatives would disturb areas that may contain archaeological resources. If resources are present there, and if they are significant resources that are eligible for the State and National Registers, the selected project alternative would result in adverse effects. The APEs that may

contain potential archaeological resources include: the potential site of the Morris Canal within the Greenville Yard APE; the Arthur Kill Lift Bridge APE; the Arlington Yard APE; the Northern Staten Island, Segment 3 APE; the Northern Staten Island, Segment 4 ventilation shaft APE; the West Maspeth Yard APE, which includes a 19th century cemetery and two potential shipwreck locations in Maspeth Creek; and areas potentially sensitive for shipwrecks off the New Jersey and Staten Island shorelines.

As described earlier, as project plans proceed, ongoing consultation will be undertaken with the New Jersey and New York SHPOs and, where the situation may warrant, with the Federal Advisory Council on Historic Preservation. As part of the consultation process, additional work will be performed where the potential for adverse effects to archaeological resources has been identified for the project components. This ongoing consultation is mandated by Section 106 of the National Historic Preservation Act of 1966. The future steps to be taken and any mitigation measures to be developed in consultation with the SHPOs will be included in a Programmatic Agreement executed by the New Jersey and New York SHPOs, FHWA, FRA, and NYCEDC.

The continuing work consists first of continuing Stage 1A archaeological investigations of the Arthur Kill Lift Bridge and the open cut portion of the Staten Island tunnel alignment which will include such measures as site file search at the New Jersey and New York SHPOs, cartographic research, and evaluation of soil borings data to further understand the subsurface conditions at these two APEs, and their potential to contain archaeological resources.

In regard to the West Maspeth Yard APE under the Double Tunnel System, given the logistical difficulty associated with testing for potential sites over the 150-acre APE, the effect of construction on potential archaeological sites should be further evaluated following the completion of more detailed construction plans. At this time, the location and depths of potential construction disturbances will be evaluated relative to the archaeological information presented in the Stage 1A Archeological Assessment.

At any locations where potential archaeological resources have been identified and the proposed project may adversely affect such resources, additional work will be undertaken to determine whether any archaeological resources are actually present in those locations and whether those resources are significant and therefore eligible for the National Register of Historic Places. This future work, which may include evaluation of soil boring data, further documentary research, and Stage 1B subsurface archaeological testing in the form of trenching/shovel pits to investigate the sensitive sections that would be affected by proposed construction, would be undertaken in consultation with the New Jersey and New York SHPOs. The Stage 1B field testing would be done to locate and identify any potential prehistoric or historic cultural features or deposits, so that the presence or absence of resources, and their extent if they are in fact present, could be determined. It is possible that Stage 1B and subsequent Stage 2 (described below) archaeological testing could be required for the FEIS.

If possible, the location of the 19th century Way-Mott Cemetery will be avoided. If avoidance is not possible, the project sponsors will follow the procedures identified in the draft Programmatic Agreement concerning testing and excavation to avoid any insensitive disturbance to human remains. These measures will include conducting outreach to and consulting with the appropriate cemetery descendant community prior to any archeological testing and construction; undertaking additional research to try to establish cemetery boundaries, interments, and disinterments; and, if indicated, requiring the presence of a physical anthropologist/forensic archeologist during testing and/or construction in the event that skeletal remains are encountered. Where applicable, contract specifications will require the Advisory Council be notified and excavations will cease

when subsurface archaeological objects or human remains are discovered during construction or field surveys, and addressed in accordance with the *Native American Graves and Repatriation Act* and in implementing regulations in 43 CFR Part 10.

In the vicinity of the areas potentially sensitive for shipwrecks, this Stage 1B testing would first involve shoreline investigations to determine if shipwrecks are visible in these areas. Additional cartographic research would also be undertaken. Remote testing would then be conducted in New York Harbor off Greenville Yard in the area that would be affected by the immersed tube portion of the New Jersey tunnel alignment or float bridge rehabilitation; in New York Harbor off the Staten Island shoreline in the area that would be affected by the tunnel ventilation shaft of the Staten Island tunnel alignment; and in Maspeth Creek to determine if, in fact, shipwrecks are located within these submerged areas. Remote testing would use such instruments as a side-scan sonar and a magnetometer.

For resources that are identified as present, Stage 2 investigations, including further excavation and research, to determine whether or not the resources identified are eligible for the State and National Registers, would be undertaken. If resources are determined to meet National Register eligibility criteria, mitigation measures would include Stage 3 data recovery in the form of a full-scale excavation or avoidance of the resources. A Section 4(f)[*] evaluation will be required for any resource that requires preservation in place and cannot be avoided. The Programmatic Agreement executed by FHWA, FRA, NYCEDC, and the New York and New Jersey SHPOs will outline the process and measures to be undertaken to avoid any adverse effects to archaeological resources. ✷

[*] As discussed in Section A of this chapter and in Appendix 1, Section 4(f) of the USDOT Act of 1966 (now designated 49 U.S.C. 303) is implemented by FHWA regulations 23 CFR 771.135. Section 4(f) refers to the USDOT's policy of avoiding the use of lands protected under the Act (such as significant public parks, recreation lands and wildlife refuges, or historic sites of national, state, or local significance) for transportation purposes.

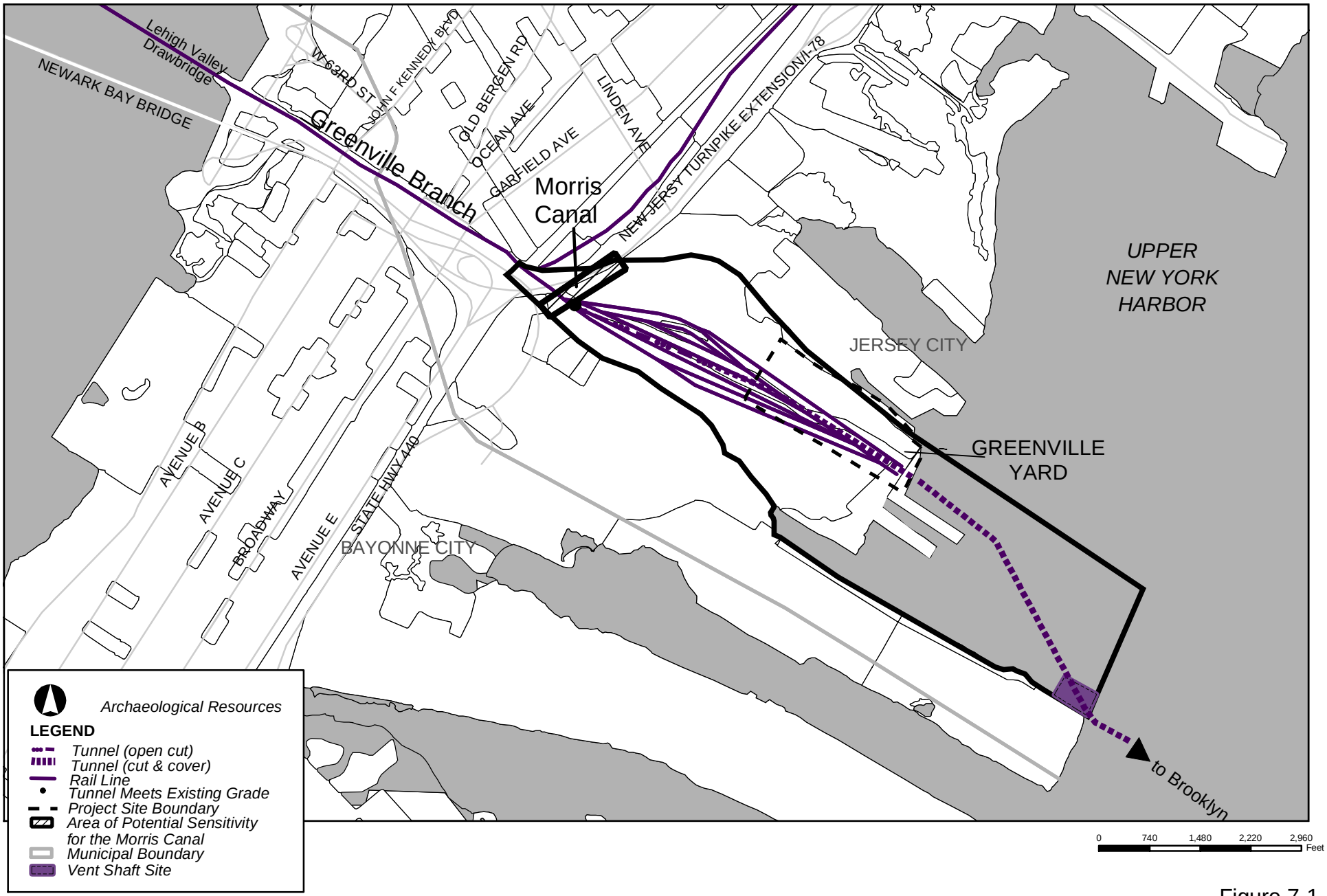


Figure 7-1

Greenville Yard/Potential Tunnel Alignment-Area of Potential Sensitivity for the Morris Canal

CROSS HARBOR FREIGHT MOVEMENT PROJECT

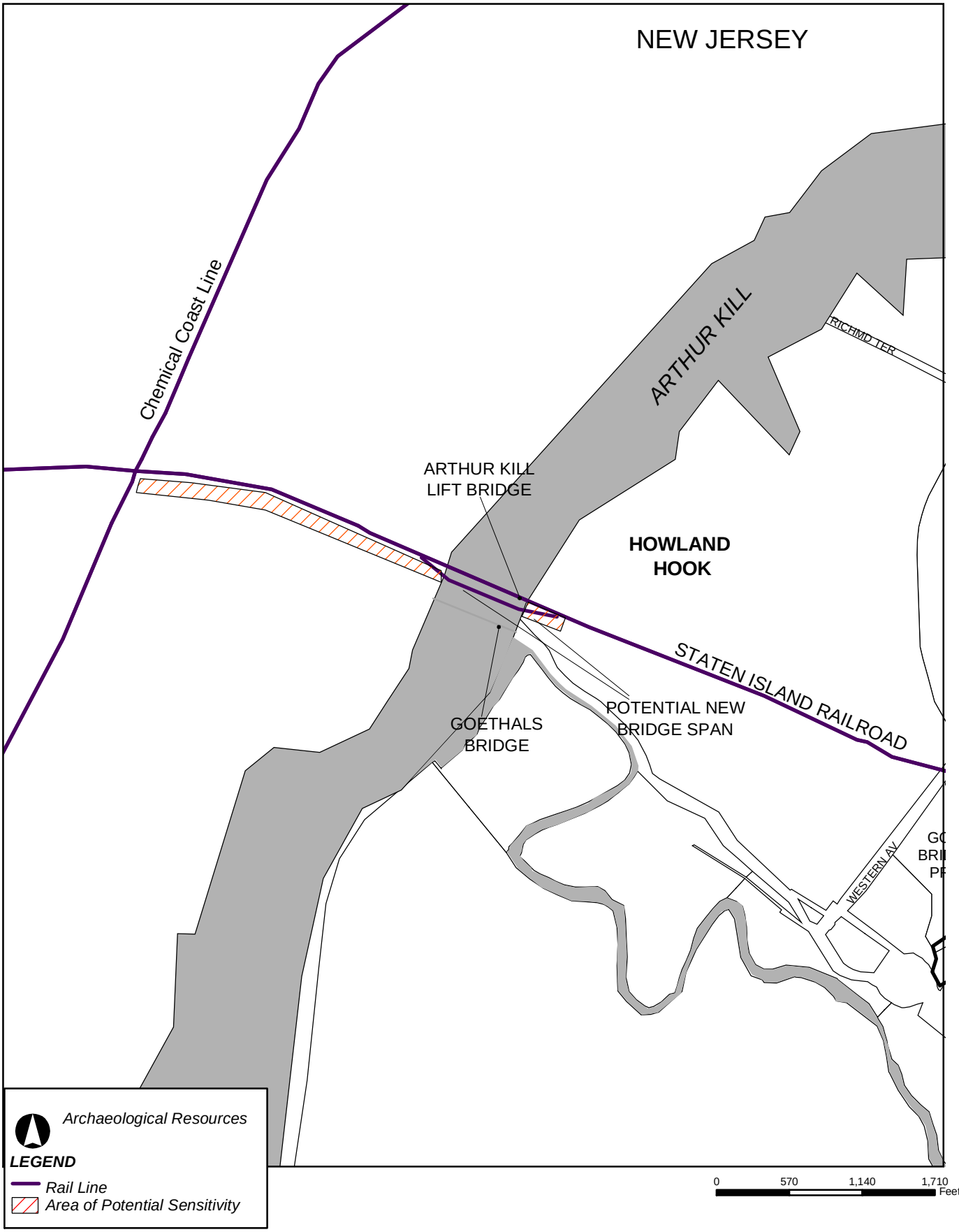


Figure 7-2
Arthur Kill Lift Bridge-Area of Potential Sensitivity
CROSS HARBOR FREIGHT MOVEMENT PROJECT

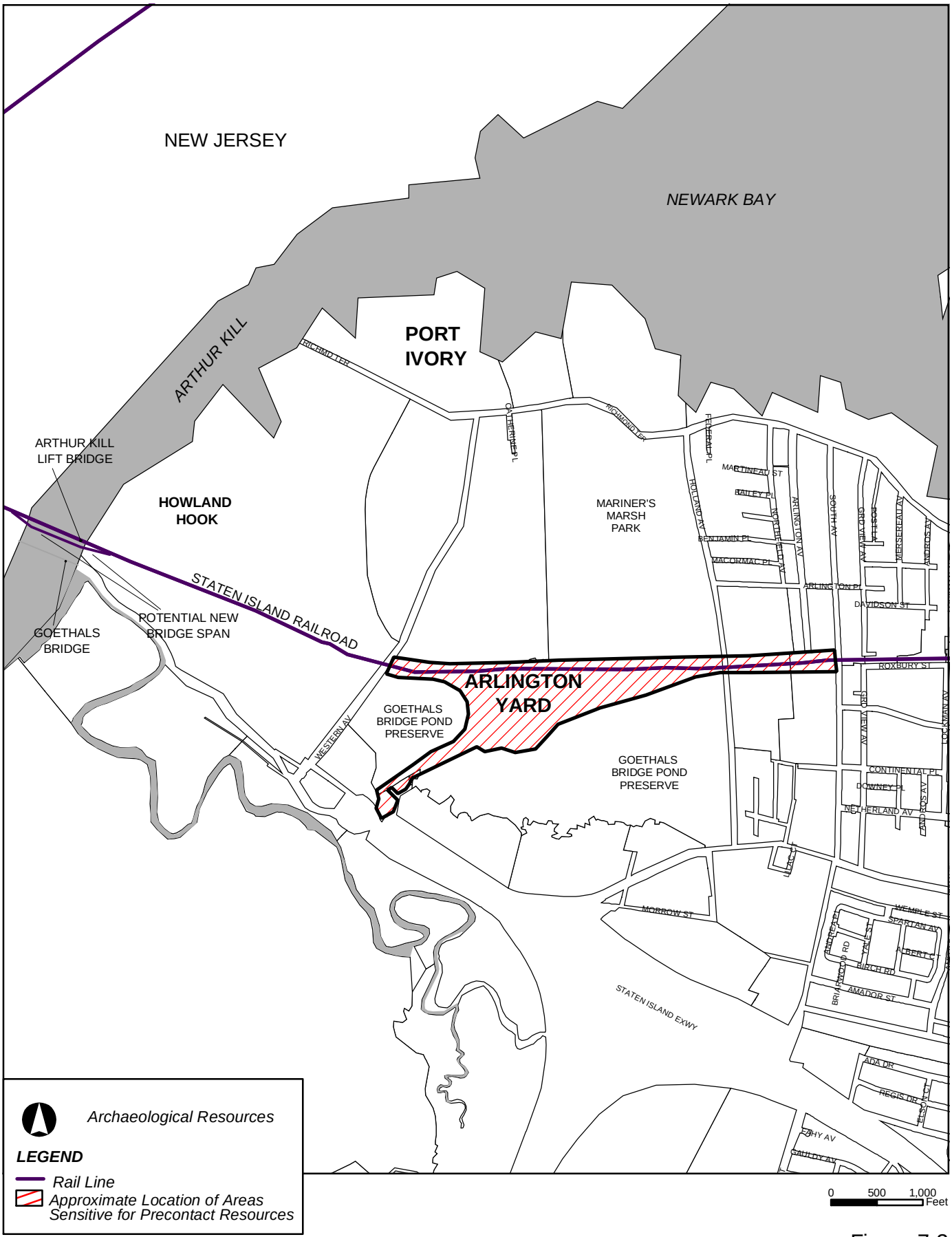


Figure 7-3
Arlington Yard-Area of Potential Sensitivity
CROSS HARBOR FREIGHT MOVEMENT PROJECT

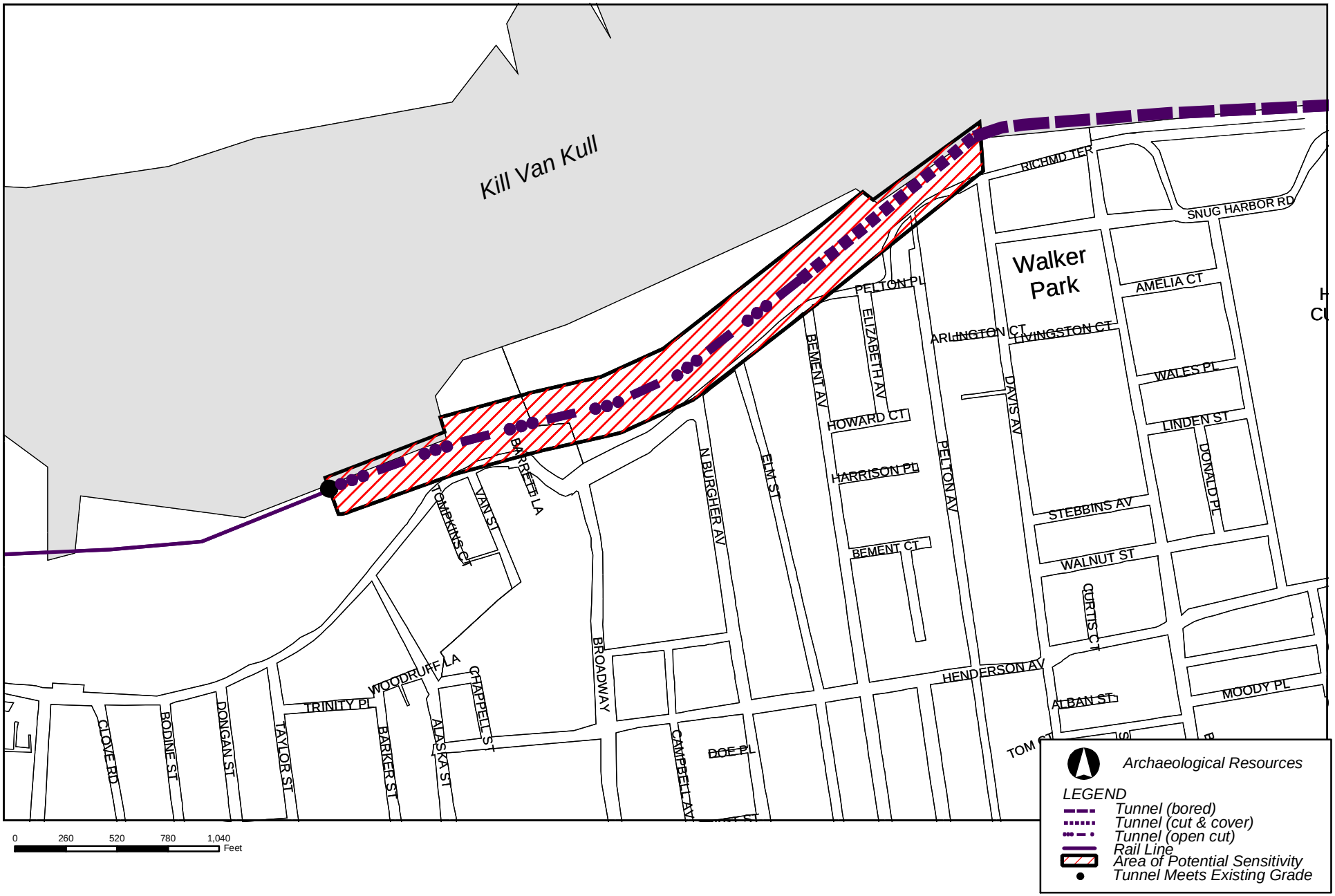


Figure 7-4
Northern Staten Island Study Area-Segment 3 Area of Potential Sensitivity
CROSS HARBOR FREIGHT MOVEMENT PROJECT

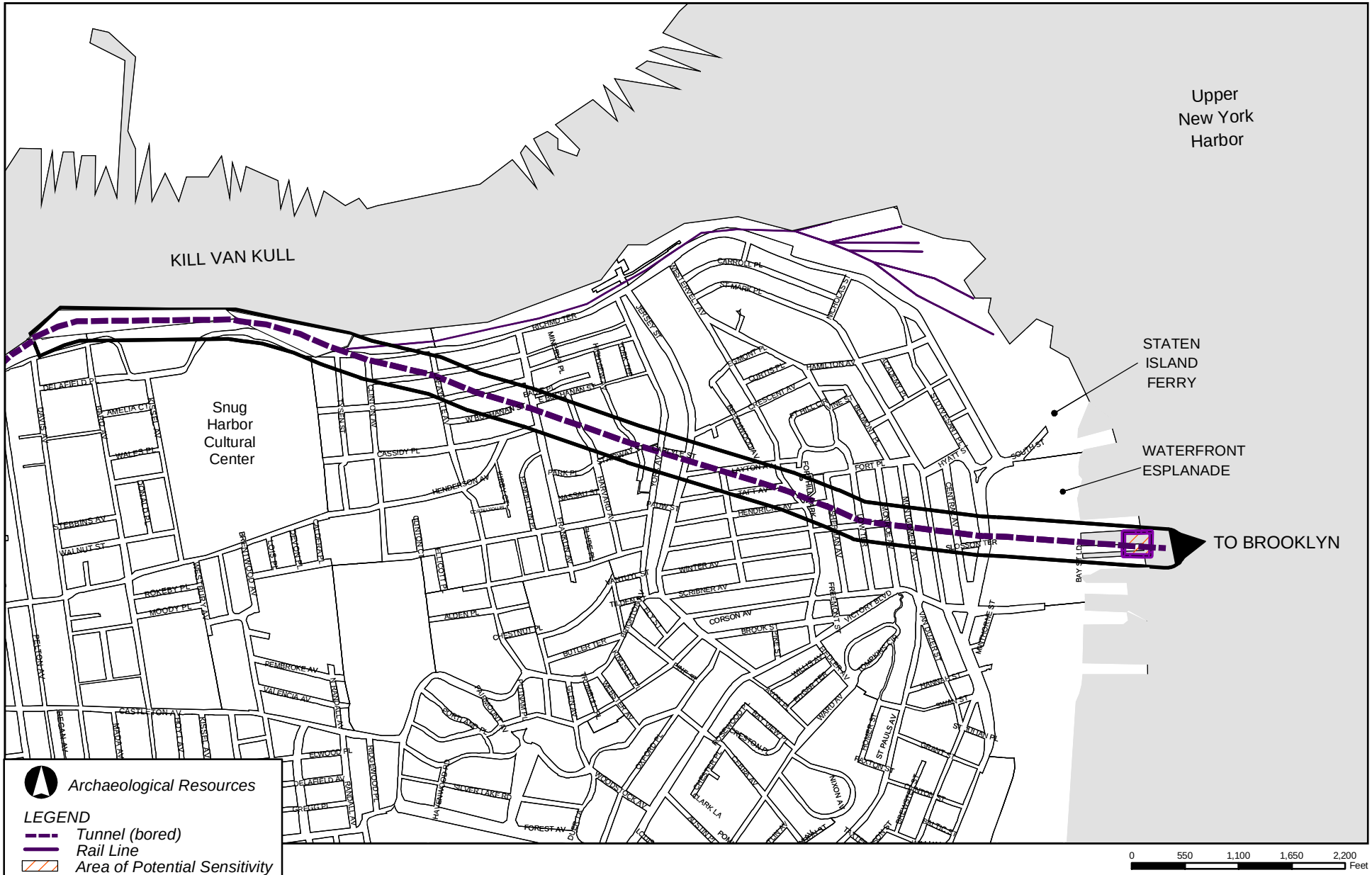


Figure 7-5
Northern Staten Island Study Area-Segment 4 Area of Potential Sensitivity

CROSS HARBOR FREIGHT MOVEMENT PROJECT

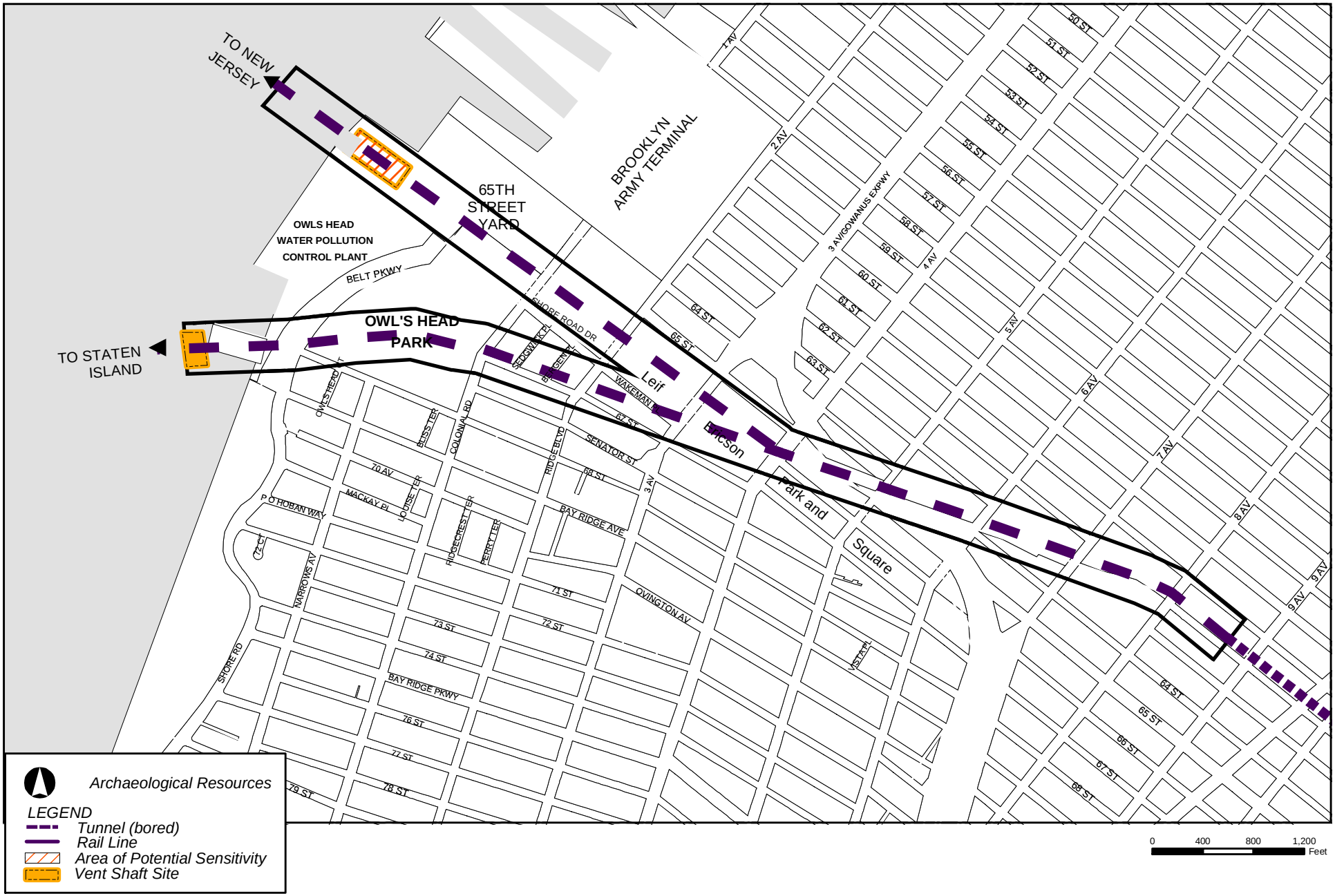


Figure 7-6

Bay Ridge Branch Study Area-Segment 1 Area of Potential Sensitivity

CROSS HARBOR FREIGHT MOVEMENT PROJECT

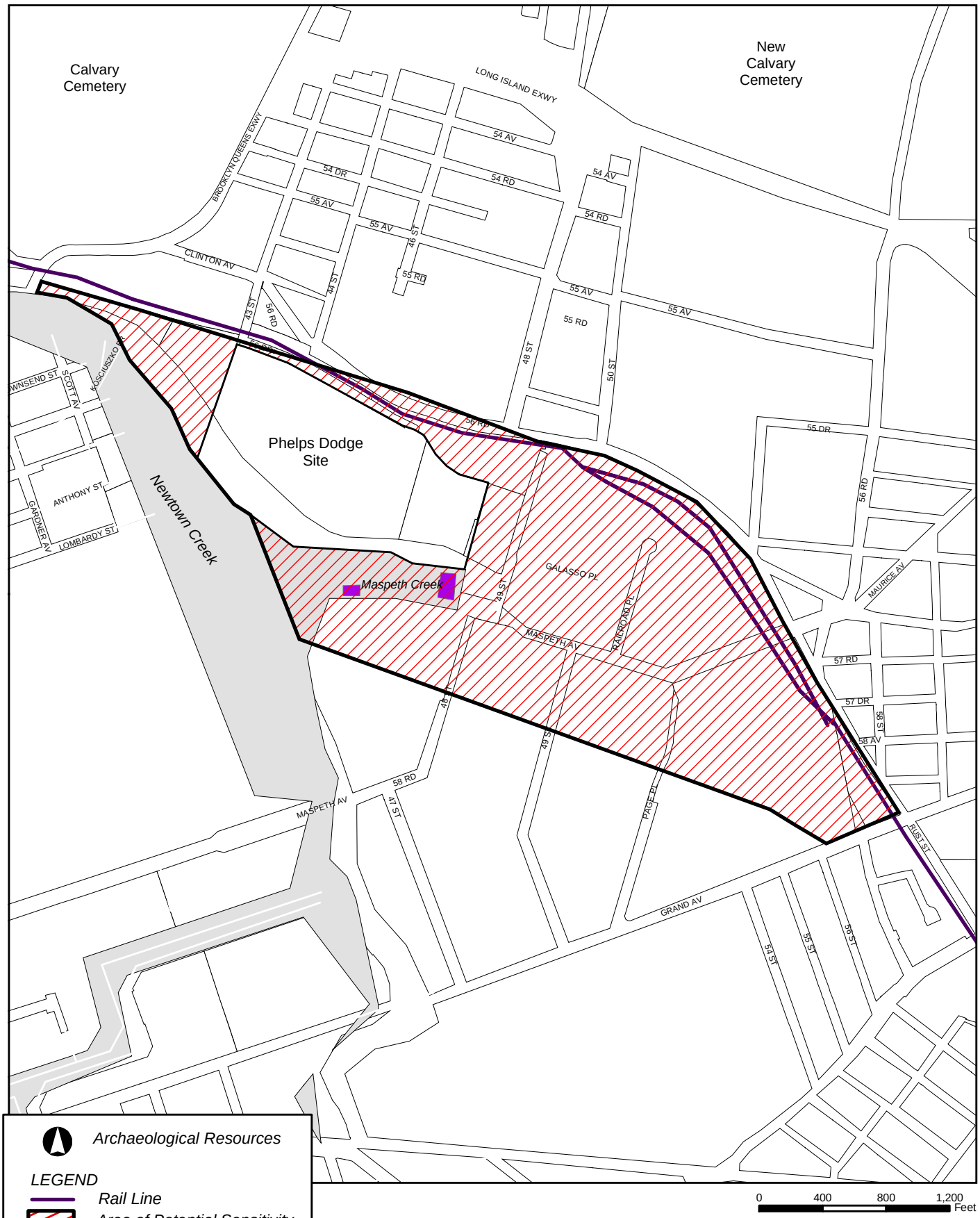


Figure 7-7

Potential West Maspeth Yard-Area of Potential Sensitivity

CROSS HARBOR FREIGHT MOVEMENT PROJECT

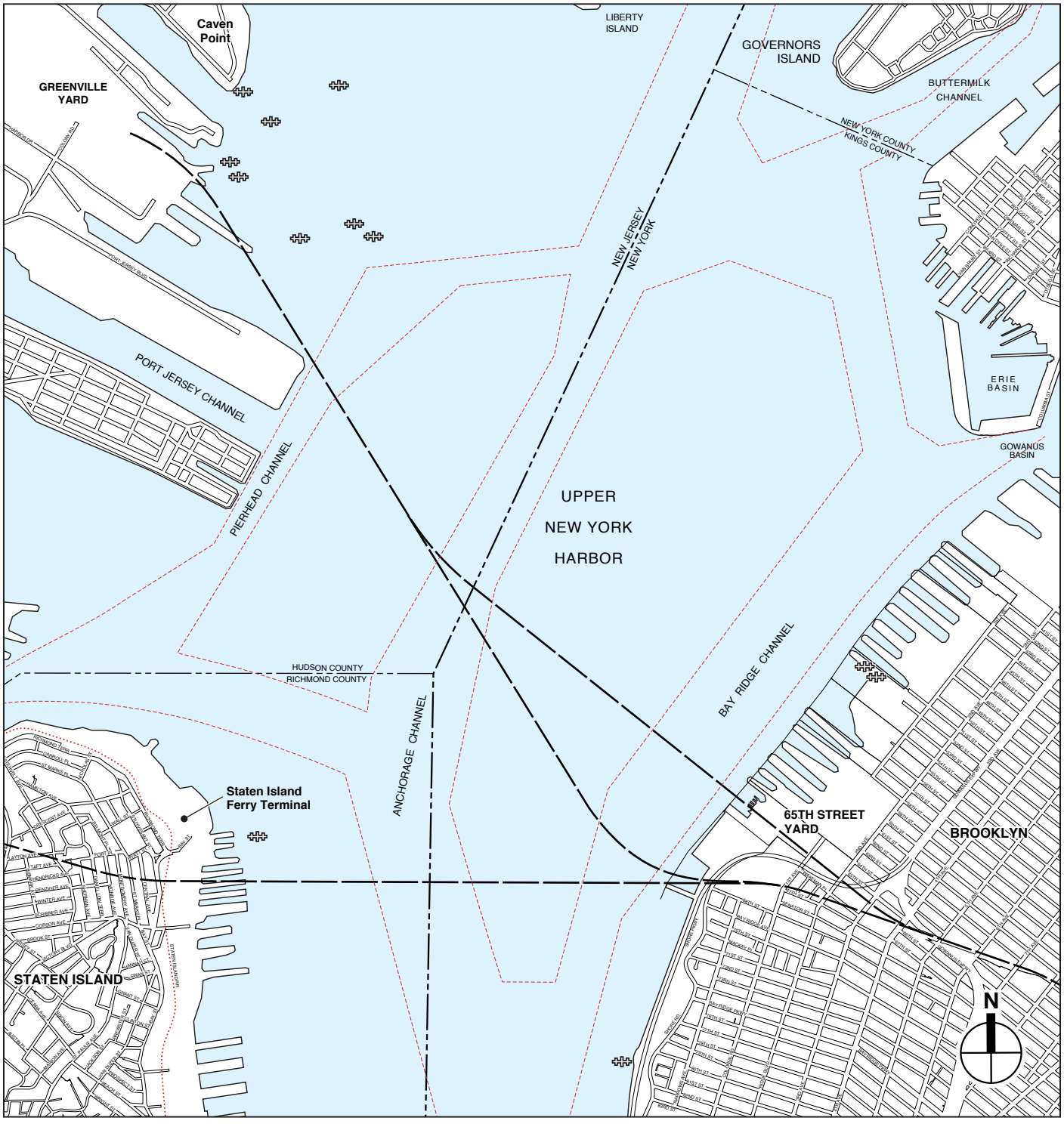


Figure 7-8

Potential Ship Wreck Locations

CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 8: Transportation

A. INTRODUCTION

This chapter assesses the effects of the project alternatives on regional freight movement (truck, barge, and rail) and on specific local components of the region's transportation system. In terms of regional travel, the project would provide an overall benefit by improving the freight transportation network and corresponding freight mobility in the New York Metropolitan area. Because of the anticipated improvements to the system, the proposed alternatives would, to varying degrees, remove truck trips from the regional and arterial roadway system and reduce overall truck vehicle miles and hours of travel (vmt/vht).

At the same time, however, the project could result in localized effects on specific elements of the transportation system. The increase in the amount of freight moved by rail could potentially result in adverse effects on the regional rail freight network. Capacity constraints may also arise at critical points in the system or at selected yards throughout the metropolitan area. In locations where the rail infrastructure network is shared with passenger lines, impacts to commuter transit service could occur. This chapter also assesses the local effects of additional truck traffic that would be generated from the increase in freight activity at new or existing intermodal or transload yards.

The effects of the project alternatives on the study area's transportation infrastructure are a prediction of the travel demand forecasting. The methodology discussed below is used to determine the mode shift or "freight diversion" from truck to rail for each alternative. This is followed by a discussion of the existing regional freight transportation system as well as specific local conditions where appropriate. A discussion of the potential impacts of the No Action and Project Alternatives follows the section on existing conditions. Finally, measures to mitigate potential adverse impacts are discussed.

Additional information regarding the transportation analyses presented in this chapter can be found in Appendix 2A, "Transportation Appendix," Appendix 2B, "Commodity Flow Analysis," and Appendix 2C, "Traffic Appendix."

B. TRAVEL DEMAND FORECASTING METHODOLOGY

OVERVIEW

The transportation impacts of the project alternatives were analyzed using a standard four-step transportation planning process. This analytical approach is identical to that used on other highway or rail transit projects, with the only difference being the sources of data are specific to freight. This process, and the data sources, are shown in Table 8-1.

Table 8-1
Four-Step Transportation Planning Process Applied to Freight

Step	Data Source	Comparable Data Source for Passenger Transportation Study
Trip Generation	Reebie Associates TRANSEARCH database	Regional economic and demographic forecasts
Trip Distribution	Reebie Associates TRANSEARCH database	Regional household or in-vehicle surveys
Mode Split	Discrete (mode) choice model	Discrete (mode) choice model or regional travel demand model
Trip Assignment	Regional travel demand model	Regional travel demand model

As described below in more detail, the total volume of freight moving into, out of, and through the region (trip generation) was determined for the 30-county planning region (see Chapter 1 for definition) using the Reebie Associates TRANSEARCH commodity flow data with future forecasts by DRI/WEFA. This data was disaggregated by commodity, mode, and origin-destination pair, thus also providing trip distribution data.

Until recently, freight forecasts primarily reflected projections of increases in truck volume based on the standard measurements (employment growth, etc.) used to forecast the overall increase in regional travel. However, this methodology fails to consider the potential for freight mode shift, freight volume increases at a different rate than other factors, and changes in the balance of freight traffic due to the economic evolution of a region. All of these factors are included in the methodology described below.

TRIP GENERATION

Freight volume (tonnage) in the region is forecast to increase by 70 percent between 2000 and 2025. As the region's prosperity grows, the volume of freight activity will increase relative to other economic indices such as population and employment. The increasing specialization of economic activity across regions of the nation (and across nations of the world) means that a given level of economic activity generates more trade (and hence more freight traffic) than previously. The New York City region once produced far more of the products which it now imports and consumes. This changing nature of economic activity in the region—the continuation of a long-term shift from manufacturing to a service-based economy—will change the nature of freight shipments from large bulk movements to smaller but more highly valued shipments.

TRIP DISTRIBUTION

In a typical passenger transportation study, the distribution of trips (i.e., origin and destination patterns) is determined by locally conducted surveys. This distribution is embedded in the TRANSEARCH database which Reebie develops by surveying freight shippers throughout the country and supplementing this information with data from other sources.

MODE SHIFT

Many regional travel demand models have mode shift elements that can capture changes in the population's preference for auto (single occupant), auto (multiple occupants), public transit, walk, and bike. These models are based on survey data which captures travelers' modal preferences based on level of service (LOS) calculations for each mode. Typically, these models

are limited to quantifiable factors such as travel time and cost, and are less able to consider qualitative factors such as reliability and comfort. However, these traditional models are typically not capable of handling the introduction of new modes in a region (such as rail transit) because the models have not been calibrated to capture travelers' preferences for new services. In these cases, surveys are conducted to capture travelers' preferences if new services are introduced with specified service levels. These surveys, called stated preference surveys, are different from revealed preference surveys which measure travelers' reactions to existing service choices.

For this project, a mode shift analysis required two issues to be resolved. First, the regional mode choice model—the New York Metropolitan Transportation Council's (NYMTC) Best Practices Model (BPM)—does not include a freight mode choice element. Thus, the model cannot predict shifts among shipper* preferences for different freight modes. Second, regional shippers have very little experience with rail freight. Therefore, a stated preference survey was conducted of regional shippers to develop the data necessary to forecast truck to rail mode shifts under varying truck and rail Level of Service (LOS) parameters.

TRIP ASSIGNMENT

The results of the first three steps were applied to NYMTC's Best Practices Model (BPM) to determine the impact of the forecast mode shift on regional highway travel. Trip assignments were completed for 2000, 2010, and 2025 for each applicable alternative.

Since 2025 was the focus of the analysis, the LOS parameters developed for 2025 were used for the 2010 alternatives. It is not known exactly when planned or proposed improvements to existing facilities will actually take effect. The commodity flow forecasts and NYMTC trip tables were adjusted between 2000 and 2025 to create the 2010 commodity flow database and NYMTC trip table. The 2007 NYMTC network, which includes current improvements programmed through the region's Transportation Improvement Program (TIP), was used to reflect the 2010 condition; the 2025 network was based on NYMTC's 2025 network reflecting improvement projects included in the region's Long Range Plan. It should be noted there were not major differences between these two networks.

REGIONAL COMMODITY FLOW

As part of the Cross Harbor EIS, a detailed regional commodity flow analysis was undertaken and the results are included as part of the project's supporting documentation (*Draft Technical Memorandum Commodity Flow Analysis, April 2002*). Since freight transportation develops in response to the underlying demand for goods, the DEIS commodity flow analysis examines what goods, in what quantities are being transported in the 30-county region. This information is critical to understanding how the existing regional transportation network is affected by the flow of commodities over time.

The Cross Harbor DEIS commodity flow analysis divided North America into 52 "zones." Of the total of 52 zones, 30 zones comprise the regional or "internal study area." The boundaries and names of the internal study area zones that are found in the Cross Harbor Commodity Flow Analysis represent the 30 counties that define the study area for the Cross Harbor DEIS, defined

* The term "shippers" is used as a reference for all decision-makers involved in freight movement – shippers, receivers, carriers and third-party logistics providers.

in Chapter 1 as the "30-county region" (see Figure 8-1). The remaining 22 zones represent the "external regions." These regions are composed of groups of counties or states that share common freight distribution patterns and service characteristics for trade with the New York/northern New Jersey region. Information documenting the exchange of goods between these regions and each of the 30-county region is also included in the DEIS analysis.

The Cross Harbor DEIS commodity flow data is based predominately on information contained in the 2000 TRANSEARCH dataset. The 2000 baseline TRANSEARCH dataset was compiled by Reebie Associates from a combination of publicly available goods movement sources, as well as direct reporting from shippers and carriers across the country. This dataset tracks goods movement information by point of origin, destination, commodity category, and mode of shipment, incorporating the latest changes in rail freight operations. The data includes information on domestic moves within the United States by truck, rail, air, and marine modes. The truck data is comprehensive and captures local distribution and warehousing truck trips. Subsequently, the modeled truck volumes accurately reflect observed traffic on the region's roadways.

All of the dollar values are based on average commodity values calculated from a regional selection of the 1993 National Commodity Flow Survey produced by the United States Department of Transportation.

FREIGHT MOVEMENTS

A total of 582 million tons of freight moved into, out of, and within the 30-county region in 2000, with an estimated value of $1.44 trillion. Of the total tonnage, some 164 million tons (28 percent) moved within the 30-county region and approximately 417 million tons (72 percent) originated in or were destined for locations outside of the region (see Figure 8-2). In addition, 68 million tons passed through the region without stopping. Looking at the difference between freight movement in and out of the region, it is clear that the region is a net consumer: approximately 236 million tons of goods were imported (57 percent), and 181 million tons were exported (43 percent). This reflects the region's large consuming population.

The region's single largest trading "partner" is the 30-county region itself (28 percent of all tonnage in 2000) (see Figure 8-3). Next is the resource-rich area of northern New York State, which accounted for 67 million tons (11.5 percent), and the Midwest, with 51 million tons (9 percent). Three other major partners include the southern tier of New York, Delaware Valley-New Jersey, and the Southeastern United States; together they accounted for 108 million tons (18 percent–6 percent each) of the 30-county region's freight tonnage in 2000. The remaining tonnage comes from or goes to many locations throughout the United States and North America.[*]

MAJOR COMMODITIES MOVED

The major commodities flowing into and out of the 30-county region are consumer goods, fuel, food, and building materials. These are typical for major metropolitan and business centers. Inbound and outbound commodities are similar, reflecting the region's role as a distribution center, in addition to its position as a large consumer market. Petroleum and warehousing/distri-

[*] International air & marine cargo is not included in these data.

bution activity dominate outbound movements, additional confirmation of the region's transshipment and distribution functions (see Figure 8-4).

FREIGHT TRANSPORT SYSTEMS

Overview and Freight Transportation Characteristics

Freight in the 30-county region moves on four systems: highway, railroad, water, and air. As shown on Figure 8-5, most freight travels in trucks—79 percent measured by weight and 92 percent measured by estimated value. Waterborne freight movement is next highest by weight (15 percent), but much lower by estimated value of freight (2 percent); this mode of carrying freight effectively transports a select number of low-value bulk commodities. Rail freight accounts for 5.6 percent by weight and 5.3 percent by estimated value. Air transport carries only 0.2 percent of the region's freight tonnage; however, the estimated value of these shipments is 0.6 percent, indicating that higher value goods move by air.

The way goods move in the 11-county project area (as defined in Chapter 1, Purpose and Need) differs from the larger region, particularly by weight. Most of the counties are on the water and rely more heavily on this mode (see Figure 8-6). More than 25 percent of freight tonnage in New York City travels by water, for example. On the New Jersey side, waterborne freight tonnage to and from Hudson and Essex Counties represents 36 and 39 percent, respectively, of each county's total tonnage. In all, 22.6 percent of freight tonnage to, in, and from the project area is transported by ship. Like the waterborne traffic, rail is used to carry freight where it and associated infrastructure are available. Thus, although overall it represents 5.2 percent of the project area's tonnage, Bronx (9.1 percent), Union (13 percent) and Hudson (14.4 percent) counties rely more heavily on this transport mode.

For both the 30-county region and the 11-county project area, the distinction between transport choices East-of-the-Hudson and West-of-the-Hudson is clear. Looking at the 30-county region, both sides of the river show a similar reliance on trucks (on the east, 78.5 percent by weight and 95.8 percent by value, and on the west, 75.9 percent by weight and 87.6 percent by value). However, rail transportation in the East-of-the-Hudson subregion accounts for only 1.6 percent of freight tonnage and only 0.6 percent by value. By contrast, the West-of-the-Hudson subregion has a rail share of 8.6 percent by weight and 9.9 percent by value.

This difference is underlined more strongly in the 11-country project area. Here, New York City and Long Island together depend on trucks for 76.6 percent of their total freight tonnage and 95.1 percent of their freight value. This compares to 65.8 percent truck freight by weight in the four counties west of the Hudson River and 79.3 percent of truck weight by value. The share of rail freight east of the Hudson is only 1.2 percent by weight and even less, 0.5 percent, by value; in the four northern New Jersey counties, rail share is 10.5 percent by weight and 16.1 percent by value.

MODE SHIFT

The process of forecasting mode shift from truck to rail in response to the project alternatives involved five key steps:

- The development of level of service parameters for future rail service to be provided by each alternative;
- The development of level of service parameters for future regional truck service;

- The completion of a stated preference survey among regional shippers;
- The development of a regional freight mode choice model based on the data collected in the shipper choice survey; and
- The application of the regional freight mode choice model in combination with the level of service parameters of each alternative to the TRANSEARCH database to determine the percentage and type of freight likely to shift under each alternative, and the total amount of freight diverted.

Each step is described below.

RAILROAD LEVEL OF SERVICE

Level of Service (LOS) tables were created for railroad and truck travel times, cost and reliability between external markets and the New York/northern New Jersey region. These tables were used to create reasonable service alternatives for the shipper survey and as inputs to the mode choice model.

Five elements constitute level-of-service:

- Trip time,
- Cost,
- Delivery window,
- Reliability within the delivery window, and
- Frequency of service.

The focus of this analysis was on freight traffic with origins or destinations in the 30-county study region. However, operating scenarios were also analyzed for trans-Hudson rail service passing through the region with origins and destinations elsewhere. The analysis of through traffic was only performed for the No Action and tunnel alternatives since neither the TSM nor Expanded Float Operations alternatives would create a level of service which would attract through traffic.

Service inbound to the region was the focus of the analysis as this represents the predominant directional flow of goods. Outgoing levels of service were not constructed from a detailed analysis. Rather, after a review of railroad operating patterns it was concluded that outgoing levels of service were essentially the same as incoming levels of service for any origin-destination pair.

Methodology for Determining Each Element of LOS

Trip time. Overall trip time indicated the actual time that a shipment would take to move from the shipper's facility to the eventual end user. This time consisted of a line-haul routing and a local analysis. The routing analysis considered actual train schedules and interchanges between the point of origin and rail facilities in northern New Jersey, Oak Point Yard (Bronx), and Fresh Pond Yard (Queens). The local analysis considered actual train schedules and interchanges from the rail yards in northern New Jersey, Oak Point, or Fresh Pond to each of five destinations within the study area. These destinations reflected other potential yard locations such as 65th Street in Brooklyn and Pilgrim State Hospital in Islip, Long Island.

Cost. Cost (to the shipper) indicated the actual total cost (per ton) that the shipper would experience in moving the product from the shipper's facility to the eventual end user. As with trip time, cost considered both a line-haul cost from the point of origin and rail facilities in

northern New Jersey, Oak Point (Bronx), and Fresh Pond (Queens) plus a local cost of moving the product from that rail facility to the end user.

Delivery window. The delivery window reflected the prevailing industry standards of what constitutes an on-time delivery.

Reliability within the delivery window. Similar to trip time, reliability consisted of both a line-haul routing and a local reliability for each of the routings for each alternative. Factors considered in the reliability analysis included basic reliability, distance, number of interchanges, impact of passenger trains, and a number of other factors.

Frequency of Service. Frequency of service was based on both the actual frequency of line-haul service from an external zone into the study area and (in the case of carload service) the actual frequency of local trains within the study area.

Sources of Input Data

As part of a rail outreach program conducted in the second half of 2001, interviews were conducted with each of the northeastern freight railroads likely to be key participants in the project: CSX, Norfolk Southern, Canadian Pacific, Providence and Worcester, and New York and Atlantic. In addition, five other railroads whose operations might be impacted by a change in the rail traffic patterns in the area were informed of the project, sent a project description, and invited to comment or be interviewed: Amtrak, MetroNorth, Long Island Rail Road, New Jersey Transit, and the New York Cross Harbor Railroad.

Schedules, Routings and Interchange Points. Rail schedules were determined from various sources including information supplied by the railroads as well as published and archival data. The results varied by railroad, but an essentially complete definition of the schedules for each of the five interviewed railroads plus a reasonably complete definition of the schedules of key connecting trains on the major external railroads (BNSF, Union Pacific, Canadian National/Illinois Central, and Guilford) was obtained.

Price Information (Cost To The Rail User) For Line-Haul Rail Moves. Railroads negotiate prices with potential shippers based on a number of free market factors including competition with other railroads and with other modes. The results of these negotiations vary and are considered highly confidential by the railroads.

Notwithstanding the above, a reasonable amount of price information is available and was used in this analysis. For example, railroads publish "official" tariffs which, more often than not, are an upper limit for the price of movement of a carload of a specific commodity or a container of unspecified commodity between two points. In other cases, some intermodal price information can be obtained from the web sites of third-party agents who market intermodal "packages" of the rail move plus the drayage at each end. In addition, railroad financial reports to stockholders contain corporate income data, traffic data, and verbal descriptions of operations which combine to allow an estimate of "average" costs to users.

This analysis used a combination of sources. To the extent possible, line-haul price information was based on tariffs and other data published by the railroads or available on their web sites. Wherever possible, redundant price sources were used. Finally, the Surface Transportation Board's (STB) Uniform Railroad Costing System (URCS) model served as a "check" to confirm that the prices used in the analysis were reasonable from the viewpoint of a railroad's cost structure.

Price information for the final movement of a train via a new tunnel or carfloat was based entirely on incremental costs. Hourly costs for cross harbor moves were built up from wage, fuel use, equipment maintenance, and similar information taken from previous projects and adjusted for inflation and local conditions.

Reliability Data. The railroads are required to provide system-wide average reliability data to the Surface Transportation Board. During interviews, some railroads provided further insight into their recent, current, and anticipated reliability. Trade press provided considerable additional insight into the northeast railroads' reliability experiences during the Conrail takeover, and also provided insight into the levels of reliability that are being achieved within some of the western and Canadian railroads. This data was used to verify the calibration of the reliability model described later in this report. As in the case of price data, multiple sources of reliability were used as a "cross-check" when available.

Line haul schedules and classification / interchange times were adjusted from the 2000 baseline to the No Action 2025 scenario to reflect rail schedule and infrastructure changes that had been made since the start of 2000 or were reasonably certain of being made before 2025. Since the timing of these improvements is somewhat unpredictable, the same levels of service were used for the 2010 analyses.

This scenario did not include any improved train schedules or additional frequency of trains that may take place as railroads respond to a modal shift of traffic as a result of possible increased traffic congestion on highways. To the extent that such rail improvements do take place, the operations model has been conservative and may have understated the improvements in level-of-service between 2000 and each of the 2025 scenarios.

The assumed levels of freight railroad service into the West-of-Hudson region are based on conditions in 2001 prior to recent service cutbacks. Hence, they represent a higher service baseline than currently exists. Based on interviews with the railroads, it is believed that growth in future baseline traffic can be accommodated by restoring service to pre-2002 levels, and increasing the *length* (but not the *frequency*) of trains. This marginal increase in train length can be readily accommodated by the existing underutilized rail freight infrastructure.

Variations in Line-Haul Trip Times for the Cross Harbor Alternatives

TSM. The TSM scenario involves a number of infrastructure and institutional improvements proposed and/or being implemented by NYCEDC on the current carfloat operation and by NYSDOT and MTA along the Hudson line between Albany and the Bronx. The potential impact of most of these improvements is on the local trip times and not on line-haul trip times.

The principal exception is the improved switch infrastructure and institutional coordination on MetroNorth's portion of the Hudson line. These improvements will open the possibility for a regularly scheduled midday freight round-trip on the Hudson line in addition to the current overnight trains. The TSM scenario reflects this improvement by reducing the overall line-haul trip times of those cars that arrive in Albany in time to connect with the midday train rather than having to wait for the current overnight trains.

Expanded Float Operations. The expanded carfloat involves several service improvements in comparison to the current carfloat operation which impact local trip times:

- Improved float bridges and terminal yards on both sides of the Hudson;
- More barges allowing an efficient scheduled hourly service 16 hours per day on weekdays and 8 hours per day on weekends;
- Improved operation of the terminal yards with switching locomotives and crews on duty at all terminals throughout the operating day; and
- Increased frequency of connecting trains on both sides of the Hudson between existing rail yards and the float terminal yards.

As part of this analysis, the concept of an additional carfloat terminal at Port Ivory (adjacent to the Howland Hook terminal) on Staten Island was considered as a possible element of an expanded carfloat scenario. After further analysis, the Howland Hook terminal was excluded from the expanded carfloat scenario level-of-service determinations for the following reasons:

- The Howland Hook carfloat would be redundant with the Greenville carfloat, competing for the same traffic. No additional traffic would likely be diverted from truck.
- With two West-of-Hudson float terminals, float operating costs and capital costs for tug boats and barges would double. Terminal and support train costs would increase by more than 50 percent.
- The Howland Hook carfloat would offer substantially less favorable trip time, price, and reliability levels-of-service than the Greenville carfloat.
- The railroads would tend to consolidate their traffic on a single carfloat and would be unlikely to perform the additional switching, classification, and running of trains needed to divide their traffic between two redundant floats.
- The railroads would likely opt for the Greenville carfloat (which is adjacent to Oak Island yard) over the Staten Island carfloat (which involves a routing along the congested Chemical Coast line) and the uncertainties associated with the frequent opening of the Arthur Kill lift bridge for maritime traffic.
- The additional capacity resulting from having two carfloats is not needed under any projection of possible carfloat use.

Preliminary runs of the diversion model demonstrated that the expanded carfloat would not attract any traffic unless the marginal operating costs were fully subsidized by a third-party other than the shipper. Therefore, a fully subsidized scenario was developed for carload and bulk transload traffic. The same dollar value of subsidy was applied to intermodal traffic. This subsidy amount was not sufficient to fully cover the marginal costs but was considered to be a reasonable degree of subsidy for analytical purposes.

The principal trip time impact of the New Jersey tunnel alignment is the opening of a new fast cross harbor option from northern New Jersey. Thus, the trip time benefits of the tunnel show up in the ability to extend the line-haul move to include the crossing of the Hudson River and bring rail freight closer to its final destination.

In the Staten Island tunnel alignment, many line-haul routings into northern New Jersey will vary from the Greenville option. The potential changes involve Norfolk Southern traffic moving via the Lehigh line (most of Norfolk Southern's traffic into the area) and CSX traffic moving from the south on the West Trenton line (a relatively small portion of CSX's traffic into the

area). Both of these routes pass through Port Reading junction in New Jersey. From Port Reading junction, there are essentially two routing choices (see Figure 8-7):

- The train can continue on the Lehigh line via South Plainfield and the Cranford area to its current northern New Jersey destination (#1).
- The train can turn right at Port Reading Junction and take the Port Reading line to the Chemical Coast line and on to its current northern New Jersey destination (#2).

Through Service

Through service represents traffic that does not originate or terminate within the study area, but which passes through the study area between external zones. For the Double Tunnel System, it is likely that a portion of carload and bulk traffic from Norfolk Southern would flow through the tunnel to southern New England via the Providence and Worcester Railroad (P&W). Some intermodal traffic might also flow through the tunnel as roadrailer traffic on special Amtrak trains, or as an overnight "TruckTrain" similar to Amtrak's existing AutoTrain. Subsequent interviews with the railroads resulted in minor reductions in the markets potentially available for diversion of through traffic via the tunnel. A through intermodal market could not be served through the Single Tunnel System.

Traffic subject to diversion was further reduced by two additional considerations:

- Traffic captive to CSX was highly unlikely to divert to the tunnel from the available Selkirk routing. CSX would long-haul itself and keep the traffic rather than giving it to P&W at Fresh Pond.
- P&W did not believe that traffic between Norfolk Southern and Guilford would divert to the tunnel. Both NS and Guilford would opt to interchange with each other near Albany rather than short-haul themselves and insert a third railroad (P&W) into the routing.

Accordingly, a post-diversion-model "filtering" process was applied to the diverted tonnage identified by the diversion model to eliminate this traffic.

Truck Level of Service

The development of truck levels of service was a much more straight-forward and simplified process than railroad level of service due to the existence of widely recognized national and regional tools from which the data could be derived. This process is described below.

Distances. Distances were calculated from each of the 22 external markets to the edge of the NYMTC model area region. The National Highway Planning Network (NHPN) was used to identify the highways used by trucks to travel between the region and the external markets. The NYMTC Best Practices Model (BPM) for 2025 was used to determine the distances and highway impacts and benefits within the study area.

Travel Times. The truck travel times were calculated separately for travel outside of and inside the NYMTC model area. For the portion of the travel outside of the NYMTC model region, the truck was assumed to travel at 55 MPH. For the portion of travel on the highways inside the NYMTC model region, the congested path assignments were used to identify the AM peak period travel times.

For all trips to East-of-Hudson markets, the travel time was considered to include not only the market-to-market time but also a within market travel time and a backhaul time. The NYMTC

model provides the travel time to the center of the market area (i.e., generally the rail/intermodal yard previously identified as the node for each study area zone such as 65th Street in Brooklyn, etc.). There was assumed to be an additional travel time within the market area of 30 minutes. The backhaul time is a penalty for goods carried to or from East-of-Hudson (EOH) markets.

Costs. The LOS truck costs were based on the times and distances identified as described above. The Characteristics and Changes in Freight Transportation Demand (Cambridge Systematics, NCHRP Project 8-30, 1995) gives the cost for a variety of trucking configurations. The report further suggests that the costs have been updated using the Bureau of Labor Statistics Producer Price Index for non-local trucking. The toll costs in the EIS reflect current toll charges. For purposes of establishing the truck LOS, it was assumed that the peak hourly rates on the PANYNJ bridges apply and that the E-ZPass rates apply on all other crossings.

As a final step in calculating the LOS truck costs, the total truck trip costs were divided by 17.5 tons, which is the average payload weight found in a region-specific selection of the Census Bureau's Vehicle Inventory and Usage Survey (VIUS), to develop market to market costs per ton.

Exogenous Markets Levels of Service

The core of the diversion modeling exercise was based on domestic cargo shipped between or through the region and other origins or destinations in North America. However, additional potential markets were also identified which might contribute traffic to the Double Tunnel System, such as port traffic and other miscellaneous traffic. The contributions of these markets to overall demand may be policy driven rather than market driven. This section briefly discusses how these potential markets were addressed.

In the case of port traffic, traffic could be generated either from the existing port activities at Port Newark/Elizabeth or from the development of a proposed two million TEU (twenty-foot equivalent unit) container port to be located in Sunset Park, Brooklyn. The latter concept was proposed by NYCEDC in the Strategic Plan for the Redevelopment of the Port of New York.

For the purposes of the Double Tunnel System analysis, four "extra" freight train round trips were assumed in the rail traffic stream to account for the potential use of the tunnel for either New Jersey port traffic bound for East-of-Hudson markets, or for other miscellaneous rail traffic. The use of the tunnel in this way by the PANYNJ is consistent with the concepts identified in the Port Inland Distribution Network (PIDN) program intended to more rapidly move containers out of the port area into secondary distribution centers. Constrained capacity on the Single Tunnel System would preclude these markets.

A Brooklyn port scenario is somewhat different in that it potentially has a major impact on the level of rail traffic using the tunnel, but is speculative in concept. Therefore, the transportation impacts of this alternative were considered as a separate cumulative impact for the Double Tunnel System and not added to the core demand and impacts for the Tunnel Alternative. In developing levels of service for this sub-alternative, PIDN assumptions about the modal distribution of cargo arriving at a Brooklyn port were used as representing the most recent data available on how such a facility might operate in relation to the existing port facilities in New Jersey. In effect, the Brooklyn port could be a (large) component of a greater PIDN strategy. The current mode split of traffic moving into and out of Port Newark/Elizabeth is 86 percent truck and 14 percent rail. The goal of PIDN is to achieve a split of 57 percent truck, 18 percent rail, and 25 percent barge by 2020. This assumption was used to test the impact of the combined tunnel/port alternative.

With the current forecast of demand for the Single Tunnel System, it is unlikely that additional demand for a port facility in Brooklyn could be accommodated without displacing traffic from the domestic intermodal market.

Stated Preference Survey and Mode Choice Model

To estimate the commodity flows that may be diverted to a new harbor crossing, choice surveys were administered to regional shippers during the MIS process. In these choice surveys, different shipping alternatives were presented in terms of the attributes that describe the alternative—travel time, cost, reliability, frequency of service, delivery window, crossing type (tunnel or float bridge), and destination in the East-of-Hudson subregion. This technique is typically used to forecast consumer response to products and services that do not presently exist. The advantage of this approach compared to standard survey techniques is that it tests respondent's choice preference against a range of future service attributes, and these results are then used to develop a model which can predict choices under a specific set of service attributes.

The Model. The results of the choice survey were used to estimate a disaggregate diversion choice model. The final set of rail and truck level of service parameters for each cross-harbor alternative were input to the model to obtain the truck to rail diversion percentage. This percentage was then applied to the 2025 forecasted TRANSEARCH database to determine the total volume of cargo which would divert to rail under each alternative. These forecasts were disaggregated by commodity type, origin-destination pairs, and type of rail service (i.e., intermodal, carload, transload).

In addition, two off-model adjustments were made to the final diversion estimate. First, while shippers might choose a railroad mode under specific circumstances, there is no guarantee that the railroad industry would chose to serve every such shipper. Economies of scales make it difficult for the railroads to service small shipments of individual commodities from isolated locations. Therefore, diverted tonnage of a given commodity that is less than a carload between any given origin-destination pair was eliminated on the grounds that the railroads would neither aggressively nor successfully market such small shipments. Similarly, diverted through traffic was filtered to reflect the fact that the competing railroads would opt not to use the tunnel to interchange traffic with another railroad when the option exists for a railroad to "long-haul" itself.

One additional manual step was included in the process. This involved the estimation of how much future rail traffic which would otherwise use the existing Selkirk routing would divert to the cross-harbor alternatives. The diversion model could not be used to estimate this volume since it does not involve diversion from truck. Also, the results of this "existing rail diversion" would have no impact on future truck volumes in the region since it reflects traffic which would be on rail anyway. The only impact of this traffic on the project facilities is its contribution to the overall volume using the tunnel itself and connecting rail lines. This volume was manually estimated based on knowledge of existing and planned railroad operations.

TRIP ASSIGNMENT

Once the mode choice model was run and the amount of diverted tons determined, the tons were converted to truckload and railcar equivalents. In the case of trucks, this diversion would result in a reduction in cross harbor truck trips with some increases in local truck trips in the vicinity of rail and intermodal yards located in the East-of-Hudson region. In the case of rail, this diversion would result in increased rail traffic on the rail infrastructure of the region (on both sides of the

Hudson). The methodology for assigning these revised trip patterns to the two modal networks is described below.

Highways

The first step in the forecasting process was to identify the truck trip movements that are likely to be candidates for modal diversion. Once the commodity flows had been translated to truck movements into and out of the counties of the metropolitan area, these truck movements were disaggregated to the finer geography used in the NYMTC BPM. The base year and forecast year No Action commodity flow truck trip end estimates for the 28 county* NYMTC model region were allocated to NYMTC's 3,586 traffic analysis zones (TAZs) and 111 external stations based on SIC-specific employment forecasts for each TAZ. The final "commodity truck" trip table was calculated by combining all of the truck trip estimates for each SIC code and origin-destination pair.

The estimated commodity truck trips were assumed to represent a subset of the total truck trip forecasts in the NYMTC BPM. The commodity truck trip table developed from the TRANSEARCH database was subtracted from the NYMTC truck trip table, so that two separate truck tables could be applied to the NYMTC Model.

One significant change was made in the 2025 network which is not included in the BPM—the twinning of the Goethals Bridge. Since conceivably this might provide an advantage to truck travel into the region relative to rail, its inclusion was requested by stakeholders during the MIS public participation process. While there are no immediate plans to implement this improvement, it is still likely to occur by the project's analysis year of 2025.

Trip Assignments. The No Action highway assignment was performed using NYMTC files and procedures. A 2000 base year assignment was completed first, updating the BPM base year from 1996, and then for the 2025 No Action Alternative.

The shipper choice diversion model forecasting tool was then used to predict changes in commodity truck trips to and from the region's counties. The county-level changes in truck trips forecast by the diversion model for each 2025 alternative under consideration were then allocated to TAZs using the SIC-specific employment forecasts by TAZ. The increased intermodal traffic resulted in increased local truck trips from West Maspeth Yard to their final East-of-Hudson destinations. Similarly, the increased bulk transload traffic resulted in increased truck trips to and from existing bulk facilities at Oak Point/Harlem River yards in the Bronx, 65th Street Yard in Brooklyn, and the proposed Pilgrim State Yard in central Long Island. Other smaller sites were identified based on a separate project performed by NYMTC in 2001 specifically to identify such sites, as well as project estimates of siding capacity.

* The NYMTC BPM model region does not coincide exactly with the 30-county study region used for the purposes of disaggregating Reebie data. Specifically, it includes Mercer County, NJ which is not in the NJTPA region and was therefore not included in the Reebie regional definition, and excludes Litchfield County, Ct and Sullivan and Ulster counties, NY. The only effect of this discontinuity is that it is not possible to produce regional statistics for the 3 excluded counties which would, in any event, be minimally impacted by this project.

Railroads

This section provides an overview of the allocation process that was used to determine the number of containers and cars, and to assign them to incoming line-haul trains and local service trains.

Assignment of projected traffic to future line-haul trains is dynamic. Actual decisions will be made by the railroads and by the shippers. The railroads continuously revise their routings, schedules, and interchange points. Over time, mergers, marketing agreements, strategic alliances, and public policy decisions will change the patterns by which long-haul rail freight traffic serves the region. It cannot be stated with certainty which trains will be offered in the future and which of these trains will handle the projected future traffic. Rather, assignment of projected diversion to trains shows one possible scenario and provides a reasonable indication of the number of trains using the tunnel, distribution of rail traffic through the day, demands on the infrastructure of the tunnel and its approaches, and demands on the East-of-Hudson rail facility infrastructure.

In addition, future NY&A operations are unknown. Actual future rail user locations within Long Island will be determined by private sector capital investment decisions motivated, in part, by public policy incentives. How NY&A will move traffic on Long Island will be determined by the market and/or NY&A, within broad constraints imposed by LIRR. The local service analysis merely indicates the potential magnitude of post tunnel demands on NY&A, infrastructure requirements at and near Fresh Pond Yard, and at least one possible way that NY&A could handle the projected traffic.

The Allocation Method. The allocation method provides an indication of the times of day when line-haul trains might utilize the tunnel, their size (tonnage, number of cars, and length), East-of-Hudson destination(s), and their demands on the rail infrastructure. This process contains five steps:

- The annual cars and containers diverted from highway to rail for each origin-destination pair[*] were determined by dividing the amount of tonnage diverted by the typical capacity of a container, manifest freight car, or bulk transload car.
- For each origin-destination pair and for each type of traffic, the resulting containers and cars were assigned to incoming line-haul trains[**] using weighting factors based on trip times determined by the operations model.
- Traffic from each marketplace was accumulated on a train-by train basis. For some trains, such as those from Chicago, a given train might be allocated traffic from up to six external zones with interchange traffic being received from three or more connecting railroads.

[*] There are 110 origin-destination pairs into the study area (22 external zones times 5 destinations within the study area). There are 18 origin-destination pairs for through traffic (6 West-of-Hudson exterior zones times 3 East-of-Hudson exterior zones).

[**] The same data base of trains was used in the operations model to determine levels of service. Accordingly, the trains used are those that ran to northern New Jersey, Fresh Pond, or Oak Point in late 2001 plus the post-tunnel direct trains from Chicago and Atlanta to the tunnel portal without an intervening stop in Northern New Jersey.

- Where practical, consolidations were made among redundant line-haul trains so that not every train arriving in northern New Jersey continues through the tunnel. In particular, trains that pass through northern New Jersey rather than terminating there are considered not to be able to use the tunnel and are not assigned diverted traffic. Likewise, known special-purpose trains (unit trains and the like) were eliminated as candidates for service through the tunnel. Tunnel capacity would limit the number of trains. Only the most desirable trains would run through the tunnel. This essentially assumes consolidation of traffic at remote locations, such as Chicago, Atlanta, Selkirk, and Reading.
- Trains were scheduled through the tunnel to West Maspeth and/or Fresh Pond Yards to determine a likely daily schedule of demands. Throughout this portion of the analysis, the schedules of existing trains West-of-Hudson were assumed to remain fixed. No line-haul trains were presumed to change their West-of-Hudson schedule merely to accommodate a continuation of their route through the tunnel.

Local Service Analysis. The local service analysis was primarily intended to provide an indication of the increased requirements placed on the New York and Atlantic ("NY&A") to handle manifest carload freight and bulk transload traffic[*] at Fresh Pond Yard destined for Brooklyn, Queens, and Central Long Island[**]. In addition to traffic arriving at Fresh Pond via the tunnel, the local service analysis considered traffic arriving over the Hell Gate Bridge from either the Albany area via the Hudson Line or the New Haven area via the New Haven Line (Northeast Corridor). Local service analysis also considered outgoing traffic (both loaded cars and empty cars) that NY&A will interchange to the line-haul carriers in a post-tunnel environment.

As of late 2001, NY&A operated six regular trains (in addition to the "stone train" unit train which NY&A interchanged with P&W). Each train usually operates five days per week, but there is substantial overlap resulting in at least some service seven days per week.

Projections for the Single Tunnel System show that inbound post-tunnel traffic to the NY&A could approach 350 cars on an average day and exceed 550 cars on a "design day," representing a seven-fold increase in traffic. Projections for the Double Tunnel System show 400 cars on an average day and over 600 cars on a "design day," representing an eight-fold increase in traffic. This increase in traffic would need to be handled within external constraints on NY&A operations:

- LIRR tends to impose a 30 car limit on freight trains on some passenger lines;
- Maximum practical length for local trains switching cars en route is about 30 cars;
- Maximum practical length for through freight trains on LIRR is about 45 cars; and
- Yard tracks at Fresh Pond have a finite capacity.

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[*] Intermodal traffic is not included. That traffic will be moved directly to and from an intermodal facility in the West Maspeth area without stopping at Fresh Pond. Should the Pilgrim EIS lead to the development of an intermodal facility and market at Pilgrim State Hospital in Islip in advance of the completion of a Cross-Harbor tunnel, there is nothing in this analysis which would preclude servicing this market via tunnel trains. Such a development would reduce the infrastructure requirements (and impacts) of the West Maspeth Yard.

[**] Traffic destined for East-of-Hudson locations served by CSX (Bronx, Manhattan, and southwestern Connecticut) out of Oak Point was not analyzed after it moves beyond Fresh Pond. CSX appears to have ample infrastructure to handle this traffic.

Accordingly, it is likely that NY&A would run additional trains to keep train lengths reasonable. A requirement for extra trains needed on each current NY&A route was determined based on maximum train lengths of approximately 30 cars for local trains and 45 cars for through trains.

C. EXISTING CONDITIONS

REGIONAL TRANSPORTATION SYSTEM

HIGHWAY

The highway network plays a critical role in the freight transportation system in the New York metropolitan area, including key Hudson River and East River bridge and tunnel crossings and several major highway corridors used by trucks in New York and New Jersey, including but not limited to those described below (see Figure 8-8). Commercial vehicles are permitted to use limited-access expressways throughout the City's five boroughs, but are not allowed on roads designated as parkways. The overall network of expressways is limited, and this reduces the number of roadway options available to trucks. In some parts of the City, through truck traffic is confined to a single route option and often results in extreme congestion as both trucks and private automobiles compete for limited capacity available on these routes. The City's arterial and street network includes designated truck routes which provide a secondary, but generally much slower, alternative to trucks. High-capacity "interstate standard" trucks* operate on an even more confined network in the region, and are excluded from most NYC roadways.

Major Bronx Highways

Major Deegan Expressway (I-87). The Major Deegan Expressway generally carries three travel lanes per direction and has an Annual Average Daily Traffic (AADT) of 125,000 vehicles. The Major Deegan has short sections of a "service road" parallel to it, but they are not continuous and do not offer significant capacity relief or options to truck traffic at times of severe congestion on the highway mainline itself. Trucks are not permitted in the left lane, which is generally true for all limited-access highways in New York City. In the northbound direction, commercial vehicles average 18 percent, 24 percent, and 12 percent of the total traffic stream in the AM, midday, and PM peak periods, respectively. In the southbound direction, commercial vehicles average 14 percent, 18 percent, and 11 percent in these three time periods, respectively. Overall, average travel speeds range from about 41 to 52 mph throughout the AM, midday, and PM peak periods, with frequent congestion occurring along the northbound and southbound approaches to the Highbridge Interchange which connects the Major Deegan with the Cross Bronx Expressway and the George Washington Bridge.

Cross Bronx Expressway (I-95). The Cross Bronx Expressway generally carries three travel lanes per direction and has an AADT of 178,000 vehicles. The portion of I-95 within Manhattan is called the Trans-Manhattan Expressway, and the portion within the Bronx is called the Cross Bronx Expressway. Trucks make up a substantial percentage of the total volume of traffic using this corridor because it is the only limited-access east-west roadway through the Bronx, connecting the George Washington Bridge with destinations in Long Island and New England. It is also part of the only approved "interstate standard" truck route to Long Island. In the eastbound direction, commercial vehicles average 28 percent, 36 percent, and 17 percent of the

* Trucks with trailers that are 53 feet long, 9 feet wide, and 14 feet tall.

total traffic stream in the AM, midday, and PM peak periods, respectively (tractor-trailers alone represent 10 percent, 18 percent, and 6 percent of the total volume, respectively, during these three time periods). In the westbound direction, commercial vehicles average 29 percent, 35 percent, and 26 percent of the total AM, midday, and PM peak period traffic volumes, respectively (tractor-trailers make up 15 percent of the AM and PM peak period volumes and 19 percent of the midday volumes). Over a 24-hour period, commercial vans / trucks make up 17 percent of the total traffic volume on the Cross Bronx Expressway. The Cross Bronx Expressway is characterized by chronic congestion throughout many hours of the day and into the evening, even though average recorded speeds are typically in the 30 to 43 mph range. Since there are virtually no east-west alternatives to this highway—except for the more circuitous Bruckner Expressway—and no continuous service road system (short segments exist), trucks and general traffic are subject to highly variable conditions day-to-day and hour-by-hour.

Bruckner Expressway (I-278). The Bruckner Expressway generally consists of three travel lanes in each direction and has an AADT of 90,000 vehicles. The Bruckner Expressway does provide an alternative east-west route for trucks through the Bronx, but it is a much more circuitous route around the southern boundary of the borough. Bruckner Boulevard runs parallel to (or beneath) the Expressway from the Major Deegan Expressway to the Sheridan Expressway, and it serves as a service road through most of the corridor. There is limited traffic data available for this roadway.

Major Brooklyn Highways

Gowanus Expressway (I-278). The Gowanus Expressway is generally a three-lane highway in each direction and carries an AADT of 130,000 vehicles along the western, and primarily industrial, edge of Brooklyn. Between 65th Street and the Shore Parkway merge, the northbound direction drops from three general purpose lanes to two; the third lane (the left lane) becomes the "Blue Lane" which is restricted to buses and medallion taxis from 6 AM to 10 AM but serves as a shoulder lane during other times. For the most part, north of 65th Street, the Gowanus Expressway is an elevated roadway; below it, 65th Street, Third Avenue, and Hamilton Avenue act as its service road. Over a 24-hour period, trucks make up 7 percent of the total traffic stream. South of 65th Street, AM peak period truck traffic is 20-25 percent of all traffic, and PM truck traffic is 18 percent. The Gowanus is characterized by chronic traffic congestion and poor levels of service, with numerous high volume weaving sections. During the AM peak period, average travel speeds in the northbound (peak) direction range from 16-21 mph, with southbound direction speeds approximately 45 mph. During the PM peak period, the section between the Prospect Expressway and the Brooklyn-Battery Tunnel averages approximately 25 mph in each direction. Other sections of the Expressway average about 43 mph in both directions. The service road—a signalized City street—has average travel speeds of about 15 mph in each direction during commuting hours.

Brooklyn-Queens Expressway (I-278). The Brooklyn-Queens Expressway (BQE) is primarily a three-lane highway in each direction and carries an AADT of 123,000 vehicles. The BQE's southern terminus is the Brooklyn-Battery Tunnel (BBT) / Hamilton Avenue interchange in Brooklyn and its northern terminus is the Grand Central Parkway in northern Queens. From the BBT to Atlantic Avenue, the BQE is a cut-section, with Hicks Street serving as a service road at surface level. From Atlantic Avenue in Brooklyn to Queens Boulevard it is an elevated roadway. Over a 24-hour period, trucks make up 13 percent of the total vehicular volume. Peak period truck percentages range from 10 to 15 percent in both directions. During the AM peak period, the average travel speed eastbound between the Gowanus Expressway and the Manhattan Bridge

is less than 20 mph due to heavy congestion. For westbound traffic, the section between Queens Boulevard and the Williamsburg Bridge has an average travel speed of less than 25 mph. Otherwise, AM travel speeds in both directions average 45 mph, while PM speeds generally average 35 mph. The Kosciuszko Bridge is a major bottleneck in both directions.

Major Manhattan Highways

There are no limited-access highways that allow commercial vehicles in the borough of Manhattan; commercial vehicles are precluded from using both the FDR Drive / Harlem River Drive on Manhattan's East Side and the Henry Hudson Parkway on Manhattan's West Side. Therefore, trucks make use of north-south arterial streets generally on the far East and West Sides of the borough, including First and Second Avenues on the East Side and Tenth and Eleventh Avenues on the West Side.

Major Queens Highways

Van Wyck / Whitestone Expressway (I-678). The Van Wyck Expressway generally consists of three travel lanes in each direction and has an AADT of 153,000 vehicles south of the Kew Gardens interchange and 110,000 vehicles north of it. The Van Wyck Expressway and the Whitestone Expressway together link John F. Kennedy Airport to the south with the Whitestone Bridge to the north. The Whitestone Expressway generally consists of four travel lanes per direction and has an AADT of 127,000 vehicles. In the northbound direction, truck traffic averages 9 percent, 10 percent, and 5 percent of the total volume in the AM, midday, and PM peak periods, respectively. In the southbound direction, truck traffic averages 7 percent, 9 percent, and 4 percent, respectively, during these three periods. Over a 24-hour period, trucks make up 7 percent of the total vehicular traffic volume south of the Long Island Expressway (LIE) and 3 percent north of the LIE. Overall, average travel speeds northbound are in the 45-50 mph range in the AM and PM peak periods, except between Linden Boulevard and the Kew Gardens interchange, where the average speed is 20 mph, due to major congestion emanating from this bottleneck location. In the southbound direction, average travel speeds are 40 mph in the AM and PM peak periods, with the exception between Jewel Avenue and Jamaica Avenue where the average travel speed is 15 mph in the PM peak period.

Clearview Expressway (I-295). The Clearview Expressway generally carries three lanes in each direction, and has an AADT of 60,000 vehicles. It provides an alternative north-south route through Queens east of the Van Wyck Expressway, but its route to the south terminates at Hillside Avenue and does not extend further south toward JFK Airport. In the northbound direction, truck traffic comprises 9 percent of the traffic stream in the AM peak period and 3 percent in the PM peak period. In the southbound direction, trucks average 18 percent in the AM period and 7 percent in the PM period. Over a 24-hour period, truck traffic represents 11-12 percent of the overall volume on the highway.

Long Island Expressway (I-495). The LIE generally consists of three travel lanes per direction with an AADT ranging from 159,000 vehicles near the BQE to 204,000 near the Grand Central Parkway. The LIE traverses the full length of Queens as well as all of Nassau County and nearly all of Suffolk County, in an east-west direction. The LIE corridor has a continuous service road on both sides of the highway mainline east of Woodhaven Boulevard in Queens and through most of Long Island. There is a High Occupancy Vehicle (HOV) lane in effect along much of the LIE corridor in Nassau and Suffolk Counties, with additional segments in the planning and construction phase. Over a 24-hour period, truck traffic comprises approximately 10 percent of the total traffic stream. The LIE experiences chronic congestion at several locations. Overall, the

average travel speeds in the eastbound direction are 50 mph and 25 mph during the AM and PM peak periods, respectively. Westbound speeds average 25 mph in the AM period and 45 mph in the PM period.

Major Staten Island Highways

West Shore Expressway (Route 440). The West Shore Expressway consists of two travel lanes per direction and an AADT of 75,000 vehicles and average travel speeds of about 45 mph. In the northbound direction, truck traffic averages 8 percent and 6 percent during the AM and PM peak periods, respectively. In the southbound direction, truck traffic averages 7 percent and 3 percent, respectively, during these two periods of the day.

Staten Island Expressway (I-278). The Staten Island Expressway (SIE) generally consists of two travel lanes per direction west of the West Shore Expressway and three lanes per direction east of it. The SIE is the only controlled-access highway carrying both commercial and non-commercial trips from the Goethals Bridge linking Staten Island and New Jersey (and points south and west) with Brooklyn via the Verrazano-Narrows Bridge. It has an AADT of 69,000 vehicles west of the West Shore Expressway, 153,000 vehicles between the West Shore Expressway and Hylan Boulevard, and 173,000 vehicles east of Hylan Boulevard. A service road is available, but is not continuous. In the eastbound direction, truck traffic averages 12 percent and 9 percent in the AM and PM peak periods respectively. In the westbound direction, truck traffic averages 14 percent and 9 percent, respectively, in these two time periods. Over a 24-hour period, trucks make up 7 percent of the total traffic stream. Overall, average travel speeds eastbound range from 15 to 57 mph during the AM peak period. In the westbound direction, average speeds range from 25 to 48 mph in the PM peak period. Travel speeds during off-peak hours range from 46 to 61 mph. Average speed on the service road is 20 mph during both peak periods.

Major New Jersey Highways

New Jersey Turnpike (I-95). The New Jersey Turnpike (NJT) serves as part of the major north-south roadway (I-95) along the Eastern seaboard of the United States, connecting the New York region to other metropolitan centers such as Boston, Philadelphia, Washington D.C., and points south. The NJT is divided into "inner" and "outer" roadways (trucks and buses are generally prohibited on the inner roadway) from Interchange 8A in Middlesex County to Interchange 15E in Newark. Along this segment, the Turnpike carries a total of six lanes per direction with the exception of the area between Interchanges 11 and 14, where seven lanes exist in each direction. North of Newark Airport, the Turnpike consists of an eastern spur, which provides access to the Lincoln Tunnel and the area of northern Hudson County east of the Hackensack River, and a western spur, which serves southern Bergen County and the Meadowlands Sports Complex. Each spur generally carries six lanes per direction through this area, though the western spur narrows to two lanes per direction for a short segment north of Route NJ-3. The two spurs merge into a single roadway at the northern terminus of the Turnpike in Ridgefield, where I-95 continues northward and merges with I-80 before crossing the George Washington Bridge.

Regional statistics obtained from the New Jersey Turnpike indicate that trucks comprise approximately 21 percent of the vehicular traffic on the roadway. This number appears to be rather high, so it is possible that the Turnpike classifies trucks not by their size but by their commercial uses, which means that this total likely includes many smaller vehicles that would not be considered "trucks" for the purpose of capacity assessments. Daily traffic volumes exceed

200,000 vehicles per day and approach 300,000 vehicles per day at the northernmost segment of I-95 between the I-80 interchange and the George Washington Bridge.

US Routes 1&9. US-1 and US-9 were the major north-south routes through eastern New Jersey in the original Federal Highway System. US-1 follows the route of the Old Post Road along the Atlantic Seaboard, while US-9 runs along the New Jersey shore and up through the Hudson River Valley. In northern New Jersey the two designated routes share the same roadway through the older, industrialized areas of Middlesex, Union, and Hudson Counties. In the New York City region, the road is primarily a barrier-separated arterial carrying two lanes per direction that runs roughly parallel to the New Jersey Turnpike, with turning lanes at intersections as needed and driveway access to adjoining land uses. The road widens to six lanes in the vicinity of Newark Airport, with grade-separated interchanges providing access to I-78, the Turnpike, and US-22. In northern New Jersey, trucks generally comprise 10 to 12 percent of the vehicles on US-1&9. Daily traffic volumes range from 55,000 vpd in northern Hudson County to 80,000 in Newark and Elizabeth.

US-1&9 serves as a major spine road through the most heavily-developed parts of the state, providing access to major industrial sites (e.g., GM in Linden, Ford in Edison, the Bayway Refinery, etc.). It also serves as a critical intermodal facility in the region, since it provides access to Port Newark/Elizabeth and nearly all of the major freight rail terminals in northern New Jersey (Oak Island Yard in Newark, Croxton Yard in Secaucus, and CSX's intermodal facility in South Kearny). NJDOT's ongoing Portway initiatives are aimed primarily at improving truck mobility along heavily-congested segments of Routes 1&9 in the port district.

Interstate 78. Interstate 78 serves as the primary route between New York City and the rapidly-growing warehouse/distribution centers in eastern Pennsylvania. It also serves as a key connection from New York to the Interstate 81 corridor (near Harrisburg) that serves as a parallel "inland route" which is heavily used by trucks to bypass the congested urban centers along the I-95 corridor. A portion of I-78 serves as the Hudson County extension of the New Jersey Turnpike, carrying two lanes per direction between the Turnpike main line and the Holland Tunnel. The roadway is divided into "local" (three lanes per direction) and "express" (two per direction) lanes between the Turnpike and Route NJ-24 in northern Union and Essex Counties, then carries three lanes per direction across New Jersey through Somerset, Hunterdon and Warren Counties. Truck volumes vary from 7.5 to 14 percent of total vehicular traffic along I-78—the truck percentage is highest in the western part of the state and generally declines in the east as the roadway becomes more heavily influenced by commuter-oriented traffic. The segment of I-78 just west of the New Jersey Turnpike generally has the heaviest traffic volumes (AADT of about 118,000 vpd, compared to less than 70,000 vpd west of I-287).

Interstate 80. Interstate 80 runs parallel to I-78 through northern New Jersey but serves a different truck market due to its access to the George Washington Bridge and its connections to the west. The road serves as one of the major east-west routes across the northern half of the United States, and links New York to the industrial Midwestern states. The cross-section varies from three to four lanes per direction through most of New Jersey, though on one segment near the I-287 interchange the roadway divides into "local" and "express" lanes. The AADT varies from about 120,000 to 135,000 in the New York metropolitan area, and truck percentages range from 8.5 to 13 percent of the total vehicular traffic. As with I-78, the share of trucks in the vehicle mix is generally highest in the western part of New Jersey and lowest in the more heavily-populated areas east of I-287. As a result of the completion of the northernmost segment of I-287 in the early 1990s, it is likely that a number of trucks that once crossed the George

Washington Bridge for trips between New England and points west are now using I-287 to access a crossing further north on the Hudson River (i.e., the Tappan Zee Bridge, or even the Newburgh-Beacon Bridge) and bypass New York City entirely.

Hudson and East River Bridge and Tunnel Crossings (see Figure 8-9)

Holland Tunnel. The Holland Tunnel provides two travel lanes per direction between New Jersey and Lower Manhattan, with a speed limit of 35 mph and an AADT (Annual Average Daily Traffic) of 101,000 vehicles. The height restriction is 12 feet 6 inches and the width restriction is 8 feet 0 inches. Campers, bottled gas, and hazardous materials are prohibited in the Holland Tunnel. Tolls are collected in the eastbound direction and E-ZPass is available. The Holland Tunnel provides access to Lower Manhattan and one of Manhattan's east-west through truck routes, Canal Street. It is attractive to trucks destined to Brooklyn, Queens, and Long Island because it links the toll-free East River crossings of the Manhattan and Williamsburg Bridges via Canal Street. Heavy congestion characterizes both approaches to the tunnel in the AM and PM peak periods. Trucks comprise 15 percent of the total eastbound traffic stream in the tunnel in the AM peak period and 5 percent in the PM peak period. Over a 24-hour period, heavy trucks account for 8 percent of the total traffic, and are only allowed to use the right lanes. Of all the eastbound heavy trucks that use the Holland Tunnel, 61 percent pass through Manhattan en route to other destinations.[*]

Lincoln Tunnel. The Lincoln Tunnel has a total of six 12-foot lanes with peak direction traffic generally utilizing four lanes and the non-peak direction allotted two lanes. The speed limit in the tunnel is 35 mph and the AADT is 124,000 vehicles. Its height restriction is 13 feet 0 inches and the width restriction is 8 feet 6 inches. Campers, bottled gas, and hazardous materials are prohibited. Tolls are collected in the eastbound direction and E-ZPass is available. There is heavy congestion in both directions in both the AM and PM peak periods, with the tunnel providing access into and across Midtown Manhattan and one of Manhattan's limited number of east-west through truck routes, 34th Street. Over a 24-hour period, heavy trucks account for 6 percent of the total traffic using the tunnel. Of all the eastbound heavy trucks crossing the Hudson River using the Lincoln Tunnel, only about 22 percent continue through Manhattan en route to other destinations.

George Washington Bridge. The George Washington Bridge (GWB) has two levels with four travel lanes per direction on the upper level and three travel lanes per direction on the lower level. The upper level has a height restriction of 14 feet 0 inches and a width restriction of 8 feet 6 inches, while the lower level has a height restriction of 13 feet 6 inches and a width restriction of 8 feet 6 inches. Hazardous materials are only permitted on the upper level. Since 9/11, commercial vehicles are restricted from use of the upper level of the bridge. The westbound direction has a speed limit of 45 mph. The total AADT for the Bridge is 276,000 vehicles, and tolls are collected eastbound with E-ZPass available. The Bridge is characterized by heavy congestion in both directions in both the AM and PM peak periods. It is the only Hudson River crossing in New York City that is part of the National Highway Network, which is a designated system of highways for 53-foot trailers. This crossing is the only option for 53-foot trailers west

[*] Since 9/11, traffic restrictions in Lower Manhattan have resulted in truck prohibitions on Canal Street. Diversion patterns are not yet known but will be analyzed in the NYMTC Regional Freight Plan. This change is highly popular with the local community. In addition, since 9/11, a Single Occupancy Auto Ban has been in effect Monday through Friday from 6AM to 10AM.

of the Hudson River bound for the Bronx, Queens, and Long Island, and it is the major option for trucks bound to New England, as well. Of all the eastbound heavy trucks using the GWB, 5 percent are destined for Manhattan, 30 percent are destined for the other four "outer" boroughs of New York City, and 65 percent are destined to Long Island, New England, or Westchester County.

More tractor-trailers cross the Hudson River over the GWB than through the Holland and Lincoln Tunnels due to the tunnels' height restrictions. Over a 24-hour period, trucks account for 10 percent of the total two-directional traffic volume, of which 70 percent are large trucks (more than two axles or more than six tires). Nine percent of eastbound vehicles are trucks in the AM period, 9 percent at midday, 4 percent in the PM, and 31 percent between 12 midnight and 6 AM. In the westbound direction, 10 percent of the total traffic stream are trucks in the AM, 14 percent at midday, 7 percent in the PM, and 17 percent between 12 midnight and 6 AM. The temporal distributions for large versus small trucks do not coincide. The early morning period of 3 to 7 AM for eastbound traffic, and the midday 10 AM to 2 PM period for westbound traffic, have the highest number of large trucks using the GWB. The small trucks tend to operate during the peak periods, with the highest volume of eastbound vehicles occurring from 6 to 10 AM, and the highest volume of such vehicles operating between 1 PM and 5 PM.

Tappan Zee Bridge. The Tappan Zee Bridge connects Westchester and Rockland Counties and has a total of seven travel lanes and a moveable barrier that can provide four of the seven travel lanes for peak direction traffic. All vehicles pay a toll to cross in the eastbound direction; E-ZPass is available. Lane widths are 11 feet 8 inches and the bridge's AADT is 130,000 vehicles. Eastbound trucks represent 4 percent of the AM peak period traffic and 6 percent of the PM peak period traffic. Westbound trucks represent 13 percent of the AM total traffic and 10 percent of the PM total traffic. The Tappan Zee Bridge is heavily used by through trucking destined for New England.

Verrazano-Narrows Bridge. The Verrazano-Narrows Bridge (VNB) has an upper level and a lower level, with three travel lanes per direction on each level. The total AADT for the VNB is 173,000 vehicles. The VNB has a toll only in the westbound direction but charges the toll based on both eastbound and westbound travel; E-ZPass is available. The VNB is the only Hudson River crossing between Staten Island and Brooklyn and points east. In the eastbound direction, truck traffic averages 12 percent and 10 percent in the AM and PM peak periods, respectively. In the westbound direction, truck traffic averages 13 percent and 9 percent during these same periods, respectively.

Brooklyn-Battery Tunnel. The Brooklyn-Battery Tunnel (BBT) carries two 12-foot travel lanes in each direction and has an AADT of 61,000 vehicles. A toll must be paid in each direction and E-ZPass is available. Over a 24-hour period, 5 percent of the vehicles are commercial, with trucks accounting for 52 percent of the total commercial traffic. The BBT has a vertical clearance of 12 feet 3 inches.

Brooklyn Bridge. There is a three-ton weight limit on the Brooklyn Bridge and trucks and buses are prohibited from using it. In the AM and PM peak periods, commercial vehicles represent 1 to 7 percent of the total traffic in both directions. Over a 24-hour period, commercial vehicles account for 4 percent of the total traffic volume, with trucks representing less than 1 percent. The bridge's AADT is 144,000 vehicles and there is no toll to cross it.

Manhattan Bridge. The Manhattan Bridge has an upper level and a lower level, with two travel lanes per direction on the upper level and a total of three travel lanes on the lower level; lane

widths are approximately 10 feet each. The AADT for the bridge is 78,000 vehicles. The Manhattan Bridge represents a major East River truck crossing because there is no toll and because it provides a linkage between the Holland Tunnel (via Canal Street) and Brooklyn whereas trucks are restricted on the Brooklyn Bridge. Trucks are restricted to using the upper level, while commercial vans are allowed on the lower level. Commercial vehicles range from 25 to 40 percent of the total traffic stream in the AM and PM peak periods.

Williamsburg Bridge. The Williamsburg Bridge carries two inner roadways and two outer roadways, each with two travel lanes, for a total of eight lanes overall. Travel lane widths vary from 10 to 11 feet. The Bridge has an AADT of 109,000 vehicles. The Williamsburg Bridge is a toll-free East River crossing that connects indirectly to the Holland tunnel via east-west streets in Lower Manhattan, i.e., Delancey Street and Kenmare Street. Trucks are allowed only on the outer roadways, yet commercial vans may use the inner roadways. In the AM and PM peak periods, commercial vehicle traffic comprises 15 to 20 percent of the total traffic volume, with the exception of westbound traffic in the PM peak period which has 50 percent commercial traffic. Over a 24-hour period, commercial vehicles account for 18 percent of the total traffic volume.

Queens-Midtown Tunnel. The Queens-Midtown Tunnel (QMT) consists of two tubes with two travel lanes in each direction. The height restriction is 12 feet 1 inch. Tolls are collected in both directions and E-ZPass is available. The QMT provides direct access between Midtown Manhattan and the Long Island Expressway in western Queens, connecting westward in Midtown Manhattan primarily via 34th Street, which is one of Manhattan's limited east-west through truck routes. The speed limit is 40 mph and the QMT has an AADT of 68,000 vehicles. Over a 24-hour period, heavy trucks account for 5 percent of the total traffic.

Queensborough Bridge. The Queensborough Bridge provides an East River crossing between East Midtown Manhattan and Queens. The bridge is not tolled, and carries an AADT of 192,000 vehicles. The bridge has both upper and lower levels as well as outer roadways alongside the main roadway of the lower level. The lower level provides two traffic lanes towards Manhattan plus a two-directional bicycle lane along the outer roadway on the north side of the bridge. The upper level has two travel lanes in each direction. Trucks are only permitted on the lower level. Trucks over 12 feet 1 inch in height on the Long Island Expressway bound for Manhattan are diverted to the Queensborough Bridge due to the height restriction at the QMT. Commercial traffic ranges from 6 to 15 percent in the AM and PM peak periods overall. Over a 24-hour period, commercial vehicles account for 15 percent of the total traffic volume.

Throgs Neck Bridge. The Throgs Neck Bridge connects the Bronx and New England with Queens with direct connections to the Clearview Expressway and the Cross Island Parkway on the Queens side of the bridge. The bridge provides three travel lanes in each direction and it carries an AADT of 99,500 vehicles. Tolls are collected in both directions and E-ZPass is available. Over a 24-hour period, commercial vehicles account for 17 percent of the total traffic volume, with trucks comprising about 8 percent.

Bronx-Whitestone Bridge. The Bronx-Whitestone Bridge also connects the Bronx with Queens, with direct connections to the Whitestone and Van Wyck Expressways on the Queens side of the bridge. Tolls are collected in both directions and E-ZPass is available. This crossing carries an AADT of 104,000 vehicles. Over a 24-hour period, commercial vehicles account for 11 percent of the total traffic stream, with trucks comprising about 6 percent of this volume.

Triborough Bridge. The Triborough Bridge links the Bronx, Queens, and Manhattan, via roadway connections to the Major Deegan and Bruckner Expressways in the Bronx, the Grand Central Parkway in Queens, and Harlem River Drive / FDR Drive in Manhattan. The Manhattan "bridge" has an AADT of 94,000 vehicles; over a 24-hour period, commercial vehicles account for 3 percent of the total traffic, with trucks comprising about 1 percent. The Bronx "bridge" has an AADT of 82,000 vehicles; over a 24-hour period, commercial vehicles account for 14 percent of the total traffic, with trucks comprising about 7 percent. Tolls are collected on both bridges in both directions and E-ZPass is available.

Goethals Bridge. The Goethals Bridge is one of three Staten Island bridges linking that borough with New Jersey; its AADT is 69,000 vehicles. Tolls are collected only in the eastbound direction, and E-ZPass is available. The capacity of the bridge is limited by its narrow 10-foot travel lanes, with two lanes in each direction. The height restriction is 14 feet 0 inches and the width restriction is 8 feet 6 inches. The Goethals Bridge experiences congestion during the AM peak period and, as a result, trucks use this facility earlier in the morning or have to wait until after the peak period. The bridge has a speed limit of 45 mph.

Outerbridge Crossing. The Outerbridge Crossing connects Staten Island with New Jersey at the southern end of Staten Island. It has a speed limit of 45 mph and carries an AADT of 72,000 vehicles. There are two 10-foot travel lanes per direction, and these narrow lanes also pose a problem to truck traffic. The height restriction is 14 feet 0 inches. Tolls are collected in the eastbound direction and E-ZPass is available.

Bayonne Bridge. The Bayonne Bridge is the third of the three Staten Island-to-New Jersey bridge crossings. It is a toll facility with two travel lanes in each direction, each with 10-foot lane widths. A toll is collected only in the Staten Island-bound direction; E-ZPass is available. The AADT for the bridge is 15,600 vehicles. Trucks account for 15 percent of the Staten Island-bound traffic in the AM peak period, 20 percent at midday, and 3 percent in the PM peak period. Trucks account for 3 percent, 19 percent, and 11 percent, respectively, of the overall traffic volume in the New Jersey-bound direction in the AM, midday, and PM peak periods.

RAIL

West of Hudson Region

Major Corridor. Four major routes are used to deliver rail freight to the West-of-Hudson region. These routes provide access from the North, West and Southwest and are generally speaking the historic gateways from the pre-Conrail era. (See Figure 8-10.)

River Line. Freight access along the Water Level Route from Chicago is routed via the CSX River Line. Trains are dispatched from Selkirk Yard near Albany and travel south along the west shore of the Hudson River to North Bergen, Kearny, Little Ferry and Port Newark yards in Northern New Jersey. The single-track River Line is heavily used and does not involve any passenger train operations. Speeds of 45-50 mph are achieved for most of the 132 mile River Line, which is controlled by the CSX dispatcher. The signal system and strategically placed passing sidings facilitate bi-directional operations.

Southern Tier Line. The Southern Tier Line provides access by Norfolk Southern (NS) from Buffalo via Binghamton to New Jersey. This 420-mile corridor is shared with NJ Transit/Metro-North passenger trains for a distance of 88 miles south of Port Jervis. The potential conflict with passenger trains is cited as the reason for limiting its use as a heavy freight corridor. The line is mostly single-track, with a double-track alignment in place south of Suffern (31 miles). Freight

train speeds of 40 mph are permitted for most of the distance. The Norfolk Southern dispatcher controls freight train movement as far as Suffern, where the NJ Transit dispatcher assumes control for the remaining segment to Croxton Yard.

Lehigh Line. The third major corridor to northern New Jersey is the NS Lehigh Line from Harrisburg. This route provides access to Oak Island Yard directly, and to Port Elizabeth Yard, Port Newark Yard and E Rail Terminal via the Elizabeth Industrial Track. Access to the inactive Staten Island Railroad is also possible at Cranford Junction. This alignment, which is primarily used as a freight corridor, is single-track with a generous allocation of passing sidings to facilitate bi-directional operation. The northern-most 13 miles of the Lehigh Line consists of a double-track alignment, which is shared with NJ Transit's Raritan Valley Line passenger trains. Train movement is controlled by the NS dispatcher as far as Aldene, where control shifts to the NJ Transit dispatcher. Freight trains move at 40-50mph along the length of the Lehigh Line.

Trenton Line. CSX utilizes the Trenton Line for service from Philadelphia and points south and southwest. The Trenton Line joins with the Lehigh Line at Port Reading Junction, where trains operate either directly to Oak Island Yard or diverge at CP Bound Brook to the Port Reading Secondary. The Trenton Line is a combination of single- (35mi.) and double- (22mi.) track alignments that accommodate speeds of 40-50mph. The final leg of the journey to Oak Island Yard is either via the Lehigh Line (25mi.) or the Port Reading Secondary/Chemical Coast Secondary. The CSX Main Line dispatcher controls movements over the Trenton Line, while the NS dispatcher and the NJ Transit dispatcher control movements into Oak Island Yard.

Northeast Corridor. In addition to the major corridors described above, the four-track Amtrak Northeast Corridor (NEC) is used for a small percentage of freight train movements. The NEC, however, carries a full schedule of Amtrak and NJ Transit passenger trains (322 trains per weekday) that results in few opportunities for relatively slow freight train movements.

Conrail Shared Assets Organization. The major corridors in Northern New Jersey are supplemented with a number of local corridors that serve to route freight traffic between major yards and to effect interconnections with the several railroads. These local corridors and some of the yards they connect are operated by the Conrail Shared Assets Organization (CSAO) and are managed by a staff whose function is to promote the seamless handling of freight trains from the several carriers serving the West-of-Hudson Region. The local corridors are described below. Unlike the major corridors, these conduits are relatively short and do not sustain operating speeds in excess of 30mph.

Chemical Coast Secondary. This corridor connects Perth Amboy with the National Docks Branch. Yards served by this corridor are Bayway, Port Newark, Doremus Avenue and Oak Island.

National Docks Branch. This corridor links Croxton and Oak Island Yards, with access to the Northern Branch/River Line and North Bergen Yard.

Port Reading Secondary. The Port Reading Secondary connects the Lehigh Line (at CP Bound Brook) with the Chemical Coast Secondary (at CP PD).

Major Yards. There are a large number of freight yards located in the West of Hudson region. "West of Hudson" reflects their geographic location with regard to the river barrier and the relatively easy access to the national rail network. Most if not all of these yards are scaled down from their original sizes to reflect the transformation of rail freight traffic to accommodate containerized and intermodal shipments. (See Figure 8-10.)

Croxton Yard. This yard is served by Norfolk Southern (NS) for piggyback (TOFC) and container (COFC) trains. The yard consists of three loading tracks situated on 135 acres. It has doublestack capability and storage for refrigerated containers. The general condition of this facility is excellent.

Little Ferry Yard. This facility is owned and operated by CSX. CSX has indicated that it is the least used of its principal northern New Jersey intermodal facilities and is sometimes used for experimental marketing services. The facility does not include warehousing capability. The yard consists of four center tracks and is equipped with lift gear and tractors. Little Ferry Yard has been judged to be in good condition.

North Bergen Yard. The North Bergen Terminal is owned and operated by CSX and is used for doublestack and TOFC trains. Premium and UPS traffic are handled at this yard. There is no warehouse/storage facility at this terminal. There are four tracks within the body of the yard for unloading trucks and/or containers. The condition of the yard and its communications equipment is considered to be good.

South Kearny Yard. Owned and operated by CSX, South Kearny is primarily devoted to handling international doublestack container traffic. Situated on 120 acres, the yard consists of six working and eight support tracks. The condition of the terminal, its tracks and communications equipment is good.

Oak Island Yard. By far the largest (500 acres) rail facility in northern New Jersey, Oak Island is mainly a classification yard. It is owned by CSAO and serves trains operated by CSX, NS and CP Rail. In keeping with its primary function, the yard consists of 30 classification tracks, 9 departure tracks and 10 receiving tracks. Although the facility is capable of handling doublestack, COFC and TOFC shipments, it does not have warehousing capability. The condition of Oak Island Yard has been judged to be only fair.

Doremus Avenue Auto Terminal. This terminal is the largest rail automobile unloading facility in the metropolitan area. Automobiles are handled between rail and ship or truck. The terminal is owned by CSAO and serves CSX and NS trams made up of multilevel auto rack cars. The yard occupies 87 acres and consists of ten unloading tracks and ten holding tracks.

ExpressRail Terminal. This terminal is an on-dock intermodal rail transfer facility serving both CSX and NS. Unlike other yards in North Jersey, ExpressRail is owned by the Port Authority of New York & New Jersey (PANYNJ). Maher Terminal Inc. is the operator of the facility and CSAO is the rail service provider. The facility is furnished with an extensive system of modem communication equipment and state-of-the-art lifting equipment to expedite the movement of containers between transportation modes. The terminal has been deemed to be in fair condition.

E-Rail Yard. This facility is also used for the transfer of doublestack transcontinental and international containers. It is operated by Rail-Bridge Terminals and serves NS. The yard consists of four tracks, which are in fair condition, although the terminal has been deemed "in need of improvement." Roadway traffic congestion has been cited as a limitation to the efficient use of this facility.

Greenville Yard. The yard is owned by CSAO and serves CSX and NS. The yard is leased to the New York Cross Harbor Railroad (NYCHRR) for operation. The yard serves as a terminal for floating operations to Brooklyn, a service provided by NYCHRR. It consists of several body tracks and one operable floatbridge. The floating operation is provided on an as-needed basis.

There is some intermodal activity conducted at Greenville Yard. The condition of the yard and floatbridge is only fair.

Arlington Yard. Arlington Yard is currently unused. It is owned by the City of New York and will be used as an adjunct to the restored Staten Island Railroad to serve the Howland Hook marine facility and the Port Ivory site.

Current Operations. Freight trains reach the West-of-Hudson Region primarily via the River Line from Selkirk Yard near Albany and via the Lehigh Line and Trenton Line from the South and Southwest. Freight service via the Southern Tier Line to Croxton is not as extensively used.

Service via the River Line. CSX is the owner of the freight-only River Line, a corridor that sees the movement of 30-40 trains per day. The line begins at Selkirk Yard and terminates at North Bergen Yard. This route is free of clearance restrictions and permits the movement of doublestack container cars.

Trains consisting of doublestack cars of international freight are terminated at South Kearny. Much of this traffic is from the west coast, and is either distributed to local markets or placed aboard ships. Traffic levels at this facility involve approximately 45 train movements per week.

Trains consisting of premium piggyback (TOFC) and UPS cars are terminated at North Bergen Yard. This facility handles mostly UPS cargo, a service that requires a high degree of schedule reliability. The yard experiences approximately 26 train movements per week. CSX has equipped the facility with sophisticated electronic tracking and billing systems to protect the schedule reliability that UPS demands.

The CSX terminal at Little Ferry is currently the least-used of its principal North Jersey facilities. This terminal can handle both TOFC and doublestack operations, although the majority of the shipments served here are TOFC. Traffic levels of 28 trains per week are witnessed at Little Ferry. CSX also uses the capacity of this facility for experimental services, such as the recently discontinued "Ice Cold Express."

Service via the Lehigh Line and Trenton Line. Norfolk Southern is the user of the Lehigh Line to Northern New Jersey, serving the principal intermodal terminals of E-Rail, Croxton and ExpressRail Yards. Merchandise trains are routed to Oak Island Yard. Tracks north of Cranford Junction are shared with 60 weekday NJ transit passenger trains.

CSX operates trains on the Trenton Line, which connects with the Lehigh Line at Port Reading Junction. Trains may be operated through to Oak Island Yard or diverge at CP Bound Brook to reach Port Newark or Doremus Avenue Yards.

E-Rail Terminal is the major destination for doublestack transcontinental and international marine containers and TOFC handled by NS. The terminal is operated by Rail-Bridge Terminals Inc. (a subsidiary of K-Line) and is equipped with a host of machinery and electronic data systems to support the operation. There are in excess of ten train movements per week serving this facility.

Service to Croxton Yard, which is owned by NS, is more frequent, with approximately 40 train movements per week. The terminal has doublestack capability. The terminal contains warehousing and refrigeration facilities, along with the requisite electronic data processing equipment to facilitate the efficient tracking and billing activities inherent with the movement of high value freight. The types of railcars handled at Croxton are piggyback (TOFC) and Container on Flatcar (COFC) vehicles.

The new on-dock facility known as ExpressRail was opened in 1996 and provides for doublestack intermodal transfer service between rail, ship, barge and truck. The facility is owned by PANYNJ and operated by Maher Terminal Inc. It is configured with five tracks each 1800ft long. The terminal experiences 12 train movements per week, serving both CSX and NS railroads.

Norfolk Southern manifest trains are handled at Oak Island Yard, the major classification facility that also handles CSX trains. This facility processes in the neighborhood of 20 inbound and outbound trains for each railroad. In addition to classification of merchandise cars, the yard is capable of handling doublestack, COFC and TOFC traffic. This latter activity is performed primarily by the Canadian Pacific/Delaware&Hudson (CP) carrier via trackage rights.

Service to Greenville. Train movement to Greenville Yard is conducted by CSAO. Deliveries are made from CSX and NS via Oak Island Yard and the Upper Bay (moveable) bridge. Most shipments to the floating operation consist of merchandise cars, although transit and commuter rail cars are also moved by carfloat. A modest amount of intermodal (rail-to-truck) activity is also performed at Greenville Yard.

East of Hudson Region

Major Corridors. There are two major routes for rail freight access to the East of Hudson region and one route that is presently used for the occasional delivery of stone to Long Island. These routes supply all the rail service to Long Island (including Brooklyn and Queens) and to the Bronx and southernmost Connecticut. They reflect the current market for freight service as it exists today given the effects of deregulation and the competition with the highway trucking industry (see Figure 8-10).

The first major rail freight access route is via the corridor beginning at Selkirk (CSX) and Saratoga (CP) Yards, which are located on the west side of the Hudson River near Albany. Trains destined for Long Island and southern Connecticut cross the river and join the multi-track CSX Hudson Line at Castleton, New York. Freight traffic on the Hudson Line shares track usage with Amtrak and, south of Poughkeepsie, with Metro-North passenger trains. Traveling south, freight trains are routed to the Oak Point Link in the Bronx. This single-track freight-only alignment provides a grade-separated route through the Bronx to Oak Point Yard. Trains are then dispatched to their ultimate destinations in southern Connecticut, the Bronx and Long Island. The CSX dispatcher controls trains operating on the Hudson Line between Castleton and Poughkeepsie; the tracks south of Poughkeepsie are under the control of the Metro-North dispatcher. There are currently 28 Amtrak and 134 Metro-North trains operating on the Hudson Line each weekday.

The corridor to Long Island is the single track Fremont Industrial Track via the Hell Gate Bridge. Train movement on the Fremont Industrial Track is under the control of the yardmaster at Oak Point Yard. Freight cars are interchanged with the New York and Atlantic Railroad. Fresh Pond Junction is grade-separated from the Montauk Branch of the Long Island Rail Road. At the present time this route is the primary means of rail freight access to Long Island.

The Providence & Worcester (P&W) utilizes trackage rights via the New Haven Line (Northeast Corridor) and Fremont Industrial Track to deliver crushed stone to Long Island on an occasional basis.

The second major rail freight access route is via New York Cross Harbor Railroad's carfloat between Greenville Yard in New Jersey and the former Bush Terminal in Brooklyn. This route

provides for access from the south and southwest and is the remnant of the once-vibrant marine transfer activities in and around New York Harbor. This activity was drastically curtailed with the merger of the Pennsylvania and New York Central Railroads and the subsequent formation of Conrail. The New York Cross Harbor Railroad performs local switching services along the Brooklyn waterfront and interchanges cars with the New York and Atlantic Railroad (NY&A) at Bush Junction in Bay Ridge. The float bridges that provide the harbor/rail interface are in a state of repair that is sufficient for the low levels of traffic that are handled.

Freight service on Long Island is provided mostly to the suburban Main Line, Montauk Branch, and Port Jefferson Branch in Nassau and Suffolk Counties and to the industrial areas of Queens and Brooklyn. Other LIRR branches experience little or no freight deliveries. Train movements to the former are conducted between regularly scheduled passenger trains, while service to the industrial areas is delivered on (mostly) freight-only trackage. Passenger traffic varies widely during the course of each weekday, with some congestion during the peak commuter hours. The number of passenger trains may be roughly stated as: Main Line west of Hicksville (176); east of Hicksville (64); Port Jefferson Branch (40); and Montauk Branch east of Babylon (42).

Major Yards.

Oak Point Yard. Oak Point Yard serves as a distribution facility for trains destined to Long Island, the Bronx and Southern New England. Trains are classified and then distributed by local train movements. Trains moving on the Oak Point Link and the Fremont Industrial track are under the control of the CSX yardmaster at Oak Point. The Metro-North dispatcher controls trains moving on the Northeast Corridor (MNR New Haven Line). (See Figure 8-10.)

Fresh Pond Yard. Virtually all the rail freight destined for Long Island, including Brooklyn and Queens, moves through Fresh Pond Yard. This facility actually consists of two yards; the West Yard that acts as a receiving yard and the East Yard where classification is performed.

The West Yard consists of five double-ended body tracks, with track one serving as a running track and an extension of the Bushwick Lead track. Cars are received from interchange via the west leg of the wye and stored on the body tracks until they are ready to be classified.

The East Yard consists of eight double-ended body tracks and two single-ended tracks, one of which serves as a team track. Cars are classified on the body tracks to make up trains for delivery to individual locations throughout Long Island.

Fresh Pond Yard is the headquarters location of the NY&A. This carrier performs all freight train operation on the Long Island Rail Road under terms of a lease with the New York Metropolitan Transportation Authority. Trains are dispatched over main tracks by the LIRR dispatcher, while operations within yard limits are controlled by the NY&A yardmaster.

Fresh Pond Yard is in generally good condition and is capable of accommodating current traffic levels.

65th Street Yard. This yard, formerly the LIRR Bay Ridge Yard, was recently renovated by NYCEDC. It consists of nine body tracks and two float bridges and is intended for use as a car-floating facility. Presently unused, this facility is in good to excellent condition and would likely serve as a terminal for expanded floating operations.

First Avenue Yard. This lightly used facility formerly served the complex known as Bush Terminal. It is switched by the New York Cross Harbor Terminal Railroad and consists of several body tracks. Its condition is generally poor.

Yard A, West Maspeth Yard, Arch Street Yard and Blissville Yard. These yard facilities are controlled by NY&A under the terms of their lease with the MTA. They are at best underutilized or, as in the case of Blissville Yard, altogether unused. Furthermore, Yard A and Arch Street Yard are both reverting to LIRR control for use as passenger car storage (Yard A) and maintenance (Arch Street). Negotiations are being conducted to locate alternative facilities for freight operations.

Yard A Freight Car Repair Facility. This facility, located at Yard A in Long Island City, is controlled by NY&A and used to perform light maintenance on freight locomotives and repairs on freight cars. The use of this facility will be lost to NY&A when the LIRR East Side (passenger) Access Project acquires the space. Final site location negotiations are still underway to furnish NY&A with an alternative repair facility.

Current Operations

Freight trains reach the East-of-Hudson Region by two major corridors; via Selkirk/Oak Point yards to Southern Connecticut, the Bronx and Long Island or via carfloat from Greenville, New Jersey to the same general destinations. The Northeast Corridor (NEC) is also used infrequently by the P&W under the terms of a trackage rights agreement with CSX.

Train service from Selkirk to Long Island via the Hell Gate Bridge and Fresh Pond Junction typically involves one round trip CSX train consisting of an average of 30 freight cars per weekday. This traffic is supplemented by one round trip operated by CP on Monday, Wednesday, and Friday that consist of an average of 10 cars and by an occasional stone train hauled by the P&W from Connecticut. All cars delivered in interchange at Fresh Pond Junction are received in the West Yard at Fresh Pond, where they are stored pending classification. Trains are classified by Long Island destination in the East Yard at Fresh Pond. Trains are then dispatched (by the LIRR dispatcher) to one of several branch lines for delivery to individual consignee sidings. Train movement is performed by NY&A crews and locomotives. As previously noted, the volume of passenger trains on the several LIRR branches varies. There are virtually none on the tracks serving the industrial areas of Brooklyn and western Queens, while east of Jamaica there are a considerable number of passenger trains each weekday.

CSX also delivers rail freight cars to line-side consignees and shippers in the Bronx and Fairfield County in Southern Connecticut via the Northeast Corridor/Metro-North New Haven Line under the control of the Metro-North dispatcher. Passenger train movements on the New Haven Line of Metro-North consist of 44 Amtrak and 220 Metro-North trains.

The New York Cross Harbor Railroad (NYCHRR) delivers rail freight cars to Brooklyn on weekdays via carfloat. These cars are distributed to several consignees along the Brooklyn waterfront or interchanged with the NY&A at Bush Junction in Bay Ridge. The volume of traffic varies considerably from day-to-day.

With the exception of those cars delivered directly by the NYCHRR, local deliveries are typically made by NY&A according to the following informal schedule:

- Long Island City and western Queens—Monday thru Friday
- Main Line from Wyandanch to Southold—Monday thru Friday
- Port Jefferson Branch from Syosset to Port Jefferson—Three days per week
- Montauk Branch from Islip to Bridgehampton—Three days per week
- Bushwick Branch—Monday thru Friday

The existing infrastructure and operations generally reflect today's market for freight movement. Freight train movements on the Hudson Line and Northeast Corridor/New Haven Line are conducted at 50 mph and 40 mph respectively, while the speed on industrial and yard tracks is limited to 10 mph.

WATERBORNE TRAFFIC AND NAVIGATION

The Port of New York and New Jersey is the largest port complex on the Atlantic seaboard. In the year 2000, the port handled almost 18.8 million tons of cargo. Navigational routes are comprised of channels, anchorages, ports and the vessels that use them. These routes pass under numerous bridges in the harbor. Vessels enter the harbor via the Ambrose Channel, pass under the Verrazano-Narrows Bridge, and then continue into the southern part of the Anchorage Channel. From this point, all vessels follow one of the following four navigational routes in the project study area (see Figure 8-11):

- Vessels continue along the Anchorage Channel en route to the Port Jersey Global Marine Terminal/Northeast Auto Terminal/MOTBY/Greenville Yard (#1).
- Vessels turn into Bay Ridge Channel en route to the South Brooklyn Marine Terminal, Red Hook Container Terminal and/or Brooklyn Marine Terminal (#2).
- Vessels veer west into the Kill Van Kull and then turn north into Newark Bay en route to Port Newark/Port Elizabeth (#3).
- Vessels veer west into the Kill Van Kull and then continue to loop around Staten Island following the Arthur Kill en route to the Howland Hook Marine Terminal (#4).

Channels

Navigation channels are present throughout the harbor. The channels which are pertinent to the project alternatives include Ambrose Channel, Anchorage Channel, Kill Van Kull, Arthur Kill, Bay Ridge Channel, Port Jersey Channel, and Buttermilk Channel. (See Figure 8-11.) All of the channels are used by vessels to reach the ports where they unload (or load) their goods. The quantity and types of ships that can reach the port are dependant upon the conditions and characteristics of the channels.

Ambrose Channel. The Ambrose Channel is the main thoroughfare for vessels into New York Harbor. The part of the channel between Brooklyn and Staten Island that runs under the Verrazano-Narrows Bridge is called the Narrows. The Ambrose Channel extends from the Narrows out into the deep water in the Atlantic Ocean and is currently maintained at a depth of 45 feet Mean Low Water (MLW).

Anchorage Channel. The Anchorage Channel is the main artery that passes through the harbor to the Hudson River. It is maintained at a depth of 45 feet MLW.

Kill Van Kull. The Kill Van Kull divides the Bayonne peninsula from Staten Island. It ranges from 500 to 1,000 feet wide and reached a depth of 40 feet MLW. Construction has begun to deepen this channel to a depth of 45 feet MLW. Vessels destined for Port Newark, Port Elizabeth, or Howland Hook travel through this channel.

Arthur Kill. The Arthur Kill is located between Staten Island's western shore and Union and Middlesex Counties in NJ. It is presently maintained at a depth of 35 feet MLW, though there are authorized plans to deepen the channel to a depth of 40-41 feet MLW. The channel is used by container vessels to reach the Howland Hook Marine Terminal as well as by vessels which

bring petroleum to the facilities located on the Arthur Kill. The channel currently spans a width of 600 to 800 feet.

Newark Bay. Newark Bay diverges north from the Kill Van Kull before it meets the Arthur Kill. It provides access to Port Newark/Port Elizabeth. It is presently maintained at a depth of 41 feet MLW, though construction has begun to deepen the channel to a depth of 45 feet MLW.

Bay Ridge Channel. The Bay Ridge Channel diverts vessels from the southern part of the Anchorage Channel into the South Brooklyn Marine Terminal. It is maintained at its authorized depth of 40 feet MLW and spans a width of between 1,200 and 1,750 feet. To the northwest of the Bay Ridge Channel lie the Bay Ridge Flats which is a shallow area with water depths of only 10 to 30 feet MLW. The flats do not affect the traffic along the Channel.

Port Jersey Channel. The Port Jersey Channel currently only serves the Global Marine Terminal, though it could serve MOTBY if it were to become an active port. It connects to the Anchorage Channel at one end and at the other harbors a 1,200-foot turning basin. It is 600 feet wide and 35 feet deep MLW, with the exception of a 200-foot stretch along the Global terminal, which is maintained at a depth of 38 feet MLW.

Buttermilk Channel. The Buttermilk Channel provides access to the Red Hook and Brooklyn Marine Terminals. It is maintained at a width of 1,000 feet. The western half of the channel is maintained at a depth of 35 feet MLW, while the eastern side, nearer to the terminals, is maintained at a lower depth of 40 feet MLW.

Anchorages

Anchorages are an important part of the harbor navigation system as they provide a place for vessels to wait for berthing availability or for favorable tides. Over sixty percent of the vessels using the anchorages are barges, with oil and gas tankers constituting another 25 percent. Vessels that make minimal use of this part of the navigational network include bulk carriers and container vessels. Chemical tankers and auto carriers don't typically wait to berth, though they can if the need arises. The anchorages used within the harbor include, Stapleton, Gravesend Bay, and Bay Ridge - Red Hook. The Stapleton Anchorage is located off the eastern coast of Staten Island near where the Anchorage and Bay Ridge Channels converge. It varies in depth from 33-70+ feet MLW. Gravesend Bay is maintained at a depth of 47 feet MLW and is located west of the Narrows in the Ambrose Channel near Brooklyn. The Bay Ridge-Red Hook Anchorage is located, as it is named, just west of the Bay Ridge Channel and southwest of Red Hook. It is maintained at a depth of 35 to 45 feet MLW.

Ports

South Brooklyn Marine Terminal. The South Brooklyn Marine Terminal is located in the Sunset Park section of Brooklyn. The terminal is currently inactive. Waterside from the south, the South Brooklyn Marine Terminal is accessible via the Bay Ridge Channel. Landside, access is provided through 39th Street and the area is adjacent to the Gowanus Expressway. Road access is difficult due to the heavy traffic in the area. Currently, there is no rail access.

Howland Hook Marine Terminal. The Howland Hook Marine Terminal is located in northwestern Staten Island just north of the Goethals Bridge. In 1998, throughput for the marine terminal was 194,000 TEUs*. Waterside, the Howland Hook Marine Terminal is accessible by

* TEU: twenty-foot equivalent unit.

the Arthur Kill, and landside, it is accessible via the Staten Island Expressway. Rail access will soon be available via the Staten Island Railroad.

Port Newark/Port Elizabeth. Port Newark/Port Elizabeth is located along the western shore of Newark Bay in Essex and Union counties in NJ. Current throughput for the marine terminal is approximately 1.9 million TEUs per year, comprising the majority of the containers within the port. Waterside, it can be accessed through Newark Bay, and landside the primary highway access is via the New Jersey Turnpike, with rail access via the Chemical Coast Line.

Global Marine Terminal/MOTBY/NEAT. There are three terminals located in Port Jersey: Global Marine Terminal, Military Ocean Terminal at Bayonne (MOTBY), and the Northeast Auto Terminal (NEAT). MOTBY is currently inactive though the City of Bayonne is currently considering a variety of uses. The throughput at the Global Marine Terminal was 180,000 TEUs in 1998. Waterside, the terminals can be reached via the Newark Bay and Port Jersey Channels, and landside via Routes 1&9 which can be accessed from the NJ Turnpike. Rail service is provided by the Greenville Branch as well as by the Port Jersey Railroad, a short-haul rail system.

Brooklyn Terminal/Red Hook Terminal. The Brooklyn and Red Hook Terminals are located opposite Governor's Island in the Cobble Hill and Red Hook parts of Brooklyn, respectively. The Brooklyn Marine Terminal is very small. Throughput at the Red Hook Container Terminal in 1998 reached 83,000 TEUs. Waterside, the terminals can be accessed via the Buttermilk Channel. There is no direct rail access to either terminal. From the Red Hook Container Terminal, there is a float service to Bay Avenue Terminal, NJ. The Brooklyn-Queens and Gowanus Expressways pass near the terminals, which are accessible via local streets.

Bridges

Most bridges in the project study area are stationary and used by vehicular traffic. Two bridges—the Arthur Kill Lift Bridge and Lehigh Valley Drawbridge—are moveable and are for use by rail.

Verrazano-Narrows Bridge. The Verrazano Narrows Bridge is located at the mouth of upper New York Bay. It connects Bay Ridge, Brooklyn with Fort Wadsworth, Staten Island and is a major link in the interstate highway system, providing the shortest route between the mid-Atlantic states and Long Island.

The bridge spans 6,690 feet with 228 feet of clearance above water. Seasonal contractions and expansions of the steel cables cause the double-decked roadway to be 12 feet lower in the summer than in the winter, but this has no effect on the vessels that pass under it.

Bayonne Bridge. The Bayonne Bridge spans the Kill Van Kull and links Bayonne, New Jersey with Port Richmond in Staten Island, New York. The bridge spans 5,780 feet with a mid-span clearance of 150 feet that permits ocean-going vessels to use this entrance to Port Newark/ Port Elizabeth without interference.

Goethals Bridge. The Goethals Bridge crosses over the Arthur Kill linking Elizabeth, New Jersey to Howland Hook, Staten Island. The total bridge length is 7,100 feet with a 135-foot channel clearance. Similar to the Bayonne Bridge, the high clearance allows for the passage of deep sea vessels.

Arthur Kill Lift Bridge. The Arthur Kill Lift Bridge is a rail-bridge located just north of the Goethals Bridge. The bridge spans approximately 500 feet with 135 foot clearance in the up

position and 31 feet of clearance in the down position. The bridge is currently fixed in the "up" position, however the Coast Guard suggests a cycle time of 10-15 minutes to lift, hold open, and close the bridge. The USACOE's Waterborne Commerce of the United States, 1999, indicates an average of 24 tankers and 60 barges per day in the Arthur Kill and Kill Van Kull combined. On average, 23 vessels pass under the Arthur Kill Lift Bridge per day. These are mostly tug/barge combinations (81 percent) with some tankers and ships traversing as well. The traffic is both scheduled and unscheduled over the entire 24 hour day, though activity is highest in the late afternoon and evening and lowest in the early morning.

Lehigh Valley Drawbridge. The Lehigh Valley Drawbridge is a railbridge located just north of Port Newark/Port Elizabeth and connects Jersey City to Newark. The bridge spans 300 feet with a 135 foot of clearance in the up position and 35 feet of clearance in the down position. On average, 10 vessels per day, both scheduled and unscheduled, move under the bridge and require opening. Similar to the Arthur Kill Lift Bridge, activity is highest in the late afternoon and evening and lowest in the early morning. Most of the vessels are tug/barge combination, though there are some tankers. The cycle time to lift, hold open and close the bridge for tug/barge combination vessels, which make up 97 percent of the traffic, is about 11-12 minutes. In cases where the bridge was held open to allow for more than one vessel to pass, the cycle time ranged between 15-30 minutes. Some tugs can fit under the bridge at low tide if they lower their antennas, but most request an opening. Based on average vessel use, the time that the bridge is unavailable for rail operation is 1.6 hours per day.

LOCAL TRANSPORTATION

VEHICULAR TRAFFIC

Traffic Analysis Methodology

The key elements of the analyses include determining the scope of the area at each site within which traffic impacts could potentially occur, analyzing key intersections within that area, and determining and analyzing the time periods in which impacts could be significant. Within this task, traffic data were assembled from existing sources, and were supplemented by new traffic counts where needed.

The 2000 Highway Capacity Manual (HCM) procedures were used in determining the capacities and levels of service for each of the intersections analyzed. The 2000 HCM is the approved methodology for use in New York City as per the New York City Department of Transportation guidelines, as well as in New Jersey per the New Jersey Department of Transportation.

Levels of service (LOS) for both signalized and unsignalized intersections based on the 2000 HCM procedures are defined in terms of average control delay per vehicle. Control delay is the portion of the total delay attributed to control measures such as signals or stop signs, and includes the initial deceleration delay for vehicles approaching signals or stop signs, queue move-up time, stopped delay, and final acceleration delay once vehicles proceed from a stopped condition. The delay ranges for each operating condition are as follows:

- LOS A describes operations with very low delay, i.e., less than 10.0 seconds of delay per vehicle. This occurs when signal progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.

- LOS B describes operations with delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. Again, most vehicles do not stop at the intersection.
- LOS C describes operations with delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- LOS D describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (v/c) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines.
- LOS E describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high volume-to-capacity ratios.
- LOS F describes operations with delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios with cycle failures. Poor progression and long cycle lengths may also be contributing to such delays.

According to generally accepted practice, LOS A, B, and C reflect the existence of delays within an acceptable range, and LOS D and E suggest delays increasing into often unacceptable or breakdown conditions (LOS F).

In terms of identifying peak analysis periods for examination, the AM and PM peak travel hours have been selected since the combination of commuter traffic and truck volumes generated by each proposed freight distribution yard will likely represent the highest trafficked hours during a typical 24-hour weekday even though generated truck volumes may be slightly higher in other periods. The identification of significant traffic impacts, if any, are determined from these peak hour analyses.

West Maspeth Yard

Traffic Study Area. The traffic study area for the West Maspeth Yard site consists of 23 intersections along access routes into and out of the area, including the key locations through which freight-related truck traffic could be concentrated. The vast majority of the intersections selected for analysis all lie within industrialized areas with large factories and processing plants, and include the following (see Figure 8-12):

- Meeker Avenue and Apollo Street
- Meeker Avenue and Vandervoort Avenue
- Vandervoort Avenue and Maspeth Avenue
- Vandervoort Avenue and Metropolitan Avenue
- Vandervoort Avenue and Grand Street
- Grand Avenue and Page Place
- Maurice Avenue / Maspeth Avenue / 58th Street / 56th Terrace
- Grand Avenue and Rust Street

- Grand Avenue and 59th Street
- Laurel Hill Boulevard and 58th Street
- Grand Avenue and 64th Street
- 64th Street and Flushing Avenue
- Grand Avenue and Flushing Avenue
- Grand Avenue and Hamilton Place
- Grand Avenue and Eastbound LIE Service Road
- Grand Avenue and Westbound LIE Service Road
- 69th Street and Eastbound LIE Service Road
- Laurel Hill Boulevard and Greenpoint Avenue and Review Avenue
- Laurel Hill Boulevard and 56th Road
- 48th Street and 56th Road
- 48th Street and Queens-Midtown Expressway (Long Island Expressway service road)
- Maurice Avenue and Westbound LIE Service Road
- Maurice Avenue and Eastbound LIE Service Road

The street network in much of this industrial area of West Maspeth is laid out as many Queens neighborhoods are, that is, with overlapping grids resulting in multi-legged intersections or other locations having streets crossing at acute angles. Maurice Avenue, for example, crosses through the area at odd angles to the prevailing West Maspeth grid, with several intersections along it having multiple or sharply angled approaches. The site of the proposed intermodal rail yard contains several large blocks that can be accessed only via a few streets in the area.

Truck and employee vehicle traffic could use several primary routes to connect to the BQE and LIE from West Maspeth Yard. To the north and east, trucks could use 48th and 58th Streets and Maurice and Grand Avenues; to the west, they could use Grand, Metropolitan, and Vandervoort Avenues. Each of these streets is a designated NYCDOT truck route, and processes vehicles within one or two travel lanes. Most intersections along these routes in the study area are signalized at key locations where heavy opposing flows require such intersection controls.

Other relevant local streets in Queens south of the LIE are Rust Street, a two-lane, two-way street situated along the northeast edge of West Maspeth Yard; and Laurel Hill Boulevard, another two-lane, two-way arterial that allows for access to the BQE-LIE interchange to the north and to Greenpoint Avenue to the west.

In Brooklyn just west of Newtown Creek, both Metropolitan Avenue and Grand Street extend to the BQE and beyond and have one or two moving lanes of traffic in each direction. (Grand Street is renamed Grand Avenue in Queens.) Vandervoort Avenue is an important arterial that allows trucks to exit the BQE at the Meeker Avenue interchange and travel to and from West Maspeth Yard via Grand Street/Avenue. Maspeth Avenue in Brooklyn will take on added importance as an access route to and from West Maspeth Yard as it is extended east-west on a new viaduct over Newtown Creek as part of the proposed Tunnel Alternative.

Nearly all streets being analyzed are local NYCDOT-designated truck routes including 48th and 58th Streets; 56th Road; Review Avenue / Laurel Hill Boulevard; Vandervoort, Metropolitan, and Grand Avenues; and the LIE/BQE service roads so it will be possible for generated truck traffic to use numerous paths within the study area.

Traffic Volumes and Levels of Service. Traffic volumes in the study area were compiled from a combination of data listed in the NYCDOS Comprehensive Solid Waste Management Plan for

the Review Avenue Transfer Station (May 1999), the Pebble Lane Waste Transfer Station Study (June 2001), and existing Automatic Traffic Recorder (ATR) machine count on-record data from NYCDOT (November 2000). Additional counts were conducted at key analysis intersections on Maurice and Maspeth Avenues in November 2001 and in May 2002, and along Grand Avenue and Vandervoort Avenue in February 2003.

A review of the manual counts and the 24-hour ATR data indicated that the morning peak traffic volumes occur in the 7:45 to 8:45 AM hour. Traffic volumes during the midday decreased and remained at a consistent level until peaking again at 4:30 to 5:30 PM. These peak hours reflect the critical analysis periods in the West Maspeth study area; peak hour volumes are shown in Figures 1 and 2 in Appendix 2.

In general, traffic volumes throughout the study area are low to moderate for particular intersection movements, except along the LIE and BQE service roads which process higher flows. Along interior streets, volumes are typically between 400 and 700 vehicles per hour (vph) along major streets such as Maurice Avenue. Grand Avenue, south of the LIE, processes about 600 to 950 vehicles per hour in either direction during the peak hours. Elsewhere within the study area, where cross streets such as Maspeth Avenue process only local traffic flows, volumes are generally 300 vph or less. Traffic flows along the LIE service roads range between 700 and 1,200 vph, with the higher volumes noted in the peak directions (e.g., westbound toward Manhattan in the AM). Volumes along Vandervoort Avenue are among the highest in the study area, ranging from 650 vph northbound in the AM just north of Metropolitan Avenue to 1,050 vph southbound at Grand Street in the PM. Metropolitan Avenue and Grand Street generally process about 400-700 vph per direction during both peak hours, with the one exception being in the westbound direction of Metropolitan Avenue where upwards of 1,100 vph are carried to the Vandervoort Avenue intersection in the AM.

In terms of existing truck traffic, many of the intersection approaches being analyzed carry a substantial percentage of heavy vehicles. Throughout the study area, between 10 and 20 percent of all flows are heavy vehicles, with one particular approach along eastbound Greenpoint Avenue peaking at about 27 percent.

Overall, 17 of the 23 study locations were found to be operating at acceptable levels of service A, B, or C for the overall intersection in the AM peak hour, with 15 of the 23 intersections operating likewise in the PM peak hour. This is due primarily to the low to moderate volume of traffic flowing through the area and, where volumes are higher, to favorable signal progression and lengthy green signal phases (see Table 8-2).

Several intersections and specific traffic movements were found to be operating with some noticeable congestion, i.e., LOS E or F, including the following:

- The multi-legged intersection of Maurice Avenue, Maspeth Avenue, and 58th Street operates with some considerable congestion. At this stop-controlled location, 58th Street currently operates at LOS F in the AM and PM peak hours, in part due to irregular geometry connecting this approach through the intersection and the lack of adequate gaps for 58th Street traffic to proceed into nonstop flows on the other approaches. Field observations indicated that motorists often proceed through the intersection slowly since attention must be given to potentially conflicting vehicles from more than one direction.
- At Grand Avenue and Rust Street, where truck volumes compose as much as one-quarter of peak direction flows along Grand Avenue, the eastbound left turn from Grand Avenue onto northbound Rust Street operates at a LOS F in the AM peak hour and LOS D in the PM peak

hour. Also, heavy vehicles have been observed to swing wide into oncoming or adjacent lanes to avoid striking the LIRR overpass abutments which, in turn, can reduce the overall vehicle throughput at this intersection.

- At Vandervoort and Meeker Avenues, where overall traffic demands are high due to access to and from the BQE, LOS E and F prevail along several approaches in both peak hours. Often, vehicles not clearing the "intersection box" during the green signal can completely block another approach from proceeding and thus reduce the amount of green time that can actually be used. On the north side of the BQE, left turns from westbound Meeker Avenue operate at LOS E in the AM and PM peak hours.
- The adjacent intersections of 64th Street/Flushing Avenue and Grand Avenue/Flushing Avenue and the intersection of Grand Avenue/Hamilton Place have one or more traffic movements operating at LOS E or F during either the AM or PM peak hours or during both hours.

Oak Point Yard

Traffic Study Area. The traffic study area for the Oak Point Yard site consists of the major intersections along Bruckner Boulevard, including the key locations through which freight-related truck traffic would be concentrated (see Figure 8-13). Additionally, local interior intersections along Leggett Avenue that would serve as funnel points toward the yard were included. Analysis locations include the following:

- Bruckner Boulevard and Hunts Point Avenue
- Bruckner Boulevard and Barretto Street
- Bruckner Boulevard and Tiffany Street
- Bruckner Boulevard and Longwood Avenue
- Bruckner Boulevard and Leggett Avenue
- Leggett Avenue and Garrison Avenue
- Leggett Avenue and Barry Street

The street network in much of this highly industrialized area of Hunts Point is laid out in a grid manner, particularly north of Tiffany Street. The streets in this particular section of the borough process substantial truck traffic volumes since they provide access to major expressways that extend into the New York metropolitan and tri-state area. Bruckner Boulevard is one of the Bronx's major north-south arterials, processing some of the area's highest traffic volumes throughout the day. Through the study area, Bruckner Boulevard is a major at-grade arterial with the elevated Bruckner Expressway aligned within (and above) its right-of-way. The boulevard is very wide, with main and service roads of two to three lanes each in both directions separated by raised medians. Exclusive left turn lanes are provided at major intersections, along with exclusive signal phases allocated to these movements. To the north, Bruckner Boulevard provides access to upstate New York, Connecticut, and New Jersey via the Bruckner Expressway, which, in turn, connects with the Cross Bronx Expressway and New England Thruway. To the south, access to Queens, Manhattan, and Long Island is possible via the Triborough Bridge.

Table 8-2
Existing Traffic Levels of Service: West Maspeth Yard

Intersection & Approach		AM Peak (7:45 – 8:45 AM) Mvt.	V/C	Control Delay	LOS	PM Peak (4:30 – 5:30 PM) Mvt.	V/C	Control Delay	LOS
Meeker Ave & Apollo St.									
Apollo Street	NB	L	0.31	30.7	C		0.24	31.2	C
	SB	TR	0.63	39.3	D	L	0.69	41.2	D
Meeker Avenue	WB	L	0.87	60.4	E	TR	0.93	65.8	E
		T	0.59	15.0	B	L	0.76	19.6	B
						T			
Overall Intersection			**0.54**	**32.3**	**C**		**0.64**	**35.6**	**D**
Meeker Ave./ Cherry St. & Vandervoort Ave.									
Vandervoort Avenue	NB	TR	0.91	57.6	E	TR	0.83	48.2	D
		R	1.03	113.7	F	R	1.03	113.8	F
	SB	DefL	0.33	24.0	C	DefL	0.45	25.6	C
		T	0.47	16.9	B	T	0.54	17.9	B
Meeker Avenue / Cherry Street	EB	LTR	0.99	56.5	E	LTR	1.01	67.7	E
Overall Intersection			**0.58**	**53.5**	**D**		**0.69**	**56.4**	**E**
Vandervoort Ave. & Maspeth Ave.									
Vandervoort Avenue	NB	LTR	0.86	28.7	C	LTR	0.29	10.6	B
	SB	LTR	0.44	12.5	B	LTR	0.49	13.0	B
Maspeth Avenue	EB	LTR	0.38	23.9	C	LTR	0.42	25.1	C
	WB	LTR	0.56	29.9	C	LTR	0.18	21.0	C
Overall Intersection			**0.75**	**23.1**	**C**		**0.47**	**14.5**	**B**
Metropolitan Ave. & Vandervoort Ave.									
Vandervoort Avenue	NB	LT	0.13	26.8	C	LT	0.07	26.1	C
	SB	TR	0.40	30.3	C	TR	0.66	34.9	C
Metropolitan Avenue	EB	LR	0.35	12.9	B	LR	0.52	15.7	B
	WB	LT	0.69	18.8	B	LT	0.44	13.9	B
		R	0.83	25.5	C	R	0.46	14.5	B
Overall Intersection			**0.67**	**22.9**	**C**		**0.57**	**22.3**	**C**
Grand St. & Vandervoort Ave.									
Vandervoort Avenue	SB	L	0.70	28.2	C	L	0.83	33.9	C
		LR	0.12	17.9	B	LR	0.70	29.8	C
Grand Street	EB	LT	0.49	23.5	C	LT	0.62	24.8	C
	WB	TR	0.45	22.0	C	TR	0.31	19.8	B
Overall Intersection			**0.60**	**24.2**	**C**		**0.72**	**27.3**	**C**
Grand Ave. & Page Pl (Unsignalized)									
Page Place	SB	LR	0.77	36.1	E	LR	0.53	19.3	C
Grand Avenue	EB	L	0.10	9.8	A	L	0.12	8.6	A
Overall Intersection				**30.8**	**D**			**15.8**	**C**
Maurice Ave. & Maspeth Ave./ 58th St./ 56th Terr. (unsignalized)									
58th Street	SB	LTR	1.00	79.4	F	LTR	0.95	58.2	F
Maurice Avenue	SB	LTR	0.68	27.5	D	LTR	0.74	30.6	D
Maspeth Avenue	WB	LTR	0.71	27.8	D	LTR	0.55	20.5	C
Overall Intersection				**42.9**	**E**			**38.3**	**E**
Grand Ave. & Rust St.									
Rust Street	NB	LTR	0.47	20.2	C	LTR	0.26	17.9	B
	SB	LTR	0.56	21.9	C	LTR	0.85	29.4	C
Grand Avenue	EB	L	1.05	114.7	F	L	0.96	49.0	D
		TR	0.24	12.3	B	TR	0.60	17.0	B
	WB	L	0.05	17.3	B	L	0.15	18.6	B
		TR	0.75	29.4	C	TR	0.55	23.9	C
Overall Intersection			**0.85**	**38.4**	**D**		**0.90**	**28.4**	**C**

Table 8-2 (cont'd)
Existing Traffic Levels of Service: West Maspeth Yard

Intersection & Approach		AM Peak (7:45 – 8:45 AM) Mvt.	V/C	Control Delay	LOS	PM Peak (4:30 – 5:30 PM) Mvt.	V/C	Control Delay	LOS
Grand Ave. & 59th St.									
59th Street	NB	LTR	0.73	22.3	C	LTR	0.39	14.1	B
Grand Street	EB	LTR	0.33	11.0	B	LTR	0.73	20.2	C
	WB	TR	0.72	18.5	B	TR	0.40	11.7	B
Overall Intersection			**0.72**	**18.7**	B		**0.57**	**16.2**	**B**
58th St. & Laurel Hill Boulevard Ave.									
58th Street	NB	LTR	0.84	30.7	C	LTR	0.53	21.9	C
	SB	LTR	0.91	44.6	D	LTR	0.98	54.6	D
Laurel Hill Boulevard	EB	LTR	0.15	21.7	C	LTR	0.36	22.9	C
	WB	DefL	0.80	39.0	D	DefL	0.89	52.7	D
		TR	0.52	26.2	C	TR	0.29	22.6	C
Overall Intersection			**0.85**	**33.9**	**C**		**0.78**	**36.0**	**D**
Grand Ave. & 64th St									
64th Street	SB	LTR	0.59	33.8	C	LTR	0.47	29.8	C
Grand Avenue	EB	LTR	0.34	20.1	C	LTR	0.99	79.4	E
	WB	TR	0.48	21.8	C	TR	0.31	19.4	B
Overall Intersection			**0.41**	**24.9**	**C**		**0.46**	**52.0**	**D**
Flushing Avenue & 64th St.									
64th Street	NB	LR	0.16	17.8	B	LR	0.36	84.2	F
	SB	LTR	0.21	17.9	B	LTR	0.33	30.1	C
Meeker Avenue	EB	TR	0.98	56.7	E	TR	0.98	59.4	E
	WB	LT	0.87	82.6	F	LT	0.60	18.0	B
Overall Intersection			**0.64**	**61.9**	**E**		**0.51**	**40.8**	**D**
Grand Ave & Flushing Ave.									
Grand Avenue	SB	T	0.19	17.6	B	T	0.50	22.3	C
Flushing Avenue	EB	T	1.02	77.3	E	T	1.02	82.3	F
	WB	T	0.91	97.9	F	T	0.56	17.0	B
Overall Intersection			**0.47**	**80.5**	**F**		**0.53**	**45.3**	**D**
Grand Ave. & Hamilton Pl.									
Hamilton Place	SB	LTR	0.47	33.8	C	LTR	0.52	34.9	C
Grand Avenue	EB	L	0.60	25.7	C	LT	0.86	80.4	F
		T	0.69	13.0	B	-	-	-	-
	WB	TR	0.62	17.4	B	TR	0.93	82.7	F
Overall Intersection			**0.66**	**17.7**	**B**		**0.79**	**76.4**	**E**
Grand Ave. & Eastbound LIE Service Rd									
Grand Avenue	NB	TR	0.93	40.2	D	TR	0.76	26.9	C
	SB	LT	0.90	33.7	C	LT	0.61	22.0	C
EB LIE Service Road	EB	LTR	0.29	12.9	B	LTR	0.54	15.6	B
Overall Intersection			**0.58**	**31.1**	**C**		**0.64**	**20.5**	**C**
Grand Ave. & Westbound LIE Service Rd									
Grand Avenue	NB	LT	0.44	22.0	C	LT	0.37	16.2	B
	SB	TR	0.37	21.0	C	TR	0.31	15.5	B
WB LIE Service Road	WB	LTR	0.74	16.7	B	LTR	0.42	16.4	B
Overall Intersection			**0.61**	**18.3**	**B**		**0.40**	**16.1**	**B**

Table 8-2 (cont'd)
Existing Traffic Levels of Service: West Maspeth Yard

Intersection & Approach		AM Peak (7:45 – 8:45 AM) Mvt.	V/C	Control Delay	LOS	PM Peak (4:30 – 5:30 PM) Mvt.	V/C	Control Delay	LOS
69th St & Eastbound LIE Service Rd.									
69th Street	NB	TR	0.80	36.1	D	TR	0.87	36.1	D
	SB	DefL	0.44	24.6	C	-	-	-	-
		T	0.62	18.3	B	T	0.73	18.7	B
EB LIE Service Road	EB	LTR	0.50	23.2	C	LTR	0.96	41.6	D
Overall Intersection			**0.65**	**27.0**	**C**		**0.87**	**33.8**	**C**
Review Ave. & Greenpoint Ave / Van Dam St.									
Review Avenue	NB	LTR	0.48	14.0	B	LTR	0.36	12.8	B
	SB	LTR	0.16	11.6	B	LTR	0.17	11.6	B
Greenpoint Avenue	EB	LTR	0.51	10.9	B	LTR	0.93	23.3	C
Van Dam Street	WB	LTR	0.58	11.4	B	DefL	0.58	14.6	B
						TR	0.88	22.6	C
Overall Intersection			**0.53**	**12.0**	**B**		**0.67**	**20.5**	**C**
Laurel Hill Blvd. & 56th Road (Unsignalized)									
Laurel Hill Boulevard	SB	L	0.02	8.0	A	L	0.05	10.1	B
56th Road	WB	LR	0.75	23.7	C	LR	0.65	24.8	C
Overall Intersection				**23.0**	**C**			**23.2**	**C**
48th St.& 56th Rd.									
48th Street	SB	L	0.36	16.3	B	L	0.48	17.2	B
		R	0.19	15.2	B	R	0.10	14.7	B
56th Road	EB	L	0.20	6.3	A	L	0.38	7.6	A
		T	0.27	6.0	A	T	0.64	9.8	A
	WB	T	0.56	8.4	A	T	0.31	6.1	A
		R	0.19	0.2	A	R	0.18	0.2	A
Overall Intersection			**0.49**	**7.6**	**A**		**0.59**	**8.4**	**A**
48th St.& Queens Midtown Expressway									
48th Street	NB	T	0.27	5.8	A	T	0.32	6.1	A
		R	0.17	5.3	A	R	0.31	6.1	A
	SB	L	0.35	6.9	A	L	0.36	7.1	A
		T	0.26	5.7	A	T	0.27	5.8	A
Queens Midtown Expressway	EB	L	0.54	20.2	C	L	0.54	20.0	B
		TR	0.45	18.9	B	TR	0.41	18.1	B
Overall Intersection			**0.42**	**10.5**	**B**		**0.42**	**9.9**	**A**
Maurice Avenue.& Westbound LIE Service Rd									
Maurice Avenue	NB	L	0.45	30.1	C	L	0.44	30.7	C
		T	0.37	17.7	B	T	0.67	23.1	C
	SB	T	0.59	30.5	C	T	0.62	31.3	C
		R	0.23	24.7	C	R	0.22	24.5	C
Westbound LIE Service Rd	WB	L	0.64	20.2	C	L	0.62	20.3	C
		T	0.39	15.0	B	T	0.20	13.3	B
		R	0.24	13.9	B	R	0.23	13.9	B
Overall Intersection			**0.66**	**20.2**	**C**		**0.68**	**22.2**	**C**
Maurice Avenue & Eastbound LIE Service Rd.									
Maurice Avenue	NB	TR	0.36	27.0	C	TR	0.73	39.2	D
	SB	L	0.45	17.5	B	L	0.54	23.0	C
		T	0.66	21.6	C	T	0.70	26.7	C
Eastbound LIE Service Road	EB	LTR	0.57	18.9	B	LTR	0.89	25.1	C
Overall Intersection			**0.61**	**21.0**	**C**		**0.81**	**27.9**	**C**

Notes: (1): Control delay measured in seconds per vehicle.
(2): Level of service (LOS) for signalized intersections is based on average control delay per vehicle (sec/veh) for each lane group.
(3): Overall intersection V/C ratio is the critical lane groups' V/C ratio, not the weighted average of all the movements.
(4): Level of service (LOS) for unsignalized intersections is based upon control delay per vehicle (sec/veh) for each minor-approach.

Each of Bruckner Boulevard's intersecting streets serve the Hunts Point area, including Hunts Point Avenue, Barretto and Tiffany Streets, and Longwood and Leggett Avenues. These streets typically operate with one to two travel lanes per direction with curb parking allowed on both sides of the street. In this area, these streets are lined with industrial and manufacturing facilities, although there is a small portion of residential and retail development near Bruckner Boulevard and on Tiffany Street. Local NYCDOT-designated truck routes include only Bruckner Boulevard and Tiffany Street, although heavy vehicles would be allowed on interior streets in the area in order to access their destination. Thus, truck traffic generated by the project will be confined primarily to these two streets within the study area.

Traffic Volumes and Levels of Service. Traffic volumes in the study area were compiled from a combination of data listed in the NYCDOS Comprehensive Solid Waste Management Plan for the Oak Point Avenue Transfer Station (May 1998), Fulton Fish Market at Hunts Point FEIS (November 1999), and the proposed Webvan Distribution Center (June 2000) counts. Additional vehicle classification data were conducted at key intersections on Bruckner Boulevard in November 2001. A review of the manual count data and the 24-hour ATR data indicated that the morning peak traffic volumes occur in the 7:15 to 8:15 AM hour. Traffic volumes during the midday decreased and remained at a consistent level until peaking again at 4:30 to 5:30 PM. These peak hours reflect the heavy rush hour traffic on Bruckner Boulevard, and are shown in Figures 3 and 4 as found in Appendix 2.

Only Bruckner Boulevard has strongly directional traffic since it provides access into Manhattan in the morning and then north to areas in the north Bronx, Westchester, upstate New York and Connecticut in the PM peak. The other east-west streets tend to process relatively balanced traffic volumes in each direction since these routes are more commercial/local in nature. During the AM peak hour, vehicle flows are heaviest along Bruckner Boulevard, with about 500 to 800 vehicles per hour (vph) northbound and 1,700 to 2,700 vph southbound. In the PM peak, volumes northbound range from 1,750 to 2,000 vph versus 900 to 1,500 vph southbound.

Volumes along the cross streets are typically modest (200-300 vehicles per hour or less), with the exception being Hunts Point Avenue, which processes much higher volumes in the 400-600 vph range due to its directness to the food distribution land uses in the Hunts Point Market area. Traffic volumes along Leggett Avenue are also higher, i.e., in the 300-500 vph range, since this street provides drivers with the first route into Hunts Point from the south.

In terms of existing truck traffic, the percent of heavy vehicles in the overall traffic flows are high. This is particularly true along the main roadways of Bruckner Boulevard, where trucks compose as much as 13 percent of the southbound flow between Leggett and Tiffany Avenues in the AM peak hour. Truck percentages vary widely along the other local streets, ranging from a low of five or six percent on Hunts Point and Leggett Avenues west of Bruckner Boulevard to highs of 15-35 percent along approaches leaving the main Hunts Point food distribution area.

Overall, each of the 5 intersections analyzed along Bruckner Boulevard were found to be operating at acceptable LOS A, B, or C to slightly congested overall LOS D due primarily to favorable signal progression and lengthy green signal phases (see Table 8-3). There is, however, one particular movement (eastbound left turn from Hunts Point Avenue) that operates at LOS E during the AM and PM peak hours due to a heavy vehicle demand making this maneuver. By contrast, cross-street approaches to Bruckner Boulevard operate with some congestion (LOS D) due to shortened green signal phases and little progression due to some driver confusion or indecision as to whether to enter the boulevard's main or service roads. For all study intersections, overall intersection operations are within acceptable LOS C conditions or better.

Harlem River Yard

Traffic Study Area. The traffic study area for the Harlem River Yard site consists of the major intersections along Bruckner Boulevard and East 134th and 135th Streets, which function as service roads to the adjacent Major Deegan Expressway, including the key locations through which freight-related truck traffic would be concentrated (see Figure 8-14). Analysis locations include the following:

- Willis Avenue and Bruckner Boulevard
- Brook Avenue and Bruckner Boulevard
- St. Ann's Avenue and Bruckner Boulevard
- Brook Avenue and East 134th Street
- St. Ann's Avenue and East 134th Street
- Willis Avenue and East 135th Street
- St. Ann's Avenue and East 135th Street

The street network in much of this industrialized area of the South Bronx (Mott Haven) is laid out in a grid manner. The streets in this particular section of the borough process substantial auto and truck traffic volumes since they tend to function as local arterial extensions of the major expressways that extend into the New York metropolitan and tri-state area. In this area, Bruckner Boulevard runs east-west and connects the local Harlem River bridges to the Bruckner Expressway; as such, it processes some of the area's highest traffic volumes throughout the day. Through the study area, Bruckner Boulevard is a major at-grade arterial just to the south of the Major Deegan Expressway. The boulevard has three lanes in each direction, with curb parking allowed in only a few locations along this section. Further north, Bruckner Boulevard provides access to upstate New York, Westchester, and Connecticut via the Bruckner Expressway which, in turn, connects with the Cross Bronx Expressway and New England Thruway. To the immediate south and west, access to Queens, Manhattan, and Long Island is possible via the Triborough Bridge.

East 134th and 135th Streets function as service roads to the Major Deegan Expressway. These streets operate as "one-way pairs" with East 134th Street running eastbound and East 135th Street westbound. Each street has two to three moving lanes along its length in Mott Haven; curb parking is typically not allowed during weekday peak travel periods. Several off- and on-ramps to the adjacent expressway allow for direct regional travel into and out of the study area.

All streets detailed above are local NYCDOT-designated truck routes, so it would be possible for truck traffic generated by the project to travel along several links of these streets.

The section of Willis Avenue south of East 135th Street functions as a limited-access arterial to quickly process vehicle traffic between the Willis Avenue Bridge and the Major Deegan Expressway. It has one-way northbound operations, and curb parking is prohibited throughout the day. Brook and St. Ann's Avenues are local streets extending south from The Hub shopping district in Melrose to their end points in Mott Haven. Their intersections with Bruckner Boulevard could serve as the main access points into the proposed rail yards. In this area, two travel lanes are typically provided along with allowances for curb parking in some areas.

Table 8-3
Existing Traffic Levels of Service: Oak Point Yard

Intersection & Approach		AM Peak (7:15 – 8:15 AM) Mvt.	V/C	Control Delay (sec)	LOS	PM Peak (4:30 – 5:30 PM) Mvt.	V/C	Control Delay (sec)	LOS
Barry St. & Leggett Ave.									
Barry Street	NB	LTR	0.12	13.3	B	LTR	0.28	14.9	B
	SB	LTR	0.04	12.5	B	LTR	0.02	12.3	B
		LT	0.30	7.3	A	LT	0.17	6.5	A
Leggett Avenue	EB	R	0.12	0.2	A	R	0.08	0.1	A
		LTR	0.27	7.2	A	LTR	0.21	6.7	A
	WB								
Overall Intersection			**0.23**	**6.6**	**A**		**0.24**	**7.3**	**A**
Garrison Ave. & Leggett Ave.									
Garrison Avenue	SB	LR	0.13	13.4	B	LR	0.33	15.7	B
Leggett Avenue	EB	LT	0.45	8.5	A	LT	0.33	7.6	A
	WB	TR	0.28	7.2	A	TR	0.31	7.4	A
Overall Intersection			**0.32**	**8.3**	**A**		**0.33**	**8.8**	**A**
Bruckner Blvd. & Leggett Ave.									
Bruckner Boulevard (Mainline)	NB	L	0.10	4.8	A	L	0.05	5.9	A
		T	0.12	21.2	C	T	0.64	23.8	C
Bruckner Boulevard (Service)	NB	TR	0.61	27.4	C	TR	0.66	24.4	C
Bruckner Boulevard (Mainline)	SB	L	0.09	3.9	A	L	0.11	7.3	A
		T	0.72	29.9	C	T	0.37	20.0	C
Bruckner Boulevard (Service)	SB	TR	0.87	35.3	D	TR	0.43	20.7	C
Leggett Avenue	EB	LTR	0.35	33.3	C	LTR	0.34	29.6	C
	WB	L	0.49	36.9	D	L	0.55	34.4	C
		LTR	0.36	34.0	C	LTR	0.14	27.1	C
Overall Intersection			**0.58**	**28.3**	**C**		**0.55**	**21.2**	**C**
Bruckner Blvd. & Longwood Ave.									
Bruckner Boulevard (Mainline)	NB	L	0.11	5.0	A	L	0.05	5.8	A
		T	0.16	4.9	A	T	0.48	8.2	A
Bruckner Boulevard (Service)	NB	TR	0.20	5.1	A	TR	0.44	7.9	A
Bruckner Boulevard (Mainline)	SB	LT	0.52	6.9	A	LT	0.21	6.5	A
Bruckner Boulevard (Service)	SB	TR	0.59	7.5	A	TR	0.29	6.9	A
Longwood Avenue	EB	LTR	0.47	34.8	C	LTR	0.80	46.4	D
	WB	DfL	0.30	32.2	C	DfL	0.42	32.5	C
		TR	0.29	31.2	C	TR	0.35	30.2	C
Overall Intersection			**0.55**	**9.5**	**A**		**0.60**	**12.5**	**B**
Bruckner Blvd. & Tiffany St.									
Bruckner Boulevard (Mainline)	NB	L	0.01	2.5	A	L	0.04	8.0	A
		T	0.28	19.8	B	T	0.54	11.7	B
Bruckner Boulevard (Service)	NB	TR	0.26	19.6	B	TR	0.43	10.7	B
Bruckner Boulevard (Mainline)	SB	L	0.32	3.4	A	L	0.53	7.6	A
		T	0.50	22.5	C	T	0.16	3.7	A
Bruckner Boulevard (Service)	SB	TR	0.83	29.9	C	TR	0.33	4.3	A
Tiffany Street	EB	LTR	0.43	38.3	D	LTR	0.36	35.3	D
	WB	LTR	0.31	35.7	D	LTR	0.24	32.2	C
Overall Intersection			**0.66**	**24.7**	**C**		**0.56**	**11.0**	**B**
Bruckner Blvd. & Barretto St.									
Bruckner Boulevard (Mainline)	NB	T	0.31	22.4	C	T	0.74	25.1	C
Bruckner Boulevard (Service)	NB	TR	0.27	22.0	C	TR	0.62	22.9	C
Bruckner Boulevard (Mainline)	SB	L	0.91	13.8	B	L	0.85	17.4	B
		LT	0.41	2.6	A	LT	0.30	2.3	A
Bruckner Boulevard (Service)	SB	TR	0.63	3.7	A	TR	0.36	2.4	A
Barretto Street	EB	LTR	0.31	37.6	D	LTR	0.59	44.5	D
Overall Intersection			**0.73**	**10.0**	**A**		**0.76**	**17.5**	**B**

Table 8-3 (cont'd)
Existing Traffic Levels of Service: Oak Point Yard

Intersection & Approach		AM Peak (7:15 – 8:15 AM) Mvt.	V/C	Control Delay (sec)	LOS	PM Peak (4:30 – 5:30 PM) Mvt.	V/C	Control Delay (sec)	LOS
Bruckner Blvd. & Hunts Point Ave.									
Bruckner Boulevard (Mainline)	NB	L	0.17	25.4	C	L	0.23	25.2	C
		T	0.43	26.9	C	T	0.88	38.1	D
Bruckner Boulevard (Service)	NB	TR	0.45	27.4	C	TR	0.67	31.2	C
Bruckner Boulevard (Mainline)	SB	T	0.56	14.5	B	T	0.35	12.0	B
Bruckner Boulevard (Service)	SB	TR	0.71	17.4	B	TR	0.33	11.8	B
Hunts Point Avenue	EB	L	0.96	68.3	E	L	0.96	75.2	E
		TR	0.26	36.8	D	TR	0.51	41.7	D
	WB	LT	0.27	36.4	D	LT	0.33	37.1	D
		R	0.59	45.0	D	R	0.74	50.5	D
Overall Intersection			**0.62**	**26.2**	**C**		**0.85**	**32.0**	**C**

Traffic Volumes and Levels of Service. Traffic volumes in the study area were obtained from the placement of Automatic Traffic Recorders (ATRs) placed on Bruckner Boulevard and East 135th Street, and from turning and vehicle classification counts on East 134th and 135th Streets in November 2001. Additional traffic data were obtained from the Bruckner Boulevard Traffic Study (1998). A review of the manual count data and the 24-hour ATR data indicated that the morning peak traffic volumes occur in the 7:15 to 8:15 AM hour. Traffic volumes during the midday decreased and remained at a consistent level until the afternoon peak (4:30 to 5:30 PM). These peak hours reflect the heavy rush hour traffic on Bruckner Boulevard and are shown in Figures 5 and 6 in Appendix 2.

Overall traffic volumes in this area are heavy, ranging from upwards of 2,000 vehicles per hour (vph) along East 135th Street at Willis Avenue in the AM peak hour and 2,100 vph on eastbound Bruckner Boulevard at Brook Avenue. East 134th Street processes between 300 and 400 vph, much lower than its 135th Street counterpart primarily due to its less-direct highway connections to the east. Traffic entering the study area from north of East 135th Street is low, with between 100 and 250 vph noted during both daily peak periods. Only Bruckner Boulevard has strongly directional traffic since it provides access into Manhattan in the morning and then north to areas in the north Bronx and points beyond in the PM peak. The other east-west streets tend to process relatively balanced traffic volumes in each direction since these routes are more commercial/local in nature. During the morning peak hours, vehicle flows are heaviest in the AM peak hour along Bruckner Boulevard, with about 1,100 to 1,300 vehicles per hour (vph) in both the east and westbound directions. In the PM peak, volumes east are approximately 2,200 vph eastbound versus 700 to 800 vph westbound. Willis Avenue carries its highest volumes (700 vph) during the PM peak hour when most traffic flows are outbound from Manhattan. Elsewhere in the study area, traffic volumes are typically modest (100-300 vehicles per hour or less) since these streets are more local in nature and do not extend to distant parts of the Bronx.

In terms of existing truck traffic, the percent of heavy vehicles in the overall traffic flows is low, primarily due to the intense commuter nature of arterials in the area. Truck percentages are typically 5 percent or less throughout the study area, with one exception—the St. Ann's Avenue/East 135th Street intersection, through which access to the NYC Department of Sanitation garage is located near the south end of St. Ann's Avenue. At this location, truck

percentages are about 15 percent of the total vehicular flow for the left turn movements from the north and westbound approaches.

Overall acceptable to slightly congested traffic operations in the study area are achieved, despite very heavy traffic flows, through efficient signal progression on major arterials in the peak travel directions (see Table 8-4). Some individual intersection approaches currently operating at LOS D during both analysis periods are: the north and southbound Willis Avenue approaches to East 135th Street; southbound St. Ann's Avenue at Bruckner Boulevard; and the southbound right turn movement from Willis Avenue to Bruckner Boulevard. In each case, while these approaches are heavily traveled, they have been allocated slightly insufficient green signal time to adequately process their vehicle demands.

65th Street Yard

Traffic Study Area. The traffic study area for the 65th Street Yard site consists of the major intersections along arterials that serve as access routes into and out of the area, including the key locations through which freight-related truck traffic would be concentrated (see Figure 8-15). Additionally, local interior intersections along 2nd Avenue that would serve as funnel points into the study area were included. Analysis locations include the following:

- 2nd Avenue and 39th Street
- 2nd Avenue and 65th Street
- 3rd Avenue and 39th Street
- 3rd Avenue and 60th Street
- 3rd Avenue and 65th Street
- 4th Avenue and 38th Street
- 7th Avenue and 65th Street

The street network in much of this area of Sunset Park is laid out in a grid manner. 3rd and 4th Avenues are two of eastern Brooklyn's major north-south arterials, processing some of the area's highest traffic volumes throughout the day. Through the study area, 3rd Avenue is a major at-grade arterial with the elevated Gowanus Expressway aligned directly above. South of about 55th Street, 3rd Avenue operates with main and service roads of two to three lanes each in both directions separated by raised medians. Exclusive left turn lanes are provided at major intersections along with exclusive signal phases allocated to these movements. North and southbound access to the Gowanus Expressway is available at the southern end of the study area at 65th Street. Access to the Brooklyn waterfront along local streets from the Gowanus Expressway is available at 38th and 60th Streets for traffic approaching from the south, but for traffic approaching from the north, it is only available at 39th Street.

Each of the east-west cross streets that connect 2nd and 4th Avenues is typically one to two travel lanes per direction, with curb parking allowed on both sides of the street. West of 3rd Avenue, the streets are lined with industrial facilities with some residential pockets, whereas east of 3rd Avenue it is primarily residential. Local NYCDOT-designated truck routes include nearly all of the intersection approach streets analyzed, except for 65th Street at its intersection with 2nd and 3rd Avenues (and streets south of the expressway), which is primarily a residential area of Bay Ridge. It would be possible for generated truck traffic to access the major truck arterials without the need to travel through local residential streets in the study area.

Table 8-4
Existing Traffic Levels of Service: Harlem River Yard

Intersection & Approach		AM Peak (7:15 – 8:15 AM) Mvt.	V/C	Control Delay (sec)	LOS	PM Peak (4:30 – 5:30 PM) Mvt.	V/C	Control Delay (sec)	LOS
Willis Ave. & Bruckner Blvd.									
Willis Avenue	SB	L	0.02	27.6	C	L	0.36	32.6	C
		R	0.64	37.4	D	R	0.75	40.7	D
Bruckner Boulevard	EB	T	0.07	4.6	A	T	0.09	4.7	A
	WB	T	0.99	24.8	C	T	0.58	7.6	A
Overall Intersection			**0.87**	**27.1**	**C**		**0.64**	**21.2**	**C**
Brook Ave. & Bruckner Blvd.									
Brook Avenue	NB	LR	0.16	30.5	C	LR	0.02	27.6	C
	SB	LTR	0.39	32.3	C	LTR	0.29	30.9	C
Bruckner Boulevard	EB	TR	0.77	10.0	B	TR	0.88	12.0	B
	WB	L	0.07	5.0	A	LT	0.61	8.0	A
		T	0.98	23.3	C				
Overall Intersection			**0.77**	**18.4**	**B**		**0.68**	**12.5**	**B**
St. Ann's Ave. & Bruckner Blvd.									
St. Ann's Avenue	NB	LTR	0.31	32.0	C	LTR	0.24	30.7	C
Bruckner Boulevard	SB	LTR	0.47	36.0	D	LTR	0.72	45.9	D
	EB	LTR	0.68	8.4	A	LTR	1.01	41.9	D
	WB	L	0.36	10.0	B	L	0.18	8.4	A
		TR	1.00	43.4	D	TR	0.53	7.1	A
Overall Intersection			**0.82**	**26.0**	**C**		**0.91**	**30.7**	**C**
Brook Ave. & East 134th St.									
Brook Avenue	SB	LT	0.20	13.5	B	LT	0.21	13.5	B
East 134th Street	EB	TR	0.45	8.5	A	TR	0.30	7.3	A
Overall Intersection			**0.35**	**9.7**	**A**		**0.26**	**9.4**	**A**
St. Ann's Ave & East 134th St.									
St. Ann's Avenue	NB	TR	0.33	7.9	A	TR	0.42	8.7	A
	SB	LT	0.40	8.9	A	LT	0.51	10.5	B
East 134th Street	EB	LTR	0.57	17.3	B	LTR	0.43	15.6	B
Overall Intersection			**0.46**	**13.1**	**B**		**0.48**	**11.8**	**B**
Willis Ave. & East 135th St.									
Willis Avenue	NB	LT	0.41	42.5	D	LT	0.78	48.7	D
	SB	R	0.22	41.0	D	R	0.24	41.3	D
East 135th Street	WB	TR	0.57	6.9	A	TR	0.60	7.2	A
Overall Intersection			**0.53**	**14.2**	**B**		**0.64**	**19.3**	**B**
St. Ann's Ave. & East 135th St.									
St. Ann's Avenue	NB	LT	0.34	7.8	A	LT	0.43	8.6	A
	SB	TR	0.16	6.6	A	TR	0.15	6.5	A
East 135th Street	WB	L	0.22	14.0	B	L	0.39	15.8	B
		TR	0.51	16.1	B	TR	0.37	14.7	B
Overall Intersection			**0.40**	**12.5**	**B**		**0.41**	**11.9**	**B**

Traffic Volumes and Levels of Service. Traffic volumes in the study area were compiled from a combination of data listed in the Gowanus Expressway Rehabilitation Traffic Monitoring Program (Spring 1999) and NYCEDC Strategic Plan for the Redevelopment of the Port of New York (April 1998). Additional vehicle counts were conducted at key intersections on 2nd, 3rd, and 7th Avenues in November 2001. A review of the manual count data and the 24-hour ATR data indicated that the morning peak traffic volumes occur in the 7:45 to 8:45 AM hour. Traffic volumes during the midday decreased and remained at a consistent level until peaking again in

an afternoon peak at 5 to 6 PM. These peak hours reflect the heavy rush hour traffic on 3rd Avenue, and are shown in Figures 7 and 8 in Appendix 2.

Both 3rd and 4th Avenues have strongly directional traffic flows since these streets provide northbound access to Downtown Brooklyn and to the river crossings into Manhattan in the morning and then south to areas in south Brooklyn, Staten Island, and New Jersey during the PM peak. During the morning peak hours, vehicle flows are heaviest for northbound 3rd and 4th Avenues, with about 2,400 to 2,700 vehicles per hour (vph) northbound and 900 to 1,300 vph southbound. In the PM peak, volumes northbound range from 600 to 800 vph versus 2,000 to 2,200 vph southbound on 3rd Avenue and 1,500 vph southbound on 4th Avenue.

The other north-south avenues tend to process relatively balanced traffic volumes in each direction since these routes are more commercial/local in nature. Volumes along cross streets are typically low (150-300 vehicles per hour or less), with the exception being the two intersections where the Gowanus Expressway ramps touch down. At these ramp intersections, local street traffic combines with ramp traffic to range from 500 to 700 vph. There is little fluctuation between the AM and PM peak hour traffic volumes at the intersection of 7th Avenue and 65th Street with the exception of the eastbound 65th Street approach, which has about 600 vph in the AM peak hour and 1,000 vph in the PM peak.

In terms of existing truck traffic, the percent of heavy vehicles in the overall traffic flows are substantial along the north-south corridors of 3rd and 4th Avenues, as high as 20 percent on the southbound 3rd Avenue approach to 65th Street. Also, truck percents are in the 20-30 percent range along westbound the 39th and 60th Street approaches to 3rd Avenue. Truck percentages along other cross streets are low, falling within a range of 4 to 8 percent moving across 3rd and 4th Avenues.

Overall, all 7 intersections analyzed were found to be operating at acceptable LOS A, B, or C to slightly congested overall LOS D. Several individual movements operate with modest to substantial congestion, particularly the exiting traffic from the northbound Gowanus Expressway onto 7th Avenue approaching 65th Street (LOS D during the AM peak hour; LOS E during the PM peak hour) and the southbound Gowanus Expressway traffic exiting at 39th Street onto 2nd Avenue (LOS D in the AM peak hour). Other problem movements include left-turning vehicles from the mainline of 3rd Avenue at 60th Street (LOS D to E), and eastbound 65th Street left turns at 3rd Avenue (LOS E in the AM; LOS D in the PM) due to lengthy signal cycle lengths and short green signal phases (see Table 8-5).

D. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

FUTURE DEMAND FORECASTS/MODE SHIFT

Table 8-6 shows the results of the diversion modeling disaggregated by the three basic types of rail service—bulk transload, carload and intermodal. These results include the off-model post-processing elimination of small shipments. In addition to these forecasted diversion of tons from truck to rail, the Tunnel Alternative would also attract some future rail traffic which would

otherwise use the crossing at Selkirk.[1] Currently, based on TRANSEARCH data, approximately 5.3 million tons travel to and from the region via rail, of which about 1 to 2 million tons move via the Selkirk routing with the remainder coming from points further north and east. This amount is forecast to increase to 7.3 million tons in 2025 based on the overall growth in freight movement in the region (the actual mode share will decline slightly). The Tunnel Alternative would attract about 4,000,000 tons, or slightly more than half of the future volume which would otherwise be expected to travel to the region via the Selkirk routing.

The TSM and Expanded Float Operations Alternatives attract relatively small diversion volumes. The only element of the TSM Alternative which would impact rail mode share is improved coordination on the Hudson Line with MetroNorth passenger trains. This permits the introduction of a new midday intermodal (TOFC) train resulting in a slight increase in intermodal traffic. However, as NYSDOT and the MetroNorth Railroad further study this option, it is possible that up to four additional trains could be accommodated. If so, the diversion estimate would still be less than that of the Expanded Float Operations Alternative.

The Expanded Float Operations Alternative attracts slightly less than half a million tons of carload and bulk transload cargo. This amount is considerably lower than the diversion forecast in the MIS. The MIS assumed the theoretical existence of a seamless transfer of cargo between trains and the floats at each terminus. In the EIS, a more thorough analysis was conducted of the actual logistics of this operation and, as described previously in the railroad LOS section, it is not likely to be seamless. Second, the filtering out of small shipments had a disproportionate affect on the Expanded Float Operations Alternative since it tended to attract relatively small volumes from any given origin/destination pair and commodity type. Third, several factors combined to eliminate intermodal cargo from the diversion equation: the delays involved in the cargo transfer between the floats and land-based rail at either end; the operational logistics involved in securing containers on floats; and the inordinate operating subsidy which would be required to resolve these two problems in a way which would create a viable and attractive service.

The diversion potential of the Expanded Float Alternative was analyzed for 2010. It would divert 272,141 tons from truck, about half the amount of forecast diversion in 2025 primarily due to the lower volume of commodities moving in the region, as well as a slightly lower diversion rate of 0.1 percent versus 0.3 percent in 2025. This lower diversion rate could be due to more severe highway congestion in 2025 which makes the float a more attractive alternative to trucking.

SINGLE TUNNEL SYSTEM

The diversion percentage for the New Jersey alignment is 5.4 percent of all truck cargo and rail/drayage trips, compared to 5.0 percent for the Staten Island alignment. The total diversion of the Staten Island tunnel alignment is somewhat less than for the New Jersey alignment due to the more circuitous routing which some trains need to take to reach the Staten Island portal, as described in the railroad LOS section.

[1] It should be noted, however, that rail traffic that would no longer use the rail crossing at Selkirk may still utilize Selkirk Yard. No decrease in usage of or employment at Selkirk Yard would be expected as a result of the Tunnel Alternative.

Table 8-5
Existing Traffic Levels of Service: 65th Street Yard

Intersection & Approach		AM Peak (7:45 – 8:45 AM) Mvt.	V/C	Control Delay (sec)	LOS	PM Peak (5:00 – 6:00 PM) Mvt.	V/C	Control Delay (sec)	LOS
2nd Avenue & 39th Street									
2nd Avenue	NB	LTR	0.64	42.0	D	LTR	0.53	39.8	D
	SB	LTR	0.27	36.3	D	LTR	0.59	43.3	D
39th Street	EB	LTR	0.10	20.3	C	LTR	0.21	21.7	C
	WB	LTR	0.22	21.6	C	LTR	0.41	24.4	C
Gowanus Expressway Exit	WB	L	0.86	51.9	D	L	0.44	32.3	C
		LTR	0.71	41.3	D	LTR	0.28	29.0	C
Overall Intersection			**0.53**	**40.3**	**D**		**0.46**	**33.2**	**C**
2nd Avenue & 65th Street									
2nd Avenue	NB	T	0.76	21.4	C	T	0.29	6.8	A
		R	0.10	10.2	B	R	0.07	5.5	A
	SB	DfL	0.39	10.8	B	LT	0.35	7.1	A
		T	0.15	5.9	A	-	-	-	-
65th Street	WB	L	0.13	25.8	C	L	0.14	26.0	C
		R	0.32	28.6	C	R	0.30	28.2	C
Overall Intersection			**0.63**	**19.0**	**B**		**0.33**	**10.0**	**A**
3rd Avenue & 39th Street									
3rd Avenue	NB	T	0.95	17.5	B	T	0.31	2.6	A
		R	0.06	5.8	A	R	0.02	2.0	A
	SB	T	0.43	7.7	A	T	0.88	8.9	A
39th Street	EB	LTR	0.35	29.0	C	LTR	0.39	36.2	D
	WB	LTR	0.55	32.7	C	LTR	0.50	38.2	D
Overall Intersection			**0.80**	**16.5**	**B**		**0.78**	**10.4**	**B**
3rd Avenue & 60th Street									
3rd Avenue Mainline	NB	L	0.87	70.0	E	L	0.77	69.3	E
		T	0.70	19.8	B	T	0.09	5.9	A
3rd Avenue Service		TR	1.00	42.7	D	TR	0.26	6.8	A
3rd Avenue Mainline	SB	L	0.58	53.4	D	L	0.87	79.0	E
		T	0.51	16.8	B	T	0.98	24.5	C
3rd Avenue Service		TR	0.20	13.6	B	TR	0.32	7.1	A
60th Street	EB	LTR	0.40	35.7	D	LTR	0.55	43.9	D
	WB	LTR	0.65	40.9	D	LTR	0.57	44.9	D
Overall Intersection			**0.86**	**32.2**	**C**		**0.88**	**25.8**	**C**
3rd Avenue & 65th Street									
3rd Avenue	NB	L	0.06	10.1	B	L	0.04	10.1	B
		T	0.62	16.3	B	T	0.20	11.1	B
	SB	TR	0.15	10.7	B	T	0.32	12.3	B
65th Street	EB	L	0.86	56.7	E	R	0.76	46.8	D
		R	0.05	26.0	C	L	0.04	25.9	C
	WB	T	0.31	29.1	C	T	0.27	28.6	C
Overall Intersection			**0.71**	**22.7**	**C**		**0.48**	**20.6**	**C**
4th Avenue & 38th Street									
4th Avenue	NB	TR	0.83	6.5	A	TR	0.31	3.0	A
	SB	T	0.47	3.5	A	T	0.52	3.8	A
38th Street	EB	L	0.70	43.6	D	L	0.73	43.7	D
		TR	0.09	32.7	C	TR	0.46	38.6	D
Overall Intersection			**0.79**	**10.5**	**B**		**0.58**	**12.8**	**B**
7th Avenue & 65th Street									
7th Avenue	NB	LTR	0.94	47.1	D	LTR	0.93	57.0	E
	SB	LTR	0.33	21.5	C	LTR	0.54	33.4	C
65th Street	EB	LTR	0.44	12.0	B	LTR	0.89	36.5	D
	WB	LTR	0.52	13.0	B	LTR	0.65	18.1	B
Overall Intersection			**0.69**	**25.2**	**C**		**0.93**	**36.3**	**D**

Table 8-6
Freight Diverted from Truck to Rail in 2025 (annual tons)

Rail Service Type	TSM	Expanded Float	Single Tunnel System		Double Tunnel System	
			New Jersey	Staten Island	New Jersey	Staten Island
Bulk Transload	0	251,000	3,734,000	3,409,000	4,275,000	3,707,000
Carload	0	208,000	2,814,000	2,585,000	3,266,000	2,841,000
Intermodal	69,000	0	2,915,000	2,788,000	7,325,000	6,399,000
Total	**69,000**	**459,000**	**9,463,000**	**8,779,000**	**14,866,000**	**12,947,000**

A disaggregated analysis of the New Jersey alignment diversion provides further insight into the nature of the market demand for the tunnel. The results are similar for the Staten Island alignment with slightly lower volumes. The directionality of demand is as follows:

- Inbound 65 percent
- Outbound 30 percent
- Through 5 percent

As is typical of freight movement in the region as a whole (with the exception of waste transport) the predominant movement is inbound reflecting the consumption orientation of the region. Thus, the inbound volume was used to size the rail facilities and is the common frame of reference used to describe freight movement throughout the chapter. Through movements represent a relatively small part of the diversion total—less than 500,000 tons. Shippers will continue to prefer, in most cases, the more circuitous but less congested routings around the region.

Of the total diversion amount, 87 percent is diverted from long-haul trucking and 13 percent (1.2 million tons) is diverted from rail/drayage from yards in northern New Jersey. This represents the diversion of about 25 percent of the total drayage market and 4 percent of the total long-haul trucking market. It is logical that a higher percentage of the drayage market would be diverted because these commodities arrive in the region (West-of-Hudson) on rail and will be able to continue on rail to their East-of-Hudson destination. On the other hand, the long-haul trucking market requires a mode shift of the entire trip from truck to rail.

About one-half (48 percent) of total diverted cargo is destined for Brooklyn. Around 10 percent each is destined for the other East-of-Hudson boroughs (Bronx, Queens, Manhattan); about 17 percent to Long Island; and 7 percent to southwestern Connecticut. About one-third (32 percent) arrives in the region on trains originating in the Chicago area, followed by Atlanta (15 percent), Syracuse (9 percent) and Richmond and Buffalo (6 percent each). No other origin point accounts for more than 5 percent of the total.

About one-quarter of the diverted cargo (27 percent) is food or kindred products, followed by New Jersey drayage (freight all kinds) at 13 percent; clay, concrete and stone (9 percent), lumber or wood products (8 percent), pulp and paper (7 percent), and primary metal products (6 percent). No other cargo category accounts for more than 5 percent of the total.

DOUBLE TUNNEL SYSTEM

The Double Tunnel System would attract significantly more diverted tonnage than was the case in the MIS. This is primarily due to the overall increase in regional commodity flows previously documented. The diversion percentage for the New Jersey tunnel alignment of 8.5 percent of all truck cargo is consistent with the effective diversion percentage found in the MIS for long-haul truckload and rail/drayage trips. The increase in diverted volume is due to the higher estimates of total future regional freight volume as contained in the TRANSEARCH database. As with the Single Tunnel System, the total diversion of the Staten Island tunnel alignment is somewhat less than for the New Jersey tunnel alignment due to the more circuitous routing which some trains need to take to reach the Staten Island portal, as described in the railroad LOS section.

The disaggregated analysis of the New Jersey tunnel alignment diversion is presented below. The results are similar for the Staten Island alignment with slightly lower volumes.

- Inbound 58 percent
- Outbound 28 percent
- Through 14 percent

In the Double Tunnel System, through movements represent a greater part of the diversion total—about 14 percent, or two million tons—than under the Single Tunnel System. Both the through movement and drayage totals (described below) are reasonably consistent with the findings of the MIS, which calculated the diversion from these markets off-model.

Of the total diversion amount, 84 percent is diverted from long-haul trucking and 16 percent (2.2 million tons) is diverted from rail/drayage from yards in northern New Jersey. This represents the diversion of 47 percent of the total drayage market and 4 percent of the total long-haul trucking market.

About one-third (32 percent) of total diverted cargo is destined for Brooklyn. Between 10 and 20 percent each is destined for the other East-of-Hudson boroughs (Bronx, Queens, Manhattan), Long Island, and southwestern Connecticut. About one-third (32 percent) arrives in the region on trains originating in the Chicago area, followed by Atlanta (15 percent), Syracuse (8 percent) and Richmond (5 percent). No other origin point accounts for more than 5 percent of the total.

About one-quarter of the diverted cargo (23 percent) is food or kindred products, followed by New Jersey drayage (freight all kinds) at 15 percent; clay, concrete and stone (7 percent), lumber or wood products (6 percent), pulp and paper (6 percent), and fabricated metal products (5 percent). No other cargo category accounts for more than 5 percent of the total.

Additional information regarding the freight diversion analysis can be found in Appendix 2A, "Transportation Appendix," and Appendix 2B, "Commodity Flow Analysis."

REGIONAL TRANSPORTATION

Three types of regional transportation impacts were analyzed:

- Changes in truck vehicle miles and hours of travel disaggregated by county for the 28-county BPM region;
- Changes in traffic volume on some 70 major roadways in the metropolitan region as produced by the BPM model assignments; and

- Changes in railroad operations on the immediate project facilities (the tunnels, Bay Ridge Branch to Fresh Pond, and Montauk Branch West to West Maspeth); East-of-Hudson operations on the Long Island Rail Road; and West-of-Hudson operations on the shared trackage of the Lehigh mainline used by New Jersey Transit.

Each is described in more detail below.

Truck Vehicle Miles and Hours of Travel

Vehicle miles and hours of travel (VMT/VHT) are the primary determinants of regional air quality. Large commodity carrying freight trucks are forecast to contribute about 20 percent of total regional truck VMT/VHT in 2025.[*] This will equal 1.4 billion truck vehicle miles of travel and 43 million truck vehicle hours of travel on an annual basis.

Under the Single Tunnel System, on a regional basis, the New Jersey alignment (which has the largest truck to rail diversion and hence the largest transportation impact) is forecast to reduce commodity truck VMT and VHT by about 3.0 percent, or an annual reduction of 40 million miles in regional truck VMT and 1.2 million hours in regional truck VHT. The reductions are comparable to the reduction in passenger vehicle travel which might be expected from a major public transportation investment. The Staten Island alignment will have slightly less impact, with a forecast reduction of about 2.7 percent in VMT and VHT.

Under the Double Tunnel System, the New Jersey alignment is forecast to reduce commodity truck VMT by 4.5 percent and VHT by 4.9 percent, or an annual reduction of 62 million miles in regional truck VMT and 2 million hours in regional truck VHT. The Staten Island tunnel alignment will have slightly less impact, with a forecast reduction of 3.8 percent in VMT and 4.4 percent in VHT.

The Expanded Float Operations Alternative would have an insignificant impact on regional commodity truck VMT/VHT of 0.1 and 0.2 percent respectively. The TSM Alternative was not independently tested due its minor diversion of freight from truck to rail.

Tables 8-7 and 8-8 show the forecast changes in daily commodity truck VHT and VMT for selected geographic areas within the study region for each 2025 alternative. Daily estimates were annualized by multiplying by an annualization factor of three hundred truck travel days per year. Results are shown for each New York City borough (county) and NYC as a whole; the two Long Island counties of Nassau and Suffolk; the five Hudson Valley counties included in the BPM—Westchester, Rockland, Putnam, Orange and Dutchess; the two Southwestern Connecticut counties of Fairfield and New Haven; and the 13 NJTPA counties plus Mercer County in New Jersey.[*]

[*] All results in this section are based on the 28-county region covered by the NYMTC BPM. Data could not be produced for Sullivan and Ulster Counties, NY, and Litchfield County, Ct. The impacts in these counties could be expected to be minor and would not alter the primary regional conclusions.

[*] Bergen, Passaic, Hudson, Essex, Union, Morris, Somerset, Middlesex, Monmouth, Ocean, Hunterdon, Warren, Sussex, and Mercer Counties.

Table 8-7
Forecast Change in Daily Regional Freight Truck VMT - 2025

County/Subregion	No Action	Expanded Float	Single Tunnel System		Double Tunnel System	
			New Jersey	Staten Island	New Jersey	Staten Island
New York City	432,272	431,786 (0%)	412,731 (-5%)	414,699 (-4%)	411,584 (-5%)	412,253 (-5%)
- Manhattan	*42,244*	*42,279 (0%)*	*41,288 (-2%)*	*41,187 (-3%)*	*39,744 (-6%)*	*40,040 (-5%)*
- Queens	*115,675*	*115,653 (0%)*	*115,407 (0%)*	*115,515 (0%)*	*120,249 (+4%)*	*119,028 (+3%)*
- Bronx	*125,138*	*125,062 (0%)*	*121,938 (-3%)*	*122,102 (-2%)*	*120,743 (-4%)*	*121,477 (-3%)*
- Brooklyn	*76,296*	*76,062 (0%)*	*70,836 (-7%)*	*71,310 (-7%)*	*70,921 (-7%)*	*70,019 (-8%)*
- Staten Island	*72,919*	*72,720 (0%)*	*63,262 (-13%)*	*64,585 (-11%)*	*61,157 (-16%)*	*61,689 (-15%)*
Long Island	222,441	222,370 (0%)	218,826 (-2%)	219,036 (-2%)	220,120 (-1%)	218,373 (-2%)
Hudson Valley	1,094,664	1,091,712 (0%)	1,053,112 (-4%)	1,058,184 (-3%)	1,026,783 (-6%)	1,038,088 (-5%)
Northern New Jersey	2,531,746	2,528,615 (0%)	2,465,702 (-3%)	2,469,345 (-2%)	2,431,128 (-4%)	2,440,720 (-4%)
Southwest Connecticut	373,502	373,409 (0%)	366,624 (-2%)	367,256 (-2%)	357,082 (-4%)	365,332 (-2%)
Regional Total	**4,654,625**	**4,627,882**	**4,516,995**	**4,528,520**	**4,446,697**	**4,474,766**

Note: Percent change shown for Build Alternatives vis-à-vis No Action.

Table 8-8
Forecast Change in Daily Regional Freight Truck VHT – 2025

County/Subregion	No Action	Expanded Float	Single Tunnel System		Double Tunnel System	
			New Jersey	Staten Island	New Jersey	Staten Island
New York City	19,023	19,026 (0%)	18,274 (-4%)	18,212 (-4%)	18,133 (-5%)	18,070 (-5%)
- Manhattan	*2,718*	*2,731 (0%)*	*2,669 (-2%)*	*2,639 (-3%)*	*2,539 (-7%)*	*2,570 (-5%)*
- Queens	*4,322*	*4,325 (0%)*	*4,343 (0%)*	*4,351 (+1%)*	*4,582 (+6%)*	*4,524 (+5%)*
- Bronx	*4,853*	*4,844 (0%)*	*4,755 (-2%)*	*4,727 (-3%)*	*4,624 (-5%)*	*4,695 (-3%)*
- Brooklyn	*4,003*	*3,995 (0%)*	*3,735 (-7%)*	*3,743 (-6%)*	*3,754 (-6%)*	*3,694 (-8%)*
- Staten Island	*3,127*	*3,131 (0%)*	*2,772 (-11%)*	*2,752 (-12%)*	*2,634 (-16%)*	*2,618 (-16%)*
Long Island	6,213	6,217 (0%)	6,109 (-2%)	6,117 (-2%)	6,141 (-1%)	6,100 (-2%)
Hudson Valley	27,776	28,584 (+3%)	27,534 (-1%)	27,802 (0%)	27,027 (-6%)	27,282 (-2%)
Northern New Jersey	77,104	77,008 (0%)	74,542 (-3%)	74,595 (-3%)	73,433 (-5%)	73,628 (-5%)
Southwest Connecticut	13,826	13,871 (0%)	13,439 (-3%)	13,442 (-3%)	13,169 (-5%)	13,454 (-3%)
Regional Total	**143,942**	**144,676**	**139,898**	**140,168**	**137,903**	**138,534**

Note: Percent change shown for Build Alternatives vis-à-vis No Action.

The percentage change is shown for the New Jersey alignment vis-à-vis the No Action forecast. Percentage changes for the Staten Island alignment follow a similar pattern but are slightly lower. Percentage changes by county for the Expanded Float Operations Alternative are smaller than the sensitivity of the NYMTC model and can not be modeled independently.

In looking at the New Jersey alignment in more detail, the forecast percentage reduction for most counties and subregions is very close to the regionwide average. The large volume of freight truck traffic in Northern New Jersey, the Hudson Valley and Southwestern Connecticut is due to through traffic and, in the case of New Jersey, traffic originating or destined for the large freight infrastructure located there. It is important to note that these areas are forecast to receive VMT/VHT reductions similar to the regional average, and in some cases larger than the benefits accruing to New York City and Long Island.

Several variations in county and subregional impacts should be noted. Under the Single Tunnel System, the percentage reduction on Staten Island for VMT is 13 percent and for VHT is forecast to be 11 percent. This results from a disproportionate reduction in future freight truck volume on the Verrazano Narrows Bridge (14 percent versus 6 percent for the George Washington Bridge). This is probably due to the slightly greater capacity for future volume growth on the VNB than on the GWB, which generally operates at or above capacity much of the time today. Thus, the freight tunnel diverts a greater proportion of this larger marginal increase on the VNB. The other anomalies are found in Queens and Long Island. The forecast reduction in VMT/VHT on Long Island is about two percent. In Queens, there is a forecast of essentially no change. This is due to the role of the West Maspeth Yard in the operation of the freight tunnel system. In Queens itself, there will be a net increase in truck activity around the West Maspeth Yard. This effect continues into western Long Island (Nassau County) where it partially balances out the decrease in regional cross-harbor trips.

Under the Double Tunnel System, the percentage reduction on Staten Island for both VMT and VHT is forecast to be 16 percent. The reduction in future freight truck volume on the Verrazano Narrows Bridge would be 17 percent versus 11 percent for the George Washington Bridge. The forecast reduction in VMT/VHT on Long Island is about one percent. In Queens, there is a forecast increase of four percent in VMT and six percent in VHT.

These effects could be mitigated by more widely dispersing the intermodal traffic to other yards such as Harlem River/Oak Point in the Bronx, 65th Street in Brooklyn, and Pilgrim in Long Island. This would, however, potentially decrease some of the project benefits in these areas. In general, the Class I railroads prefer to have a single concentrated point of intermodal operation East-of-Hudson. Use of multiple intermodal yards could degrade the efficiency of railroad operations and hence the attractiveness of the tunnel to intermodal shippers. The end result would be a smaller reduction in cross-harbor truck trips and net decline in regional benefits. The use of the Pilgrim State Hospital site is further complicated by the inability to operate modern double stack equipment on the Long Island Rail Road because well cars (as currently constructed) cannot clear the third rail. Resolution of this problem is a major effort in and of itself and is more properly addressed as part of the Pilgrim State project EIS expected to get underway shortly. Operating single stack TOFC equipment would be much less attractive to the railroads and shippers, and provides a much less efficient service in comparison to transferring

cargo to truck at West Maspeth. However, it should be stressed that all of these facilities would be used as major distribution centers for carload and bulk transload traffic.*

HIGHWAY NETWORK

This section of the EIS identifies and analyzes traffic volume changes effected under the alternatives in year 2025, and is addressed separately below for: a) the Hudson River crossings; b) Staten Island Bridge crossings; c) the East River crossings; and d) selected "inland" roadways across the region. The analyses are based on the travel demand model used throughout this project, and focus on the ability of the alternatives to reduce the volume of commodity trucks (i.e., the "larger" trucks, generally tractor-trailer combinations) since the reduction of that truck traffic would constitute a primary benefit of the Build alternatives.

The major findings of the analyses are:

- The Tunnel Alternative would significantly reduce the volume of large trucks currently using the Hudson River crossings and the Staten Island Bridge crossings as freight would be intercepted west of the Hudson River and transported by rail from New Jersey or Staten Island to points east and north. The George Washington Bridge, Goethals Bridge, and Verrazano-Narrows Bridge, in particular, would benefit.
- There is no other significant change in the cross-Hudson volumes other than that represented by the reduction in large commodity trucks. There is a minor decrease in the number of small trucks counterbalanced by a small increase in the number of autos. There is no significant backfilling effect (the diversion of trips from other routes) because of the finite number of Hudson River crossings and the underlying origin-destination pattern of all Hudson crossing trips remains essentially unchanged. Thus, the clearest impact of the rail diversion on truck traffic can be seen on these facilities.
- There would likely be operational benefits to traffic on these bridges and tunnels since the number of passenger car equivalents (PCEs) would decrease. Commodity trucks can be considered to be the equivalent of three to four passenger cars in terms of their spatial needs, operations, and impacts on roadway capacity and safety.
- The reduction in commodity trucks on the region's roadways, bridges, and tunnels would lessen the wear and tear on the regional infrastructure.
- There is a forecasted increase of 5,124 large commodity trucks from the existing condition to the 2025 No Action condition, a 25 percent increase compared to today's conditions if nothing is done to mitigate this growth. As an example of potential project benefits, the New Jersey alignment under the Double Tunnel System would capture 57 percent of this forecast growth, or more than half.

* Intermodal traffic will be moved directly to and from an intermodal facility in the West Maspeth area without stopping at Fresh Pond. Should the Pilgrim EIS lead to the development of an intermodal facility and market at Pilgrim State Hospital in Islip in advance of the completion of a Cross-Harbor tunnel, there is nothing in this analysis which would preclude servicing this market via tunnel trains. Such a development would reduce the infrastructure requirements (and impacts) of the expanded West Maspeth Yard.

- The Expanded Float Operations Alternative would create a minimal—virtually imperceptible—reduction in commodity trucks using the region's bridges, tunnels, and general roadway network.
- The TSM Alternative would have no measurable impact.
- The reduction in commodity-type trucks realized on several of the major bridge and tunnel crossings would not be as pronounced on the arterial roadway network, except for locations where there is a single roadway connecting two major bridge or tunnel facilities that would have reduced truck traffic. For example, there would be considerable commodity truck reduction benefits on the Staten Island Expressway which is the sole arterial connector between the Goethals Bridge and the Verrazano-Narrows Bridge (both of which would experience considerable reductions in commodity truck utilization). On the other hand, commodity truck reductions expected for the George Washington Bridge would not be as pronounced on the Bronx roadways on the east side of the Bridge, since truck volume reductions would be divided among three alternate routes—the Cross Bronx Expressway and the northbound and southbound directions of the Major Deegan Expressway; each of these roadways would experience commodity truck reductions, but the level of reductions would not be as significant as on the Staten Island Expressway which is the sole major roadway option between the Goethals and Verrazano-Narrows Bridges. In addition, the impact of the commodity truck diversion cannot be isolated to the extent it can on the finite number of Hudson crossings or on relatively isolated approach routes like the SIE. Existing auto and small truck trips may be attracted to these landside routings from smaller arterials as space opens up as a result of the large truck diversion. This is a positive regional impact—moving traffic from local streets to larger roadways—but it tends to blur the impact on any single roadway facility.

Supporting tables in this section depict these changes and findings; more detailed tables are provided in the Transportation Appendix to this EIS.

HUDSON RIVER CROSSINGS

The Hudson River crossings addressed in this section include the Bear Mountain Bridge, I-84 Toll Bridge, Tappan Zee Bridge, George Washington Bridge, Lincoln Tunnel, Holland Tunnel, and Verrazano-Narrows Bridge. A summary of findings for projected year 2025 conditions is presented in Table 8-9 and described below.

Under the No Action Alternative in year 2025, the volume of commodity trucks (i.e., large trucks) is projected to increase by 40 percent in the 6-10 AM peak period, by 23 percent in the 3-7 PM peak period, and by 25 percent over the course of a typical 24-hour weekday. The volume of all trucks is projected to remain relatively flat (i.e., an increase of 3 percent versus existing conditions) in the 6-10 AM peak period, increase by 22 percent in the 3-7 PM peak period, and increase by 18 percent over a full 24-hour weekday. The total volume of all vehicular traffic is projected to increase by 52 percent in the 6-10 AM peak period, 41 percent in the 3-7 PM peak period, and by 47 percent over the course of a full typical weekday. These volumes represent the future baseline against which the various Build alternatives are compared below.

Table 8-9
Projected Truck And General Traffic Volume Changes:
Hudson River Crossings, No Action Vs. Build Alternatives (Year 2025)

	2000 Existing	No Action (% vs. Existing)	Expanded Float Alt. (% vs. No Action)	Single Tunnel System		Double Tunnel System	
				New Jersey (% vs. No Action)	Staten Island (% vs. No Action)	New Jersey (% vs. No Action)	Staten Island (% vs. No Action)
Commodity Trucks							
6-10 AM	3,684	5,173 (+40%)	5,158 (0%)	4,828 (-7%)	4,853 (-6%)	4,587 (-11%)	4,642 (-10%)
3-7 PM	2,935	3,618 (+23%)	3,608 (0%)	3,377 (-7%)	3,394 (-6%)	3,208 (-11%)	3,246 (-10%)
24 Hour	20,734	25,858 (+25%)	25,781 (0%)	24,121 (-7%)	24,246 (-6%)	22,924 (-11%)	23,196 (-10%)
All Trucks							
6-10 AM	19,891	20,497 (+3%)	20,481 (0%)	20,152 (-2%)	20,177 (-2%)	19,911 (-3%)	19,966 (-3%)
3-7 PM	9,320	11,349 (+22%)	11,338 (0%)	11,108 (-2%)	11,125 (-2%)	10,939 (-4%)	10,977 (-3%)
24 Hour	72,460	85,819 (+18%)	85,742 (0%)	84,082 (-2%)	84,207 (-2%)	82,884 (-3%)	83,156 (-3%)
Total Traffic							
6-10 AM	218,507	331,335 (+52%)	331,326 (0%)	331,016 (0%)	331,040 (0%)	330,771 (0%)	330,831 (0%)
3-7 PM	247,664	348,518 (+41%)	348,513 (0%)	348,255 (0%)	348,297 (0%)	348,051 (0%)	348,132 (0%)
24 Hour	929,591	1,368,823 (+47%)	1,368,725 (0%)	1,367,116 (0%)	1,367,257 (0%)	1,365,938 (0%)	1,366,190 (0%)

Under the Expanded Float Operations Alternative in year 2025, the volume of commodity trucks, all trucks, and the total volume of vehicular traffic is expected to experience a minimal change when compared to the No Action Alternative. This negligible effect of the Expanded Float Operations Alternative relates to the negligible amount of freight demand characterizing this alternative. Hence, these impacts were not independently modeled or included in the tables.

As shown in Table 8-10, under the New Jersey alignment of the Single Tunnel System in year 2025, the volume of commodity trucks is projected to decrease by 7 percent in the 6-10 AM and 3-7 PM peak periods, as well as on a 24-hour basis. The volume of all trucks is projected to decrease by about 2 percent during these same periods, while overall total traffic volumes are projected to experience a minimal reduction.

Under the New Jersey alignment of the Double Tunnel System in year 2025, the volume of commodity trucks is projected to decrease by 11 percent in the 6-10 AM and 3-7 PM peak periods, as well as on a 24-hour basis. The volume of all trucks is projected to decrease by about 3 to 4 percent during these same periods, while overall total traffic volumes are projected to experience a minimal reduction.

Projections under the Staten Island alignment would be very similar to those anticipated for the New Jersey alignment—projected commodity truck reductions under the Staten Island alignment would be only slightly smaller (by about 1 percent) than under the New Jersey alignment with regards to Hudson River crossings, overall.

A closer inspection of the projected breakdown in commodity truck volumes at the Hudson River Crossings is provided in Table 8-10.

Table 8-10
Projected Commodity Truck Volumes
By Alternative In Year 2025: Hudson River Crossings

Peak Period & Crossing	2000 Existing	2025 No Action	Expanded Float Alternative	Single Tunnel System		Double Tunnel System	
				New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment
6-10 AM							
Bear Mountain Bridge	31	133	134	128	127	120	120
I-84 Toll Bridge	660	793	792	773	779	725	749
Tappan Zee Bridge	634	1,098	1,087	1,058	1,068	1,025	1,026
George Washington Br.	1,479	1,840	1,840	1,734	1,725	1,618	1,646
Lincoln Tunnel	0	0	0	0	0	0	0
Holland Tunnel	0	0	0	0	0	0	0
Verrazano-Narrows Br.	880	1,309	1,309	1,133	1,153	1,101	1,100
Total	3,984	5,173 (+30%)	5,157 (0%)	4,828 (-7%)	4,853 (-6%)	4,580 (-11%)	4,641 (-10%)
3-7 PM							
Bear Mountain Bridge	17	80	83	91	74	80	73
I-84 Toll Bridge	648	582	583	556	561	522	546
Tappan Zee Bridge	619	849	844	788	812	778	786
George Washington Br.	1,148	1,241	1,218	1,185	1,187	1,108	1,123
Lincoln Tunnel	0	0	0	0	0	0	0
Holland Tunnel	0	0	0	0	0	0	0
Verrazano-Narrows Br.	603	865	861	758	761	720	730
Total	3,035	3,617 (+19%)	3,589 (-1%)	3,377 (-8%)	3,394 (-6%)	3,208 (-11%)	3,258 (-10%)
24-Hour							
Bear Mountain Bridge	123	509	513	504	484	482	467
I-84 Toll Bridge	4,298	4,192	4,185	4,064	4,089	3,845	3,942
Tappan Zee Bridge	2,895	5,369	5,354	5,098	5,169	4,521	5,036
George Washington Br.	8,821	9,597	9,584	9,128	9,109	8,487	8,607
Lincoln Tunnel	0	0	0	0	0	0	0
Holland Tunnel	0	0	0	0	0	0	0
Verrazano-Narrows Br.	4,598	6,190	6,146	5,327	5,395	5,089	5,144
Total	**20,735**	**25,857 (+25%)**	**25,782 (0%)**	**24,121 (-7%)**	**24,246 (-7%)**	**22,424 (-13%)**	**23,196 (-10%)**

Notes:
[1] No Action percentages shown are versus the Existing Conditions; Expanded Float Operations and Tunnel Alternative percentages shown are versus the No Action Alternative.
[2] Trucks taller than 12'-6" are not allowed in the Lincoln and Holland Tunnels

The major findings emerging from Table 8-10 are:

- The George Washington Bridge (GWB) and the Verrazano-Narrows Bridge (VNB) would experience the largest reductions in commodity trucks under the Tunnel Alternative, while significantly less reductions would be expected on the Bear Mountain, I-84, and Tappan Zee Bridges, which is to be expected since they are considerably north of the major influence area of the proposed Tunnel Alternatives and tend to service through trips traveling between the North American hinterland west of the Hudson and points to the east such as New England and the Canadian maritime provinces. As described earlier in the diversion analysis, the Tunnel Alternatives, while diverting some through traffic, have a larger impact on traffic

bound for the New York City Metro region. No impact would be expected in the two tunnel crossings since the largest trucks are generally prohibited from these facilities.

- Under the Single Tunnel System, the volume of commodity trucks would decrease by about 106 to 115 vehicles in the 6-10 AM period on the GWB, and by about 156 to 176 vehicles on the VNB. In the 3-7 PM period, about 50 to 54 commodity truck trips would be eliminated on the GWB and about 104 to 107 such vehicles would be eliminated from the VNB. Over a 24-hour period, commodity truck volume reductions would be about 795 to 863 on the VNB and 469 to 488 on the GWB.
- Under the Double Tunnel System, the volume of commodity trucks would decrease by about 190 to 220 vehicles in the 6-10 AM period on the GWB, and by about 210 vehicles on the VNB. In the 3-7 PM period, about 120 to 130 commodity truck trips would be eliminated on the GWB and about 135 to 145 such vehicles would be eliminated from the VNB. Over a 24-hour period, commodity truck volume reductions would be about 1,000 to 1,100 on both the GWB and the VNB.

STATEN ISLAND BRIDGE CROSSINGS

The Staten Island Bridge Crossings addressed in this section include the Verrazano-Narrows Bridge, the Goethals Bridge, the Outerbridge Crossing, and the Bayonne Bridge (note: the Verrazano-Narrows Bridge is shown both in this section on Staten Island Bridge crossings and in the previous section on Hudson Bridge crossings). A summary of findings for projected year 2025 conditions is presented in Table 8-11 and described below.

As shown in Table 8-11, under the No Action Alternative in year 2025, the volume of commodity trucks is projected to increase by 49 percent in the 6-10 AM peak period, by 44 percent in the 3-7 PM peak period, and by 37 percent over the course of a typical 24-hour weekday. The volume of all trucks is projected to increase by about 6 percent in the 6-10 AM peak period, by 17 percent in the 3-7 PM peak period, and by 9 percent over a full 24-hour weekday. The total volume of all vehicular traffic is projected to increase by 25 to 27 percent during each of these time periods. These volumes represent the future baseline against which the various Build alternatives are compared below.

Under the Expanded Float Operations Alternative in year 2025, the volume of trucks and overall general vehicular traffic is expected to experience minimal change (i.e., a negligible effect) when compared to the No Action Alternative.

Under the New Jersey alignment of the Single Tunnel System, the volume of commodity trucks in year 2025 is projected to decrease by 12 to 13 percent in the 6-10 AM and 3-7 PM peak periods, as well as on a 24-hour basis. Under the Double Tunnel System, the projected decrease is 15 to 17 percent. Projections under the Staten Island tunnel alignment would be very similar to those anticipated for the New Jersey tunnel alignment.

A closer inspection of the projected breakdown in commodity truck reductions at the Staten Island Bridge Crossings is provided in Table 8-12.

Table 8-11
Projected Truck And General Traffic Volumes:
Staten Island Bridge Crossings, No Action Vs. Build Alternatives (Year 2025)

	2000 Existing	No Action (% vs. Existing)	Expanded Float Alt. (% vs. No Action)	Single Tunnel System		Double Tunnel System	
				New Jersey (% vs. No Action)	Staten Island (% vs. No Action)	New Jersey (% vs. No Action)	Staten Island (% vs. No Action)
Commodity Trucks							
6-10 AM	1,835	2,734 (+49%)	2,714 (-1%)	2,385 (-12%)	2,425 (-11%)	2,320 (-15%)	2,321 (-15%)
3-7 PM	1,270	1,830 (+44%)	1,819 (-1%)	1,614 (-12%)	1,614 (-12%)	1,541 (-16%)	1,556 (-15%)
24 Hour	9,620	13,138 (+37%)	13,050 (-1%)	11,411 (-13%)	11,547 (-12%)	10,934 (-17%)	11,402 (-16%)
All Trucks							
6-10 AM	8,970	9,480 (+6%)	9,460 (0%)	9,125 (-4%)	9,162 (-3%)	9,090 (-4%)	9,060 (-4%)
3-7 PM	3,940	4,620 (+17%)	4,630 (0%)	4,442 (-4%)	4,429 (-4%)	4,350 (-6%)	4,390 (-5%)
24 Hour	31,670	34,560 (+9%)	34,480 (0%)	32,869 (-5%)	33,000 (-5%)	32,310 (-7%)	32,500 (-6%)
Total Traffic							
6-10 AM	121,059	151,080 (+25%)	151,364 (0%)	151,871 (0%)	150,838 (0%)	151,372 (0%)	150,900 (0%)
3-7 PM	122,182	155,521 (+27%)	155,706 (0%)	156,731 (0%)	155,393 (0%)	155,746 (0%)	155,393 (0%)
24 Hour	479,331	604,973 (+26%)	605,265 (0%)	605,729 (0%)	604,501 (0%)	604,230 (0%)	604,347 (0%)

The major findings emerging from Table 8-12 are:

- The Goethals Bridge and the Verrazano-Narrows Bridge (VNB) would experience the largest reductions in commodity trucks under the Tunnel Alternative, while significantly smaller reductions would be expected on the Bayonne Bridge and the Outerbridge Crossing, which is to be expected since they currently are not as heavily utilized by the larger trucks as the other two bridges.
- Under the Tunnel Alternative, the reduction in commodity truck volumes on the Goethals Bridge would be about 150 to 160 vehicles in the 6-10 AM period, 90 to 100 vehicles in the 3-7 PM period, and about 700 to 730 vehicles over a 24-hour period. VNB commodity truck reductions were discussed in the section above on Hudson River Crossings.

EAST RIVER CROSSINGS

The East River Crossings addressed in this section include the Queensboro Bridge, Williamsburg Bridge, Manhattan Bridge, Brooklyn-Battery Tunnel, Brooklyn Bridge, Queens-Midtown Tunnel, Whitestone Bridge, and Triboro Bridge. A summary of findings for projected year 2025 conditions is presented in Table 8-13 and described below.

Table 8-12
Projected Commodity Truck Volumes
By Alternative In Year 2025: Staten Island Bridge Crossings

Peak Period & Crossing	2000 Existing	2025 No Action	Expanded Float Alternative	Single Tunnel System		Double Tunnel System	
				New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment
6-10 AM							
Bayonne Bridge	78	212	210	209	207	202	201
Goethals Bridge	601	751	725	611	617	598	591
Outerbridge Crossing	277	463	481	434	450	421	428
Verrazano-Narrows Br.	880	1,309	1,309	1,133	1,154	1,101	1,100
Total	1,836	2,735 (+49%)	2,725 (0%)	2,385 (-13%)	2,425 (-11%)	2,322 (-15%)	2,320 (-15%)
3-7 PM							
Bayonne Bridge	55	126	126	124	124	121	120
Goethals Bridge	441	532	535	460	452	441	430
Outerbridge Crossing	171	307	298	273	282	259	276
Verrazano-Narrows Br.	603	865	861	758	761	720	730
Total	1,270	1,830 (+44%)	1,820 (-1%)	1,614 (-12%)	1,614 (-12%)	1,541 (-16%)	1,556 (-15%)
24-Hour							
Bayonne Bridge	315	811	811	796	794	777	780
Goethals Bridge	3,587	3,908	3,837	3,358	3,336	3,204	3,177
Outerbridge Crossing	1,102	2,228	2,257	1,930	2,022	1,864	1,941
Verrazano-Narrows Br.	4,598	6,190	6,146	5,327	5,396	5,089	5,144
Total	9,602	13,137 (+37%)	13,051 (-1%)	11,411 (-13%)	11,547 (-12%)	10,934 (-17%)	11,402 (-16%)

Note: No Action percentages shown are versus the Existing Conditions; Car Float and Tunnel Alternative percentages shown are versus the No Action Alternative.

As shown in Table 8-13, under the No Action Alternative in year 2025, the volume of commodity trucks is projected to increase by 49 percent in the 6-10 AM peak period, by 52 percent in the 3-7 PM peak period, and by 45 percent over the course of a typical 24-hour weekday. The volume of all trucks is projected to decrease by about 3 percent in the 6-10 AM peak period, increase by 1 percent in the 3-7 PM peak period, and remain flat over a full 24-hour weekday. The total volume of all vehicular traffic is projected to increase by 22 to 26 percent during each of these time periods. These volumes represent the future baseline against which the various Build alternatives are compared below.

Table 8-13
Projected Truck And General Traffic Volumes:
East River Crossings, No Action vs. Build Alternatives (Year 2025)

	2000 Existing	No Action (% vs. Existing)	Expanded Float Alt. (% vs. No Action)	Single Tunnel System		Double Tunnel System	
				New Jersey (% vs. No Action)	Staten Island (% vs. No Action)	New Jersey (% vs. No Action)	Staten Island (% vs. No Action)
Commodity Trucks							
6-10 AM	1,024	1,521 (+49%)	1,527 (0%)	1,548 (+2%)	1,535 (+1%)	1,639 (+8%)	1,638 (+8%)
3-7 PM	718	1,092 (+52%)	1,090 (0%)	1,143 (+5%)	1,142 (+5%)	1,277 (+17%)	1,257 (+15%)
24 Hour	5,190	7,549 (+45%)	7,554 (0%)	7,638 (+1%)	7,625 (+1%)	8,025 (+6%)	7,975 (+6%)
All Trucks							
6-10 AM	14,990	14,600 (-3%)	14,680 (+1%)	14,663 (0%)	14,632 (0%)	14,700 (+1%)	14,790 (+1%)
3-7 PM	5,730	5,760 (+1%)	5,770 (0%)	5,815 (+1%)	5,819 (+1%)	5,930 (+3%)	5,900 (+2%)
24 Hour	45,060	45,260 (0%)	45,330 (0%)	45,387 (0%)	45,384 (0%)	45,740 (+1%)	45,700 (+1%)
Total Traffic							
6-10 AM	224,860	274,550 (+22%)	274,646 (0%)	274,861 (0%)	275,175 (0%)	275,199 (0.2%)	275,620 (0%)
3-7 PM	221,537	279,580 (+26%)	279,467 (0%)	279926 (0%)	279,175 (0%)	279,179 (0%)	278,526 (0%)
24 Hour	867,363	1,082,710 (+25%)	1,082,926 (0%)	1,083,547 (0%)	1,083,215 (0%)	1,084,385 (0%)	1,083,031 (0%)

The diversion of cross-Hudson freight traffic would not be expected to result in the reduction of commodity truck trips on the East River bridges since few of these trips use this routing today. Trucks originating in New Jersey can access geographic Long Island, the Bronx and Manhattan directly via either the George Washington or Verrazano Narrows Bridges. In the case of the Tunnel Alternative, approximately half of the diverted cargo is intermodal bound for the new yard at West Maspeth. Approximately 30 percent of this intermodal cargo, or slightly less than two million tons per year, is destined for Manhattan or the Bronx and will have to travel over an East River crossing to its final destination. This movement accounts for the forecast increase in commodity truck trips on the East River crossings.

Under the TSM/Expanded Float Alternative in year 2025, the volume of trucks and overall general vehicular traffic are expected to experience minimal change (i.e., a negligible effect) when compared to the No Action Alternative.

Under the New Jersey alignment of the Single Tunnel System, the volume of commodity trucks in year 2025 is projected to increase by 2 percent in the 6-10 AM period, 5 percent in the 3-7 PM peak period, and 1 percent over the course of a typical 24-hour weekday. The volume of all trucks is project to increase 0 to 1 percent during these same periods, while overall total traffic volumes are projected to remain flat, i.e., virtually no change.

Under the New Jersey alignment of the Double Tunnel System, the volume of commodity trucks in year 2025 is projected to increase by 8 percent in the 6-10 AM, by 17 percent in the 3-7 PM

peak period, and by 6 percent over the course of a typical 24-hour weekday. The volume of all trucks is projected to increase slightly by about 1 to 3 percent during these same periods, while overall total traffic volumes are projected to remain flat.

Projections under the Staten Island tunnel alignment would be very similar to those anticipated for the New Jersey tunnel alignment.

A closer inspection of the projected breakdown in commodity truck volumes at the East River Crossings is provided in Table 8-14 and shows that the increase in these trucks would be insignificant and virtually imperceptible on an hourly per-direction basis at each of the East River crossings.

ARTERIAL ROADWAYS

This section addresses projected changes in commodity trucks along a selected set of arterial roadways in the New York-New Jersey region including: the Staten Island Expressway (SIE) and Route 440 in Staten Island; the Cross Bronx Expressway and Major Deegan Expressway in the Bronx; the Gowanus Expressway, and Third Avenue in Brooklyn; and the Brooklyn-Queens Expressway (BQE), Long Island Expressway (LIE), Linden Boulevard, and Atlantic Avenue as Brooklyn-Queens connector arterials; the New Jersey Turnpike and US Routes 1&9 in Northern New Jersey, and I-95 in southwestern Connecticut. A summary of findings for projected year 2025 conditions is presented in Table 8-15 and described in text below, oriented just to the two Tunnel Alternatives.

A sampling of two Staten Island arterials (the SIE and Route 440) shows that the SIE would experience a significant reduction in the volume of commodity trucks under the Single Tunnel System—about 150 to 160 vehicle reduction in the 6-10 AM peak period, about 70 to 110 vehicles in the 3-7 PM peak period, and 775 to 840 vehicles over the course of a 24-hour day. This is generally consistent with the order-of-magnitude reductions in such trucks at the two bridges at either end of the SIE corridor, namely the Goethals and Verrazano-Narrows Bridges. Route 440, which traverses the western edge of the borough generally connecting the Outerbridge Crossing and the SIE/Goethals Bridge would experience a far less significant commodity truck trip reduction.

Under the Double Tunnel System, the SIE would experience about 170 to 200 vehicle reduction in the 6-10 AM peak period, about 100 to 120 vehicles in the 3-7 PM peak period, and 900 to 1,000 vehicles over the course of a 24-hour day.

A review of two of the major arterial roadways in the Bronx—the Cross Bronx Expressway and the Major Deegan Expressway—indicates that these two roadways would receive relatively modest commodity truck trip reductions, far lower than would occur on the George Washington Bridge (GWB) to the west. This may be attributable to the fact that the GWB feeds three roadways—the Cross Bronx Expressway and both the section of the Major Deegan Expressway north of the Cross Bronx Expressway and south of it; so, in a sense, commodity truck trip reductions expected on the GWB would “split three-ways” onto these three roadways. This is different from the situation in Staten Island where commodity truck trip reductions on the Verrazano-Narrows Bridge and Goethals Bridge are essentially fully realized along the SIE since that is the only direct link between the two bridges.

Table 8-14
Projected Commodity Truck Volumes
By Alternative In Year 2025: East River Crossings

Peak Period & Crossing	2000 Existing	2025 No Action	Expanded Float Alternative	Single Tunnel System		Double Tunnel System	
				New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment
6-10 AM							
Triboro Bridge	284	404	408	427	426	433	432
Queensboro Bridge	42	90	92	104	102	110	109
Queens-Midtown Tunnel	33	51	51	63	63	77	72
Williamsburg Br.	21	37	38	41	41	44	44
Manhattan Bridge	163	244	252	238	239	240	238
Brooklyn Bridge	0	0	0	0	0	0	0
Brooklyn-Battery Tunnel	106	122	114	115	113	112	112
Total	649	948 (+46%)	955 (+1%)	988 (+4%)	984 (+4%)	1,106 (+7%)	1,007 (+6%)
3-7 PM							
Triboro Bridge	234	298	295	325	326	347	334
Queensboro Bridge	26	56	56	63	63	69	67
Queens-Midtown Tunnel	24	45	45	64	64	84	78
Williamsburg Br.	14	21	20	25	24	29	28
Manhattan Bridge	86	144	145	142	141	140	140
Brooklyn Bridge	0	0	0	0	0	0	0
Brooklyn-Battery Tunnel	87	114	116	114	111	112	111
Total	471	678 (+44%)	677 (0%)	733 (+8%)	729 (+8%)	781 (+15%)	758 (+12%)
24-Hour							
Triboro Bridge	1,731	2,159	2,161	2,289	2,278	2,329	2,314
Queensboro Bridge	206	417	420	449	447	470	467
Queens-Midtown Tunnel	177	275	275	328	327	388	373
Williamsburg Br.	121	172	173	186	185	199	195
Manhattan Bridge	625	977	984	949	949	950	942
Brooklyn Bridge	0	0	0	0	0	0	0
Brooklyn-Battery Tunnel	592	741	736	708	704	700	689
Total	3,452	4,741 (+37%)	4,749 (0%)	4,909 (+4%)	4,890 (+3%)	5,036 (+6%)	4,980 (+5%)

Notes:
[1] No Action percentages shown are versus the Existing Conditions; Expanded Float and Tunnel Alternative percentages shown are versus the No Action Alternative.
[2] Commercial vehicles are not allowed on the Brooklyn Bridge

Table 8-15
Projected Commodity Truck Volumes
By Alternative In Year 2025: Selected Arterial Roadways

Peak Period & Crossing	2000 Existing	2025 No Action	Expanded Float Alternative	Single Tunnel System		Double Tunnel System	
				New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment
6-10 AM							
Staten Island Expy. (S.I.)	N/A	1,044	998	884	896	850	871
Route 440 (S.I.)	161	265	269	253	253	254	270
Cross Bronx Expy. (Bronx)	920	922	958	883	908	886	907
Major Deegan Expy. (Bronx)	373	534	558	538	528	497	495
Gowanus Expy. (Bklyn.)	428	455	456	383	395	391	382
Third Avenue (Bklyn.)	55	146	128	141	135	127	150
BQE (Bklyn.)	233	197	196	201	213	232	214
LIE ((Nassau)	497	693	633	758	789	604	644
Linden Blvd (Bklyn-Queens)	157	270	279	264	265	263	263
Atlantic Ave, (Bklyn-Queens)	115	181	178	170	174	168	173
NJ Turnpike (Port Elizabeth)	1,859	1,851	1,823	1,815	1,795	1,771	1,803
US 1&9 (NJ)	179	412	398	386	417	355	392
NJ Turnpike (15W-16W)	1,352	1,484	1,433	1,421	1,434	1,401	1,366
I-95 Conn/NY line	5,771	288	281	292	279	311	316
3-7 PM							
Staten Island Expy. (S.I.)	N/A	679	678	610	569	576	562
Route 440 (S.I.)	99	176	191	179	164	178	174
Cross Bronx Expy. (Bronx)	640	661	648	637	623	609	600
Major Deegan Expy. (Bronx)	290	353	342	336	340	344	328
Gowanus Expy. (Bklyn.)	293	228	224	212	212	196	203
Third Avenue (Bklyn.)	22	158	160	164	159	148	151
BQE (Bklyn.)	185	151	149	176	172	194	188
LIE (Nassau)	325	481	485	608	615	467	473
Linden Blvd (Bklyn-Queens)	110	180	182	179	179	179	176
Atlantic Ave, (Bklyn-Queens)	57	80	78	74	78	73	76
NJ Turnpike (Port Elizabeth)	1,358	1,391	1,386	1,361	1,376	1,333	1,333
US 1&9 (NJ)	82	212	221	214	213	218	208
NJ Turnpike (15W-16W)	1,077	1,053	1,060	996	1,012	847	958
I-95 Conn/NY line	485	242	241	244	245	304	303
24–Hour							
Staten Island Expy. (S.I.)	N/A	5,351	5,237	4,508	4,576	4,338	4,416
Route 440 (S.I.)	675	1,171	1,167	1,175	1,154	1,158	1,193
Cross Bronx Expy. (Bronx)	5,583	5,404	5,401	5,130	5,165	4,883	4,943
Major Deegan Expy. (Bronx)	2,129	2,894	2,897	2,805	2,793	2,730	2,701
Gowanus Expy. (Bklyn.)	2,705	2,216	2,196	1,935	1,962	1,880	1,878
Third Avenue (Bklyn.)	151	809	789	833	844	717	722
BQE (Bklyn.)	1,711	1,368	1,376	1,415	1,423	1,460	1,434
LIE) (Nassau)	2,864	4,652	4,596	3,593	3,581	4,447	4,560
Linden Blvd (Bklyn-Queens)	844	1,291	1,302	1,267	1,269	1,260	1,259
Atlantic Ave, (Bklyn-Queens)	393	570	555	532	541	526	540
NJ Turnpike (Port Elizabeth)	9,676	9,627	9,577	9,405	9,375	9,232	9,190
US 1&9 (NJ)	550	1,352	1,335	1,318	1,337	1,275	1,293
NJ Turnpike (15W-16W)	7,889	7,773	7,723	7,483	7,499	7,274	7,256
I-95 Conn/NY line	3,947	2,011	2,057	2,017	1,988	1,972	2,015

Table 8-15 shows a relatively modest reduction in commodity truck trips on the Gowanus Expressway and a somewhat lower reduction along Third Avenue immediately below the Gowanus. This results from two somewhat counter-balancing factors—the reduction in through truck trips on the Gowanus slightly offset by the increase in truck traffic activity at the bulk carload facility along the Brooklyn waterfront in this area. Commodity truck trip increases summarized in Table 8-15 for the BQE, on the other hand, reflect the increase in truck activity on approach and departure routes to/from the West Maspeth Yard, an integral component of the Tunnel Alternative. Further east on the LIE in Nassau County, there would be a fairly significant reduction in volume. Linden Boulevard and Atlantic Avenue, two significant arterials connecting Brooklyn and Queens, would realize only modest reductions in commodity truck activity under the Tunnel Alternative.

A review of projected commodity truck volumes in Table 8-15 above for two sections of the New Jersey Turnpike and US Routes 1&9 indicates that commodity truck volume reductions on the New Jersey Turnpike of approximately 15 to 60 vehicles in the 6-10 AM and 3-7 PM peak periods, and reductions of about 220 to 290 trucks on a daily basis. Commodity truck reductions on Routes 1&9 would be largely imperceptible. There would also be modest reductions on I-95 in Connecticut.

Under the Double Tunnel System, New Jersey Turnpike would experience reductions of approximately 50 to 100 vehicles in the 6-10 AM and 3-7 PM peak periods, and reductions of about 400 to 500 vehicles on a daily basis. Commodity truck reductions on Routes 1&9 would be largely imperceptible. There would also be modest reductions on I-95 in Connecticut.

RAILROAD OPERATIONS

Implementation of any one of the Cross Harbor alternatives would impact elements of the existing rail transportation system to varying degrees, depending on the alternative. The following section identifies the probable operating impacts of each of the alternatives under consideration. Additional information regarding rail transportation systems analysis is provided in Appendix 2A, "Transportation Appendix."

Types of Rail Service

The operations analysis includes separate treatment of two primary types of rail service with fundamentally different operating characteristics: intermodal and bulk/carload. Intermodal service generally offers expedited transit between a limited number of origin-destination pairs. Bulk/carload service is offered between a large number of origins and destinations. Cars are handled several times en-route as shipments are consolidated into trunk line trains, and then re-classified for individual destinations. Since low shipment cost is the main objective, transit time is often increased in the interest of operating cost efficiency. A single bulk/carload shipment may also be interchanged between several railroads to reach its ultimate destination.

The analysis also makes a distinction between linehaul bulk/carload train movements that move between major yards without stopping, and local delivery operations that require frequent "spotting" or pick-up of cars on local sidings. Because intermodal trains are assumed to only operate between major yards, local delivery operations are only conducted with bulk/carload traffic. Impacts on local operations other than those on LIRR lines are not significant, thus local operations are only assessed for geographic Long Island.

Conceptual Operating Plan

In order to assess the possible impacts of the project alternatives, an operating plan consistent with current industry trends and conventions was developed. This plan is only one feasible approach to accommodating increases in rail freight volumes. It is intended to demonstrate that the project alternatives can be accommodated with acceptable impacts on the existing rail system. It is fully anticipated that the regional railroads can refine this plan based on their systemwide scheduling capability to further reduce impacts to the network. This operating plan is largely consistent with the rail Level of Service (LOS) assumptions, which served as a key input to the demand estimation process. In turn, the operating plan is designed to meet this forecast level of demand.

Figure 8-10 shows the major rail facilities referred to in the operating analysis. The operating plan uses the following core assumptions:

- Where possible, except where crew hours of service constraints and capacity for additional cars preclude it, East-of-Hudson destinations will be served by an extension of current trains serving the seven major West-of-Hudson yards[*] today.
- Additional trains would be added between major external rail markets on an as-needed basis.
- The major linehaul destinations east of the Hudson River would be an expanded West Yard and Maspeth intermodal facility for all intermodal traffic and Fresh Pond Yard for all bulk/carload traffic. At Fresh Pond, all Long Island bulk/carload traffic would be interchanged with the local freight carrier for delivery to sidings and yards on the various lines of the LIRR network. See Figure 8-10.

No Action Alternative. Trains for the East-of-Hudson region would continue to access the region via the current two possible routes: 1) from the north via the Hudson Line, where intensive passenger usage effectively limits the passage of freight trains to windows in the late night and early morning; or 2) via the unscheduled railcar float to 65th Street in Brooklyn.

TSM Alternative. In this alternative, trains would reach the East-of-Hudson region via one of two improved routes: 1) the Hudson Line with upgraded signaling and reworked train schedules that allow an extra freight operating window in the midday time period; or 2) a rehabilitated float service from Greenville Yard, NJ to 65th Street Yard, NY. Trains entering the region from the north travel down the Oak Point Link, and over the Fremont Secondary to Fresh Pond Yard. Cars would be interchanged at Oak Point, Fresh Pond, or at an intermodal facility in West Maspeth, Queens.

Trains entering the East-of-Hudson region via the Brooklyn carfloat are reassembled into trains at 65th Street Yard, and travel via the NY&A up the Bay Ridge Branch to Fresh Pond. From here, cars would be interchanged with local NY&A trains for points on Long Island, or with CSX or CP for points north.

Expanded Float Operations Alternative. In this alternative, trains would reach the East-of-Hudson region primarily via an upgraded Greenville, NJ to Brooklyn, NY railcar float. Arriving shuttle trains from the various West-of-Hudson bulk/carload yards would be separated into barge-sized segments at Greenville Yard, loaded onto regularly-scheduled float barges for the

[*] Little Ferry (CSX), North Bergen (CSX), Croxton (NS), Kearney (CSX), Port Newark (CSX), Oak Island (CSAO/CP), and E-Rail/Elizabethport (CSX/NS).

trip across the harbor, and reassembled on the opposite shore into continuing NY&A trains. These trains would then proceed up the Bay Ridge Branch to Fresh Pond Yard, where they would be interchanged with CSX or CP for delivery to points north, or continue on NY&A to a final destination on geographic Long Island.

Tunnel Alternative. In this alternative, trains would arrive at the western portal of the tunnel via a variety of access corridors that depend on the tunnel alignment, the train's point of origin, and any local stops made in northern New Jersey to drop cars. (See detailed analysis of line volumes below.) The New Jersey tunnel would be accessed primarily by the Greenville Branch and, under the Double Tunnel System, by the National Docks Secondary, while the Staten Island tunnel alignment would be accessed primarily by the Chemical Coast Line. All trains proceed through the tunnel and up the Bay Ridge Branch to Fresh Pond Yard. Bulk/carload trains would stop at Fresh Pond to interchange cars destined for geographic Long Island or points north. Intermodal trains would proceed directly west on the Montauk Branch to a new intermodal terminal in West Maspeth, Queens.

Direct trains to the South Brooklyn waterfront (such as potential port trains) could be accommodated via a reversing move. Upon exiting the tunnel, waterfront trains would advance to a set of sidings along the Bay Ridge Branch at New Lots Avenue. After traction power is reversed, the trains would back down the Bay Ridge Branch to the junction with a spur line leading to the Brooklyn waterfront and First Avenue industrial track. Port traffic is not included in the alternative diversion numbers presented earlier.

RESULTS OF THE TRAIN ASSIGNMENT PROCESS

The following sections identify the anticipated rail line volumes, and assess their impact on existing rail operations throughout the region.

Linehaul Train Movements

Table 8-16 shows a summary of average daily railcar and train volumes entering the East-of-Hudson region under each of the project alternatives. The TSM and Expanded Float alternatives would offer some increase in railcar volumes over the expected No Action condition. The Tunnel Alternative would generate a substantial increase in both bulk/merchandise and intermodal traffic.

Table 8-16
Anticipated East-of-Hudson Average Day Volumes for Each Alternative

	No Action	TSM	Expanded Float	Single Tunnel System		Double Tunnel System	
				New Jersey	Staten Island	New Jersey	Staten Island
NUMBER OF RAILCARS	233	240	270	740	710	1,090	975
Intermodal	-	5	-	183	176	480	420
Bulk/Carload	233	235	270	557	534	610	555
NUMBER OF TRAINS	4	5	4	17	15	34	34
Intermodal		1		6	5	19	19
Bulk/Carload	3	3	3	7	8	9	9
Mixed				1	1	2	2
Unit	1	1	1	1	1	4	4

Under the Single Tunnel System, the effects on the rail system due to the additional 14 daily trains (NJ) and 12 daily trains (SI) would be considerable. These operational impacts must be considered in the context of the overall freight system. Of the 17 trains that would arrive in the East-of-Hudson region under the New Jersey alignment (15 for Staten Island):

- 2 would be the future version of trains that currently arrive in the East-of-Hudson region via the Hudson and New Haven Lines;
- 8 would be extensions of existing trains that currently terminate in Northern New Jersey (6 for SI alignment);
- 5 would be entirely new trains generated by increased demand in the East-of-Hudson region and the newly-created ability to offer through carload service;
- 1 would be the future version of the current CP train, which would likely switch to using the tunnel rather than the Hudson line;
- 1 unit train representing a miscellaneous Oak Point train, which is assumed to use the Hudson Line to reach Oak Point.

Under the Double Tunnel System, these trains would consist of the following:

- 2 would be the future version of trains that currently arrive in the East-of-Hudson region via the Hudson and New Haven Lines;
- 17 would be extensions of existing trains that currently terminate in Northern New Jersey;
- 10 would be entirely new trains generated by increased demand in the East-of-Hudson region and the newly-created ability to offer through carload and intermodal rail service;
- 1 would be the future version of the current CP train, which would likely switch to using the tunnel rather than the Hudson line;
- 4 are unit trains included in the analysis to account for policy-driven shipments, such as dedicated port trains or miscellaneous freight trains.

Impacts on Regional Rail Lines

While the network impacts of the TSM and Expanded Float Operations Alternatives (nominal lengthening of existing trains or the addition of a single train to the regional network) would be negligible, tunnel traffic could have a pronounced effect on the broader rail network. The impact on a given rail link is highly dependent on the selected tunnel alignment, since different portal locations require different routes to access the tunnel. Line impacts are the result of additional trains (two one-way segment trips for each additional train), as well as the rerouting of existing trains to reach the tunnel or to eliminate reversing movements.

Single Tunnel System. As expected, the most pronounced effects would be near the tunnel portal locations. For the New Jersey tunnel alignment, the Bay Ridge Branch would experience the largest increase in train volumes of 28 train trips per day, while the Montauk Branch would receive an additional 14 train trips per day. For the Staten Island alignment, an additional 24 train trips would use the Bay Ridge Branch each day, and an additional 12 train trips would use the Montauk Branch.

The New Jersey tunnel alignment would add substantial traffic (28 train trips per day) to the segment of the Greenville Branch between Oak Island Yard and Greenville Yard. It would also

result in moderate increases of 12 and 16 trips per day, respectively, on the P & H Line between Croxton and Waverly, and the Greenville Branch between Waverly and Oak Island. This alternative would result in minimal increases (fewer than 8 additional trips per day) on the Lehigh Line, River Line, the Northern Branch between North Bergen and Croxton, the Chemical Coast Line, Port Reading Secondary, and Fremont Secondary. The New Jersey Alignment would result in no change to the levels of traffic on the Southern Tier Line, Northeast Corridor, National Docks Secondary, Staten Island Railroad, or New Haven Line. The alignment would reduce the daily number of trains on the Hudson Line by 2 trips per day. Figure 8-16 shows a summary of the New Jersey alignment's incremental line volumes on study area rail lines.

The Staten Island alignment would add 24 train trips to the Staten Island Railroad and 18 daily trips to the northern portions of the Chemical Coast Line. It would also have moderate increases of between 4 and 8 additional trains on the Lehigh Mainline, River Line, Northern Branch, Port Reading Secondary, southern Chemical Coast Line, National Docks Secondary, and Greenville Branch. (Between Oak Island and Greenville Yard) The alignment has minimal impacts on the P&H Line, Greenville Branch (Between Waverly and Oak Island, and Fremont Secondary. It would not impact traffic levels on the Southern Tier, Northeast Corridor, or New Haven Line. Finally, the alternative reduces traffic slightly on the Hudson Line. Figures 8-16 and 8-17 show the average change in the number of daily linehaul trains on each corridor between the No Action condition, and the New Jersey and Staten Island alignments, respectively.

Double Tunnel System. As with the Single Tunnel System, the most pronounced effects would be near the tunnel portal locations. For both tunnel alignments, the Bay Ridge Branch would experience the largest increase in train volumes of 64 trains per day, while the Montauk Branch would receive an additional 40 trains per day.

The New Jersey tunnel alignment would add substantial traffic (46 trains per day) to the segment of the Greenville Branch between Oak Island Yard and Greenville Yard. It would also result in moderate increases of between 12 and 30 trains per day on the Greenville Branch between Waverly and Oak Island, the National Docks Secondary, the Chemical Coast Line between E-Rail and Oak Island, and the Lehigh Mainline. This alternative would have minimal increases (fewer than 10 additional trains per day) on the Fremont Secondary, New Haven Line, Northeast Corridor, River Line, P&H Line between Croxton and Waverly, and Southern Tier Line. The alignment would reduce the daily number of trains on the Hudson Line, and Chemical Coast Line south of E-rail, and the Port Reading Secondary, as shown on Figure 8-18.

The Staten Island alignment would add considerable traffic to the Chemical Coast Line (as many as 44 trains per day on the segment between Oak Island and E-rail). It would also have moderate increases of between 12 and 24 additional trains on the Greenville Branch, the National Docks Secondary, and the Lehigh Mainline. The alignment has minimal impacts on the Fremont Secondary, New Haven Line, Northeast Corridor, River Line, P&H Line and Southern Tier Line. Finally, the alternative reduces traffic slightly on the Hudson Line.

Figures 8-18 and 8-19 show the change in number of daily linehaul trains on each corridor between the No Action condition, and the New Jersey and Staten Island tunnel alignments, respectively.

Local Distribution on Geographic Long Island

Rail lines owned by the Long Island Rail Road (LIRR) have a heavy existing density of passenger traffic and would experience the concentrated effects of the Tunnel Alternative. Because of this impact, a more detailed analysis was conducted of the project impacts on local

delivery of freight to geographic Long Island. As with the regional network impacts, the effects of the TSM and Expanded Float Operations alternative on the LIRR network would be negligible. Since the New Jersey tunnel alignment would divert the greatest amount of bulk/carload traffic, the analysis focused on the impacts of Greenville traffic as a worst-case scenario.

Impacts on LIRR Rail Lines

Under the Single Tunnel System, 557 bulk/carload cars are anticipated to reach the East-of-Hudson region on an average day in 2025. Of these, 342 are expected to be distributed to yards or sidings on LIRR tracks. Under the Double Tunnel System, of the 610 bulk/carload cars anticipated to reach the East-of-Hudson region on an average day in 2025, 374 are expected to be distributed to yards or sidings on LIRR tracks. All of this traffic would pass through Fresh Pond Yard for initial classification (a detailed assessment of impacts at Fresh Pond is included later in this chapter). From Fresh Pond, a network of distribution trains closely resembling the current NY&A operation is anticipated to transport cars either to their final destination, or to serving yards (such as Pineaire Yard in Suffolk County) for further classification.

Table 8-17 shows the forecasted allocation of cars, and the resulting number of trains on each major line and branch of the LIRR network. It is interesting to note that most of the carload volume stays off of the heavily-used passenger corridors, since the Bay Ridge and Bushwick Branches are not used for passenger service, and the Montauk Branch west of Jamaica is only used for minimal passenger service. Only trains serving Pineaire Yard or the Port Jefferson Branch have the potential to conflict with mainline passenger service.

Table 8-17
Average Daily Local Volumes on LIRR Trackage

	Fresh Pond Area & Bushwick Branch	Montauk Branch East of Jamaica	Bay Ridge Branch & Flatbush	Main Line and Pineaire Yard[1]	Port Jefferson & Oyster Bay	Total
Single Tunnel System						
Number of Cars	57	28	130	88	39	342
Number of Daily Trains	2	1	4	4	2	13
Double Tunnel System						
Number of Cars	63	30	143	94	44	374
Number of Daily Trains	3	1	5	4	2	15

Note: [1] Includes current 32-car dedicated P&W "stone train".

Figure 8-20 shows the incremental rail line volumes on the LIRR network. NY&A currently runs at least one train per day on each of the lines with freight service, so the incremental effects of additional traffic are small outside of the Bay Ridge/Montauk Corridors. An operating simulation of the tunnel/Bay Ridge/Montauk corridor is included in the next section. It is followed by a detailed operating assessment of the LIRR main line between Jamaica and Mineola assuming six additional freight trains per day for both the Single Tunnel System and the Double Tunnel System. A similar assessment is also included for the impact of West-of-Hudson train movements on New Jersey Transit (NJT) operations.

Additional service information on the LIRR network is provided in Appendix 2A, "Transportation Appendix."

SIMULATION AND OPERATIONAL ASSESSMENT OF RAIL ALTERNATIVES

This EIS has developed a series of physical designs and operating plans to capture intermodal and bulk/carload rail traffic. As a means of validating these designs and operating plans, two approaches to rail network simulation modeling were employed:

- A "discrete event" simulation of the portion of the rail network proposed for improvement as part of this project, to determine if the designs and operating plans can accommodate the forecasted levels of demand and provide the required levels of service. For the Single Tunnel System, the discrete event simulation was also used to test three different levels of infrastructure investment, and to determine which improvements needed to be constructed.
- A "manual simulation" involving the development of stringline diagrams (graphs showing the position of each train on the network over a 24-hour period) for the regional rail system, to determine if the designs and operating plans create conflicts or congestion beyond the boundaries of the discrete event simulation.

The key finding of the discrete event simulation is that both the New Jersey tunnel alignment and the Staten Island tunnel alignment could successfully handle the rail traffic assigned to it, but with varying degrees of performance.

The manual simulation addresses the issue of how the rail traffic generated by the discrete event simulation is distributed throughout the regional rail system. Its basic finding, discussed later in this chapter, is that the regional rail system is capable of absorbing the additional rail traffic associated with these alternatives.

Discrete Event Simulation Model

Discrete-event simulation is a powerful tool for modeling and analyzing complex logistics movements. Essentially, a discrete-event model "creates" events—such as train movements—at fixed coordinates in time and space. The model then processes these events according to user-specified rules, such as train destination, route, travel speed, and presence of conflicts. At the conclusion of the event, the model "remembers" the attributes of each individual event—the time it took, the delays encountered, etc. Finally, the model provides a report on what each train experienced, and how the system performed as a whole.

Results from the Discrete Event Simulation Model

For purposes of this analysis, no effort was made to "optimize" the schedules to reduce or minimize conflict or improve performance. The schedules generated by the EIS operating plan were used without modification. In practice, some of the train moves could be adjusted to reduce conflicts, especially the local moves which occur entirely in the East-of-Hudson region and do not involve an interface with the national rail system in New Jersey.

For the Single Tunnel System, the simulation was run for 10 separate 30-hour periods. Because the greater capacity of the Double Tunnel System made performance less of a concern, the simulation was run only for three representative 24-hour periods. Because the model uses a probability function for generating lift bridge events and train arrivals, no two runs generated precisely the same results. The results discussed below are based on the aggregate performance measures from multiple runs for each alternative. The performance results listed correspond to

the infrastructure outlined in Chapter 2, "Project Alternatives." Refer to Appendix 2 for a complete discussion of the various build scenarios.

Single Tunnel System. For the capacity-constrained Single Tunnel System, the discrete event simulation model was used both to validate the level of service assumptions used in the diversion analysis, and to help determine the basic infrastructure requirements needed to meet that desired level of service. The results of the iterative simulation process are reflected in the ultimate design of the Single Tunnel System alignments. Both resulting alignments are able to meet the assumed level of service criteria; however, the New Jersey alignment performs somewhat better than the Staten Island alignment,* and is therefore more comfortably within the assumed levels of service.

The tunnel alignments of the Single Tunnel System were subjected to a significantly more rigorous simulation process, because the removal of one harbor tunnel creates a potentially serious bottleneck in the rail system. To thoroughly explore this possibility, the alternatives were simulated for ten independent repetitions of a 30-hour period, with increased variability in train arrival and stop times, and tighter controls on passing and following distances. To adhere to the assumed levels of service and offer the Class I railroads an attractive service option, expected delays must be reasonably controlled, and 90 percent of tunnel trains must pass through the system in less than two hours (the anticipated available crew time for West-of-Hudson trains continuing on to Brooklyn). The results of this simulation effort are summarized below.

New Jersey Tunnel Alignment. The New Jersey alignment appears to adequately meet the level of service criteria to attract the forecast traffic levels. While there is one tunnel train that takes 2 hours and 51 minutes to traverse the system, this is only a single train movement that could likely be addressed with minor revisions to the schedule. Aside from this outlying train, the distributions of both delay and train travel cluster much closer within the reasonable performance range. For example, the 90th percentile values of delay and travel time are only thirty minutes and one hour twenty minutes, respectively. This suggests that the system operates under reasonably stable conditions, and would allow train operators to meet the assumed levels of service.

Staten Island Tunnel Alignment. Although the Staten Island alignment technically meets the established level-of service criteria, it shows signs of degraded stability that make it less likely to provide adequate capacity. The maximum travel time experienced by any tunnel train is slightly less than for the New Jersey alignment; however, even with significantly fewer trains on the network, a greater percentage of trains experience delay, and the average and 90th percentile delays are greater than for the New Jersey alignment. Greater delays and variability appear to be caused by the Arthur Kill Lift Bridge, which is opened for maritime traffic with greater frequency than the New Jersey alignment's corresponding Lehigh Valley Drawbridge. The Staten Island simulation system experienced a total of 90 hours and 46 minutes of delay, as opposed to only 78 hours and 55 minutes for the New Jersey alignment.

Greater delays translate into longer travel times on the simulation network. The average travel time through the network is one hour and nine minutes, and 10 percent of the trains take more than one hour and fifty-five minutes. This longer travel time, coupled with the more circuitous routing from the major West-of-Hudson rail yards* make it less likely that the Staten Island

* Please refer to the detailed discussion of simulation results.

* Please refer to the manual simulation discussion later in this chapter.

alignment can meet the assumed level of service criteria. The physical alignment defined for the simulation already includes all possible infrastructure aside from the second tunnel, so there are no further enhancements that can be made to this alignment to improve service reliability.

Table 8-18 contains a summary of the results of the Single Tunnel System discrete event simulation.

Table 8-18
Results of Single Tunnel System
Discrete Simulation (Over 10 Iterations of 30 Hours Each)

	Single Tunnel System New Jersey Alignment	Single Tunnel System Staten Island Alignment
All Simulation Trains		
Total Train Moves (including local and switching moves)	631	568
Average Delay Per Train Move	0:07:16	0:09:23
Delayed Trains		
Number of Moves Experiencing Delay (including local and switching moves)	295	297
Percent of Moves Experiencing Delay	46.8%	52.3%
Average Delay of Delayed Trains	0:15:33	0:17:57
90th Percentile Delay	0:30:00	0:35:00
Maximum Delay	1:22:19	2:05:47
Tunnel Trains		
Total Tunnel Train Moves	178	142
Average Travel Time through System (including scheduled stops)	0:51:22	1:09:07
90th Percentile Travel Time (including scheduled stops)	1:20:00	1:55:00
Maximum Travel Time (including scheduled stops)	2:51:02	2:49:44
Total Simulation System Delay (over 10 iterations of 30 hours)	78:55:01	90:46:01

Double Tunnel System

- The New Jersey tunnel alignment appears capable of accommodating the full rail traffic forecast without incurring significant delay or loss of reliability, and validates the level of service assumptions in the mode choice model. This analysis takes into account the fact that the Newark Bay Lift Bridge would be in the "up" position a certain part of each day to accommodate marine vessel traffic.
- The Staten Island tunnel alignment incurs higher levels of delay and reduced reliability, to the point where the levels of service needed to attract rail traffic may be compromised. This diminished level of service was reflected in the mode choice model, and resulted in a reduced rail traffic forecast for this alignment. The diminished level of service is due largely to the effect of the Arthur Kill Lift Bridge, which would be in the "up" position more often than the Lehigh Valley Drawbridge.

New Jersey Alignment. Even without schedule optimization, the results indicate very good performance for this tunnel alignment, which came very close to meeting all its schedule times. This suggests that the LOS assumptions used to forecast market demand are reasonable. A total of 73 train moves experienced no delay, while only 17 experienced any delay. The average delay experienced by these 17 moves was 5 minutes and 16 seconds. Delays are most critical for the intermodal trains, which must offer the best levels of service to attract and maintain business; of the 34 intermodal train moves in the simulation, only 4 experienced any delay, with an average delay time of 6 minutes and 16 seconds.

Staten Island Alignment. The results indicate a reduced level of performance for this alternative, with a total delay time twice as high as the New Jersey alignment. A total of 68 train moves experienced no delay, while 22 moves experienced some delay. The average delay experienced by these 22 trains was 8 minutes. Of the 34 intermodal train moves in the simulation, 8 experienced some delay, with an average delay time of 11 minutes and 4 seconds. Total delay for time-sensitive container traffic was three times as high as for the New Jersey alignment. This greater level of delay and uncertainty is reflected in the LOS assumptions for this alternative, which resulted in somewhat lower levels of traffic diversion.

Table 8-19 below presents a summary of the discrete event simulation model results.

Table 8-19
Results of Discrete Event Simulation over 24 Hours—Double Tunnel System

	New Jersey Alignment	Staten Island Alignment
All Trains		
Total Train Moves	90	90
Total Time, Travel + Delay (hrs : min : sec)	43:11:48	43:03:33
Average Time, Travel + Delay	28:48	28:42
Average Time, Delay Only	1:00	1:57
Delayed Trains		
Delayed Moves	17	22
Total Delay Time	1:29:34	2:56:11
Average Delay Time	5:16	8:00
Maximum Delay Time	12:20	29:54
Delayed Container Trains		
Total Moves	34	34
Delayed Moves	4	8
Total Delay Time	25:06	1:28:35
Average Delay Time	6:16	11:04
Maximum Delay Time	9:57	27:19

Manual Simulation

The operational analysis includes an assessment of impacts on major rail corridors beyond the immediate project improvement area. To accomplish this, a manual simulation of rail traffic was performed on key segments of the broader rail network that represent potential "choke points" on the rail freight network. These analysis segments were selected based on a combination of factors, including:

- Significant anticipated incremental tunnel traffic,
- Large no action traffic volumes,
- Limited anticipated capacity in the 2025 analysis year,
- An important role in the project alternatives, or
- Use by scheduled passenger service.

For both the Single and Double Tunnel Systems, the five segments selected for analysis are the Lehigh Mainline between Aldene and Hunter, the Chemical Coast Line between E-rail and Oak Island, the Greenville Branch corridor from Waverly to Greenville Yard, the National Docks Secondary, and the LIRR Mainline between Hall and Hicksville.

Description of the Manual Simulation Process

For the West-of-Hudson lines, the trajectories of all trains were analyzed, including all No Action Alternative trains and changes resulting from alternative implementation (new trains and rerouted trains). Based on this analysis, it is possible to identify schedule conflicts, where the scheduled service exceeds track capacity at a given point and time. Schedules and routing of incremental trains can then be revised to eliminate conflicts, and maintain minimum headways. For these purposes, passenger train schedules are held fixed, and some flexibility is assumed in rail freight schedules. General levels of congestion and sensitivity to schedule disruptions are also assessed qualitatively.

The LIRR mainline was treated differently. Since the operating plan only calls for local bulk/carload freight service on this heavily-used passenger corridor, the stringline analysis identified potential windows for these freight movements to take place. The available windows were then used in defining the operating plan for Fresh Pond Yard. This plan is presented at the end of this section. Since all time-sensitive intermodal traffic is assumed to terminate at West Maspeth Yard, it is possible to schedule the less time-sensitive bulk/carload traffic completely around passenger service requirements.

No Action freight train volumes were based on data available in Spring 2003, and forecasted commodity growth in the absence of any cross harbor improvements. The freight railroads have recently eliminated several bulk/carload trains from the regular schedule. Thus, some of the growth generated by the Tunnel Alternative can be accommodated simply by returning to service levels of one year ago. Furthermore, as the rail freight industry increasingly moves toward heavier and more efficient cars[*], more tonnage can be carried per foot of train length. Interviews with the railroads also indicate that their primary operational response to increasing traffic levels will be to operate longer, rather than more frequent, trains. This philosophy is embedded in the operational approach to new East-of-Hudson service, but also reflects the railroads' likely response to increases in ambient (West-of-Hudson) traffic. Discussions with the railroads suggest that current train lengths are short enough to allow capacity expansion without the need for additional trains. As a result, no additional freight trains beyond those listed in the fall 2001 service schedule are assumed to be needed. An increase in train length from 4,000 feet to 6,000 feet (a 50 percent lengthening of the train over the existing average) results in an increase of only 34 seconds in the amount of time it takes a train to pass a given point at 40 mph. This change is not likely to unduly impact operations.

[*] This includes a greater reliance on doublestack intermodal equipment, and the general transition to a 286,000 pound per axle standard for bulk cars.

Results of the Manual Simulation

Single Tunnel System.

The following section presents summary results for the manual simulation of the Single Tunnel System. The basic operating measures are combined into an overall assessment for each analysis segment. Please refer to the Transportation Appendix for the complete results of the manual simulation, including stringline diagrams, segment track diagrams, and train schedules.

Lehigh Main Line. The freight operations and the NJ Transit passenger service to the Raritan Valley Line share the two-track alignment of this segment. NJ Transit operates 60 daily passenger trains between the Raritan Valley Line (CP Aldene) and the Northeast Corridor (Hunter). The Lehigh Main Line is the primary route for freight trains from the south and southwest. NJ Transit service is characterized by peaks during the morning and evening commuter periods and by hourly service during off-peak periods. The proposed freight-operating plan for this segment envisions 21 daily movements.

The freight traffic for the New Jersey tunnel alignment shown in the operating plan introduces some conflicts with the passenger trains, especially at CP Aldene. These conflicts may be resolved by adjusting the affected freight trains to operate 10 to 30 minutes earlier or later as each particular case may warrant. The ultimate decision regarding conflict resolution will be made by the individual freight railroads, in consultation with NJ Transit. Traffic on the whole for this segment appears to be capable of accommodation without significant delays or loss of operating reliability, although some instability may be experienced at various times.

The Staten Island tunnel alignment alters the times that westbound freight trains will traverse this route segment, resulting in more potential conflicts with NJ Transit passenger trains during the peak periods. As a result overall train movement during these times becomes less reliable. The degree of instability inherent with the use of the Staten Island alignment indicates that the existing Lehigh Main Line infrastructure in the segment under study may be inadequate to accommodate both freight and passenger train operations during the peak commuter hours. A number of trains may need to be rerouted to the Port Reading Secondary to avoid conflicts. Alternatively, this inadequacy may be overcome with the construction of a third main track through this segment.

Chemical Coast Secondary. Traffic on this segment varies greatly by tunnel alignment. The New Jersey alignment calls for a light level of traffic (5 trains) on this segment. Dwell times at E-Rail and Port Newark may be adjusted to resolve any potential conflicts.

The Staten Island tunnel alternative, however, introduces a slight increase in the number of train movements (7). This number will further increase due to the reentry of trains after their dwell time has expired at E Rail and Port Newark yards. Trains from other yards and gateways will also be routed to the tunnel via this segment. The inevitable result is the potential for many conflicts over the single-track portion of the alignment. Furthermore, the construction of a single-track cross-harbor tunnel will result in the need for track space to "stack" eastbound trains that must wait for clearance to proceed through the tunnel. Capital improvements in the form of a second running track, track space to "stack" two trains, and additional signal control devices would be necessary to resolve potential conflicts. In its *State Rail Plan,* the New Jersey Department of Transportation has identified a second main track on the Chemical Coast Line as one of its funded projects; however, additional storage tracks would still need to be constructed as part of the Staten Island alignment.

National Docks Secondary. A total of 8 freight trains are planned to use this segment for the Staten Island tunnel alignment. Traffic to and from the tunnel portal is well spread out with no apparent conflicts. Train movements to the New Jersey tunnel alignment will proceed via the P&H Line and the Waverly Loop, actually reducing the use of the National Docks Secondary.

Greenville Branch. The segment referred to at the "Greenville Branch" is actually a conglomeration of individual tracks passing east to west through and around the Oak Island Yard complex. These include the eastern end of the Lehigh Mainline, southern end of the National Docks Secondary, and Greenville Running Track. The total number of trains using this segment is roughly the same for each tunnel alignment, although the routes taken vary greatly for each tunnel alignment.

The traffic for the New Jersey tunnel alignment experiences significant congestion at the single-track Waverly Loop. Although some congestion may be eased by scheduling adjustments, there are three periods (5:00-6:00, 11:00-12:00 and 16:40-17:20) when the conflicts are unavoidable. The only way to reliably achieve scheduled movements over this segment is by adding a second loop track. Consequently, a second track on the Waverly Loop has been incorporated into the tunnel alternative.

Traffic destined for the Staten Island tunnel alternative experiences the same levels of congestion at the Waverly Loop. The only viable solution is the aforementioned addition of a second loop track.

Double Tunnel System.

Table 8-20 shows a summary of the stringline analysis for the key West-of-Hudson corridors for the New Jersey tunnel alignment. Table 8-21 shows the same information for the Staten Island tunnel alignment. All of the operating measures are combined into an overall feasibility assessment for each segment.

Table 8-20

Manual Simulation Results for New Jersey Alignment – Double Tunnel System

New Jersey Tunnel Alignment	Lehigh Mainline (Aldene to Hunter)	Chemical Coast Line* (E-Rail to Oak Island)	Greenville Branch	National Docks Secondary
Total Number of Daily Train Movements on Segment	95 (including NJT service)	14	59	20
Trains Shifted by 10 Min. or Less	4	0	7	1
Trains Shifted by between 10 and 30 min.	1	1	0	0
Trains Shifted by More than 30 min.	3	0	0	0
Trains Rerouted	4	0	0	0
General Level of Congestion and Stability	Some tight scheduling during commuter peaks, otherwise OK	Traffic on the Chem. Coast Line is light and virtually congestion free	Traffic is well spread out. Minor congestion at Waverly Loop	Trains are well spread out, with virtually no congestion

Note: *Includes trains "rerouted" from Lehigh Mainline.

Table 8-21
Manual Simulation Results for Staten Island Alignment – Double Tunnel System

New Jersey Tunnel Alignment	Lehigh Mainline (Aldene to Hunter)	Chemical Coast Line* (E-Rail to Oak Island)	Greenville Branch	National Docks Secondary
Total Number of Daily Train Movements on Segment	95 (including NJT service)	45*	56	20
Trains Shifted by 10 Min. or Less	4	2	5	1
Trains Shifted by between 10 and 30 min.	1	1	2	0
Trains Shifted by More than 30 min.	3	12	2	0
Trains Rerouted	4	0	0	0
General Level of Congestion and Stability	Some tight scheduling during commuter peaks, otherwise OK	Significant congestion & conflicts at 1-track segment between E-rail and Bayway	Severe congestion at Waverly Loop and "PN/Pike" interlocking	Trains are well spread out, with virtually no congestion

Note: *Includes trains "rerouted" from Lehigh Mainline.

Lehigh Valley Mainline. Under both alternatives, minor conflicts with passenger crossover moves at Aldene can be readily eliminated by adjustments in the freight train schedule of less than 10 minutes per train. Tighter scheduling windows during peak commuter service (around 7:00 and 19:30) necessitate the rescheduling of four trains to off-peak timeslots, and the rerouting of 4 trains to the parallel Port Reading Secondary/Chemical Coast Corridor. The somewhat more circuitous routing of freight trains under the Staten Island tunnel alignment means that there may be less opportunity to reschedule train service, and dispatchers may need to rely more heavily on the Chemical Coast route to respond to system disruptions (such as late trains).

Chemical Coast Line. Under the New Jersey tunnel alignment, many trains stop at Port Newark, E-rail and Elizabethport yards. This dwell time provides opportunities for dispatchers to respond to congestion or delay in the system. The relatively smaller number of trains on the line under this alternative (including the 4 rerouted from the Lehigh Mainline) results in very little congestion, even on the one-track segment between E-rail and Bayway.

Under the Staten Island tunnel alignment, significantly larger train volumes, combined with the 3.5 mile one-track section create a number of conflicts, since northbound trains must wait for southbound trains to clear the single track, and vice versa. These conflicts cannot be resolved without rescheduling of 12 daily trains. The results seem to suggest that the Chemical Coast line would need to be double-tracked along its entire length to accommodate the proposed growth in freight traffic under the Staten Island tunnel alignment. With access to a second track, most of the scheduling conflicts are removed, and the corridor has adequate capacity to handle the increased traffic. Since double-tracking was not assumed in the definition of this alternative, it is possible that the LOS assumptions used to estimate the market demand for this alternative were optimistic, and the actual diversion levels would be lower than estimated. Fortunately, a second track on the Chemical Coast Line is included as an improvement in the current New Jersey state rail plan.

National Docks Secondary. A total of 20 freight trains are planned to use this segment under both the New Jersey and the Staten Island alignments. Traffic to and from the tunnel portal is well spread out and there are virtually no conflicting movements during the 24–hour period. If needed, trains operating from North Bergen Yard may be alternatively routed via the Northern Running Track, P&H Line and Waverly Loop segment to reach either tunnel alignment, although the operation over the National Docks segment is quite stable.

Greenville Branch. The movement of trains over this segment of track will vary greatly depending on the tunnel alignment chosen. Although the number of train movements is essentially the same for each alternative, the portal destination (Greenville or Staten Island) dictates differing routes across the available infrastructure.

- In the case of the New Jersey alignment, traffic is well spread out and only minor congestion is experienced by some trains following too closely. The single track of the restored Waverly Loop is a point of constraint, although not to the extent that the operation is rendered unstable.
- The Staten Island alignment is another case, however. Access to the tunnel portal impacts the directional routing of trains to such an extent that significant congestion appears in the vicinity of Oak Island Yard and within the "PN" interlocking. In this scenario the single-track configuration of Waverly Loop becomes more critical and the number of conflicts rises to the point that operational stability is threatened. Some of these problems can be resolved by rerouting a few trains via the alternate Port Reading Secondary route, but even this mitigation is inadequate to preserve operational stability. Under the Staten Island alignment, the Waverly Loop must be double-tracked in order to accommodate the projected level of freight traffic.

LIRR Mainline

Table 8-22 shows the available windows on the LIRR mainline for local freight service. Traffic during peak commuter periods precludes freight service. However, there are consistent windows spread throughout the midday and late night off-peaks to allow a number of local freight trains to transit the line.

Table 8-22
Available Freight Windows on the LIRR Mainline

	Eastbound (time at Jamaica)	Westbound (time at Mineola)
Midday	10:24–10:40 10:44–10:56 11:25–11:40 12:25–12:40 13:24–13:40 14:24–14:40 15:24–15:40	09:45–10:24 10:44–11:15 11:47–12:16 12:44–13:16 13:44–14:16 14:44–15:15
Late Night	21:24–21:40 22:22–22:38 23:36–24:59 00:19–00.39 01:19–01:59 02:19–03:13	21:43–22:15 22:43–23:15 23:45–00:15 00:45–01:15 01:45–02:16

No Action Rail Improvements

In addition to the rail improvements identified as part of the project alternatives themselves, the Cross Harbor alternatives leverage the capabilities generated by other sponsors' rail improvement projects. These improvements are considered part of the "no action" condition because they have already been identified as needed improvements absent the Cross Harbor alternatives, and due to broad-based support, are likely to be completed independently before the implementation of any Cross Harbor alternative. The cost of implementation is assumed to be borne by other regional stakeholders.

However, since there is a degree of interdependence between these No Action projects and the build alternatives it is important to discuss that relationship. It is possible that some no action improvements will not have been completed within the expected timeframe, and that a contribution to funding as part of the Cross Harbor project may be needed to bring the implementation timeline in line with the needs of the selected project alternative.

Table 8-23 contains a summary of the no action projects that have a close relationship to the Cross Harbor project, and specifies the role that each No Action project plays in the Cross Harbor project.

WATERBORNE TRANSPORT

No Action Alternative

Overview. The No Action alternative includes channel deepening projects that currently exist or that have been committed to within regional transportation plans, capital plans, or otherwise likely to be implemented through public or private investment by the future analysis years for the EIS, 2010 and 2025. In addition to channel projects, related anchorage, port and bridge projects are included in the No Action Alternative. The projects included in the No Action Alternative are independent initiatives that may complement the project alternatives, but are not dependent on them.

Channels. All of the channels in the study area, with the exception of Buttermilk Channel, will be impacted by planned PONYNJ navigation projects. Important Navigation projects in the PONYNJ, their impacts on the channels, and the EIS future analysis year by which the project will be implemented are described below.

Kill Van Kull & Newark Bay Federal Channels Deepening Project. The entire Newark Bay-Kill Van Kull channels are more than 13 miles long. They are currently between 40 and 41 feet MLW and will be deepened to 45 feet MLW by the 2010 EIS analysis year.

Arthur Kill Channel-Howland Hook Marine Terminal Deepening. The Arthur Kill Channel/ Howland Hook Marine Terminal Deepening Project provides for deepening the existing 35-foot Arthur Kill Channel to 41 feet MLW from its confluence with the Kill Van Kull Channel to the Howland Hook Marine Terminal in Staten Island, New York, and to 40 feet MLW from Howland Hook Marine Terminal south to Perth Amboy. However, due to an unfavorable Reconnaissance report in 1999, the project has been put on hold.

Table 8-23
Summary of Interdependent No Action Projects

Project	Description	Current Status	Projected Cost ($ in millions)	Relationship to EIS Alternatives
Waverly Loop Connection	Construction of a one-track connection between the P&H Line and the Greenville Branch.	Funded under phase II of NJDOT's rail freight improvement plan	$13.6	All tunnel alternatives depend on capacity/flexibility of movement provided by this improvement.
Reactivation of the SIRR	Rehabilitation of track from Arthur Kill Lift Bridge thru Arlington Yard, and new connection between the Chemical Coast Line and SIRR	Rehabilitation currently in progress by NYCEDC. Construction contracts let by PANYNJ for Chem Coast connection	NA	Reactivation is essential for access to Staten Island tunnel alignment.
Lehigh Mainline Capacity Expansion	2nd Track from Potter to Bound Brook; Connecting Track from P&H Line; and Signal Upgrades	Funded under phase I of NJDOT's rail freight improvement plan	$26.2	All tunnel alternatives depend on increased capacity for train moves through the Lehigh gateway.
Chemical Coast Line Capacity Expansion	Upgrade to continuous double-track main from Port Reading Sec. to Oak Island Yard	Funded under phases I & II of NJDOT's rail freight improvement plan	$20.6	Staten Island tunnel alignment requires additional capacity to accommodate increased train volumes.
Port Reading Sec. Connectivity and Capacity Expansion	Lengthen sidings, upgrade signals, and build connection to Trenton Line	Funded under phase II of NJDOT's rail freight improvement plan	$15.2	Port Reading Sec. serves as a main approach to the Staten Island tunnel alignment, and as an alternate route for increased double tunnel system train volumes.
Northern Br. Capacity Expansion	Add second track and upgrade signals on P&H line between Lehigh Mainline and Croxton Yard	Funded under phases I & II of NJDOT's rail freight improvement plan	$37.2	In conjunction with Waverly Loop, improvements to the P&H line provide added capacity and flexibility for tunnel train routing.
Thru track capacity at Oak Island Yard	Acquire Raff property south of Oak Island Yard and construct new mainline tracks from Lehigh Mainline to Newark Bay Bridge	Funded under phases I & II of NJDOT's rail freight improvement plan	$17.5	Additional thru capacity improves service for trains accessing the New Jersey tunnel alignment, but it is not essential to any alternative.
National Docks Sec. Capacity and Geometry	Raise clearances to allow doublestack rail service and add an additional passing siding to one-track right-of-way.	Identified as medium-term priority by the northern New Jersey rail planning task force	NA	National Docks Sec. provides an alternate route for increased double tunnel system train volumes.

Port Jersey Channel Deepening Project. The Port Jersey Channel will be deepened to 41 feet MLW by the 2010 EIS analysis year. The turning basin will also be excavated to the new depth.

New York/New Jersey Harbor Navigation Project. The project includes deepening the Ambrose Channel from deep water to the Verrazano-Narrows Bridge (10.6 nautical miles) to 53 feet MLW. The Port Jersey and Kill Van Kull Channels will both be deepened to a depth of 52 feet MLW but maintained at a depth of 50 feet MLW. The Anchorage Channel (from the Verrazano-Narrows Bridge to its confluence with the Port Jersey Channel), portions of the Newark Bay Channel, the Arthur Kill Channel (from the Kill Van Kull to the Howland Hook Marine Terminal), and the Bay Ridge Channel will be deepened to 50 feet MLW each. The 2010 EIS analysis year assumes 50 feet for Port Jersey and Kill van Kull and 45 feet for Arthur Kill; 2025 assumes 50 feet for Arthur Kill.

Anchorages. The New York Anchorages Study was commissioned to determine the feasibility of providing deep water anchorage area in the Upper and Lower Harbor. The Reconnaissance Report was completed in 1993, but since then lack of support has delayed the start of the feasibility study. Recently, at the request of the Port Authority, the scope of the work has been reduced to study only the Red Hook Area. Further studies are progressing but no definite projects are planned or authorized.

Ports. All five port areas located within the project study area are expected to undergo development and/or expansion by the project dates of 2010 and 2025. Listed below are the main projects, their project sponsor and the EIS future analysis year by which the project will be implemented. More detailed descriptions of the No Action Alternative regarding the Ports can be found in Chapter 2, "Project Alternatives."

South Brooklyn Terminal.

- Redevelopment of South Brooklyn Marine Terminal for maritime use. Project sponsor: NYCEDC. EIS Analysis Year: 2010.

Howland Hook Marine Terminal.

- Expansion of Howland Hook Marine Terminal involving improvements to the existing site and the development of the adjacent Proctor and Gamble site into an intermodal rail terminal. Project sponsor: PANYNJ. EIS Analysis Year: 2010.
- Development of a barge and rail facility at Port Ivory for the transport of municipal solid waste. Project sponsor: New York City Department of Sanitation (NYCDOS). EIS Analysis Year: 2010.

Port Newark/Port Elizabeth.

- Redevelopment of Port Newark/Elizabeth including relocating warehouses, reconfiguring portions of the site, and the construction of a railcar storage facility. Project sponsor: PANYNJ. EIS Analysis Year: 2010.

Global Marine Terminal/MOTBY/NEAT.

- Development of a future container terminal at the former Military Ocean Terminal at Bayonne (MOTBY). Project sponsor: PANYNJ. EIS Analysis Year: 2010.
- Development of Port Reading as an automobile terminal. Project sponsor: PANYNJ. EIS Analysis Year: 2010.

Brooklyn Terminal/Red Hook Terminal.

- Development of intermodal rail facilities including possible float bridges, on-dock rail yards and other short term improvements at the South Brooklyn Marine Terminal and Red Hook Container Terminal. Project sponsor: NYCDEC. EIS Analysis Year: 2010.

Bridges. There are two bridges that will be affected in the No Action Alternative, the Goethals Bridge and the Arthur Kill Lift Bridge. It was assumed that the Goethals Bridge will be upgraded to current engineering standards and a second bridge adjacent to the existing one will be constructed. This project is sponsored by PANYNJ and there is a reasonable chance it will be completed by the 2025 EIS analysis year. The currently inactive Arthur Kill Lift Bridge will reenter active service as part of the reactivated Staten Island Railroad under both 2010 and 2025 conditions. This means that the bridge will be in the "down" position more frequently, which could potentially impact marine traffic.

Transportation Systems Management (TSM) Alternative

This alternative, which emphasizes operating improvements such as more efficient float operations between Greenville Yard, Jersey City, New Jersey and 65th Street Yard, Brooklyn, New York and some strategic upgrades to the existing rail freight infrastructure, would not have a measurable impact on existing or anticipated harbor operations. The improvements as proposed focus on upgrades to the freight movement system in the region that would marginally affect the way in which maritime traffic presently operates.

Expanded Float Operations Alternative

This alternative would include enhanced and expanded capacity for the railcar float system across New York Harbor between Greenville Yard in Jersey City and the 65th Street Yard in Brooklyn, in addition to several low-cost capital improvements along existing rail lines.

The operation of the Expanded Float Operations Alternative should not have an adverse impact on existing or anticipated harbor operations. Although there would be more cross-harbor (east-west or west-east) moves by the tugs and carfloats, in general, the larger maritime vessels entering and exiting the harbor (south-north and north-south) would be the "burdened vessel" (the less-maneuverable vessel). As such, under maritime law and tradition, the vessels entering or leaving the harbor would almost always have the right of way. Accordingly, the enhanced carfloats would have to work their way around the other vessels. Thus, maritime traffic would not be affected by this alternative.

Tunnel Alternative

Operations of the Lehigh Valley Drawbridge and the Arthur Kill Lift Bridge would not have an adverse impact on maritime traffic. The maritime traffic would continue to have priority as it does now. The bridges would be positioned for rail traffic to move over the bridge only when doing so does not impede maritime traffic. Rail operations, not maritime operations, would experience whatever delays are necessary when both want to move at the same time. This is maritime law. A bridge normally in the down position would be lifted on demand in time for maritime traffic to pass without delay. A bridge normally in the up position would not be lowered for rail traffic if a vessel is approaching and expected to arrive before the bridge could be restored to the up position after passage of the train.

If anything, the impact of the New Jersey tunnel alignment on the Lehigh Valley Drawbridge would have a positive impact on maritime traffic. The railroads now use the bridge (and the

track to the east) as a convenient tail track for the east end of Oak Island Yard. The New Jersey tunnel alignment would preclude such use of the bridge as a tail track. Trains on the bridge would be tunnel trains moving at a reasonable speed (probably 25 to 40 mph) to or from the tunnel. There would be ample track on both sides of the bridge to hold tunnel trains while a lift is taking place.

The project level of service model has considered the lift bridges as factors impacting rail operations and rail level-of-service. Trip time, cost, and reliability are all degraded by having a lift bridge near the tunnel. The amount of degradation is a function of the following four elements: frequency of bridge openings; duration of bridge openings; randomness of bridge openings, and capacity of the adjacent rail infrastructure to handle trains delayed by bridge openings. All of these elements were considered when determining the time for a typical cross-Hudson rail move and when calculating the reliability factor for the cross-harbor portion of the trip. Time and reliability, in turn, help determine the cost, per ton, of the rail move.

The impact of the lift bridges differs between the two tunnel alignment alternatives, both in the nature of the maritime traffic involved and in the geographic constraints on adjacent rail infrastructure. The information used regarding bridge and maritime operations was mostly determined from bridge logs and from information supplied by the Coast Guard. As such, it reflects the actual situations at the two lift bridges.

LOCAL TRANSPORTATION

VEHICULAR TRAFFIC

The proposed Tunnel Alternative is expected to reduce the volume of trucks on the regional highway network, but would increase the volume of truck activity at new or existing yards. The TSM and Expanded Float Operation alternatives are not expected to significantly reduce regional truck traffic or generate significant incremental truck activities at any location. The objective of this section, "Local Transportation" is to evaluate whether there would be significant traffic impacts at any of the proposed yard sites and what traffic improvements would be needed to mitigate them.

The analysis of future traffic conditions without the proposed project (i.e., the future No Action condition) serves as the baseline against which the impacts of the project are compared. The No Action Alternative analysis includes background traffic volume increases to reflect expected growth in overall travel through and within the area, major anticipated developments, and roadway changes, if any.

In determining background traffic growth rates, several alternative sources were considered in addition to rates suggested in the CEQR Technical Manual. This was necessary since the expected Build (i.e., operational) year for the Tunnel Alternative is 2025, and close to 25 years of compounded traffic growth would be very substantial. Regional model traffic forecasts to the year 2025 were an important source of information in this evaluation; the specific assumptions used are described individually later in this chapter.

The analysis of future conditions with the project in place involved the determination of the volume of auto and truck trips expected to be generated by each proposed rail freight yard, the assignment of these vehicle trips to the local street network approaching each site, and the determination of projected levels of service at the critical locations analyzed. The volume of truck trips generated at each site was determined using the freight forecast model developed for

this project, including traffic operations for average day and reasonable peak day activity levels. Reasonable peak day projections were conservatively used in the impact analyses.

Intersection capacities and levels of service were analyzed in order to determine whether significant traffic impacts would be expected at signalized and unsignalized locations. As per *CEQR Technical Manual* guidelines, significant impacts are defined as follows: increases in approach delays of five seconds or more between the No Action and Build conditions in LOS D; increases of four seconds in LOS E; increases of three seconds in LOS F; or delay increases of one second within LOS F when the No Action condition is above 120 seconds of delay. Also, levels of service that deteriorate from acceptable levels A, B, or C in the future No Action to marginally acceptable mid-LOS D or worse in the future Build condition are considered significant traffic impacts.

While other technical disciplines are examining four separate alternatives in varying levels of detail, the traffic analyses have focused on determining potential traffic impacts only for the New Jersey tunnel alignment since that particular option would generate the highest volume of local truck trips. A second rail tunnel option through Staten Island would have about 13 percent less than the projected freight tonnage of the New Jersey tunnel alignment. The TSM and Expanded Float Operations Alternatives would result in significantly lower increases in the movement of freight and thus the potential for traffic impacts. Therefore, the traffic analyses focused on impact determination of the New Jersey tunnel alignment as the worst-case assessment for potential local area impacts, and should traffic improvements be identified for this alternative, the same or somewhat less mitigation, if needed, would be applicable to the Staten Island tunnel alignment to mitigate adverse conditions. The expanded float operations alternative, in fact, would generate negligible vehicle traffic activity and would not significantly impact local traffic conditions.

West Maspeth Yard

No Action Alternative (2025). Since West Maspeth is heavily industrialized, the annual growth rate of one percent for traffic volumes specified in the *CEQR Technical Manual* was deemed to be overly conservative for these analyses. Instead, an areawide growth rate of 0.5 percent per year, or a total projected increase of about 12 to 13 percent by the year 2025 was applied based on traffic trends indicated in the New York Metropolitan Transportation Council model and projected employment data over that same period.

This traffic volume increase would most likely deteriorate those intersections operating at or above capacity (LOS E or F) in the existing condition further within these unacceptable conditions in the No Action condition. Intersections operating just below capacity or at marginally acceptable LOS D in the existing condition could deteriorate to unacceptable LOS D, E, or F in the No Action Alternative.

In general, increases in traffic volumes in the future No Action year would be moderate. On most intersection approaches, traffic volumes would increase by up to 50 to 100 vph during both peak hours. Along Grand Avenue, south of the LIE, increases of 90 to 110 and 70 to 80 vph would occur during the AM and PM peak hours, respectively. Volumes along Maurice Avenue to/from West Maspeth Yard would experience increases of about 50 to 60 vph during peak hours. Vandervoort Avenue, south of the BQE, would experience volume increases of 40 to 70 vph during peak hours. As mentioned in the Existing Conditions section, many of the intersection approaches being analyzed carry a modest to high percent (10 to 20 percent) of

heavy vehicles in their overall traffic flows, so even small increases in these vehicle flows could significantly worsen resulting levels of service.

Those intersections currently operating at congested levels would deteriorate further in the No Action Alternative. Overall, one or more approaches at 9 (AM peak hour) or 10 (PM peak hour) intersections analyzed would experience worsened levels of service from an existing LOS D or better into a congested LOS E or F, or worsen to higher approach delays within LOS E and F. These include: approaches at the various intersections of Meeker Avenue at Apollo Street; Vandervoort Avenue at Meeker Avenue/Cherry Street; Grand Avenue at Page Place; Maurice Avenue at Maspeth Avenue/58th Street/56th Terrace; Grand Avenue at Rust Street; 58th Street at Laurel Hill Boulevard; Flushing Avenue at 64th Street; Grand Avenue at Flushing Avenue; Grand Avenue at Hamilton Place; and Grand Avenue at Eastbound LIE Service Road. The largest deteriorations in delay and level of service would occur at the intersections of Vandervoort Avenue at Meeker Avenue/Cherry Street, Maurice Avenue at Maspeth Avenue/58th Street/56th Terrace, Grand Avenue at Rust Street, 64th Street at Flushing Avenue, Grand Avenue at Hamilton Place, with all containing one or more approaches with delays worsening to delays greater than 120 seconds. Details of these findings are provided in Appendix 2.

Single Tunnel System (Year 2025). The intermodal yard facility in West Maspeth would have the highest volume of trips generated by any of the proposed rail yard sites because of the extensive level of intermodal activity expected there. As shown in Table 8-24, about 54 vehicle trips would be generated either to or from the site in the AM peak hour, and about 66 vehicle trips would be generated in the PM peak hour. Of these trips, about 80 to 90 percent would be truck trips (48 vph in the AM; 54 vph in the PM).

Table 8-24
Single Tunnel System: Year 2025
West Maspeth Yard Trip Generation

Vehicle Movement	AM Peak Hour	PM Peak Hour
Autos In	3	6
Autos Out	3	6
Trucks In	23	26
Trucks Out	25	28
Total Vehicles	54	66

West Maspeth Yard would have two entry access points—via Page Place from Grand Avenue on the south side of the yard area, and via a new bridge over Newtown Creek along an extension of Maspeth Avenue on the west side of the yard area. There would, however, be a significant change in the traffic patterns in the area as a result of the closure of the Maspeth Avenue entry route into the yard area from the east (necessitated by the need to avoid vehicular crossings of rail tracks in the yard) and the resulting diversion of the majority of these vehicular trips to the Rust Avenue and Grand Avenue corridors, as well as the construction of a new bridge over Newtown Creek along an east-west extension of Maspeth Avenue.

Truck trips were routed into the area based on the regional model assignments. For this site, trucks from Long Island and Brooklyn would generate the highest percentage of trips, with 27

percent of all inbound truck trips from Long Island and 22 percent from Brooklyn. The highest percentage of outbound truck trips (43 percent) would be oriented to Brooklyn (see Table 8-25)*.

Table 8-25
Single Tunnel System
West Maspeth Yard Truck Trip
Origins and Destinations

Origin / Destination	Inbound	Outbound
Brooklyn	22%	43%
Queens	10	6
Manhattan	16	15
Bronx	4	3
Long Island	27	19
Westchester/ Connecticut	21	14
Total	100%	100%

These regional percentage assignments were the starting point from which local street assignments were determined. For some truck origins, all generated truck trips would be expected to use one primary highway that accesses West Maspeth. Specifically, truck trips to and from Long Island would use the Long Island Expressway, while truck trips to or from Westchester and Connecticut would use the BQE. On the other hand, truck trips from some sections of Brooklyn and Queens could use more than a single path because a number of highways lead to Maspeth and since local truck routes could also be used within each borough. Employee trips were assigned uniformly from all directions into and out of West Maspeth.

In terms of projected traffic increases in the study area, most streets would have low to moderate volume growth due to rail yard generated traffic, but many streets would have a significant amount of additional volume due to the new Maspeth Avenue bridge and the road closure at Maspeth Avenue and Rust Street.

Figures 8-21 and 8-22 illustrate the projected volume of incremental rail yard trips routed through the study area. From Brooklyn, Maspeth Avenue would have an increase of between 12 and 16 vehicles in each direction during each peak hour of analysis. Volumes along Grand Avenue, which connects to the LIE, would increase by as much as 9 to 12 vehicle trips westbound and 7 to 9 trips eastbound during both peak hours. Between Rust Street and Page Place, Grand Avenue would carry 13 to 16 new vehicle trips westbound and between 10 to 14 new vehicle trips eastbound.

There would also be a significant diversion of traffic in the area due to the new Maspeth Avenue bridge and road closure at Maspeth Avenue and Rust Street. Volumes along Vandervoort Avenue, which connects to the BQE, would increase by as much as 190 to 270 vehicle trips southbound and 85 to 90 trips northbound during the AM and PM peak hours. Southbound volumes on Rust Street at Grand Avenue would increase between 130 and 150 vehicles, and on

* It should be noted that most of the Brooklyn truck origins and destinations are in the industrialized areas of Brooklyn nearest West Maspeth.

Grand Avenue the volume would increase by as much as 115 to 150 vehicles eastbound and 60 to 75 vehicles westbound. Detailed figures are provided in Appendix 2.

The level of service analyses for the Single Tunnel System indicate that significant traffic impacts would be expected at eight intersections in the study area in the year 2025. The following is a detailed description of each impacted study intersection and mitigation needed to eliminate significant impacts (see Table 8-26 for a summary of findings; detailed analysis results are contained in Appendix 2).

- At the intersection of Meeker Avenue and Apollo Street, the westbound left turn movement would deteriorate from LOS E to F in the AM peak hour and deteriorate within LOS F during the PM peak hour. In order to mitigate this impact, the westbound approach would be restriped from one 15-foot wide left turn lane and one 15-foot wide through lane to two left turn lanes and one through lane.
- At the intersection of Vandervoort and Meeker Avenues, the northbound approach of Vandervoort Avenue would experience a significant impact either within LOS F or worsening from LOS E to LOS F. Mitigation would involve offsetting the center line and restriping the approach from one through/right lane and one exclusive right turn lane to three travel lanes (one through lane, one through/right lane, and one exclusive right turn lane). In addition, parking would need to be prohibited along the approach.
- At Vandervoort and Maspeth Avenues, the southbound and westbound approaches would experience significant impacts during the AM peak hour. The southbound left turn movement would become a "de facto" left turn lane under the Build conditions and deteriorate from LOS B to LOS F. The westbound approach would worsen from LOS C to LOS F. In order to mitigate these impacts, parking would need to be prohibited along the east side of the northbound approach and along the north side of the westbound approach. The northbound approach would be restriped from two 12-foot travel lanes to two 15-foot travel lanes. The westbound approach would be restriped from one lane to one left/through lane and one exclusive right turn lane. Signal timing modifications would also be needed.
- At the intersection of Grand Avenue and Page Place, the southbound Page Place approach would deteriorate within LOS F during the AM peak hour and deteriorate from LOS C to LOS F during the PM peak hour. Mitigation would involve the installation of a new traffic signal.
- At Grand Avenue and Rust Street, the eastbound Grand Avenue left turn movement would deteriorate within LOS F in the AM peak hour and worsen from LOS E to LOS F during the PM peak hour. The westbound through/right movement would worsen from LOS C to LOS D in the AM and the southbound approach of Rust Street would deteriorate from LOS C to LOS D in the PM. Mitigation would consist of signal phasing and timing changes and re-striping the southbound approach from two mixed travel lanes to a shared left/through lane and a separate right turn lane. Re-striping along the eastbound approach would also be needed to move back the stop line and widen the left turn lane.
- At 64th Street and Grand Avenue, the eastbound approach would deteriorate within LOS F during the PM peak hour. Parking would need to be prohibited on the eastbound approach in the PM peak hour in order to mitigate the impact.

Table 8-26
Overall Intersection Level of Service: 2025 No Action Alternative vs. 2025 Build Condition Single Tunnel System – West Maspeth Yard

Intersection	AM Peak Hour Level of Service		PM Peak Hour Level of Service		Significant Impact[1] (Time Period)	Mitigation Required
	No Build	Build	No Build	Build		
Meeker Ave. at Apollo St.	D	F	D	E	YES (AM/PM)	Standard mitigation [2]
Vandervoort Ave. at Meeker Ave./ Cherry St.	E	F	F	F	YES (AM/PM)	Standard mitigation [2]
Vandervoort Ave. at Maspeth Ave.	C	F	B	C	YES (AM)	Standard mitigation [2]
48th S Vandervoort Ave at Metropolitan Ave.	C	C	C	C	—	—
Vandervoort Ave. at Grand St.	C	C	C	C	—	—
Grand Ave. at Page Place (Unsignalized)	F	F	C	F	YES (AM/PM)	Install new traffic signal
Maurice Ave. at Maspeth Ave./ 58th St./ 56th Terr. (unsignalized)	F	C	F	D	—	—
Grand Ave. at Rust St.	D	E	C	F	YES (AM/PM)	Standard mitigation [2]
Grand St. at 59th St.	C	C	B	C	—	—
58th St. at Laurel Hill Blvd.	D	D	D	D	—	—
Grand Ave. at 64th St.	C	C	E	F	YES (PM)	Standard mitigation [2]
Flushing Ave. at 64th St	F	F	E	E	—	—
Grand Ave. at Flushing Ave.	F	F	D	D	—	—
Grand Ave. at Hamilton Pl.	C	C	F	F	YES (AM/PM)	Standard mitigation [2]
Grand Ave. at Eastbound LIE Service Rd.	D	E	C	C	YES (AM)	Standard mitigation [2]
Grand Ave. at Westbound LIE Service Rd.	C	C	B	B	—	—
69th St. at Eastbound LIE Service Rd.	C	C	E	E	—	—
Review Ave.at Greenpoint Ave / Van Dam St.	—	—	—	—	—	—
Laurel Hill Boulevard at 56th Road (Unsignalized)	—	—	—	—	—	—
48th St. at 56th Rd.	—	—	—	—	—	—
48th St. at Queens Midtown Exp. (LIE Service Rd)	—	—	—	—	—	—
Maurice Ave. at Westbound LIE Service Rd.	—	—	—	—	—	—
Maurice Ave. at Eastbound LIE Service Rd.	—	—	—	—	—	—

Note:
1. Significant impact on any lane group or approach.
2. Requires standard traffic engineering mitigation improvements such as signal timing changes, lane restriping, or parking prohibitions.
3. Intersection level of service improvements would occur where traffic diversions result in lower volumes.
4. Intersections with no level of service shown are not affected by this alternative.

Overall intersection level of service is shown above.

- At the intersection of Grand Avenue and Hamilton Place, the eastbound Grand Avenue left turn movement would worsen from LOS D to LOS E in the AM peak hour and the eastbound/westbound approaches would both deteriorate within LOS F during the PM peak hour. In order to mitigate these impacts during the AM peak hour, a minor signal modification would be needed; during the PM peak hour, parking would need to be prohibited on the eastbound and westbound approaches.
- At Grand Avenue and the LIE eastbound service road during the AM peak hour, the northbound Grand Avenue approach would deteriorate within LOS E and the southbound Grand Avenue approach would worsen from LOS D to LOS F. Mitigation would include minor signal timing modifications.

Double Tunnel System (Year 2025). The major differences in expected traffic conditions with the Double Tunnel System versus the Single Tunnel System are: (1) the Double Tunnel System would generate about 92 more vehicle trips overall in the AM peak hour and about 108 more vehicle trips overall in the PM peak hour; (2) the Double Tunnel System is assumed to have two separate rail freight operators at the West Maspeth Yard site, each with separate access points from the local street network—one of the operators (on the western side of the Yard) would have access via Page Place from Grand Avenue and via a new bridge over Newtown Creek along an extension of Maspeth Avenue from the west side of the creek, while the other operator (on the eastern side of the Yard) would have access from 48th Street and 56th Road with the access point into the Yard at the intersection of 49th Street and 56th Road. As shown in 8-27, about 146 vehicle trips would be generated either to or from the site in the AM peak hour, and about 175 vehicle trips would be generated in the PM peak hour. Of these trips, about 80 to 90 percent would be truck trips (130 vph in the AM; 145 vph in the PM).

Table 8-27
Double Tunnel System: Year 2025 West Maspeth Yard Trip Generation

Vehicle Movement	AM Peak Hour	PM Peak Hour
Autos In	8	15
Autos Out	8	15
Trucks In	67	73
Trucks Out	63	71
Total Vehicles	146	174

Trucks from Brooklyn would generate the highest percentage of trips, with 24 percent of all inbound truck trips and 38 percent of all outbound truck trips all oriented to Brooklyn (see Table 8-28). This is followed by Long Island and by Westchester/Connecticut, each with roughly 20-25 percent of all inbound truck trips and 15-17 percent of all outbound truck trips oriented to and from the site.

Table 8-28
Double Tunnel System
West Maspeth Yard Truck Trip
Origins and Destinations

Origin / Destination	Inbound	Outbound
Brooklyn	24%	38%
Queens	12	11
Manhattan	13	16
Bronx	6	3
Long Island	24	17
Westchester / Connecticut	21	15
Total	100%	100%

These regional percentage assignments were the starting point from which local street assignments were determined following the same approach used for the Single Tunnel System. In terms of projected traffic increases in the study area, most streets would have low to moderate volume growth due to rail yard generated traffic. Many streets would, however, have a substantial amount of additional volume due to the new Maspeth Avenue bridge and the road closure at Maspeth Avenue and Rust Street. Figures 8-23 and 8-24 illustrate the projected volume of incremental trips routed through the study area. From Brooklyn, Maspeth Avenue would carry between 15 and 18 vehicles in each direction during each peak hour. Volumes along 58th Street, which connects to the BQE, would increase by as much as 15 vehicle trips southbound and by about 10 trips northbound during both peak hours. Maurice Avenue leading to the 49th Street entrance to West Maspeth Yard would carry an additional 17 to 18 peak hour vehicle trips in the southbound direction and 9 to 10 trips in the northbound direction. Grand Avenue west of the Page Place entrance would carry 12 to 14 trips westbound in the peak hours. East of the site toward Rust Street, Grand Avenue would carry about 20 new vehicle trips in both directions during the peak hours.

The level of service analyses for the Double Tunnel System indicate that significant traffic impacts would be expected at nine intersections in the study area in the year 2025 (see Table 8-29 for a summary of findings; detailed analysis results are contained in Appendix 2).

The intersections that would be significantly impacted under the Single Tunnel System would generally also be impacted under the Double Tunnel System, with the addition of impacts at 69th Street and the eastbound LIE service road. Mitigation measures needed for the Single Tunnel System would generally also be needed to mitigate impacted intersections for the Double Tunnel System. At the additional impact location—the intersection of 69th Street and the eastbound LIE service road—the eastbound approach would deteriorate within LOS E during the PM peak hour. Mitigation would consist of offsetting the center line and restriping the northbound 69th Street approach from one through lane and one through/right lane to two through lanes and one exclusive right turn lane. The southbound 69th Street approach would also be restriped from one left/through lane and one through lane to one exclusive left turn lane and one through lane. A modest signal timing change would also be needed.

Oak Point Yard

No Action Alternative (Year 2025). Areawide traffic volumes are projected to increase by about 27 percent by the year 2025, or about one percent per year. This growth rate is conservatively higher than the rate issued in the NYC CEQR guidelines for the Bronx, but consistent with traffic trends indicated in the New York Metropolitan Transportation Council model and projected employment data.

Vehicle flows along Bruckner Boulevard would increase by 300 to 400 vph in the peak travel direction (i.e., southbound in the AM, northbound in the PM), and by about 150-200 vph in the off-peak direction. Volumes along the cross streets would increase by between 100 and 150 vph, with the higher increases expected along Hunts Point Avenue that feeds directly into the food distribution area. Barry Street, the street directly leading into the proposed rail yard, would experience an increase of 10 to 30 vph over existing volumes.

Those intersections currently operating at congested levels would deteriorate to a worse level of service in the No Action condition. Overall, 5 of the 7 intersections analyzed would experience worsened levels of service on one or more approaches from an existing LOS D or better into a congested LOS E or F. These include approaches at the intersections of Bruckner Boulevard at Leggett, Longwood, and Hunts Point Avenues, and at Tiffany and Barretto Streets.

Single Tunnel System (Year 2025). The rail facility at the Oak Point Yard would serve as a destination for local bulk freight as well as classification yard for bulk rail movements to the Bronx and southern New England. At this yard, trains would be classified and then distributed by local train movements, so overall trucking activities generated by this yard would be low. As shown in Table 8-30, 16 vehicle trips would be generated either to or from the site in the AM peak hour, and 12 vehicle trips would be generated in the PM peak hour. Of these trips, half or less than half would be truck trips (8 vph in the AM; 4 vph in the PM).

The limited volume of auto and truck trips generated at this yard site was assigned to the local street network. For this site, vehicles were assigned to north and southbound Bruckner Boulevard to the nearby west since this roadway provides for the highway connections to other areas. Most streets in this study area would carry an additional 5 vehicles or less per hour—an increase of less than 1 percent compared to the future No Action traffic levels in the Hunts Point area. Figure 8-25 illustrates the travel assignment paths into and out of the study area and the volume of incremental trips assigned to each path. No significant impacts are expected during either of the AM or PM peak study hours (see Table 8-31), and no further traffic analyses are required.

Double Tunnel System (Year 2025). The volume of auto and truck trips generated at the Oak Point Yard site would be only slightly higher under the Double Tunnel System (18 vehicle trips in the AM peak hour and 14 vehicle trips in the PM peak hour) than under the Single Tunnel System (16 vehicle trips in the AM peak hour and 12 vehicle trips in the PM peak hour). No significant impacts are expected in either the AM or PM peak hours. Projected overall levels of service are identical to those shown in Table 8-31 for the Single Tunnel System.

Table 8-29
Overall Intersection Level of Service: 2025 No Action Alternative vs. 2025 Build Condition Double Tunnel System-West Maspeth Yard

Intersection	AM Peak Hour Level of Service		PM Peak Hour Level of Service		Significant Impact[1] (Time Period)	Mitigation Required
	No Build	Build	No Build	Build		
Meeker Ave. at Apollo St.	D	F	D	E	YES (AM/PM)	Standard mitigation [2]
Vandervoort Ave. at Meeker Ave./ Cherry St.	E	F	F	F	YES (AM/PM)	Standard mitigation [2]
Vandervoort Ave. at Maspeth Ave.	C	F	B	C	YES (AM)	Standard mitigation [2]
Vandervoort Ave at Metropolitan Ave.	C	C	C	C	—	—
Vandervoort Ave. at Grand St.	C	C	C	C	—	—
Grand Ave. at Page Place (Unsignalized)	F	F	C	F	YES (AM/PM)	Standard mitigation [2]
Maurice Ave. at Maspeth Ave./ 58th St./ 56th Terr. (unsignalized)	F	C	F	D	—	—
Grand Ave. at Rust St.	D	E	C	F	YES (AM/PM)	Standard mitigation [2]
Grand St. at 59th St.	C	C	B	C	—	—
58th St. at Laurel Hill Blvd.	D	D	D	D	—	—
Grand Ave. at 64th St.	C	C	E	F	YES (PM)	Standard mitigation [2]
Flushing Ave. at 64th St	F	F	E	E	—	—
Grand Ave. at Flushing Ave.	F	F	D	D	—	—
Grand Ave. at Hamilton Pl.	C	C	F	F	YES (AM/PM)	Standard mitigation [2]
Grand Ave. at Eastbound LIE Service Rd.	D	E	C	C	YES (AM)	Standard mitigation [2]
Grand Ave. at Westbound LIE Service Rd.	C	C	B	B	—	—
69th St. at Eastbound LIE Service Rd.	C	C	E	E	YES (PM)	Standard mitigation [2]
Review Ave.at Greenpoint Ave / Van Dam St.	B	B	D	D	—	—
Laurel Hill Boulevard at 56th Road (Unsignalized)	D	E	E	E	—	—
48th St. at 56th Rd.	A	A	A	A	—	—
48th St. at Queens Midtown Exp. (LIE Service Rd)	B	B	B	B	—	—
Maurice Ave. at Westbound LIE Service Rd.	C	C	C	C	—	—
Maurice Ave. at Eastbound LIE Service Rd.	C	C	D	D	—	—

Notes:

1. Significant impact on any lane group or approach.
2. Requires standard traffic engineering mitigation improvements such as signal timing changes, lane restriping, or parking prohibitions.
3. Intersection level of service improvements would occur where traffic diversions result in lower volumes.

Overall intersection level of service is shown above.

Table 8-30
Single Tunnel System: Year 2025
Oak Point Yard Trip Generation

Vehicle Movement	AM Peak Hour	PM Peak Hour
Autos In	4	4
Autos Out	4	4
Trucks In	4	2
Trucks Out	4	2
Total Vehicles	16	12

Table 8-31
Single Tunnel System: Year 2025 Traffic Impacts
Oak Point Yard

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact
	No Action	Build	No Action	Build	
Barry St. at Leggett Ave.	A	A	A	A	–
Garrison Ave. at Leggett Ave.	A	A	A	A	–
Bruckner Blvd. at Leggett Ave.	D	D	C	C	–
Bruckner Blvd. at Longwood Ave.	B	B	B	B	–
Bruckner Blvd. at Tiffany St.	D	D	B	B	–
Bruckner Blvd. at Barretto St.	C	C	C	C	–
Bruckner Blvd. at Hunts Point Ave.	D	D	E	E	–

Harlem River Yard

No Action Alternative (Year 2025). Areawide traffic volumes are projected to increase by about 27 percent by the year 2025, or about one percent per year. This growth rate is conservatively higher than the rate issued in the NYC CEQR guidelines for the Bronx, but consistent with traffic trends indicated in the New York Metropolitan Transportation Council model and projected employment data.

Since overall traffic volumes in this area are substantial, some sizeable increases would be expected along study area streets. Increases of 500 to 550 vph would occur along East 135th Street at Willis Avenue in both peak hours and on eastbound Bruckner Boulevard at Brook Avenue during the PM peak hour. Traffic volumes along Willis Avenue would increase by about 200 vph during the PM peak hour when most vehicle flows are outbound from Manhattan. By contrast, East 134th Street would process an increase of 100 to 125 vph during both peak hours, while traffic volumes along other local side streets would increase by less than 100 vph.

Those intersections currently operating at congested levels would deteriorate to a worse level of service in the No Action condition. Overall, 4 of the 7 intersections analyzed would experience worsened levels of service from an existing LOS D or better into a congested LOS E or F. These include approaches at the intersections of Bruckner Boulevard at Willis, Brook, and St. Ann's Avenues, and Willis Avenue at East 135th Street.

Single Tunnel System (Year 2025).

The rail facility at Harlem River Yard would be for local bulk freight and only a modest number of truck trips per day would be generated there. As shown in Table 8-32, 16 vehicle trips would be generated either to or from the site in the AM peak hour, and 12 vehicle trips would be generated in the PM peak hour. Of these trips, half or less than half would be truck trips (8 vph in the AM; 4 vph in the PM).

Table 8-32
Single Tunnel System: Year 2025
Harlem River Yard Trip Generation

Vehicle Movement	AM Peak Hour	PM Peak Hour
Autos In	4	4
Autos Out	4	4
Trucks In	4	2
Trucks Out	4	2
Total Vehicles	16	12

The limited volume of auto and truck trips generated at this yard site was assigned to the local street network. For this site, an equal distribution of trips was assumed to occur from the east and west via the Major Deegan and Bruckner Expressways. In this area, the Major Deegan Expressway has a number of local exits that allow trips to connect to the site's main access at the southern tip of Brook Avenue (currently, a dead-end street). Figure 8-26 illustrates the travel assignment paths into and out of the study area and the volume of incremental trips assigned to each path. Most streets in this study area would carry up to an additional 5 to 10 vehicles—an increase of less than one percent compared to the future No Action traffic levels in the Hunts Point area. No significant impacts are expected during either of the AM or PM peak study hours (see Table 8-33), and no further traffic analyses are required.

Table 8-33
Single Tunnel System: Year 2025 Traffic Impacts
Harlem River Yard

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact
	No Action	Build	No Action	Build	
Willis Ave. at Bruckner Blvd.	F	F	C	C	–
Brook Ave. at Bruckner Blvd.	E	E	E	E	–
St. Ann's Ave. at Bruckner Blvd.	E	E	F	F	–
Brook Ave. at East 134th St.	B	B	A	A	–
St. Ann's Ave. at East 134th St.	B	B	B	B	–
Willis Ave. at East 135th St.	B	B	C	C	–
St. Ann's Ave. at East 135th St.	B	B	B	B	–

Double Tunnel System (Year 2025). The volume of auto and truck trips generated at the Harlem River Yard site would be only slightly higher under the Double Tunnel System (18 vehicle trips in the AM peak hour and 14 vehicle trips in the PM peak hour) than under the Single Tunnel System (16 vehicle trips in the AM peak hour and 12 vehicle trips in the PM peak hour). No

significant impacts are expected in either the AM or PM peak hours. Projected overall levels of service are identical to those shown in Table 8-33 for the Single Tunnel System.

65th Street Yard

No Action Alternative (Year 2025). Areawide traffic volumes are projected to increase by about 13 percent by the year 2025, or about one half percent per year. This growth rate is within the range of NYC CEQR guidelines for Brooklyn, and consistent with traffic trends for Brooklyn indicated in the New York Metropolitan Transportation Council model.

During the morning peak hour, vehicle flows for northbound 3rd and 4th Avenues would increase in the No Action condition by about 125 to 350, which represent the largest traffic increases in the study area. During the PM peak hour, volume increases of 100 to 300 would occur on the southbound directions of these same avenues. Volumes along Second Avenue would increase by 50 to 100 vph during both study peak hours. Along cross streets in the study area, traffic would increase by between 20 and 70 vph over existing traffic levels.

Those intersections currently operating at congested levels would deteriorate to a worse level of service in the No Action condition. Overall, 5 of the 7 intersections analyzed would experience worsened levels of service on one or more approaches from an existing LOS D or better into a congested LOS E or F. These would include approaches at the intersections of 3rd Avenue at 39th, 60th, and 65th Streets, 2nd Avenue at 39th Street, and 7th Avenue at 65th Street.

Single Tunnel System (Year 2025). 65th Street Yard would serve as one of Brooklyn's bulk freight rail yards, and while it is likely to attract a concentration of freight traffic, only a modest number of truck trips per day would be generated there. As shown in Table 8-34, 18 vehicle trips would be generated either to or from the site in the AM peak hour, and 14 vehicle trips would be generated in the PM peak hour. Of these trips, truck trips would be about half of the total (10 vph in the AM; 6 vph in the PM).

Table 8-34
Single Tunnel System: Year 2025
65th Street Yard Trip Generation

Vehicle Movement	AM Peak Hour	PM Peak Hour
Autos In	4	4
Autos Out	4	4
Trucks In	5	3
Trucks Out	5	3
Total Vehicles	18	14

The limited volume of auto and truck trips generated at this yard site was assigned to the local street network. For this site, vehicles were routed to and from the Gowanus Expressway, but because there are only a limited number of on- and off-ramps to the highway, different paths would be used. Also, the Gowanus Expressway does not extend far south of the yards or into central portions of the borough, so trucks can only use the highway from points north or, alternately, must use local truck routes leading directly to the yard. For arrivals, a large portion of trips was assigned to the 39th Street exit ramp that leads from the southbound Gowanus Expressway directly to 1st Avenue. The remaining truck assignments were allocated to designated truck routes, including 65th, 60th, and 39th Streets. For departing trips, trucks destined to the Gowanus Expressway would have to travel slightly south to the 65th Street

northbound on-ramp, while other departures were assigned to northbound 3rd Avenue; the remainder were assigned to local truck routes leading into central Brooklyn.

Overall, most streets in this study area would carry up to an additional 5 to 10 vehicles—an increase of less than one percent compared to the future No Action traffic levels in the Sunset Park and Bay Ridge areas. Figures 8-27 and 8-28 illustrate the travel assignment paths into and out of the study area and the volume of incremental trips assigned to each path. Of the 7 intersections studied, one location would experience a significant traffic impact; namely, the 3rd Avenue/65th Street intersection, where during the AM peak hour, a shift of one second of green time from the north/south to the east/west approaches could mitigate the impact (see Table 8-35). For the remaining 6 intersections, no significant impacts are expected during either of the AM or PM peak study hours, and no further traffic analyses are required.

Table 8-35
Single Tunnel System: Year 2025
Traffic Impacts at 65th Street Yard

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact[1] (Time Period)	Mitigation Required
	No Action	Build	No Action	Build		
2nd Ave. at 39th St.	D	D	D	D	–	–
2nd Ave. at 65th St.	C	C	B	B	–	–
3rd Ave. at 39th St.	D	D	B	B	–	–
3rd Ave. at 60th St.	D	D	D	D	–	–
3rd Ave. at 65th St.	C	C	C	C	YES (AM)	Signal timing change
4th Ave. at 38th St.	B	B	B	B	–	–
7th Ave. at 65th St.	D	D	D	D	–	–

Double Tunnel System (Year 2025). The volume of auto and truck trips generated at the 65th Street Yard site would be only slightly higher under the Double Tunnel System (20 vehicle trips in the AM peak hour and 16 vehicle trips in the PM peak hour) than under the Single Tunnel System (18 vehicle trips in the AM peak hour and 14 vehicle trips in the PM peak hour). Impacts and mitigation would be the same as those shown in Table 8-35 for the Single Tunnel System.

YARD OPERATIONS

Fresh Pond Yard

Because of the large increase in the number of bulk and carload railcars transiting to geographic Long Island under the tunnel alternative, the role of and traffic levels at Fresh Pond Yard are likely to change dramatically. An operational analysis of the yard was conducted to determine if the existing yard could feasibly serve the anticipated role. This analysis serves two purposes:

- To demonstrate that a redesigned Fresh Pond Yard within the current "footprint" of the rail yard will have the capacity to handle anticipated inbound[1] traffic on a "design day."

[1] Outbound traffic is assumed to interchange either at sidings at New Lots, or if necessary at Oak Island Yard in New Jersey. Since these cars would not require classification, outbound operations are more easily accomplished and not evaluated in detail here.

- To provide insight into the level of activity that will take place at Fresh Pond on an "average day."[1]

Fresh Pond Operating Plan

As with the rest of the rail operations analysis, the operating scheme outlined below is intended to establish whether forecasted rail volumes can be accommodated, and is merely one possible operating scenario which the region's railroads could use. Many other scenarios are possible. There is no reason to assume that the scenario used to generate this report is the best possible operating plan, or that the region's railroads cannot refine operations further to achieve greater capacity. The operating plan presented here is designed to meet the maximum expected demand from the Double Tunnel System, and therefore represents a "worst-case scenario."

Figure 8-29 shows a schematic diagram of the yard layout used in the analysis. This layout requires a minimal reworking of current track, and fits entirely within the current footprint of Fresh Pond Yard. The analysis also used the following general operating assumptions:

- Interchange on the upper tracks at Fresh Pond (U3 to U 9 and F1 to F4) is limited to interchange of all incoming cars from all other railroads to NY&A, interchange of outgoing cars from NY&A to CSX, CP, or P&W (routed via the Hellgate Bridge), and interchange of (non-NY&A) tunnel train traffic between the line-haul carriers[2] that does not involve NY&A. Interchange of outgoing cars from NY&A to CP, CSX, and NS tunnel trains will take place elsewhere—probably at New Lots, but possibly at Oak Island.
- Classification within the "east yard" at Fresh Pond (E1 to E9, A1, A2, and T1) is limited to NY&A classification of incoming interchange cars into local trains for the various NY&A routes. Secondary classification (arranging a train's cars into the optimum sequence for switching at local customers' sites) and classification of outgoing cars is to take place elsewhere on the NY&A system after the local train departs from Fresh Pond.
- NY&A will have use and control of the southern-most track (M2) of the existing two tracks on the Montauk branch at Fresh Pond and east to the vicinity of the junction with the LIRR main line near Jamaica.
- Three tracks (W1 to W3) will be available in the "west yard" at Fresh Pond for NY&A to store classified cars awaiting departure on NY&A local trains.

Results of Operating Assessment

Fresh Pond Yard (as proposed) appears capable of handling 104 percent of projected "design day" incoming traffic. This translates into 168 percent of "average day" traffic. The annual capacity appears to be 196 percent of the projected annual use. While this is slightly less than the traditional railroad "rule of thumb" of designing a yard to be able to handle twice the projected annual use, careful yard management and an adequately-designed (and maintained) yard infrastructure should enable Fresh Pond yard to meet anticipated needs.

On a "design day" Fresh Pond yard is anticipated to be active throughout the day and night except for one period of approximately 50 minutes shortly after 5:15 in the morning. Under one

[1] The "average day" represents the average weekday (or twice the average weekend day or holiday). It is a valid indicator of average environmental impacts. It is not a valid determinant of infrastructure needs.

[2] CSX, NS, CP, and P&W.

possible scenario, seventeen NY&A trains with incoming cars will depart Fresh Pond on a design day as follows (see Table 8-36):

Table 8-36
Fresh Pond Yard Operating Assesment

Destination	Quantity	Approximate times departing Fresh Pond
Brooklyn	6	1:01, 4:06, 10:26, 16:21, 19:21, 22:11
Bushwick	3	1:06, 10:46, 19:11
Main Line (through train)	2	10:31, 22:06
Main Line (local)	1	0:56
Port Jefferson	2	10:56, 22:11
Montauk branch	2	10:36, 22:16
CLI (unit stone train)	1	2:06

On an "average day," the activity at Fresh Pond decreases from just over 23 hours to approximately 13 hours. Part of this decrease in activity (approximately 3 ½ hours) is realized in the early morning hours with the yard inactive from approximately 1:45 am until shortly after 6 am. The rest of the inactivity is achieved in small increments throughout the remainder of the day. On an average day, the number of NY&A trains departing Fresh Pond is reduced from 17 to 14.*

Additional details regarding operations at Fresh Pond Yard is provided in Appendix 2A, "Transportation Appendix."

E. MITIGATION MEASURES

REGIONAL (RAIL) MITIGATION

The basic definitions of the alternative improvements were modified in a few instances to mitigate rail operations issues identified in the operational analyses. The specific modifications are outlined below.

The results of the discrete event simulation modeling were presented in Section D above. For the New Jersey alignment of the Single Tunnel System, the proposed rail infrastructure improvements (including additional rail tracks on the Bay Ridge Branch west of New Lots) were sufficient to alleviate congestion and meet the level of service criteria needed to attract the forecast traffic levels. As discussed above, the Staten Island alignment of the Single Tunnel System is less likely to achieve these level of service criteria. All feasible infrastructure improvements and mitigation measures were included in these simulations, including the construction of a second span of the Arthur Kill Lift Bridge.

As presented in Chapter 2, "Project Alternatives," measures identified to accommodate the projected rail freight traffic under the Double Tunnel System would include: the boring of a second cross-harbor tunnel; the expansion of the rail yard in West Maspeth; under the New Jersey alignment, construction of a direct connection between the National Docks Secondary and the tunnel.

* Two Brooklyn trains and one Bushwick train are eliminated. The schedules of the remaining trains on these lines are adjusted accordingly.

The manual simulation identified the follow potential issues and possible solutions under the Single Tunnel System:

- Potential conflicts between New Jersey Transit passenger trains and freight operations along a shared segment of the Lehigh Main Line under the Single Tunnel System could be mitigated by adjusting the affected freight trains to operate 10 to 30 minutes earlier or later. Under the Staten Island alignment, trains may be rerouted via the Port Reading Secondary or construction of a third Lehigh mainline track may be needed.
- For the Staten Island alignment, additional siding track space and additional signal control devices would be necessary on the Chemical Coast line.
- The second Waverly Loop Track would resolve potential train conflicts on the P&H Line and the Greenville Branch.

The manual simulation also identified the following mitigation measures for congestion under the Double Tunnel System:

- For the Lehigh Valley Mainline, scheduling adjustments and use of the Port Reading Secondary/Chemical Coast Line;
- For the Chemical Coast Line, the Staten Island alignment presents considerable potential for conflicts, which could require either major rescheduling of trains or the installation of a second track along the entire length of the line. A second track is not included as part of the Tunnel Alternative, since it is part of the New Jersey State Rail Plan and was therefore assumed to be part of the No Action Alternative.
- The second Waverly Loop Track would be critical for resolving congestion along the Greenville Branch under the Staten Island alignment of the Double Tunnel System

LOCAL (VEHICULAR) MITIGATION

WEST MASPETH YARD

The level of service analyses for the Single Tunnel System indicate that significant traffic impacts would be expected at eight intersections in the study area in the year 2025, as shown in Section D above. Mitigation measures needed to eliminate significant impacts at the eight intersections include the following:

- For the intersection of Meeker Avenue and Apollo Street on the north side of the BQE, restriping the westbound approach would be needed to add a third travel lane and eliminate the significant impact.
- At the intersection of Vandervoort and Meeker Avenues, mitigation would entail offsetting the centerline of Vandervoort Avenue, restriping the approach, and prohibiting parking along the northbound approach in order to add a travel lane.
- At Vandervoort and Maspeth Avenues, parking would need to be prohibited along the northbound approach in order to widen the two northbound travel lanes and to prohibit parking also on the westbound approach in order to add a second travel lane; restriping and signal timing modifications would also be needed.
- At Grand Avenue and Page Place, the installation of a traffic signal would eliminate the impact on the southbound approach.

- For the intersection of Grand Avenue and Rust Street, restriping and signal timing changes would eliminate significant impacts on the southbound and eastbound approaches. The stop line along the eastbound approach should also be moved back and the left turn lane widened in order to facilitate turning movements.
- At the intersection of 64th Street and Grand Avenue, minor signal timing modification would be needed to improve the westbound approach in the AM peak hour and parking would need to be prohibited in the PM peak hour to eliminate impacts along the eastbound approach.
- At Grand Avenue and Hamilton Place, mitigation would include minor signal timing changes during the AM peak hour; for the PM peak hour, parking would need to be prohibited on the eastbound and westbound approaches.
- At the intersection of Grand Avenue and the eastbound LIE service road, signal timing modifications would be needed to eliminate impacts on the northbound and southbound approaches.

The intersections above would also be impacted under the Double Tunnel System, as discussed in Section D, with the addition of significant impacts at the intersection of 69th Street and the eastbound LIE eastbound service road. Mitigation measures needed for the Single Tunnel System would generally also be needed to mitigate impacted intersections for the Double Tunnel System. At the intersection of 69th Street and the eastbound LIE service road, mitigation would consist of offsetting the centerline of 69th Street and restriping the northbound 69th Street approach to add a travel lane, restriping the southbound approach to change lane designations, and signal timing changes.

65TH STREET YARD

The level of service analyses for the Single Tunnel System and Double Tunnel System indicate that significant traffic impacts would be expected at one of the seven intersections analyzed in the study area—the intersection of Third Avenue and 65th Street—where a modest signal timing modification would be needed to eliminate the significant impact on the westbound approach during the AM peak hour. ✷

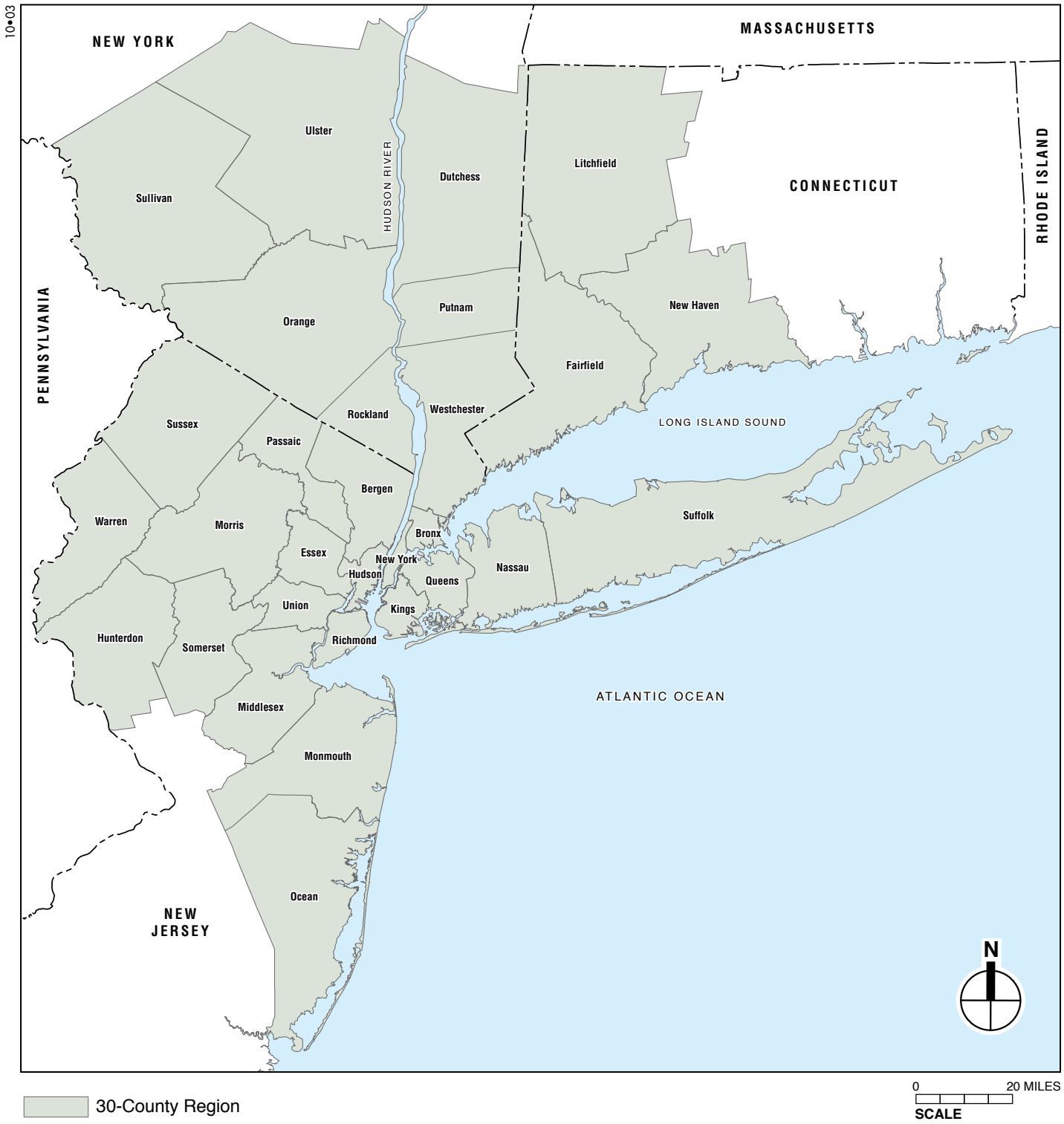
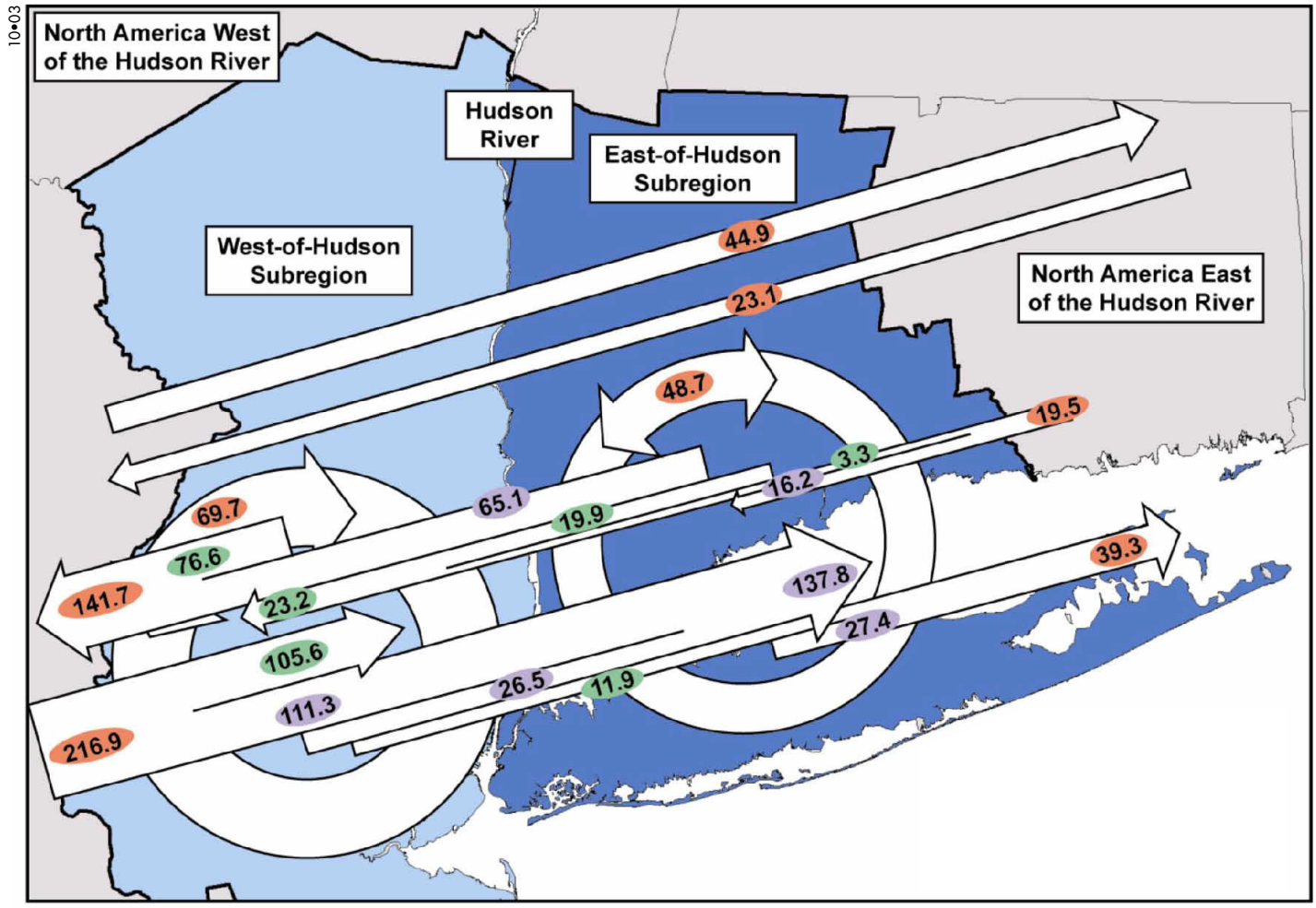


Figure 8-1
30-County Cross Harbor
Regional Study Area

CROSS HARBOR FREIGHT MOVEMENT PROJECT



Shipments to/from East-of-Hudson Subregion

Shipments to/from West-of-Hudson Subregion

Total Shipments

Millions of Tons

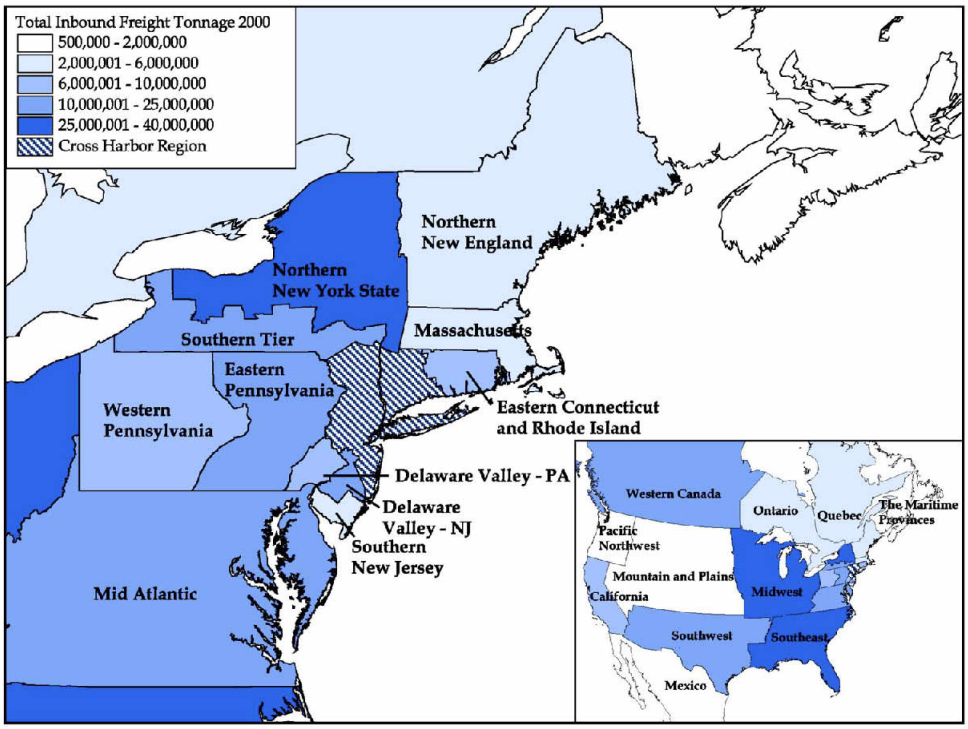
Source: Draft Commodity Flow Analysis, April 2002

Figure 8-2

30-County Region Commodity Flows, 2000

CROSS HARBOR FREIGHT MOVEMENT PROJECT

Inbound Freight Tonnage, 2000



Outbound Freight Tonnage, 2000

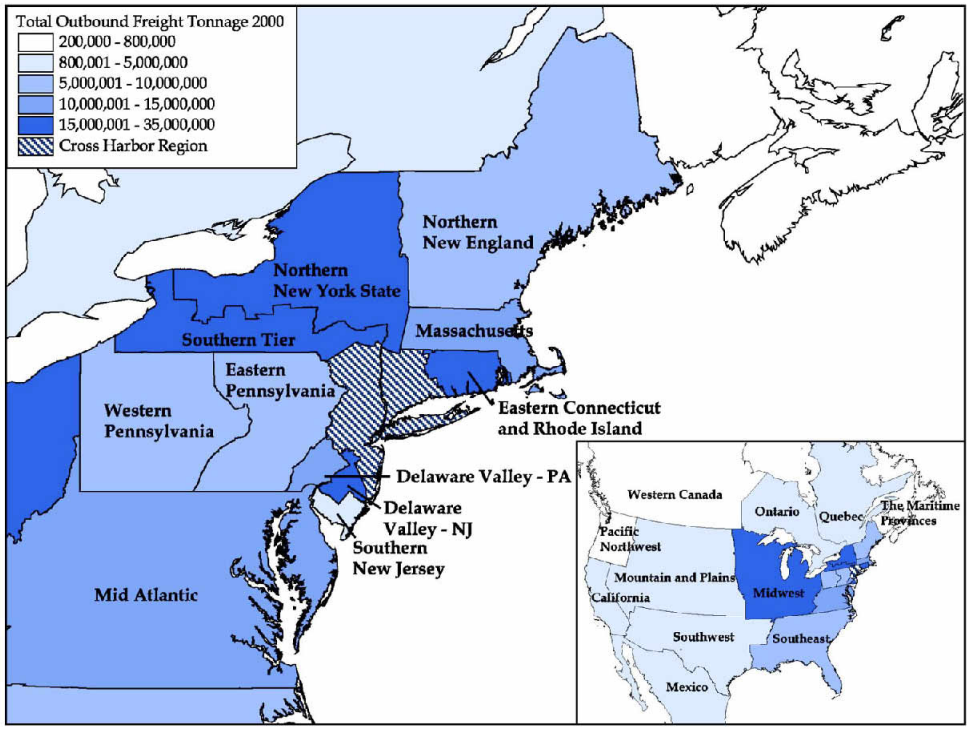
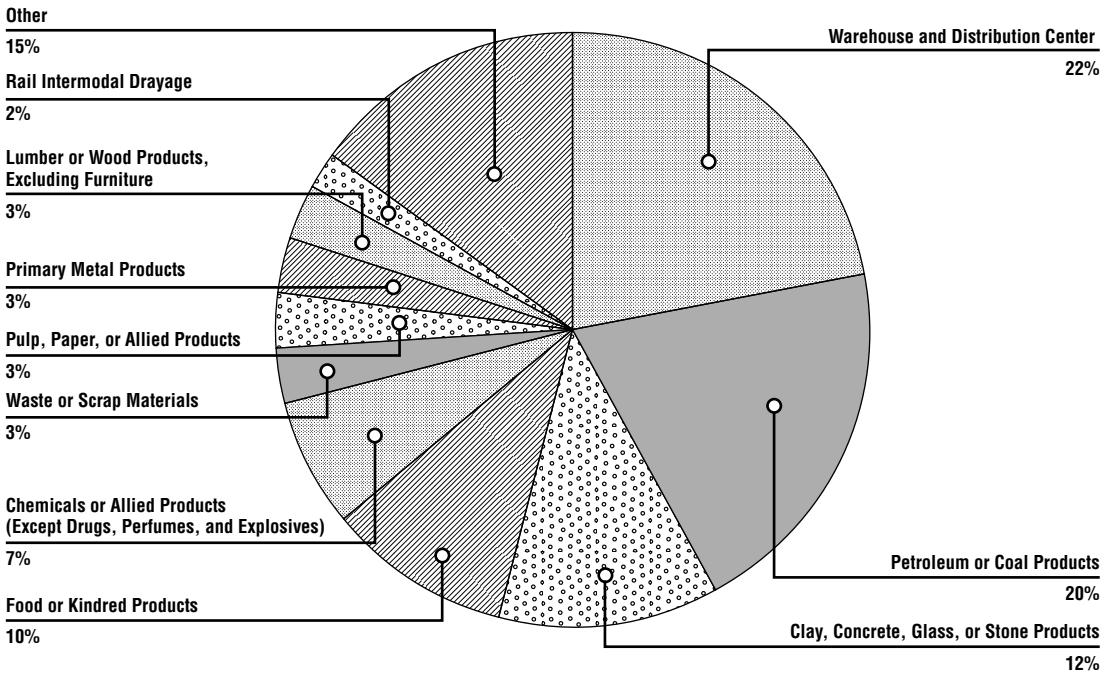


Figure 8-3
Regional Trading Partners

By Weight



By Value

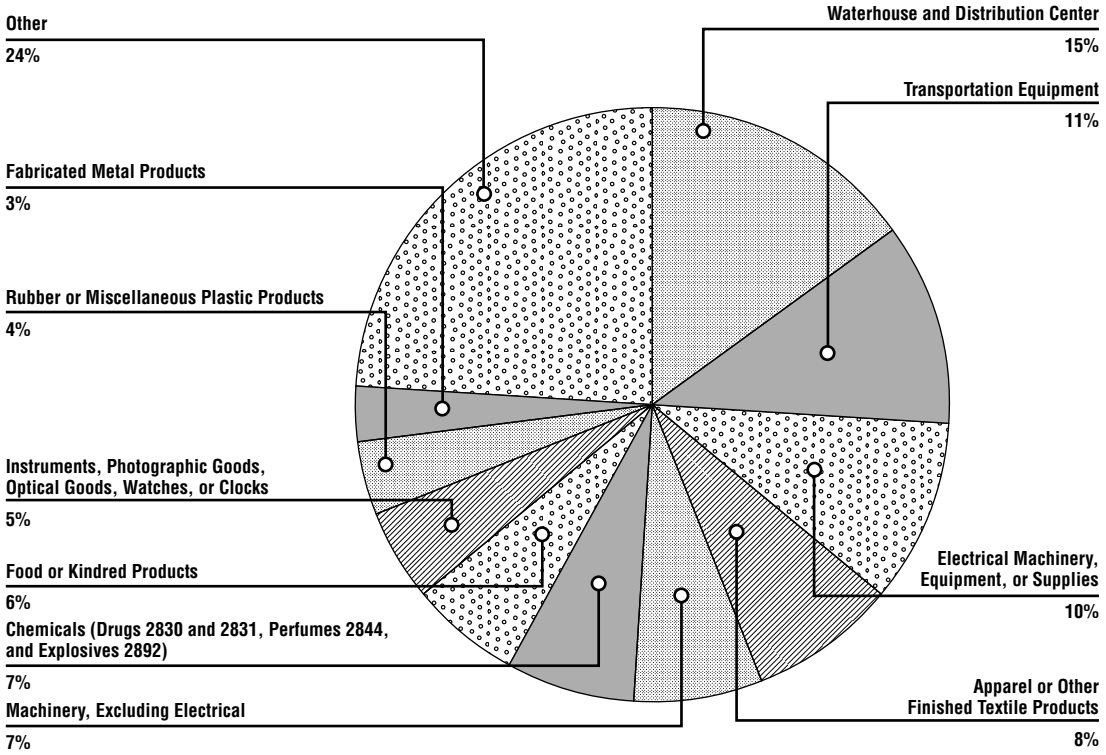
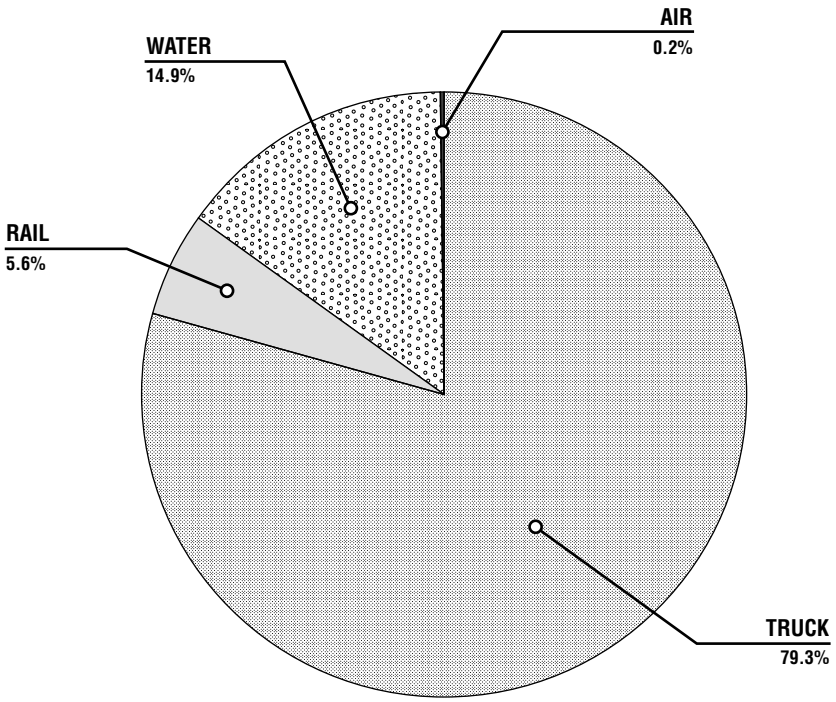


Figure 8-4
Top 10 Commodities Moved in the 30-County Region, 2000

By Weight



By Value

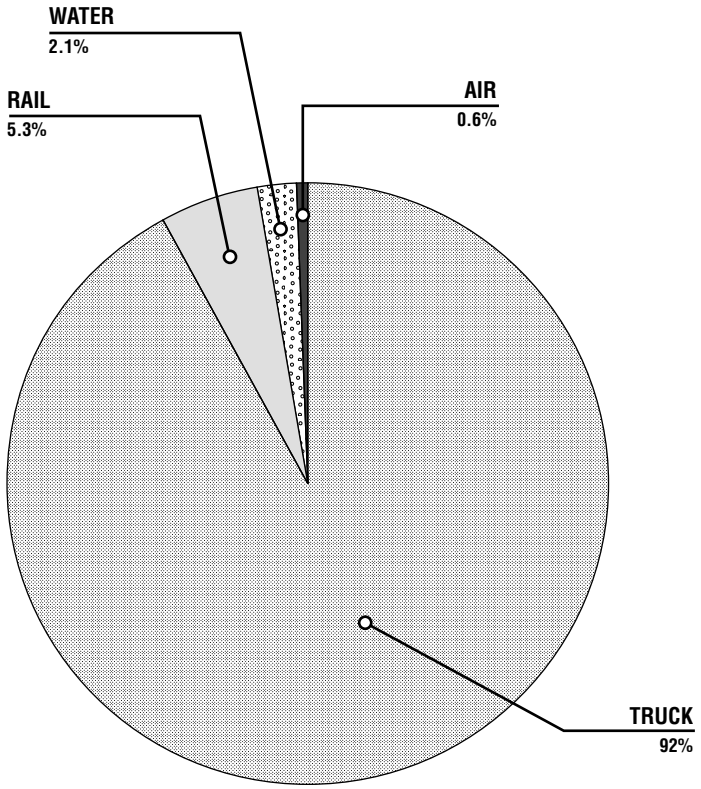
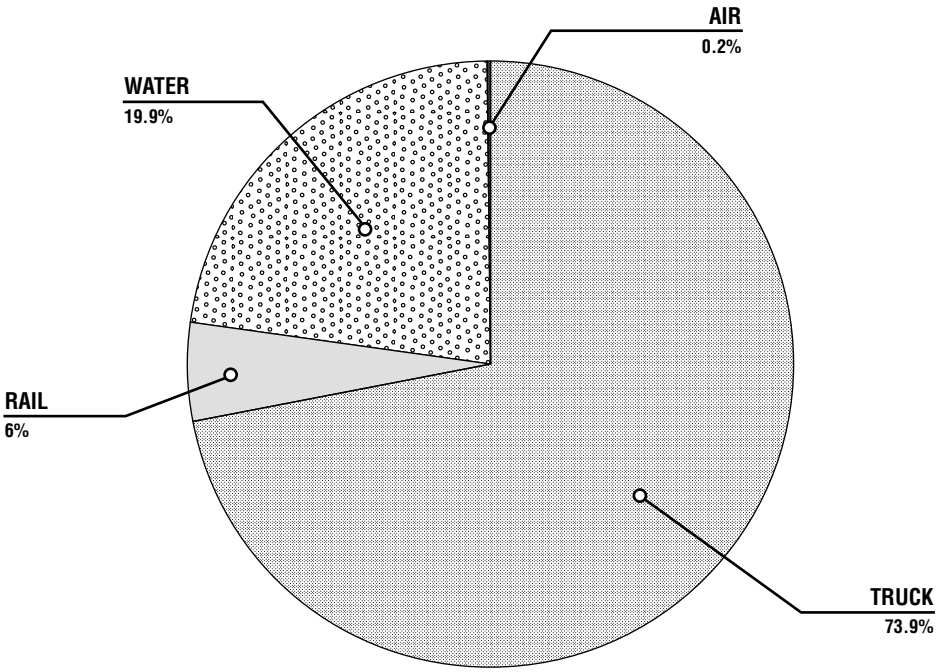


Figure 8-5
30-County Region Freight Transport Mode
CROSS HARBOR FREIGHT MOVEMENT PROJECT

By Weight



By Value

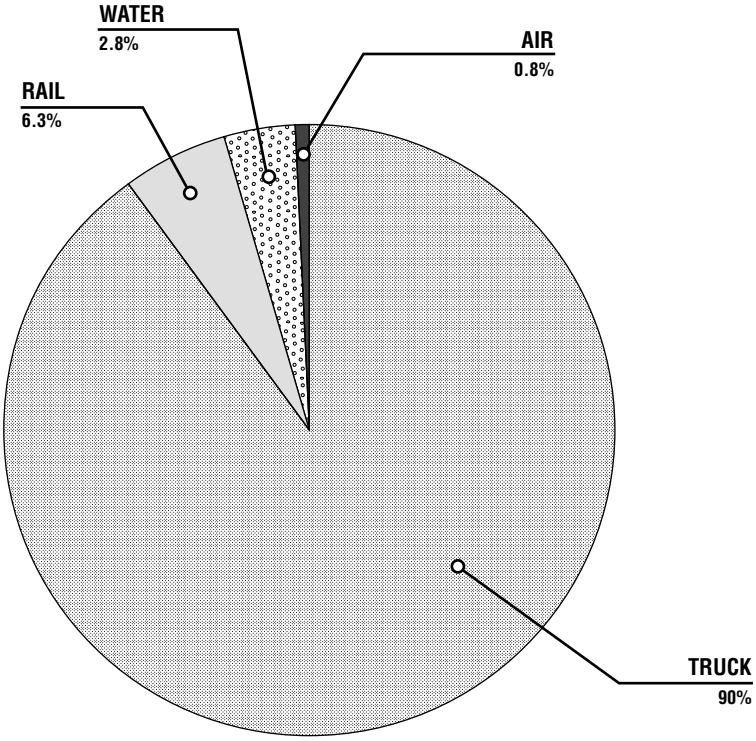


Figure 8-6
11-County Project Area Freight Transport Mode
CROSS HARBOR FREIGHT MOVEMENT PROJECT

10•03

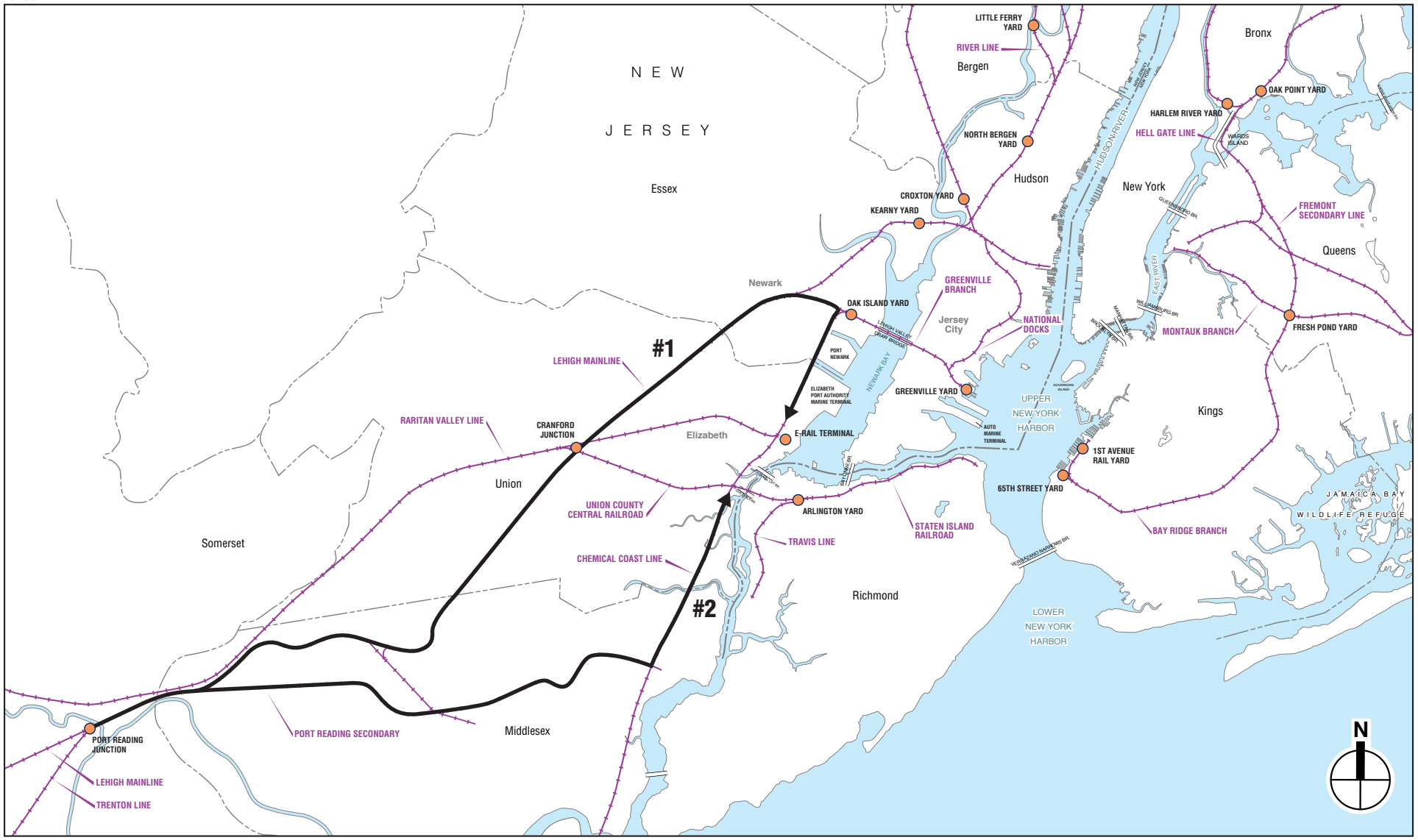


Figure 8-7

Optional Routings to the Staten Island Tunnel Alignment from the South

CROSS HARBOR FREIGHT MOVEMENT PROJECT

10•03

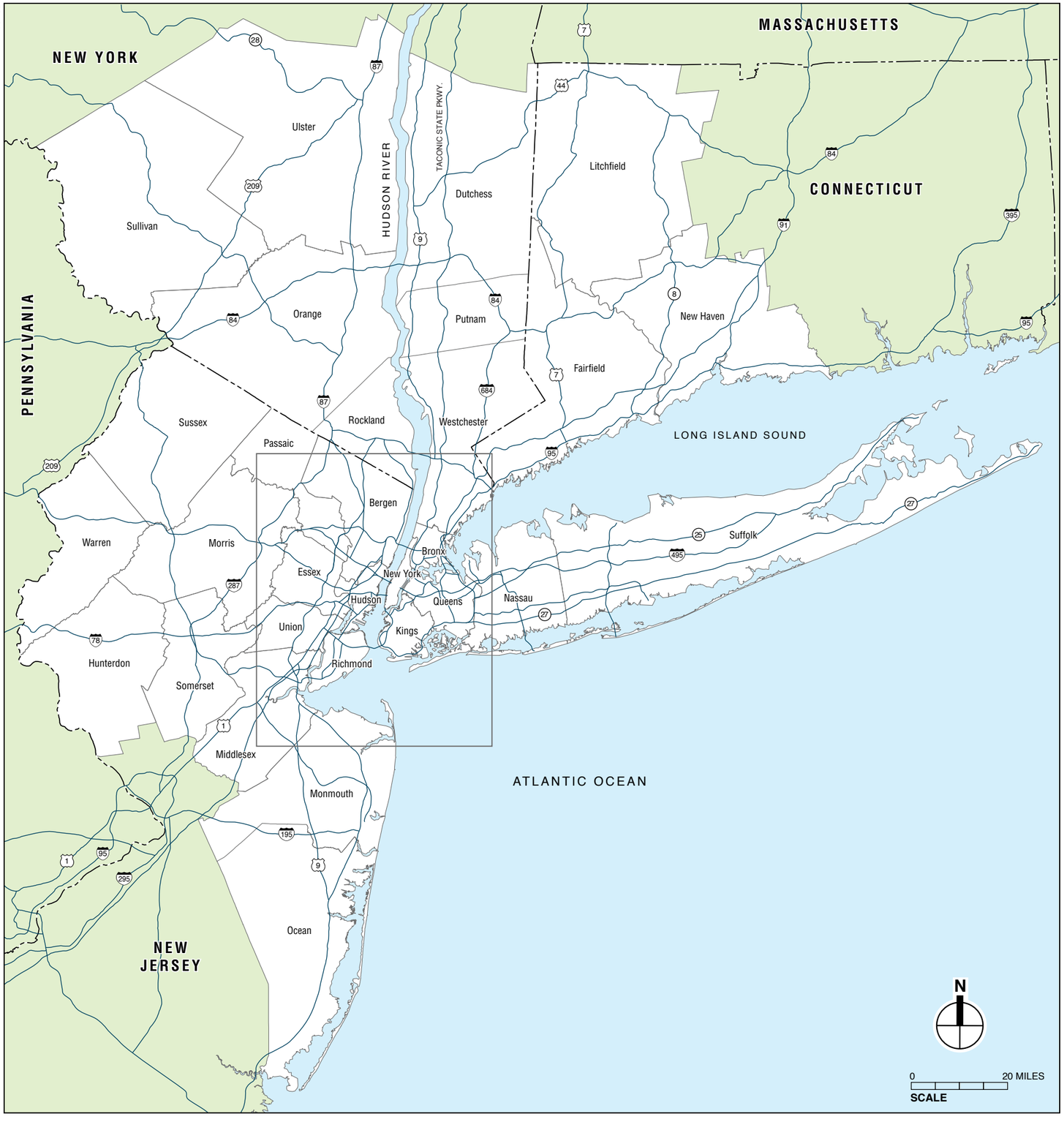




Figure 8-8

Regional Highway System

CROSS HARBOR FREIGHT MOVEMENT PROJECT

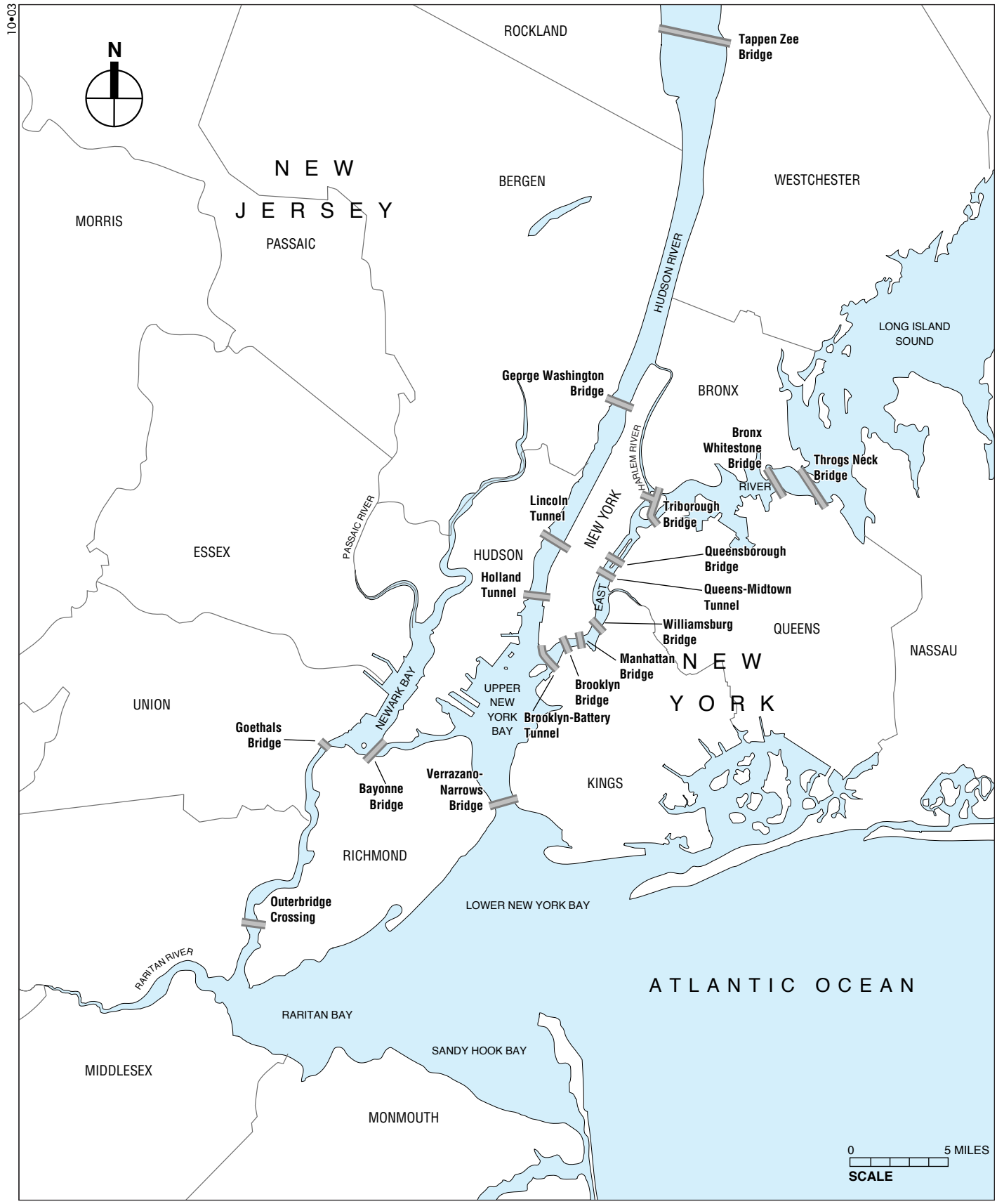


Figure 8-9

Major Bridge and Tunnel Crossings

CROSS HARBOR FREIGHT MOVEMENT PROJECT

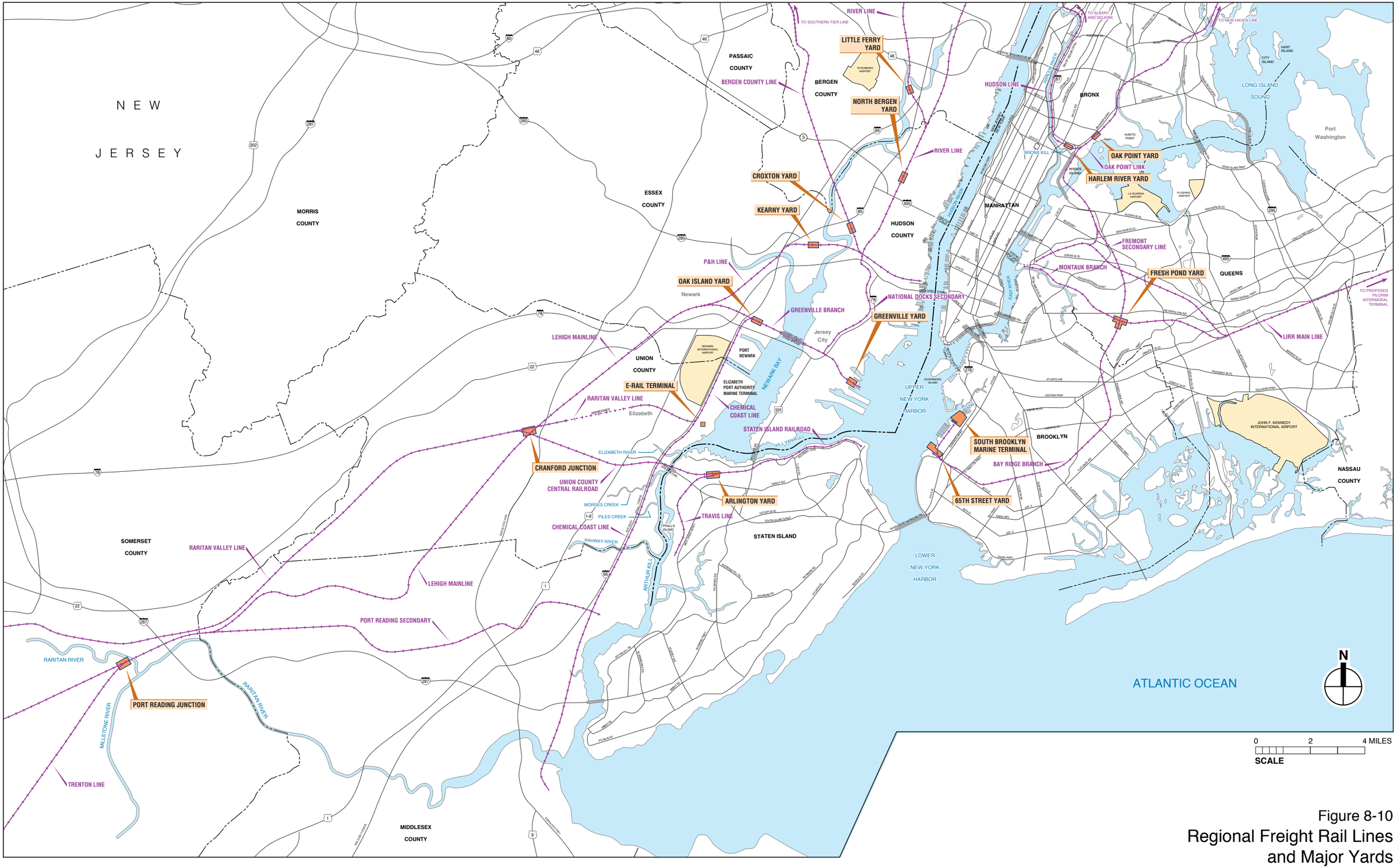


Figure 8-10
Regional Freight Rail Lines and Major Yards

CROSS HARBOR FREIGHT MOVEMENT PROJECT

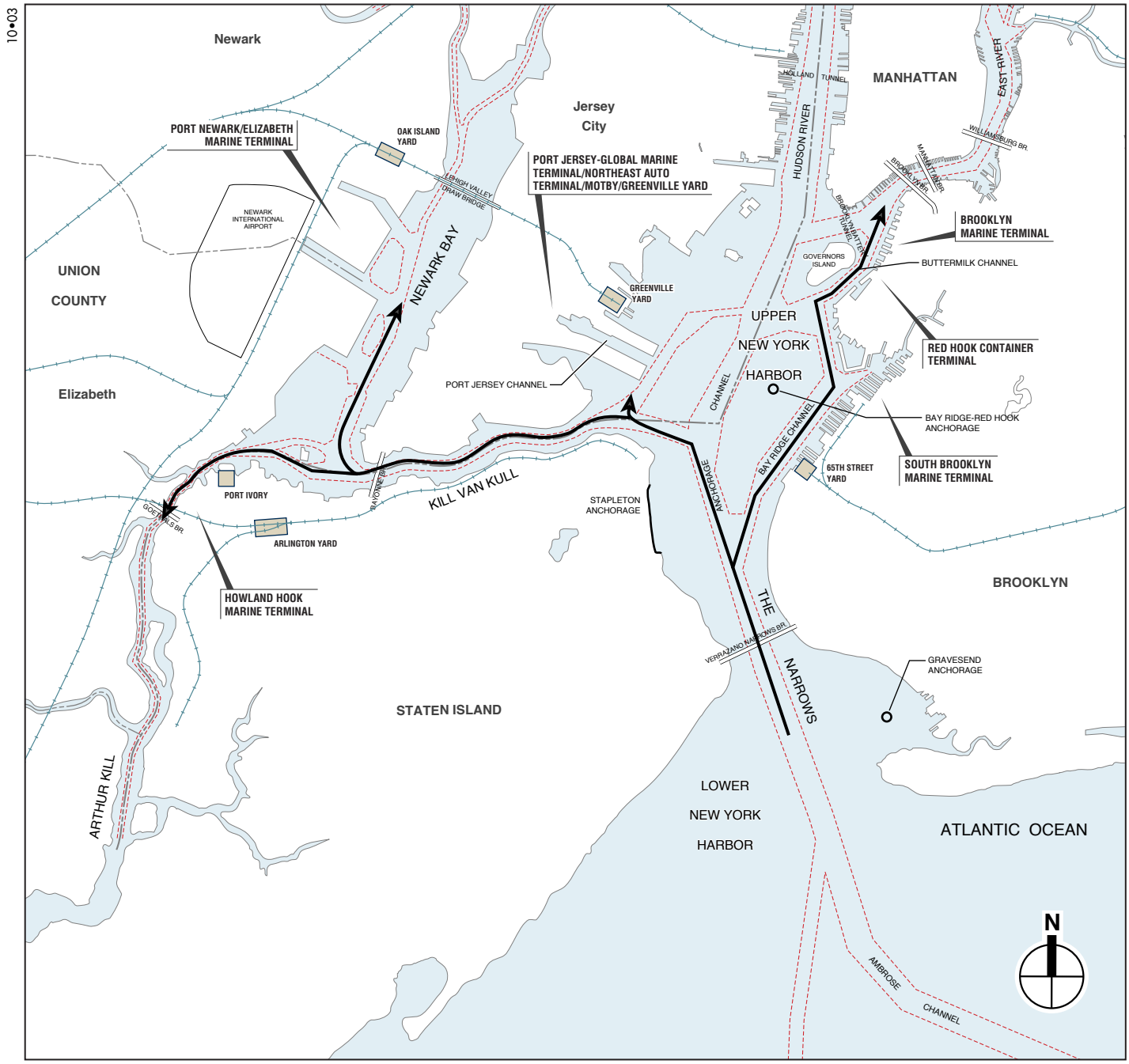
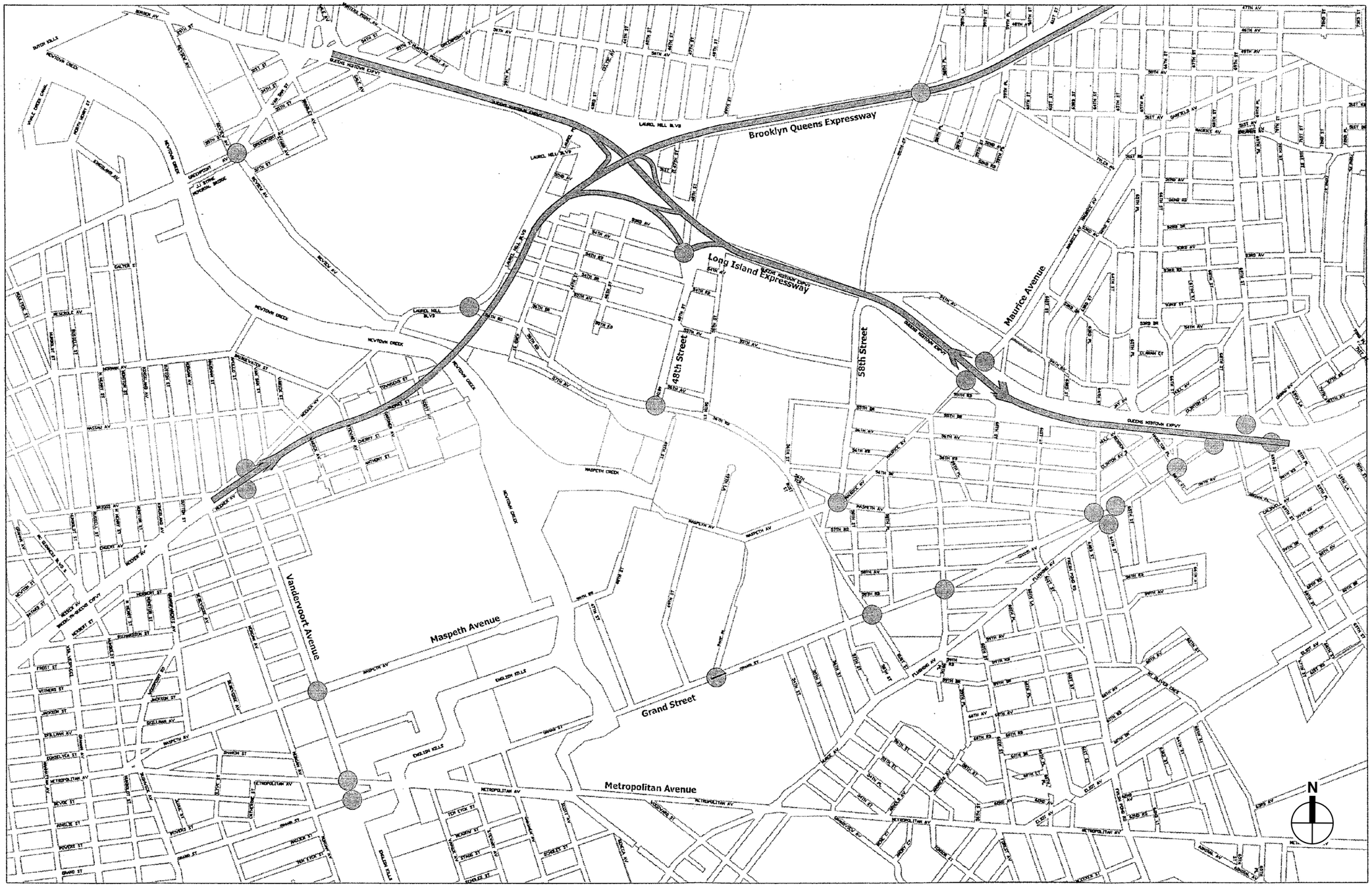


Figure 8-11

Federal Navigational Channels in New York Harbor

CROSS HARBOR FREIGHT MOVEMENT PROJECT

12+03



NOTE: NOT TO SCALE

Figure 8-12
Traffic Study Area
West Maspeth Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

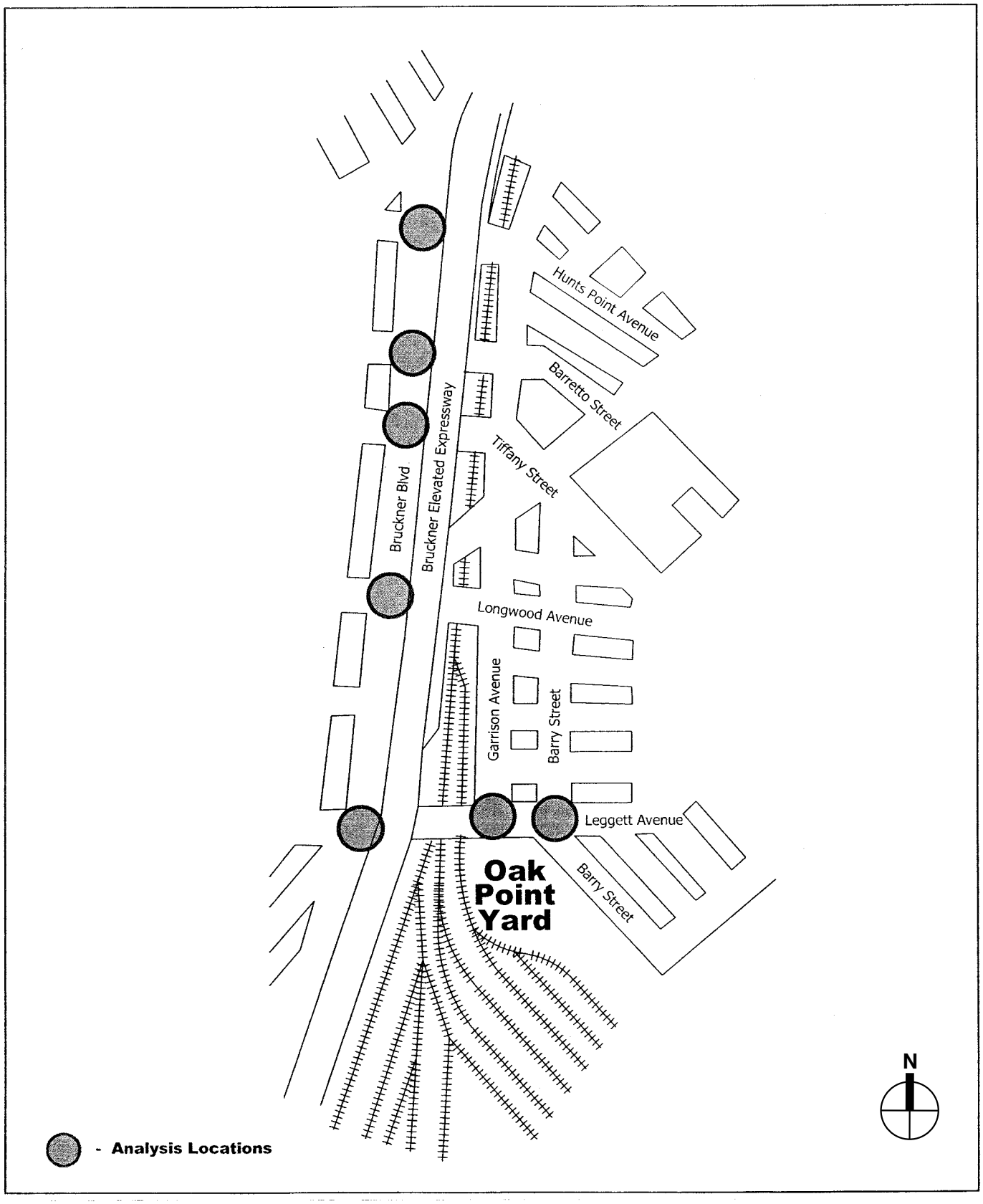


Figure 8-13
Traffic Study Area—Oak Point Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

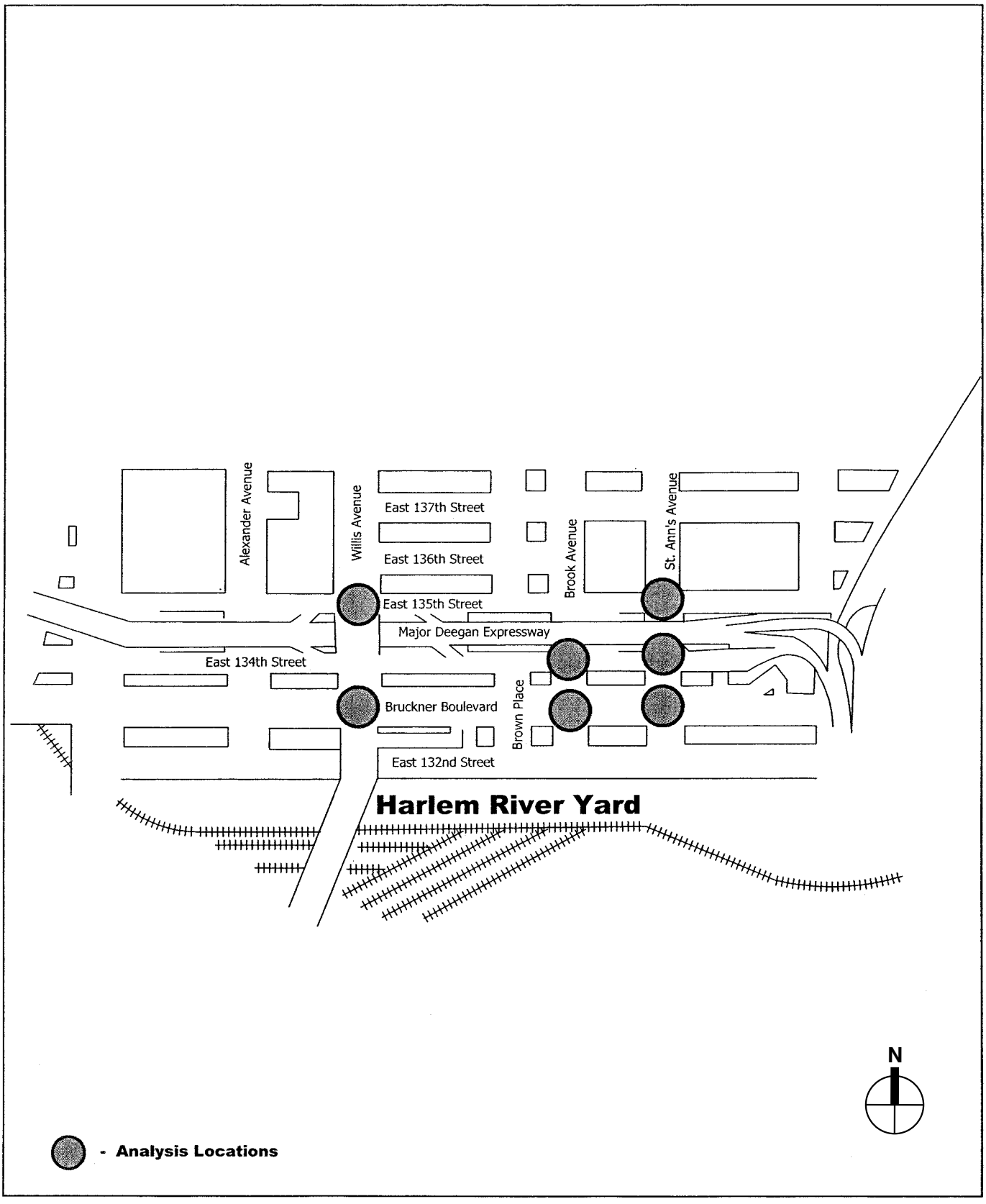


Figure 8-14
Traffic Study Area—Harlem River Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

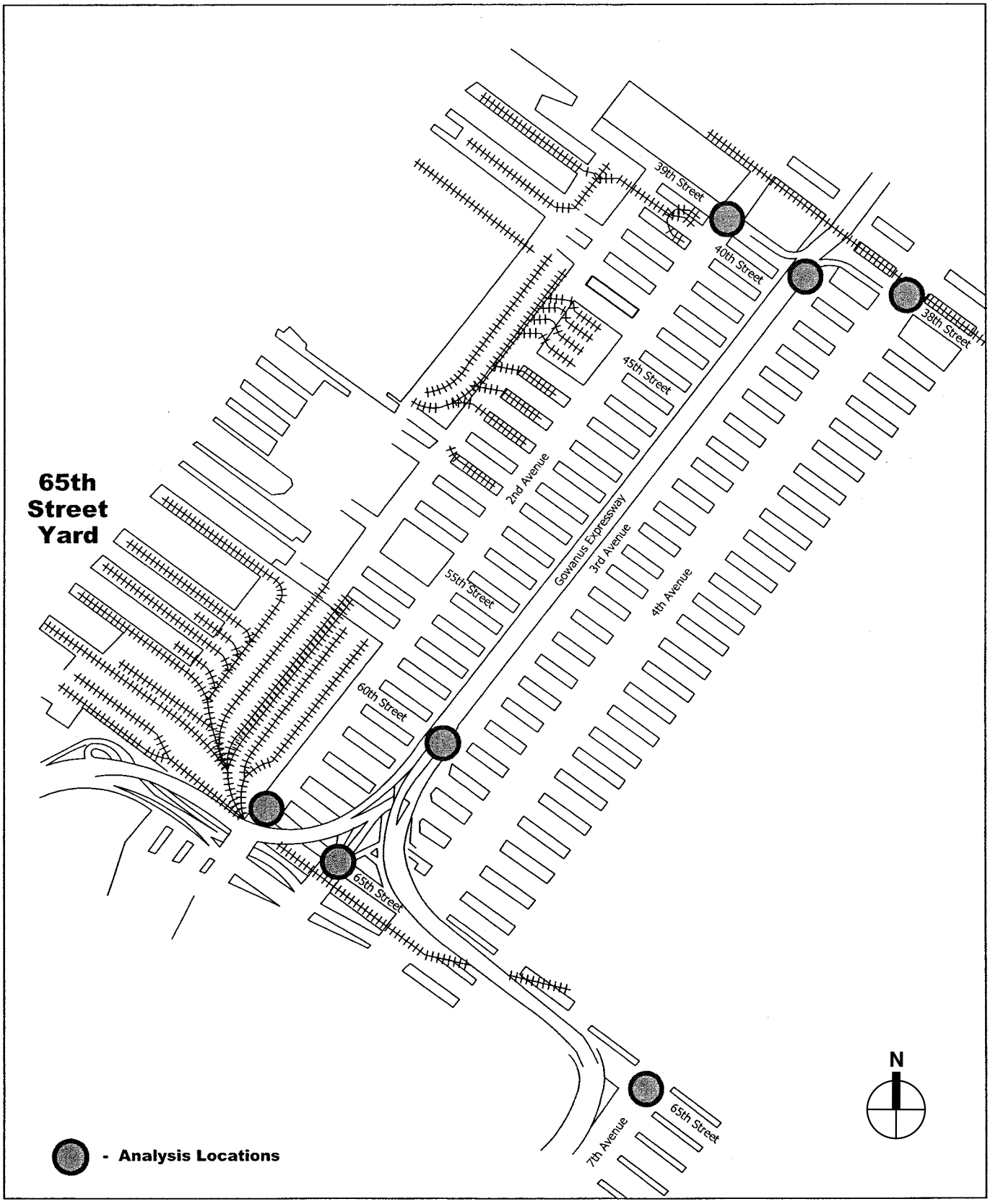


Figure 8-15

Traffic Study Area—65th Street Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

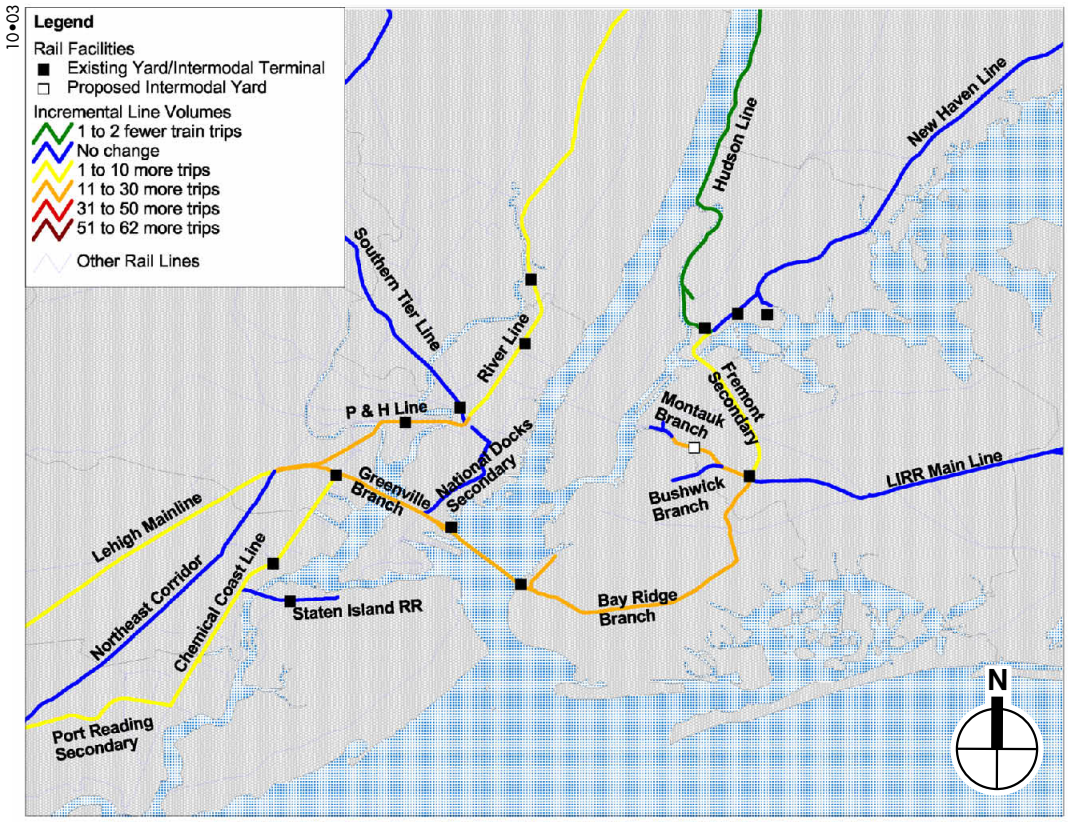


Figure 8-16

Incremental Daily Linehaul Train Trips on Major Regional Corridors

Single Tunnel System-New Jersey Tunnel Alignment

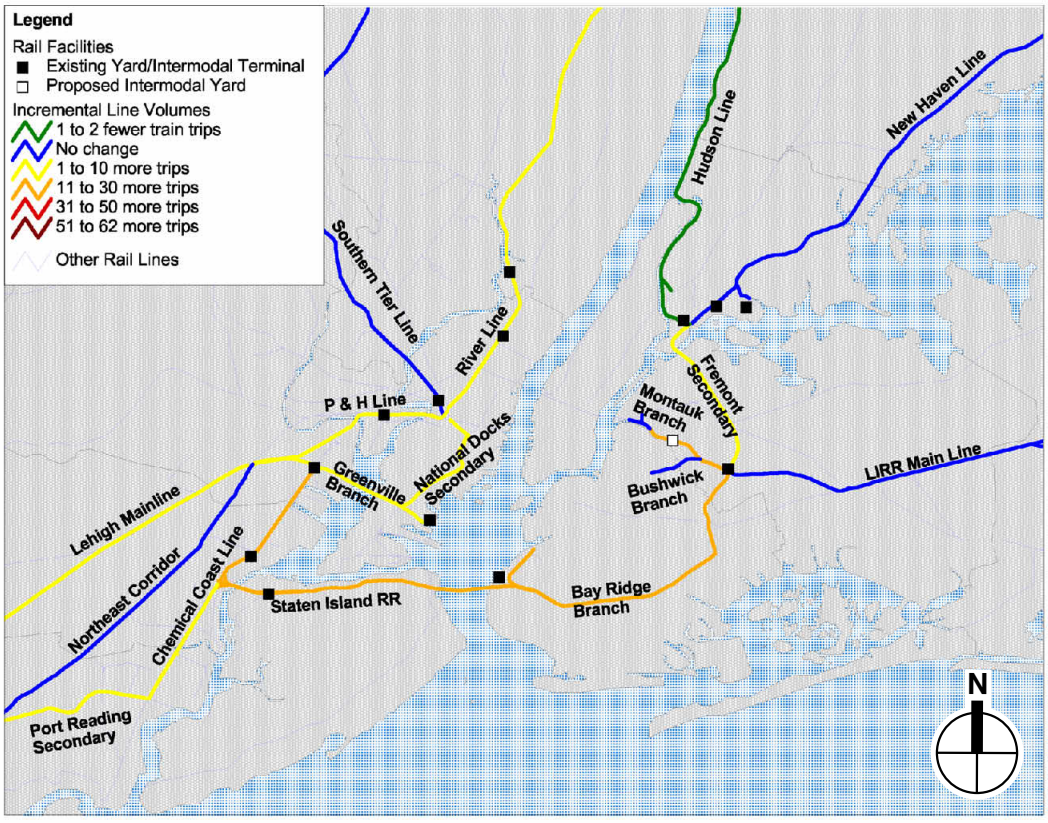


Figure 8-17

Incremental Daily Linehaul Train Trips on Major Regional Corridors

Single Tunnel System-Staten Island Tunnel Alignment

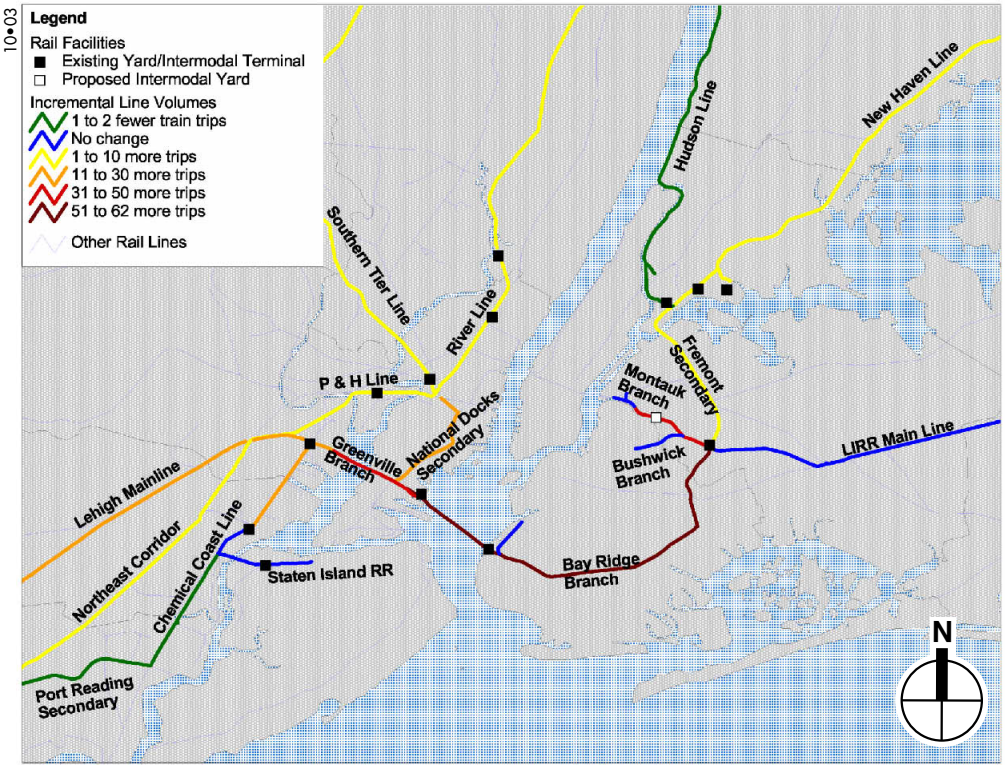


Figure 8-18
Incremental Daily Linehaul Train Trips on Major Regional Corridors
Double Tunnel System-New Jersey Tunnel Alignment

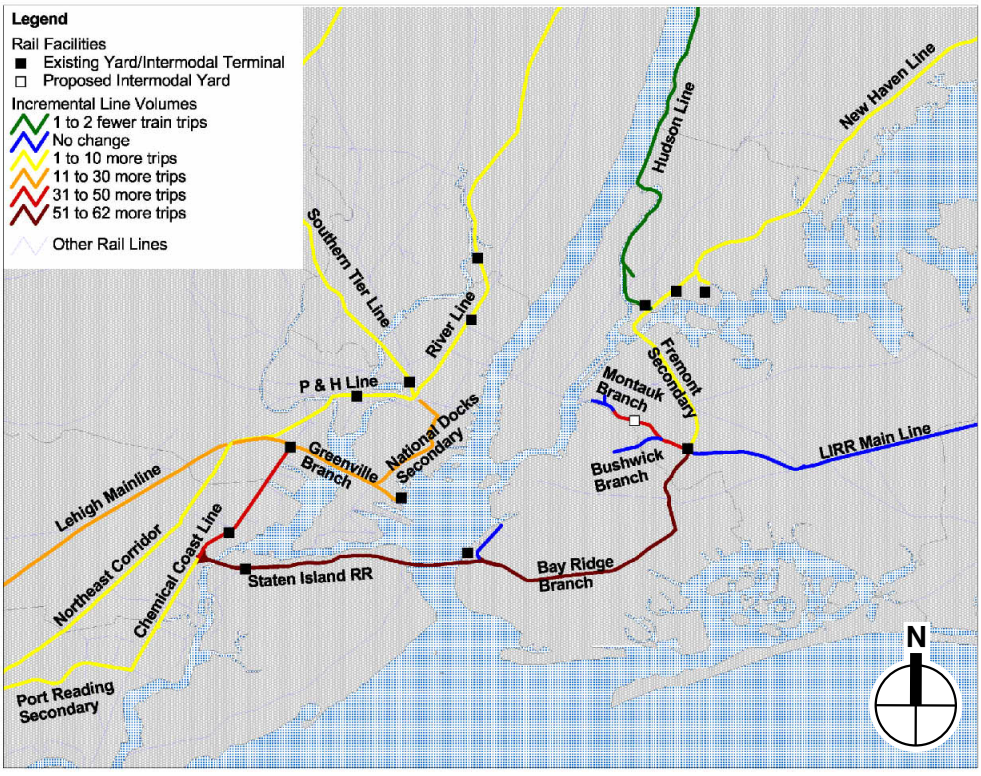


Figure 8-19
Incremental Daily Linehaul Train Trips on Major Regional Corridors
Double Tunnel System-Staten Island Tunnel Alignment

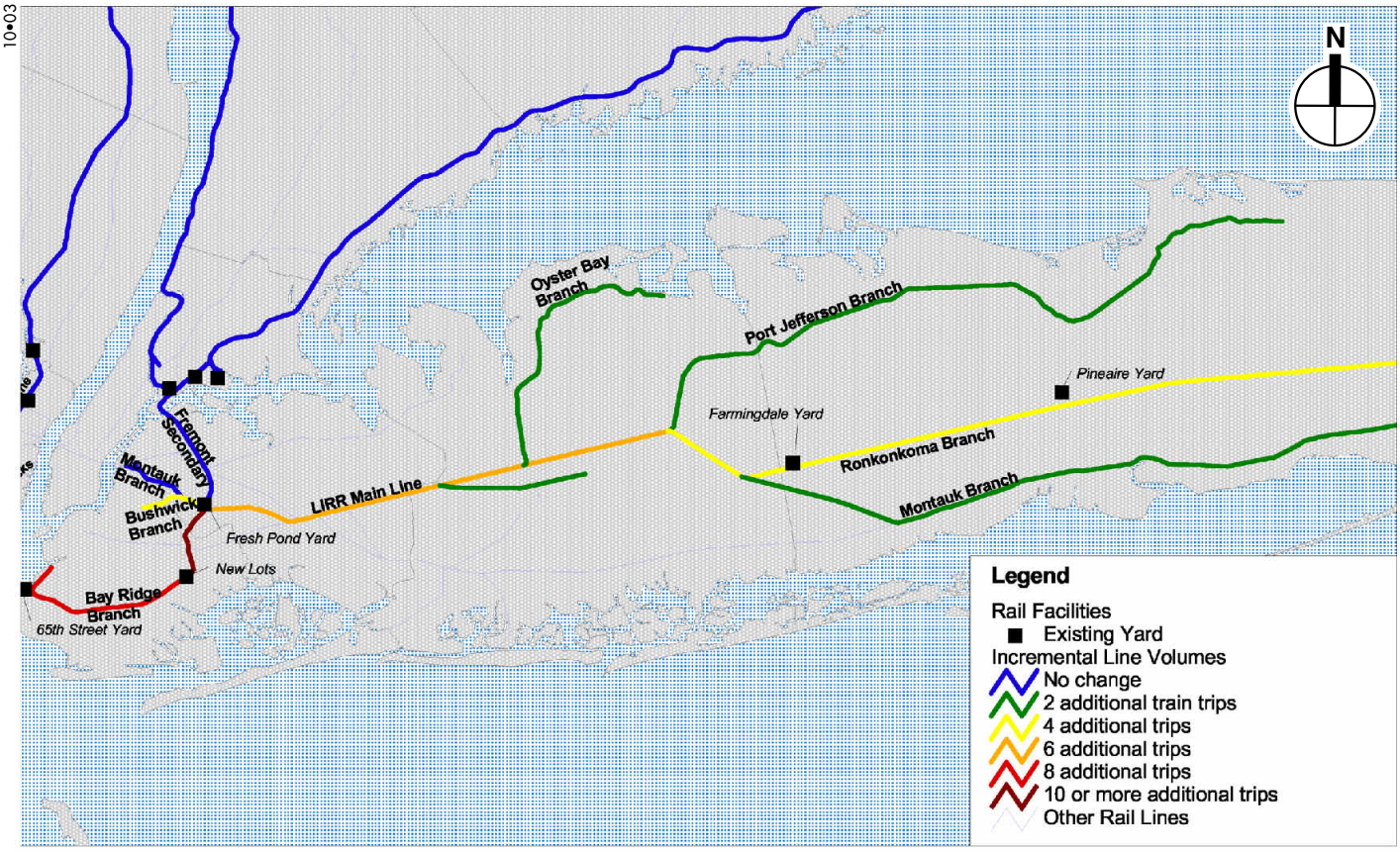
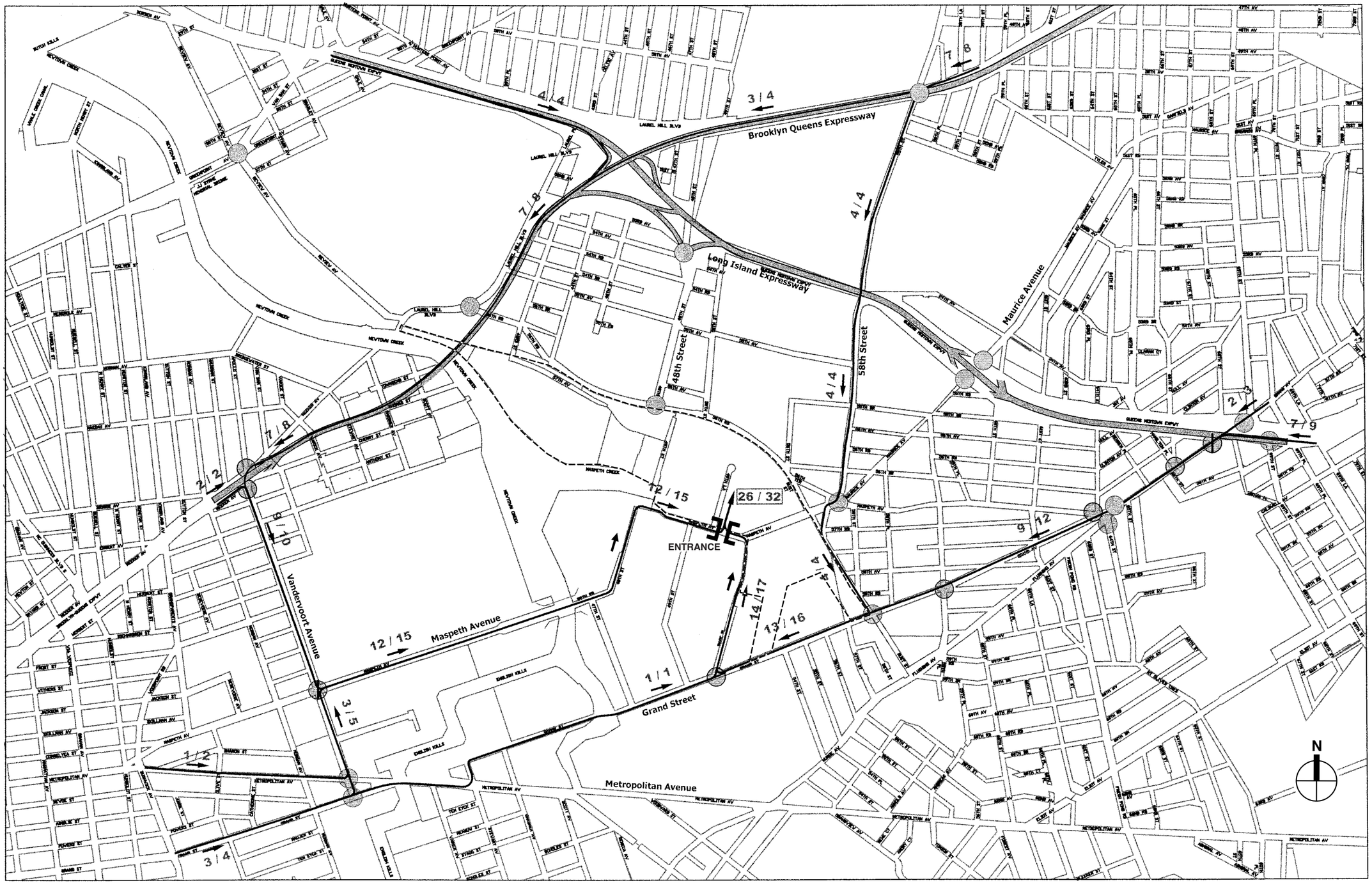


Figure 8-20
Incremental Daily Local Train Trips on Geographic Long Island

12+03



NOTE: NOT TO SCALE

X/X=AM/PM Generated Vehicle Trips

-------- Site Boundary

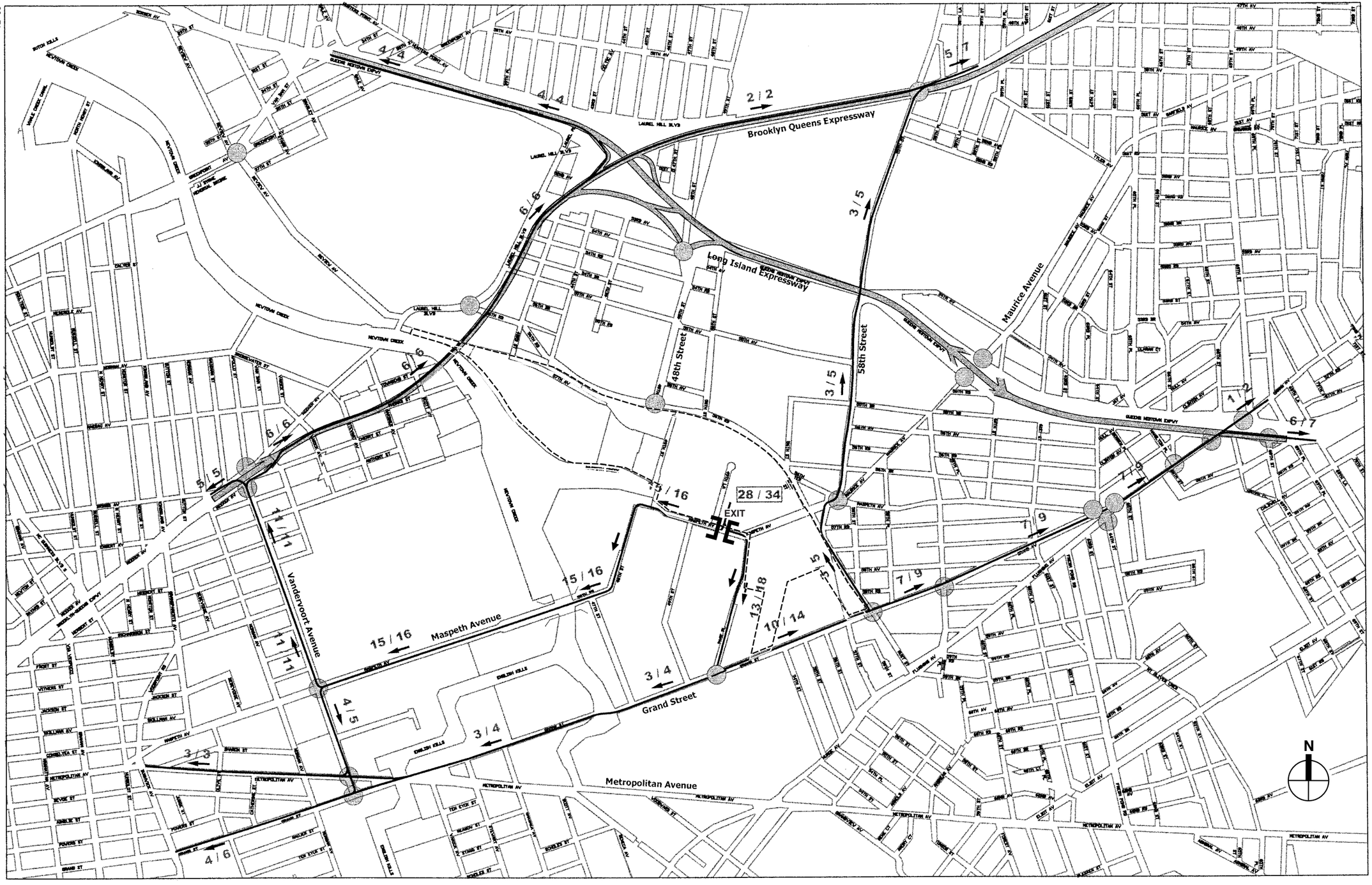
Figure 8-21

Year 2025 Single Tunnel System

Inbound Trips to West Maspeth

CROSS HARBOR FREIGHT MOVEMENT PROJECT

12•03



NOTE: NOT TO SCALE

X/X=AM/PM Generated Vehicle Trips

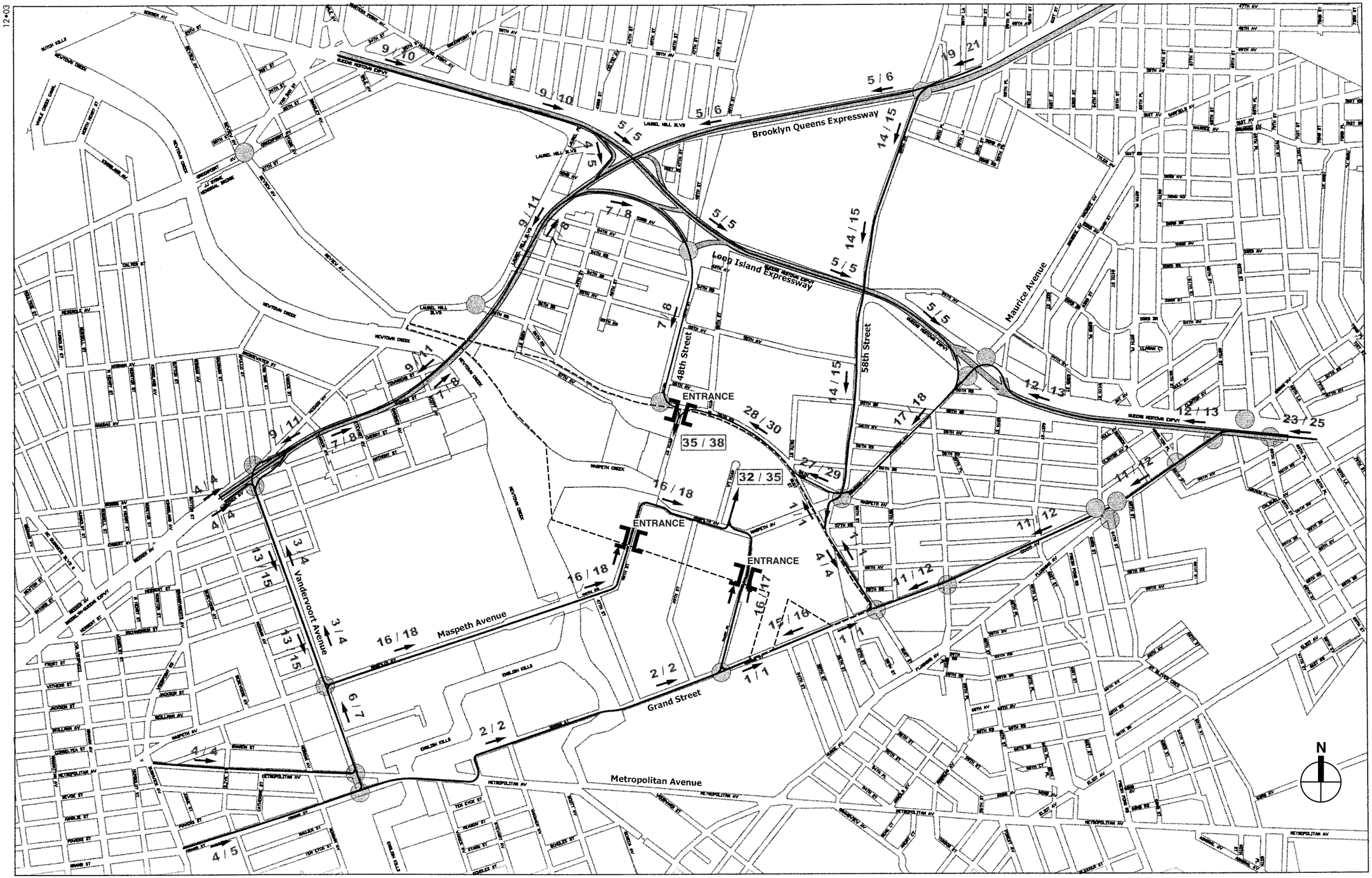
-------- Site Boundary

Figure 8-22

Year 2025 Single Tunnel System
Outbound Trips from West Maspeth

CROSS HARBOR FREIGHT MOVEMENT PROJECT

12•03



NOTE: NOT TO SCALE

X/X=AM/PM Generated Vehicle Trips

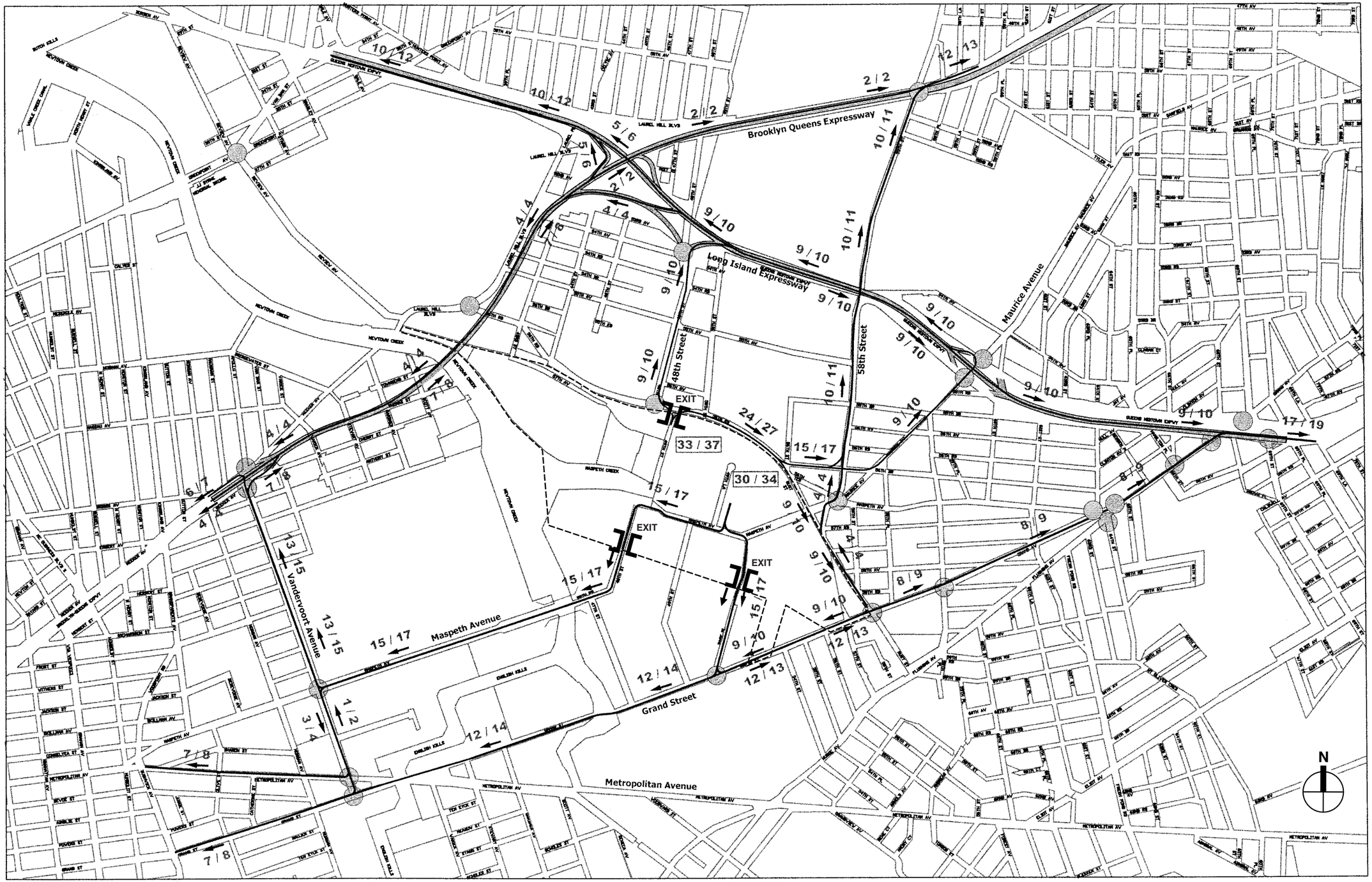
-------- Site Boundary

Figure 8-23

Year 2025 Double Tunnel System

Inbound Trips to West Maspeth

CROSS HARBOR FREIGHT MOVEMENT PROJECT



NOTE: NOT TO SCALE

X/X=AM/PM Generated Vehicle Trips

-------- Site Boundary

Figure 8-24

Year 2025 Double Tunnel System
Outbound Trips from West Maspeth

CROSS HARBOR FREIGHT MOVEMENT PROJECT

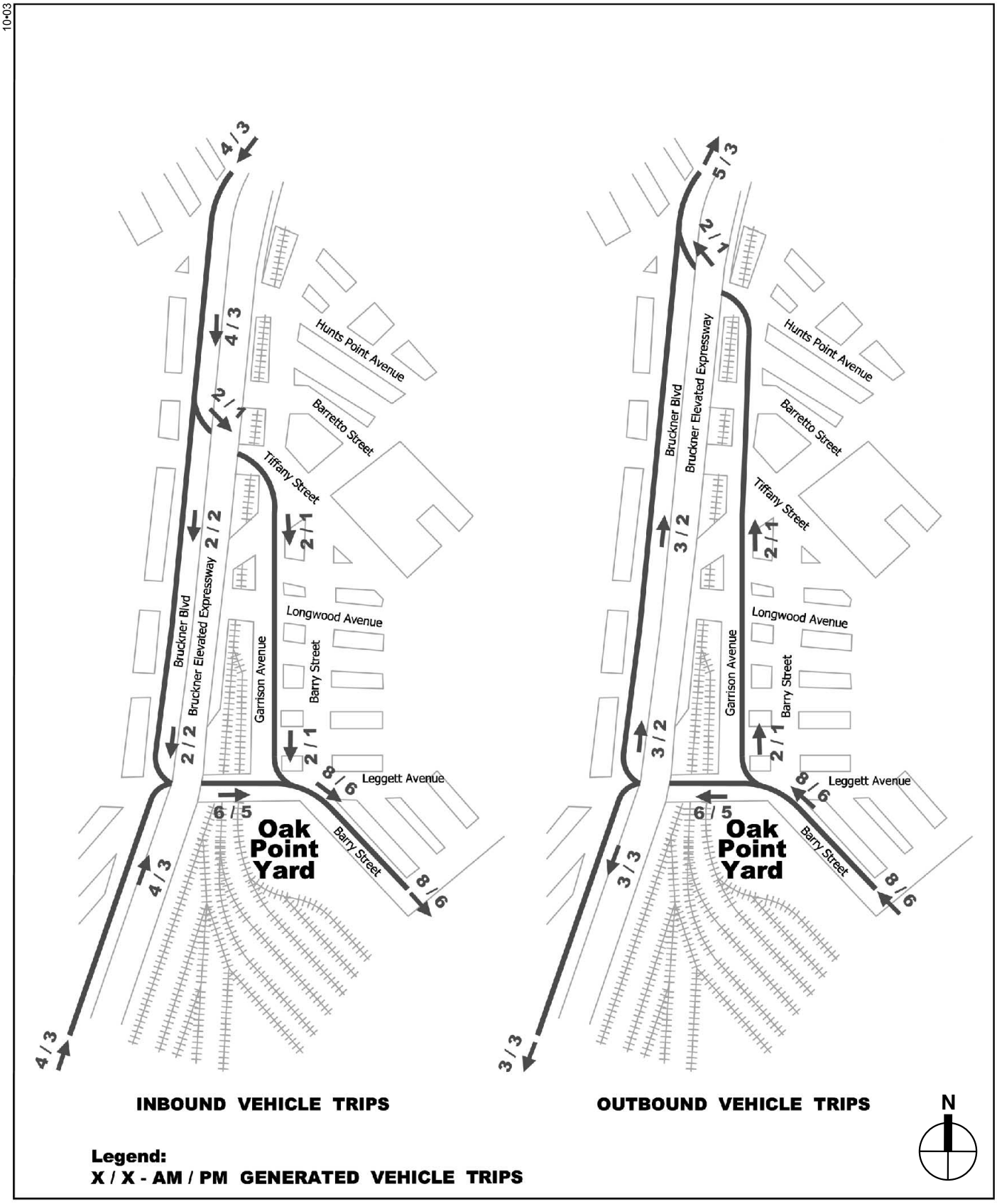


Figure 8-25

Single Tunnel System • Trips to Oak Point Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

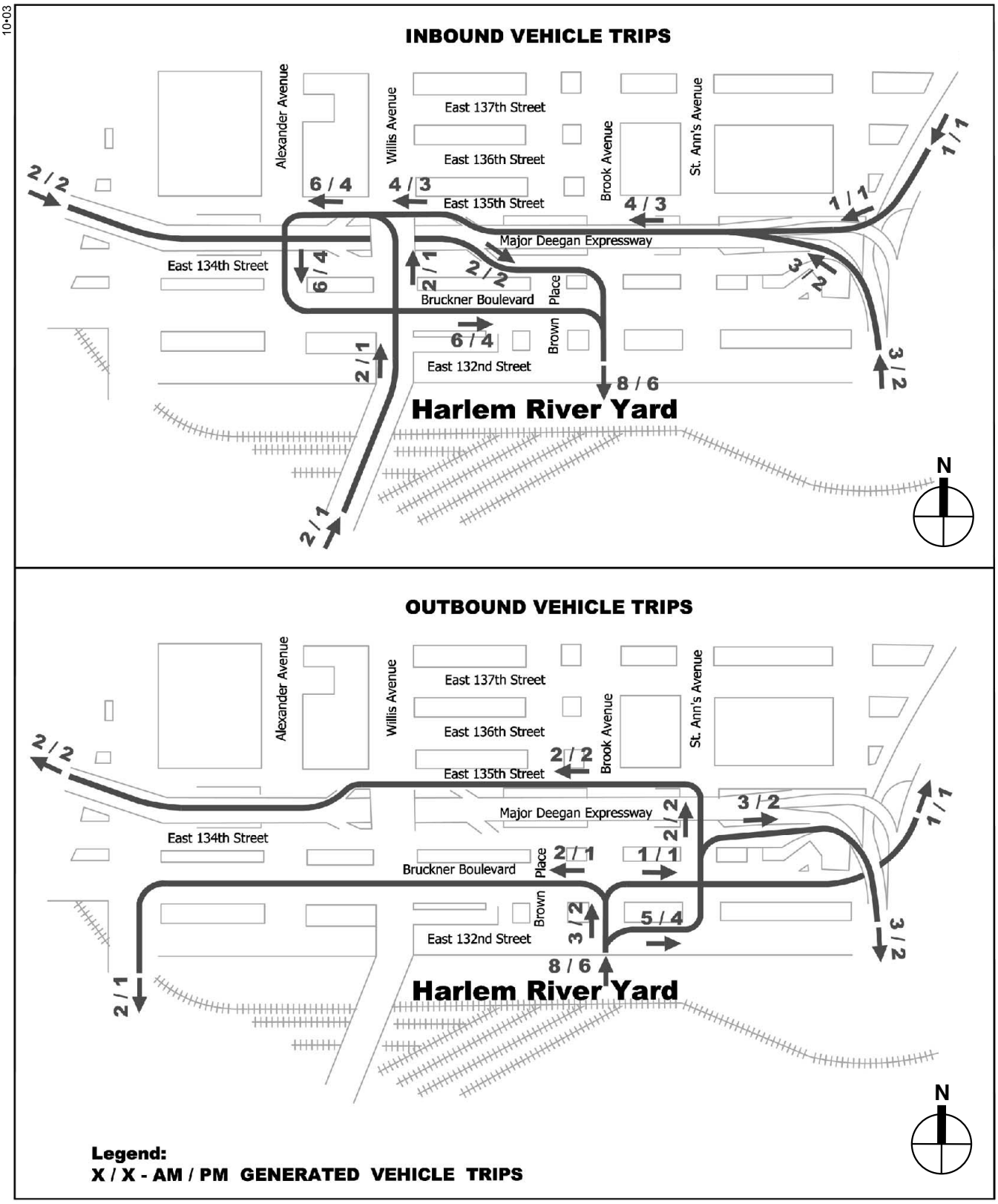


Figure 8-26

Single Tunnel System • Trips to Harlem River Yard

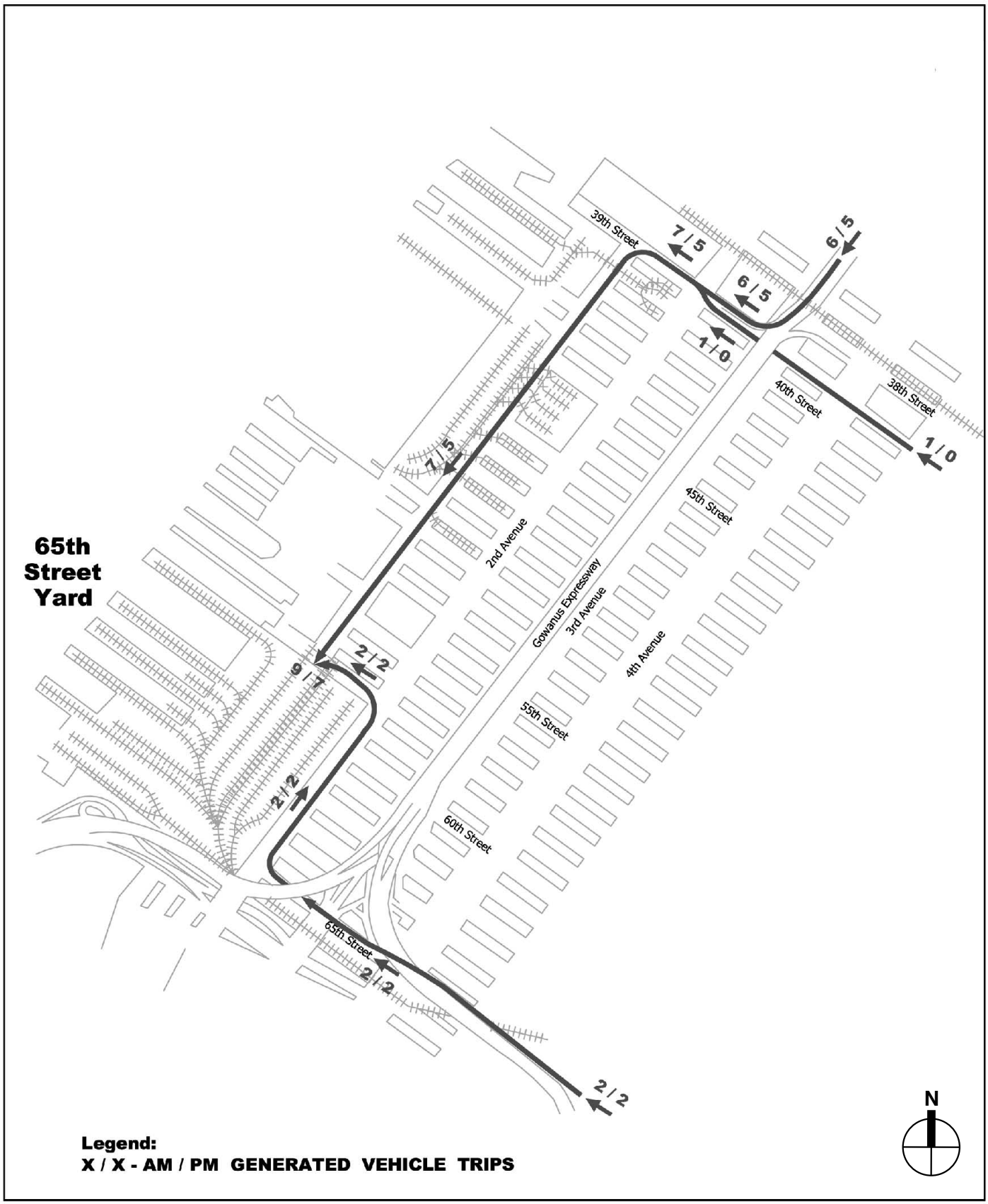


Figure 8-27

Single Tunnel System • Inbound Trips to 65th Street Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

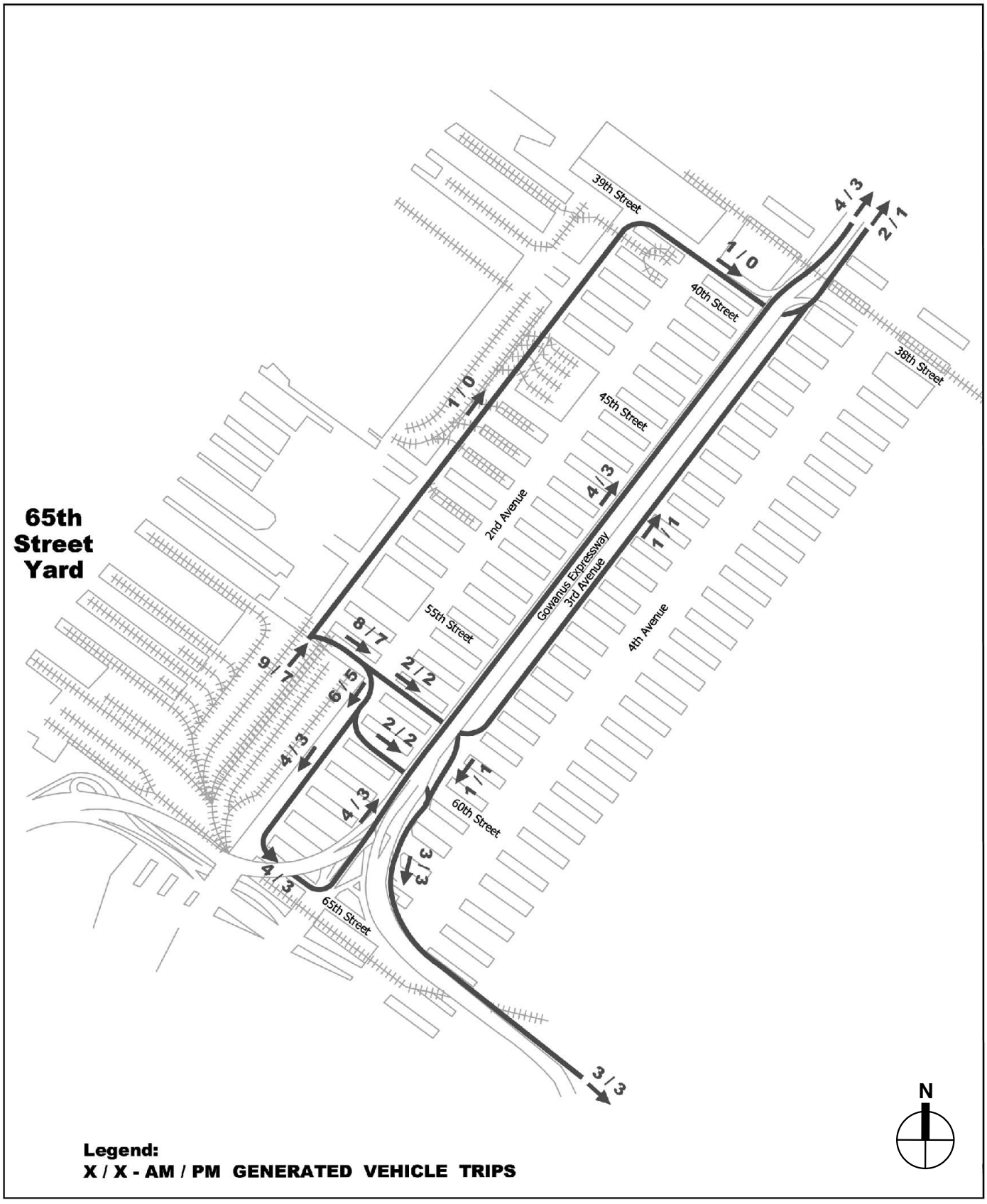


Figure 8-28

Single Tunnel System • Outbound Trips from 65th Street Yard

CROSS HARBOR FREIGHT MOVEMENT PROJECT

10•03

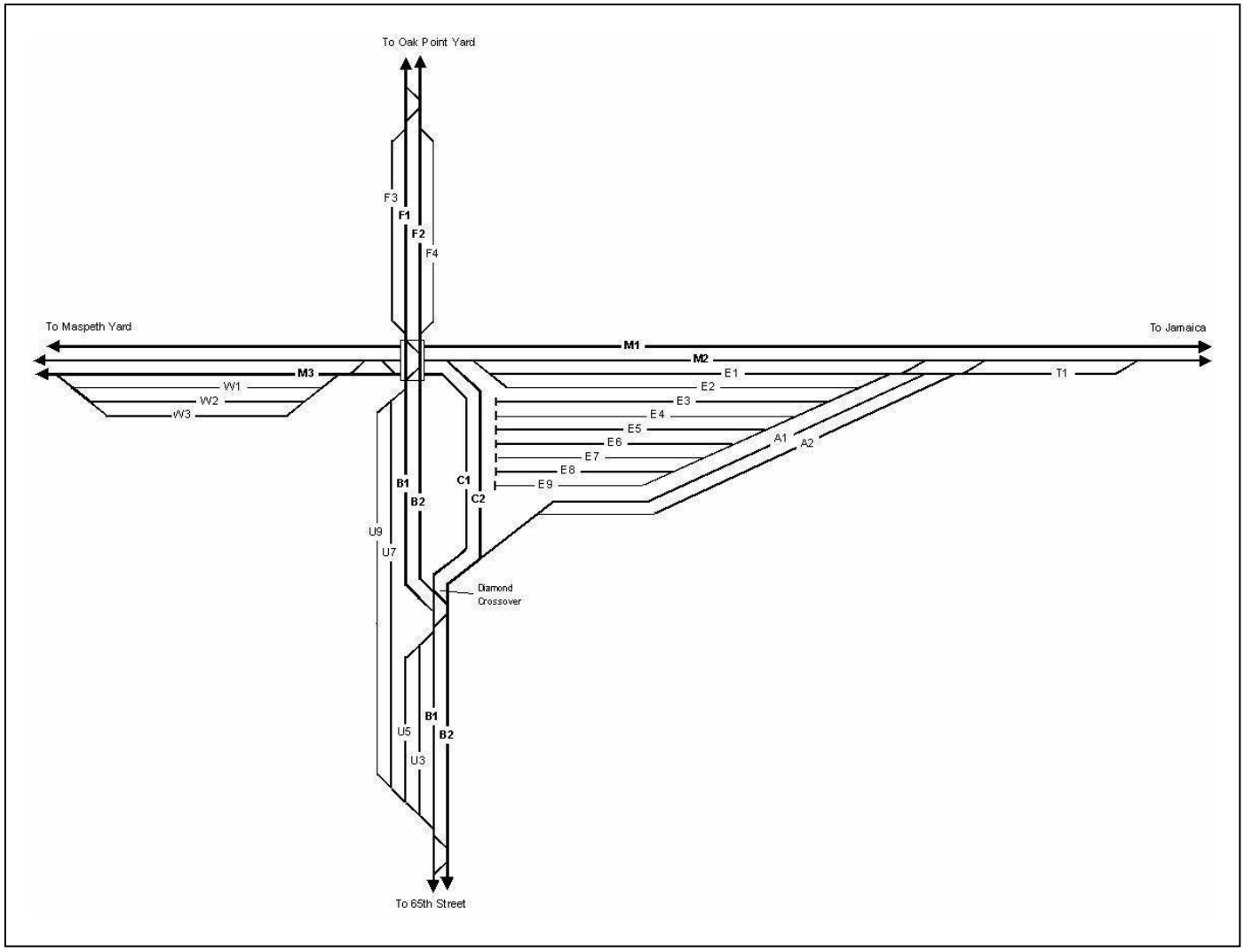


Figure 8-29
Schematic Track Layout for Fresh Pond Yard

A. INTRODUCTION AND METHODOLOGY

The effects of the project alternatives on air quality are analyzed in this chapter. Air quality can be affected by air pollutants produced by moving sources, such as vehicular and rail traffic, and by fixed or immobile sources, such as tunnel portals and ventilation shafts. While the project alternatives would result in an overall decrease in regional pollutant emissions because they would reduce truck miles traveled, they would increase vehicular emissions locally in the vicinity of existing or proposed rail yards where truck traffic would be expected to increase. In addition, the project alternatives would result in an increase in the operations of diesel-powered locomotives at various locations throughout the study area, including rail yards, rail lines, and tunnels. Investigated in this chapter is the potential of the project alternatives to reduce regional emissions, and the potential of the predicted local emission increases to cause adverse impacts on local air quality. Construction-related air quality effects are discussed in Chapter 16, "Construction and Construction Impacts."

POLLUTANTS FOR ANALYSIS

In the New York Metropolitan Area, ambient concentrations of carbon monoxide are predominantly influenced by mobile source emissions, emissions of particulate matter and nitrogen oxides come from both mobile and stationary sources, and emissions of sulfur dioxide is associated mainly with stationary sources. Ozone, one of the region's most problematic air pollutants, is not emitted directly by any source but is formed in the atmosphere from the reaction of other pollutants.

CARBON MONOXIDE

Carbon monoxide (CO), a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In an urban area, approximately 80 to 90 percent of CO emissions are from motor vehicles. CO concentrations can vary greatly over relatively short distances. Elevated concentrations are usually limited to locations near crowded intersections, along heavily traveled and congested roadways or at parking lots or garages. Consequently, CO concentrations must be predicted on a localized or microscale basis. Project alternatives would result in additional vehicular traffic (employee and truck) at various locations in the area of the proposed yard sites and, therefore, an analysis of the impact from traffic increases on CO levels at critical intersections in the project study area was performed. In addition, an analysis was performed to determine the effect of increased locomotive operation on local CO levels. A regional analysis was performed for CO, computing expected reductions of CO emitted in a year, to determine potential benefits resulting from the general changes in vehicular activity on overall background levels of this pollutant.

NITROGEN OXIDES AND OZONE

Nitrogen oxides (NO_2, and NO calculated as NO_2, together referred to as "NO_x" are of principal concern because of their role, together with volatile organic compounds (VOCs), as precursors in the formation of ozone. While there is a standard for average annual nitrogen dioxide (NO_2) concentrations, it is normally examined only for fossil fuel energy sources. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from mobile sources are therefore generally examined on a regional basis, together with the emissions of these pollutants from stationary sources. The change in regional mobile source emissions of these pollutants is related to the total number of vehicle trips and vehicle miles of travel throughout the New York Metropolitan Area, which is designated as a severe non-attainment area for ozone by USEPA. The project alternatives would potentially result in changes to the regional vehicular travel patterns in the study area zones. Therefore, the change in regional NO_x and VOC emissions was analyzed. In addition, because the tunnel dictates emissions within a closed space, and their concentrated release into the atmosphere from a stationary point, an analysis of NO_x emissions from the ventilation system and its effects on ambient NO_2 concentrations was performed.

LEAD

Lead emissions are principally associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, and all produced after 1980, are designed to use unleaded fuel. As these newer vehicles have replaced the older ones, motor-vehicle-related lead emissions have decreased. As a result, ambient concentrations of lead have declined significantly. Nationally, the average measured atmospheric lead level in 1985 was only about one-quarter the level in 1975. In 1985, USEPA announced new rules drastically reducing the amount of lead permitted in leaded gasoline. The maximum allowable lead level in leaded gasoline was reduced from the previous limit of 1.1 to 0.5 grams per gallon effective July 1, 1985, and to 0.1 grams per gallon effective January 1, 1986. Monitoring results indicate that this action has been effective in significantly reducing atmospheric lead levels. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the national standard of 1.5 micrograms per cubic meter (3-month average). No significant sources of lead are associated with the proposed project, and, therefore, an analysis was not warranted.

RESPIRABLE PARTICULATE MATTER—PM_{10} AND $PM_{2.5}$

Particulate matter (PM) is a broad class of air pollutants, composed of discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets or solids suspended in the atmosphere (aerosols). The constituents of PM are both numerous and varied, and they are emitted by a wide variety of sources (both natural and anthropogenic). Natural sources include the condensed and reacted forms of natural organic vapors; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and debris from live and decaying plant and animal life; particles eroded from beaches, soil and rock; particles emitted from volcanic and geothermal eruptions and from forest fires. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, home heating), chemical and manufacturing processes, all types of construction,

agricultural activities, as well as wood-burning stoves and fireplaces in areas where this is common practice in the winter.

Fine Particulate Matter, or $PM_{2.5}$, are "fine particles" with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$). This smaller fraction of the particle size range has the ability to reach the lower regions of the respiratory tract, contains higher levels of toxic and carcinogenic compounds, and is also extremely persistent in the atmosphere. $PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary particulate matter (often after the release from an exhauster or stack) or from precursor gases reacting in the atmosphere (secondary particulate matter). Since diesel-powered vehicles, especially heavy trucks and buses, as well as diesel-powered locomotives, do emit particles; particulate concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel-powered vehicles or in the vicinity of diesel trains or barge operations. An analysis of $PM_{2.5}$ and PM_{10} (particles with an aerodynamic diameter of less than or equal to 10 micrometers) has been conducted for the proposed project.

SULFUR DIOXIDE

Sulfur dioxide (SO_2) emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. Due to the federal restrictions on the sulfur content in diesel fuel for on-road vehicles, no significant quantities are emitted from vehicular sources. However, diesel-fueled locomotives do emit SO_2 and, therefore, an analysis of the effects of additional rail freight operations on ambient levels of this pollutant in the vicinity of the tunnel portals and ventilation facilities were conducted.

AIR QUALITY STANDARDS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the Clean Air Act, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: carbon monoxide, nitrogen dioxide, ozone, respirable particulate matter, sulfur dioxide, and lead. USEPA recently promulgated additional respirable particulate matter standards. In addition to retaining the PM_{10} standards, USEPA adopted 24-hour and annual standards for respirable particulate matter with an aerodynamic equivalent diameter less than 2.5 μm ($PM_{2.5}$), which became effective September 16, 1997. However, USEPA has yet to implement the new standards. Table 9-1 shows the standards for these pollutants. These standards have also been adopted as the ambient air quality standards for the States of New York and New Jersey. The primary standards protect the public health, and represent levels at which there are no known significant effects on human health. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. For CO, NO_2, ozone, and respirable particles, the primary and secondary standards are the same.

Table 9-1
National and New York State Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	PPM	$\mu g/m^3$	PPM	$\mu g/m^3$
Carbon Monoxide (CO)				
Maximum 8-Hour Concentration[1]	9	(10,000)		None
Maximum 1-Hour Concentration[1]	35	(40,000)		
Lead				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months	N/A	1.5		None
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.053	(100)	0.053	(100)
Ozone				
1-Hour Average[2]	0.12	(235)	0.12	(235)
8-Hour Average[3]	0.08	(157)	0.08	(157)
Total Suspended Particulates (TSP)[3,4]				
Annual Mean	N/A	75		N/A
Maximum 24-Hour Concentration	N/A	250		
Respirable Particle Matter (PM_{10})				
Annual Arithmetic Mean	N/A	50		50
Maximum 24-Hour Concentration[5]	N/A	150		150
Fine Respirable Matter ($PM_{2.5}$)				
Most Recent 3-Year Arithmetic Mean	N/A	15		15
Maximum 24-Hour Concentration[6]	N/A	65		65
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	(80)	N/A	N/A
Maximum 24-Hour Concentration[1]	0.14	(365)	N/A	N/A
Maximum 3-Hour Concentration[1]	N/A	N/A	0.50	(1,300)

Notes:

Parenthetical values are approximately equivalent concentrations.

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

N/A = Not Applicable

[1] Not to be exceeded more than once a year.

[2] Applies only to areas designated as non-attainment.

[3] Three-year average of the annual fourth highest daily maximum 8-hr average concentration.

[4] TSP levels are regulated by a New York State Standard only.

[5] Not to be exceeded by the 99th percentile of 24-hour PM_{10} concentrations in a year (averaged over three years.

[6] Not to be exceeded by the 98th percentile of 24-hour $PM_{2.5}$ concentrations in a year (averaged over three years).

Sources: 40 CFR Part 50—National Primary and Secondary Ambient Air Quality Standards, 6 NYCRR Part 257—Air Quality Standards.

INTERIM GUIDANCE CRITERIA REGARDING $PM_{2.5}$

The above mentioned 24-hour and annual average NAAQS for $PM_{2.5}$, aimed at protecting public health and welfare, came into effect September 16, 1997. These standards have also been adopted by the State of New York.

The New York State Department of Environmental Conservation (NYSDEC) is currently reviewing and evaluating the $PM_{2.5}$ ambient air quality monitoring data that have been collected within the City. At this time, USEPA has not yet formally determined if the measured $PM_{2.5}$ levels in New York City indicate whether the City (or counties within the City) will be designated as either attainment (i.e., meeting the standards) or non-attainment (i.e., not meeting the standards) with respect to the $PM_{2.5}$ ambient air quality standards.

New York City Department of Environmental Protection (NYCDEP) is currently using interim guidance criteria for evaluating the potential $PM_{2.5}$ impacts from NYCDEP projects under City Environmental Quality Review (CEQR). The interim guidance criteria, currently used by NYCDEP[1] for determination of potential significant adverse impacts from $PM_{2.5}$ have been adopted for determination of impacts in this EIS. These interim guidance criteria are as follows:

- Predicted increase in concentrations of $PM_{2.5}$ greater than 5 $\mu g/m^3$ averaged over a 24-hour (daily) period at a discrete location of public access, either at ground or elevated levels (microscale analysis); or
- Predicted increase in ground-level concentrations of $PM_{2.5}$ greater than 0.1 $\mu g/m^3$ on an annual average neighborhood-scale basis (i.e., the annual increase in concentration representing the average over an area of approximately one square kilometer, centered on the location where the maximum impact is predicted).

Actions under CEQR that would result in predicted incremental $PM_{2.5}$ impacts greater than the interim guidance criteria above will be considered to result in potential significant adverse impacts. Actions subject to CEQR which fail such criteria (until they are finalized) will require the preparation of an EIS and an examination of potential measures to reduce or eliminate such potential significant adverse impacts.

In addition, NYSDEC has published a policy[2] to provide interim direction for evaluating $PM_{2.5}$ impacts. This policy applies to facilities applying for permits or major permit modification under State Environmental Quality Review Act (SEQRA) which emit 15 tons of PM_{10} or more annually. The interim policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum predicted impacts are shown to constitute more than 0.3 $\mu g/m^3$ averaged annually, or more than 5 $\mu g/m^3$ on a 24-hour basis. Projects that exceed either the annual or 24-hour threshold will be required to prepare an EIS to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

In order to put these levels in context, the average difference between 24-average $PM_{2.5}$ concentrations measured at collocated monitors (i.e., two identical monitors at the same location) in four monitoring stations in New York City ranged from 0.41 to 0.83 $\mu g/m^3$.

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[1] NYCDEP, *Croton Water Treatment Plant Draft Supplemental EIS*, Dec 31, 2003.

[2] NYSDEC, *CP-33 / Assessing and Mitigating Impacts of Fine Particulate Matter Emissions,* 12/29/2003.

Monitored changes in concentration that would be lower than these levels could not conclusively indicate any change in concentration.

In the absence of guidance at the federal level, the above criteria have been used for the purpose of evaluating the significance of predicted impacts of the project alternatives on $PM_{2.5}$ concentrations in all study areas (including those in New Jersey, in the absence of comparable NJDEP criteria). If new federal guidance is issued, the FEIS will utilize the available guidance to examine potential $PM_{2.5}$ impacts based upon criteria standards that are the best available and will apply any revised environmental criteria as appropriate.

STATE IMPLEMENTATION PLAN

The Clean Air Act Amendments of 1990 (CAAA) define non-attainment areas as geographic regions that have been designated as not meeting one or more of the NAAQS. The attainment status for the counties in the study area is shown in Table 9-2.

Table 9-2
Counties Designated Non-Attainment by USEPA in the Study Area

County	Ozone*	PM_{10}**	CO**
Kings	✓		
Bronx	✓		
Manhattan	✓	✓	
Richmond	✓		
Queens	✓		
Nassau	✓		
Suffolk	✓		
Essex	✓		✓
Hudson	✓		✓
Union	✓		✓
Middlesex	✓		

Notes:
* Severe non-attainment.
** Moderate non-attainment.
The status in respect to $PM_{2.5}$ is yet to be determined.

USEPA has recently redesignated New York City to attainment for CO. The Clean Air Act Amendments require that a maintenance plan ensure continued compliance of the CO NAAQS for former non-attainment areas. New York City is also committed to implementing area-wide and site-specific control measures to reduce CO levels should unanticipated localized growth result in elevated CO levels in the maintenance period. Additionally, on February 13, 2004, New York State formally recommended that EPA designate the five counties of New York City Metropolitan Area as nonattainment for $PM_{2.5}$. EPA has not yet made a determination of attainment.

While the table shows counties in New Jersey that are still classified as non-attainment for CO, USEPA has determined that these counties have in fact attained the NAAQS. The State of New Jersey has submitted a redesignation request to USEPA in October 2001. The New Jersey request is under review.

A State Implementation Plan (SIP) is a state's plan on how it will meet the NAAQS under the deadlines established by the CAAA. In November of 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone* which addressed attainment of the NAAQS by 2007. New Jersey also submitted its Ozone SIP in 1998. Both states have recently submitted revisions to their respective SIPs for the attainment of the one-hour ozone NAAQS. These SIP revisions included additional emission reductions that USEPA requested to demonstrate attainment of the standard.

TRANSPORTATION CONFORMITY

The conformity requirements of the Clean Air Act and regulations promulgated thereunder (conformity requirements) limit the ability of federal agencies to assist, fund, permit, and approve transportation projects that do not conform to the applicable SIP. An area's metropolitan planning organization (MPO), the forum for cooperative decision making for the metropolitan area, together with the State, are responsible for demonstrating conformity with respect to the SIP on metropolitan long-range transportation plans (LRTPs) and transportation improvement programs (TIPs). The EPA must then concur with such conformity determinations. The U.S. Department of Transportation has final approval power of conforming plans and TIPs. Conformity determinations must be made according to the requirements of 40 CFR Part 93 (Federal transportation conformity regulations) and 6 NYCCRR Part 240 (New York State transportation conformity regulations).

The New York Metropolitan Transportation Council (NYMTC) is the MPO for the NYS portion of this region. NYMTC approved the conformity determination for the LRTP, known as the Regional Transportation Plan entitled *Mobility for the Millennium*, on September 23, 1999. FHWA and FTA then approved the LRTP conformity determination on September 30, 1999, and EPA concurred with the findings. The most recent TIP (2004-2006) was approved by NYMTC on September 30, 2003. Because of the conformity waiver described below, a joint FHWA/FTA conformity determination was not necessary for this TIP.

NYMTC's sister agency in New Jersey is the North Jersey Transportation Planning Authority (NJTPA). The NJTPA adopted the *2025 Access & Mobility* Regional Transportation Plan for northern New Jersey on September 17, 2002. The NJTPA determined that the Regional Transportation Plan as amended in 2003 and the Fiscal Years 2004-2006 TIP for northern New Jersey conform to the State Implementation Program provided by NJDEP (as stated in NJTPA's "Air Quality Conformity Determination," dated July 14, 2003).

The transportation conformity requirements for the New York Metropolitan area have been temporarily waived until September 30, 2005, pursuant to Public Law 107-230; Stat. 1469, enacted October 1, 2002. This waiver followed the World Trade Center disaster on September 11, 2001, due to the ensuing loss of NYMTC's files containing regional transportation and air quality data, the damage incurred to the downtown mass transit system, and the disruption of the regional transportation landscape resulting in new traffic patterns.

METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS FROM ROADWAYS

Maximum concentrations of CO, PM_{10}, and $PM_{2.5}$ were predicted for the analysis year 2025. The concentrations were calculated for the averaging periods corresponding to those defined for each pollutant in the NAAQS: 24-hour and annual for PM and 8-hour for CO. Since no violations of

the 1-hour CO standard have been measured in New York City within the last 10 years, 1-hour averages were not summarized in this report (although all 1-hour predicted CO concentrations would be well within the applicable standard).

The analysis uses a modeling approach approved by EPA that has been widely employed for evaluating CO and PM_{10} impacts of projects in New York City, New York State, New Jersey, and throughout the country, with some additional, newer procedures for modeling $PM_{2.5}$ that have been developed in coordination with NYCDEP. This approach is coupled with a series of worst-case assumptions relating to meteorology, traffic, and background concentrations, resulting in a conservatively high estimate of expected concentrations and ensuing air quality impacts caused by the proposed project. Additional details of the data used are provided in Appendix 3.

VEHICLE EMISSIONS DATA

Vehicular exhaust emission factors were computed using the EPA Mobile Source Emissions Model, MOBILE6.2. This is the latest, recently released emissions model, capable of calculating engine emission factors for various vehicle types based on the fuel (gas, diesel, or alternative technologies), meteorological conditions, vehicle speeds, roadway types, number of starts per day and engine soak time, and various other factors that influence emissions, such as inspection maintenance programs.

Vehicle classification data were based on field studies and data obtained from other traffic studies as discussed in Chapter 8, "Transportation." Emission estimates were based on guidance from NYCDEP and NYSDEC on the appropriate credits to be used in the MOBILE6.2 model to accurately reflect the inspection and maintenance program. The inspection and maintenance programs require inspections of automobiles and light trucks to determine if pollutant emissions from the vehicles' exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered.

Based on the latest guidance from NYSDEC and NYCDEP, sport utility vehicles (SUVs) were classified as light-duty gasoline powered trucks, with operating conditions (starts per day and soak time) and registration characteristics (age of vehicles and mileage accumulation) set to be the same as for light-duty vehicles (LDV), in order to properly model their emissions. Taxis are assumed to all be in hot stabilized mode (excluding any start emissions). The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative fleet-wide breakdown[1].

An ambient temperature of 52.5° Fahrenheit was used for the sites analyzed. This temperature, calculated based on the latest guidance from EPA, NYSDEC, and NYCDEP, represents the average temperature measured at the Central Park meteorological station during the 10 highest 8-hour CO events measured at the East 34th Street NYSDEC monitoring station in 2000 through 2002.

EPA has recently proposed revisions to the transportation conformity rules to incorporate procedures for assessing the effects of $PM_{2.5}$ for future projects that may be subject to

[1] The MOBILE6 emissions model utilizes 29 vehicle categories by size and fuel. Traffic counts and predictions are based on broader size categories, and then broken down according to the fleet-wide distribution of subcategories and fuel types (diesel, gasoline, or alternative).

transportation conformity in $PM_{2.5}$ non-attainment areas.[1] Under these proposed revisions, fugitive road dust would be included in regional emissions and in local hotspot analyses only if it is identified as a significant contributor to $PM_{2.5}$ regional air quality. Although EPA has not yet made a determination as to whether any specific areas have a regional $PM_{2.5}$ issue with respect to road dust, it is unlikely that such a determination would be made for locations within the New York City metropolitan area. First, predicted impacts based on modeling emission inventories are significantly higher than actual measured concentrations of PM attributed to road dust. This is the case in New York City, where the primary component of measured PM_{10} concentrations in the designated Non-Attainment area (Manhattan) was found to be due to diesel engine exhausts, rather than road dust. Second, while EPA has determined that areas that are not in attainment with the PM_{10} standard have significant emissions of fugitive road dust, there is less evidence that this road dust is a contributor to $PM_{2.5}$ concentrations.

Furthermore, in the event that EPA would require quantified analysis of $PM_{2.5}$ at "hot-spot" (i.e., microscale receptor) locations, EPA would only require an assessment of the contribution from fugitive dust if those emissions were identified as regionally significant. This would first require preparation of a $PM_{2.5}$ SIP by NYSDEC, an identification of specific hot-spot locations requiring quantified analysis for transportation conformity decisions, and a determination that inclusion of re-entrained road dust in the hot-spot analysis is warranted; designation of New York in regard to attainment of the $PM_{2.5}$ NAAQS is expected in 2004. Since none of these criteria have been met, and since fugitive road dust is unlikely to be characterized as a regionally or locally significant contributor to $PM_{2.5}$ concentrations, inclusion of fugitive road dust was not considered to be necessary for assessing $PM_{2.5}$ impacts from the proposed project.

Since the contribution of re-entrained road dust to PM_{10} concentrations, as presented in the PM_{10} SIP, is considered to be significant, the PM_{10} estimates include both exhaust and road dust. Road dust emission factors were calculated according to the latest procedure delineated by EPA[2].

DISPERSION MODELS

Carbon Monoxide

At all sites selected for CO analysis, initial screening of worst-case predicted maximum 1- and 8-hour average CO concentrations were determined using EPA's CAL3QHC model[3], Version 2.0. The CAL3QHC model is a Gaussian dispersion model, which assumes that the dispersion of pollutants downwind of a pollution source follows a Gaussian (or normal) distribution, and is designed specifically for predicting CO concentrations along roadway segments.

Particulate Matter

Ambient concentrations of PM were computed at the selected analysis sites using the more refined version, CAL3QHCR. This version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating 24-hour and annual average

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[1] 68 Fed. Reg. 62690-62729, November 5, 2003.

[2] EPA, "Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources", Draft Ch. 13.2.1, NC, http://www.epa.gov/ttn/chief/ap42/, August 2003.

[3] EPA, User's guide to CAL3QHC, "A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections", Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, September 1995.

concentrations. Tier II analysis, which includes the modeling of hour-by-hour concentrations based on hourly traffic data and hourly meteorological data over a 5-year monitoring period, was performed to predict maximum 24-hour and annual average PM levels.

METEOROLOGICAL CONDITIONS

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability, which accounts for the effects of dispersion or mixing in the atmosphere.

The CAL3QHC CO computations were performed using a wind speed of 1 meter/second, and stability class D, representative of neutral conditions in New York City. At each receptor location (i.e. locations in the model where concentrations are predicted), the wind angle that maximized the pollutant concentrations was used in the analysis regardless of frequency of occurrence.

The CAL3QHCR Tier II PM analyses utilized monitored hourly meteorological data from LaGuardia Airport station in the years 1997 to 2001. All hours are modeled, and the highest resulting concentration for any averaging time is presented.

SITE SELECTION FOR CO ANALYSIS

Analysis locations were selected based on a screening of traffic volumes and approach delays and the projected number of project-generated vehicle trips (see Table 9-3 and Figures 9-1, 9-2, and 9-3). The screening analysis determined the intersections that would be subjected to full-scale microscale analysis for the future alternatives. To select those locations, the intersections analyzed as part of the project's transportation analysis (which is presented in Chapter 8, "Transportation,") were ranked based on the methodology developed by NYSDOT and NYSDEC to evaluate critical locations. The screening methodology is based on three criteria—the Level of Service (LOS), or congestion, predicted for the intersection; the intersection's total traffic volumes; and the number of project-generated vehicles expected to travel through the intersection.

SITE SELECTION AND RECEPTOR PLACEMENT FOR PARTICULATE MATTER

The intersections selected for the PM analyses were those with the greatest potential for increases in pollutant concentrations due to project generated trucks. Tier II analyses, which include the modeling of hour-by-hour concentrations based on hourly traffic data and hourly meteorological data over a five-year monitoring period, were performed to predict maximum 24-hour and annual average PM_{10} levels. At each intersection analyzed, receptors were located at the nearest sensitive land use. Unlike the short-term CO standards which are more applicable to sidewalk receptors, the NAAQS for particulate matter are based on 24-hour and annual averages and therefore the project's impact assessment was focused on locations where exposure to these pollutants would accurately correspond to the averaging period in the standard. Some PM_{10} sites included additional receptors at other public spaces such as sidewalks. In those cases, the results are more conservative due to the closer proximity of the receptors to the source. For the annual $PM_{2.5}$ models neighborhood scale receptors at a minimum distance of 15 meters from the nearest moving lane were used, based on the NYCDEP procedure for mobile $PM_{2.5}$ modeling. Background concentrations from NYSDEC monitoring sites were added to the modeled predictions to determine total ambient levels at each site.

Table 9-3
Mobile Source Analysis Locations

Site ID	Area	Site Location	CO	PM_{10}	$PM_{2.5}$
1	65th Street Yard	65th St./3rd Ave.	✓		
2		60th St./3rd Ave.	✓	✓	
3		38th St./4th Ave.	✓		
4	West Maspeth Yard	LIE Service Rd./Maurice Ave.	✓		
5		Maurice Ave./Maspeth Ave./58th St./56th Terr.	✓		
6		Grand Ave./Rust Ave.	✓	✓	✓
7		Grand Ave./Vandervoort Ave.	✓		
8		Vandervoort Ave./Cherry Ave./Meeker Ave.	✓		
9		Grand Ave. / LIE Service Road / 69th Street	✓		
10		Grand Ave. / Page Place	✓		
11		Vandervoort Ave. / Maspeth Ave.	✓		
12	Harlem River Yard	Willis Ave./E. 135th Street	✓		
13		St. Ann's Avenue/135th Street	✓		
14	Oak Point Yard	Leggett Ave./Bruckner Blvd.	✓		
15		Hunts Point Ave./Bruckner Blvd.	✓	✓	

METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS FROM TUNNEL VENTILATION EXHAUST SYSTEMS

EMISSIONS MODELING

Emission factors and exhaust parameters used in the analysis of stationary sources were based on USEPA'S *Emission Factors for Locomotives* (EPA 420-F-97-051, December 1997)* together with a detailed tunnel ventilation study and engine performance modeling performed for six train consists along the alignment. The performance modeling predicted the power and fuel consumption of each category by size along the specific rail segments being modeled. The ventilation study included the modeling of dispersion of pollutants throughout the tunnel, and finally their release into the surrounding environment via portals and ventilation exhaust. The standard assumption is that a maximum level of 75 percent of the emitted NO_x is transformed to NO_2. All PM emitted from locomotives was assumed to be $PM_{2.5}$ (that is PM_{10} and $PM_{2.5}$ emissions are identical). A detailed description of this methodology can be found in Appendix 3, "Air Quality," Section A.

Since emissions from locomotives are predicted to decrease steadily due to improved engine efficiencies, the modeling was performed using emission factors predicted for the year 2015, in conjunction with the maximum predicted train frequencies generated by the Cross Harbor Freight Movement Project (i.e., beginning in the year 2025). This results in a conservative analysis because locomotive emissions in 2025 would actually be lower than the year 2015 emissions used in the modeling. In order to compare these results to a less conservative analysis, the maximum predicted resulting concentrations were also calculated for sections of the Bay

* USEPA, December 1997, *Emission Factors for Locomotives,* EPA420-F-97-051 ; and USEPA, April 1997, Regulatory Support Document (RSD) for the U.S. EPA's Locomotive Emission Standards Final Rulemaking (spreadsheet data file), http://www.epa.gov/otaq/regs/nonroad/locomotv/frm/locorsd.wk3

Ridge Branch based on emission factors predicted for year 2025 and the same maximum train frequencies.

DISPERSION MODELING

Air quality impacts from tunnel ventilation system and portal emissions were evaluated using the Industrial Source Complex Short Term (ISC3) dispersion model developed by USEPA. The ISC3 model calculates pollutant concentrations from one or more sources (e.g., exhaust vents and tunnel portals) based on hourly meteorological data, and has the capability to take into account the effect of downwash (exhaust plume affected by wakes and eddies from nearby structures). The meteorological data set consisted of the five latest years of concurrent meteorological data appropriate for the study sites, LaGuardia Airport (1997-2001).

The tunnel ventilation stacks were modeled as point sources, using USEPA's Building Profile Input Program (BPIP) to determine the projected building dimensions for use in the ISC3 model with the building downwash algorithm enabled. Modeling was performed both with and without downwash.

The tunnel portals were modeled as volume sources representing the turbulent mixing of the pollutants in the air adjacent to the portals. This method introduces the conservative assumption that the polluted air vented from the portals is well mixed within the small volume of air in the depressed section nearby and then dispersed with the mean wind. In reality, the air discharged at velocities of up to 3.5 m/s from the portals will be diluted as a jet farther downwind within the depressed section, before being diverted out of the right-of-way into public or private areas. This method results in higher concentrations than those that would be produced by a jet model.

Full detail of the analyses, including the location of sources and receptors, can be found in Section A of Appendix 3, "Air Quality."

RECEPTOR PLACEMENT

Discrete receptors (i.e. locations in the model where concentrations were predicted) were placed in locations with continuous public access in the vicinity of the ventilation buildings. The receptor network consisted of ground-level receptors located at 6 feet and elevated receptors in nearby buildings.

METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS FROM RAIL LINES, RAIL YARDS AND TUNNEL PORTALS

EMISSIONS ESTIMATES

In addition to examining the effect of tunnel exhaust on ambient pollutant levels, an analysis was conducted for assessing the potential change in concentrations of these same pollutants at locations adjacent to the rail rights-of-way and rail yards under the project alternatives. The emission estimates for diesel locomotives were based on engine performance modeling for the various trains in key locations, and the USEPA emission factors described above.

For the analyses of the New Lots rail sidings along the Bay Ridge Branch and the West Maspeth rail yard (which would both include significant locomotive idling activity under the Tunnel Alternative) the model was performed separately for PM. This is because the ratio between the NO_x and PM emission factors for idling and cruising are not the same, and therefore cannot be used to accurately estimate the concentrations of one based on the other. For other pollutants,

since the ratios to NO_x idle emissions are lower than the ratios of the cruise emissions, an estimate was made based on the ratios and would be a conservatively high estimate. Fresh Pond Yard did not include idling emissions since it was modeled under the worst case assumption that the switcher locomotives (i.e., locomotives used to sort and move rail cars) would be in motion all day.

West Maspeth Yard would include air pollutant emission sources other than locomotives. The analysis included road engines (e.g., the locomotives operating on the lines), switcher locomotives sorting cars, diesel forklifts loading and unloading rail freight containers on both rail cars and trucks, trucks delivering and picking up cargo, and hostling tractors moving containers to and from storage. For more detail on the assumptions for these sources, see Appendix 3, "Air Quality," Section A.

For the rail yard analyses, where the focus was on receptors immediately adjacent to the train yard sources, it is assumed that a full conversion of NO to NO_2 would not occur. The time scale for maximum conversion under urban conditions is on the order of 30 to 45 minutes (Seinfeld and Pandis, 1997)[*]. The mean wind speed at these locations is 5.4 meters per second, and the distance from the center of the source to the nearest receptors is 300 meters. The average detention time for the chemical reactions is therefore expected to be on the order of one minute. At five minutes the expected conversion level is 36 percent. Although one minute of detention time would produce a much smaller conversion, a more conservative estimate was used for this study, assuming the average conversion rate to be 40 percent. All other sites were modeled using the default conservative value of 75 percent NO to NO_2 conversion.

DISPERSION MODELING

Pollutant concentrations from diesel locomotives were predicted using the USEPA ISC3 dispersion model, as described above for stationary sources. Modeling was performed for rail lines and yards. Portal site models included both rail lines and tunnel portals as sources. Rail yards were modeled as area sources. Since many potential receptors lie adjacent to the rail lines and rail yards in the project study areas, an analysis was conducted under various worst-case scenarios for select train yards and rail lines. The locations chosen were those with the largest potential impact and the nearest sensitive uses, such as residential buildings adjacent to the alignment. Pollutant levels were examined based on reasonable worst-case operating conditions, both at the nearest sidewalk, open space and residential receptors. The results were then summarized and discussed with respect to various locations throughout the study areas.

RECEPTOR PLACEMENT

For the purposes of this air quality analysis, receptors were located in all residential locations in the vicinity of each model. Additional analyses were performed in order to estimate annual average neighborhood-scale $PM_{2.5}$ concentrations. For these runs, receptors were placed at 25 meter intervals beginning from the point along the track where the maximum annual $PM_{2.5}$ concentration was modeled (with the original receptor grid), and ending at a distance of 500 meters in each direction from the track. The average concentration from all of these receptors would represent a neighborhood scale concentration.

[*] Seinfeld, John H., Pandis, Spyros N. 1998, Atmospheric Chemistry and Physics – From Air Pollution to Climate Change, John Wiley & Sons, New York, NY, 1997.

METHODOLOGY FOR PREDICTING REGIONAL (MESOSCALE) IMPACTS

A mesoscale analysis is typically performed by computing total pollutant levels ("burdens") within a project's overall study area. Pollutant burdens represent total expected quantities of pollutant emissions for a region throughout a defined time period. Pollutant burdens over the No Action Alternative were computed for the annual quantities of CO, VOCs, NO_x, and PM_{10} that would be emitted due to project-related changes in vehicular activity within the entire study area accounting for any increases in rail related emissions.

Emission factors for diesel rail locomotives were based on the USEPA estimates for Class I locomotive emission rates for the analysis years (USEPA, 1997).* These emission factors include the three existing tiers of emission standards for locomotives—Tier 0, Tier 1, and Tier 2. Tier 0 standards apply to locomotives that were manufactured prior to 2002. Tier 1 standards apply to locomotives manufactured between 2002 and 2004. Tier 2 standards apply to locomotives manufactured after year 2004. The USEPA has developed emission factors for future years based upon the expected number of Tier 0, Tier 1, and Tier 2 locomotives that would be operating in each future year. The emission factors for locomotives improve over time as the number of newer Tier 2 locomotives increase. As discussed in later sections of this chapter, it is likely that more stringent emission standards will be implemented in future years, resulting in further reductions in locomotive emissions.

Vehicular pollutant burdens were computed based on the USEPA vehicle emission estimating procedures, MOBILE6.2 and on the changes in vehicle miles traveled (VMT) for the analysis years. Emissions modeling was performed as described above for mobile source modeling of CO and PM. Emissions of VOC and NO_x were computed for ozone season (summer) conditions, using the data and information provided by NYSDEC for the ozone SIP emissions model procedure. Changes in VMT over the No Action Alternative within the network were based on the project's transportation model (described in Chapter 8, "Transportation"). Vehicular speeds for each county were based on NYMTC's regional traffic model.

The MOBILE6.2 vehicular emissions estimations reflect recently adopted emission standards for heavy duty on-road diesel engines. While stringent regulations have been implemented for manufacturers of these on-road vehicular engines and therefore corresponding emission factors can be utilized in this analysis, comparable recent regulations for diesel locomotives do not yet exist. It is likely that more stringent emission regulations for diesel locomotives will be promulgated prior to the project analysis year of 2025. The mesoscale air quality analysis for this project estimates net emissions by summing the predicted reduction in diesel truck emissions (due to diversion of freight from truck to rail) and the predicted increase in emissions from diesel locomotives. The future 2025 emission standards for these modes, however, are not known, and therefore the analysis relies on the projections of current regulations into future years. To reduce the speculation associated with projecting emission standards twenty years into the future, a mesoscale analysis was performed for the intermediate year of 2015 in addition to the EIS analysis year of 2025.

* USEPA, April 1997, *Regulatory Support Document (RSD) for the U.S. EPA's Locomotive Emission Standards Final Rulemaking* (spreadsheet data file), http://www.epa.gov/otaq/regs/nonroad/locomotv/frm/locorsd.wk3

BACKGROUND CONCENTRATIONS

The modeling analysis directly accounts for only those pollutants emitted by the sources included in the model. For CO and PM_{10} intersection modeling, the analysis accounts for vehicular-generated emissions on the streets within 1,000 to 1,600 feet within the line-of-sight of the analyzed intersection. In modeling emissions from locomotives, barges, or the tunnel ventilation systems, only those individual sources are modeled. In addition to these sources, background concentrations must be added to the model predictions to obtain total or ambient levels at a prediction site.

The background concentrations used in the analysis are shown in Table 9-4. These values were obtained from NYCDEP and NJDEP and are based on recent monitoring data from within the study area. For the modeling analysis, the background CO concentrations were adjusted for future years to account for the impact of reduced vehicular emissions on background levels in the analysis years, as described in the CEQR Technical Manual and provided by NYCDEP.

Table 9-4
Background Concentrations

	CO	NO_2	PM_{10}		SO_2		
	8-Hour (ppm)	Annual Average ($\mu g/m^3$)	Annual Average ($\mu g/m^3$)	24-Hour Average ($\mu g/m^3$)	Annual Average ($\mu g/m^3$)	24-Hour Average ($\mu g/m^3$)	3-Hour Average ($\mu g/m^3$)
New Jersey	4	51	31	77	26	73	123
Staten Island	3	70	19	50	16	63	123
Brooklyn	3	68	24	48	24	89	144
Queens	4	51	26	50	18	86	165
Bronx	4	68	25	55	26	99	212

B. EXISTING CONDITIONS

EXISTING MONITORED AIR QUALITY CONDITIONS

Monitored concentrations of CO, SO_2, PM_{10}, NO_2, lead, and ozone ambient air quality data for the New York City area are shown in Table 9-5, while Table 9-6 shows data for the relevant areas of New Jersey. As can be seen from the monitored data, in both areas, only the ozone standard continues to be exceeded. It should be noted, however, that in recent years, measured PM_{10} concentrations at the Madison Avenue site in Manhattan have exceeded the annual average standard and the 1997 levels are still extremely close to the NAAQS. Conversely, no violations of the CO standard have been recorded in the study area since 1991, even though the New Jersey counties still retain their non-attainment designation for that pollutant.

C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

In the future, with or without the project alternatives, air quality in the region should continue to improve due to the effects of federally mandated emission control programs scheduled to be implemented over the next several years. Many of these programs were part of the 1990 Clean Air Act Amendments or are included as part of each state's SIP to meet the ozone NAAQS. These programs cover a wide range of sources, both mobile and stationary and will effect

emissions of NO_x, SO_2, CO, particulate matter and volatile organic compounds. The more relevant programs with respect to the project alternatives are described in the following sections.

DIESEL LOCOMOTIVES

In April of 1998, USEPA published a final rule on emission standards for new or re-manufactured diesel locomotives. The rule covers three time periods. Tier 0 standards apply to engines manufactured between 1973 and 2000 that are re-manufactured after 2000. Stricter standards apply to new engines manufactured between 2000 and 2004 while even lower emission levels are required for engines manufactured in 2005 and beyond. These emission standards include CO, NO_x, hydrocarbons, and PM.

ON ROAD HEAVY-DUTY VEHICLES

As part of the 1990 Clean Air Act Amendments, USEPA set new emission standards for heavy-duty diesel trucks and buses which began to take effect in the 1990s. In October of 2000, they published a final rule for the *Control of Emissions of Air Pollution from 2004 and Later Model Year Heavy-Duty Highway Engines and Vehicles*. On December 21, 2000 a final rule was signed by the Administrator for additional emission reductions for the model year 2007 with a reduction in the sulfur content of diesel fuel to take effect by mid-2006.

NONROAD ENGINES

As directed in the 1990 CAAA, USEPA has taken measures to reduce emissions from non-road diesel engines (e.g., construction equipment) in two past regulatory actions. A 1994 final rule set initial emission standards for new non-road diesel engines greater than 50 hp. These standards ("Tier 1") resulted in modest NO_x emission reductions. In 1998, USEPA adopted more stringent standards for these engines, Tier 2 and Tier 3, as well as standards for engines under 50 hp. These new standards will dramatically decrease the emissions of particulate matter from non-road diesel engines.

D. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

This section presents the predicted air quality impacts of the project alternatives. For the purposes of this air quality analysis, adverse impacts are deemed "significant" if they exceed federal, state, and/or local criteria.

REGIONAL (MESOSCALE) ANALYSIS

The Cross Harbor Freight Movement Project would result in the removal of trucks from the region's roadways. As discussed in Chapter 8, "Transportation," several of the project alternatives would result in the diversion of a large quantity of freight from truck to rail, which can be correlated to a reduced number of vehicle miles traveled (VMT). The number of diesel truck VMT saved each year can be used to calculate the tons of diesel fuel emissions that would also be conserved.

Table 9-5
Representative Monitored Ambient Air Quality Data, New York City

Pollutant	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	Bloomingdale's	ppm	8-hour	—	6.8	6.2	0	0
			1-hour	—	5.5	4.7	0	0
	Brooklyn Transit	ppm	8-hour	—	5.4	5.0	0	0
			1-hour	—	7.8	7.3	0	0
SO_2	Susan Wagner	ppm	Annual	0.006	—	—	0	—
			24-hour	—	0.024	0.022	0	—
			3-hour	—	0.041	0.041	—	0
	Queensboro Community College	ppm	Annual	0.007	—	—	0	—
			24-hour	—	0.041	0.029	0	—
			3-hour	—	0.071	0.063	—	0
	Morrisania	ppm	Annual	0.011	—	—	0	—
			24-hour	—	0.052	0.041	0	—
			3-hour	—	0.124	0.079	0	0
NO_2	P.S. 59	ppm	Annual	0.041	—	—	0	0
	Morrisania	ppm	Annual	0.033	—	—	0	0
	Queensboro	ppm	Annual	0.026	—	—	0	0
Lead	Susan Wagner	$\mu g/m^3$	3-month	—	0.040	0.020	0	0
	Greenpoint	$\mu g/m^3$	3-month	—	0.010	0.010	0	0
O_3	Queensboro Community College	ppm	1-hour	—	0.139	0.132	4	4
	Susan Wagner	ppm	1-hour	—	0.153	0.145	3	3
	I.S. 155	ppm	1-hour	—	0.105	0.104	0	
Respirable Particulate matter (PM_{10})	Madison Avenue and 46th Street	$\mu g/m^3$	Annual	47	—	—	0	0
			24-hour	—	102	79	0	0
	I.S. 52	$\mu g/m^3$	Annual	16	—	—	0	0
			24-hour	—	27	22	0	0
	Greenpoint	$\mu g/m^3$	Annual	23	—	—	0	0
			24-hour	—	51	46	0	0
	Susan Wagner	$\mu g/m^3$	Annual	16	—	—	0	0
			24-hour	—	45	43	0	0
Fine Particulate Matter ($PM_{2.5}$)	P.S. 59	$\mu g/m^3$	Annual	18.4	—	—	NA**	—
			24-hour	—	42*	—		—
	Morrisania	$\mu g/m^3$	Annual	16.6	—	—	NA**	—
			24-hour	—	40*	—		—
	P.S. 321	$\mu g/m^3$	Annual	14.8	—	—	NA**	—
			24-hour	—	42*	—		—
	Susan Wagner	$\mu g/m^3$	Annual	12.4	—	—	NA**	—
			24-hour	—	33*	—		—
	Queensboro	$\mu g/m^3$	Annual	13.0	—	—	NA**	—
			24-hour	—	33*	—		—

Notes:
* The value presented is the 98th percentile concentration based on the 24-hour standard for $PM_{2.5}$
** The determination of compliance with the NAAQS for $PM_{2.5}$ is to be based on a 3-year averaging of ambient levels. Since only 2 full years of data are available it cannot be determined if exceedances have occurred.
Source: New York State Air Quality Report, Ambient Air Monitoring Systems, Annual 1999 (data for $PM_{2.5}$ is from 2000).

Table 9-6
Representative Monitored Ambient Air Quality Data, New Jersey

Pollutant	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	North Bergen	ppm	1-hour 8-hour	— —	10.5 6.4	10.0 6.1	0 0	0 0
	Elizabeth	ppm	1-hour 8-hour	— —	9.8 0.7	8.9 6.6	0 0	0 0
	Jersey City	ppm	1-hour 8-hour	— —	6.2 4.0	5.9 3.9	0 0	0 0
SO_2	Jersey City	ppm	Annual 24-hour 3-hour	0.009 — —	— 0.036 0.081	— 0.032 0.064	0 0 —	— — 0
	Elizabeth Lab	ppm	Annual 24-hour 3-hour	0.008 — —	— 0.026 0.075	— 0.025 0.051	0 0 —	— — 0
NO_2	Bayonne	ppm	Annual	0.027	—	—	0	0
	Elizabeth Lab	ppm	Annual	0.042	—	—	0	0
	Newark	ppm	Annual	0.033	—	—	0	0
Lead	New Brunswick	$\mu g/m^3$	3-month	—	0.183	0.053	—	—
O_3	Bayonne	ppm	1-hour	—	0.147	0.139	5	5
	Newark	ppm	1-hour	—	0.133	0.122	1	1
Respirable Particulate Matter (PM_{10})	Jersey City	$\mu g/m^3$	Annual 24-hour	28 —	— 61	— 56	0 0	0 0
	Elizabeth Lab	$\mu g/m^3$	Annual 24-hour	33 —	— 87	— 67	0 0	0 0
Fine Particulate Matter ($PM_{2.5}$)	Jersey City	$\mu g/m^3$	Annual 24-hour	NA* —	— 47	— 40	NA*	— —
	Elizabeth Lab	$\mu g/m^3$	Annual 24-hour	18.7 —	— 50	— 41	NA*	— —
	Newark	$\mu g/m^3$	Annual 24-hour	NA* —	— 48	— 44	NA*	— —

Notes:
* The determination of compliance with the NAAQS for $PM_{2.5}$ is to be based on a 3-year averaging of ambient levels. Since only 2 full years of data are available it cannot be determined if exceedances have occurred.
Source: 1999 Air Quality Report, New Jersey Department of Environmental Protection, Bureau of Air Monitoring, December 2000 (data for $PM_{2.5}$ is from 2000).

As shown in Table 9-7 and 9-8, the Expanded Float Operation Alternative and the Tunnel Alternative would reduce emissions of certain air pollutants—including CO and VOCs—within the New York metropolitan area in the analysis years 2015 and 2025. The small diversion of freight for the TSM Alternative would not produce meaningful changes in travel demand forecasts when applied to the four time periods of the NYMTC model (AM and PM peaks, midday and nighttime). Appendix 3 provides a back-up of this regional air quality analysis.

Table 9-7
Annual Emissions Reductions
in New York Metro Region in 2015
(tons per year)

	Single Tunnel System		Double Tunnel System		Expanded Float Operations Alternative
	New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment	
VOC	-19.4	-20.2	-41.4	-44.1	-1.9
CO	-1,526.8	-1,504.6	-2,867.8	-2,829.6	-117.3
NO_x	172.8	147.1	227.7	163.0	5.5
PM_{10}	3.0	2.1	2.2	-0.1	0.0
CO_2	-62,085.4	-62,126.7	-121,515.7	-122,585.6	-5,164.3
Note:	**Negative ("-") values represent a projected decrease in regional emissions. Positive ("+") values represent a projected increase in regional emissions.**				

Table 9-8
Annual Emissions Reductions
in New York Metro Region in 2025
(tons per year)

	Single Tunnel System		Double Tunnel System		Expanded Float Operations Alternative
	New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment	
VOC	-18.0	-18.8	-38.1	-40.3	-1.7
CO	-1,332.2	-1,313.4	-2,504.6	-2,472.7	-102.6
NO_x	225.2	201.5	337.6	278.8	10.4
PM_{10}	2.2	1.6	1.3	-0.5	-0.1
CO_2	-62,085.4	-62,126.7	-121,515.7	-122,585.6	-5,164.3
Note:	**Negative ("-") values represent a projected decrease in regional emissions. Positive ("+") values represent a projected increase in regional emissions.**				

Due to the relative efficiency of rail freight transport, substantial reductions in emissions of VOC, CO, and CO_2 would result from the Tunnel Alternative in the analysis years 2015 and 2025. Tables 9-7 and 9-8 reflect estimated CO_2 emissions of the various alternatives (see Appendix 3). While not a pollutant, the New York State Energy Plan requires all transportation projects consider CO_2 impacts, as it is the main greenhouse gas produced by the transportation sector. The Tunnel Alternative would result in a major decrease in this compound. Regional PM_{10} emissions would not change substantially with any of the alternatives in either analysis year. Since almost all of the PM emitted from diesel engines is smaller than 2.5 microns, the change in $PM_{2.5}$ direct emissions is similar to the figures presented for PM_{10}.

In order for any of the Cross Harbor alternatives to be built, the project must come from a fiscally constrained and air quality conforming TIP and Regional Transportation Plan. Under the methodology described above, Tables 9-7 and 9-8 show increases in NO_X due to the tunnel alignments in amounts ranging from 147.1 to 337.6 tons per year. To put these amounts in

perspective, it should be noted that transportation conformity analyses done by an MPO are calculated on a tons per day basis, rather than tons per year. Tables 9-7 and 9-8 are thus equivalent to a NO_x increase of approximately 0.4 to 1.0 tons per day due to the various alignments. While this does represent an increase in NO_x, transportation conformity is determined by the total emissions from all covered transportation projects in the NYMTC region for each criteria pollutant. Thus, while one project may reflect an increase in NO_x, the NYMTC region as a whole would pass the transportation conformity test if the total NO_x emissions from all transportation emissions in the NYMTC region were less than the NO_x SIP budget. The increases reflected in Tables 9-7 and 9-8 should not represent a serious impact on NYMTC's ability to pass the future transportation conformity tests on its TIP and Plan relative to the regional NO_x emissions in the SIP budget.

As also explained in the Methodology section above, more stringent regulations have been issued for diesel trucks compared to the regulations that are currently being imposed on diesel locomotives with respect to the emission of nitrogen oxides, and the emissions factors available for the future years 2015 and 2025 are based upon these current regulations. The existing regulations result in a situation where even though freight locomotives are over four times as energy efficient as a diesel truck at moving a ton of goods[1], the NO_x emission rate per gallon of fuel is greater for diesel locomotives than for heavy-duty trucks. Although no new regulations are proposed at this time for locomotive engines, it is expected that as new technology is introduced in diesel truck engines, similar technologies will also be implemented in diesel locomotive engines, and new emission standards will be issued. As the regulations for locomotives progress to a level similar to truck regulations, the projected NO_x emissions from locomotives will decrease and subsequently, the net emissions from the project will decrease. This is exemplified by the 2015 analysis above, which reflects less discrepancy between the vehicular and locomotive NO_x emission factors and lower net NO_x emissions than the 2025 analysis.

LOCALIZED (MICROSCALE) ANALYSIS

CO FROM MOBILE SOURCES

A microscale CO analysis for the Tunnel Alternative was performed for the year 2025. CO analysis for the TSM and Expanded Float Operations Alternatives were not performed because those alternatives would not generate a significant number of trucks in any one area, which could lead to increases in local air pollutant concentrations. The analysis was based on the traffic studies outlined in Chapter 8, and was performed for the New Jersey alignment, since the number of trucks generated for the Staten Island alignment would be similar, though slightly less, to the New Jersey alignment. Table 9-9 shows the results of the CO analysis for No Action and Tunnel Alternative for 2025.

No 1-hour values are shown since the predicted concentrations are far below the respective standard. In addition, 8-hour values are most critical for impact assessment. The values shown for CAL3QHC modeling are the highest predicted concentrations for each site and time period analyzed.

[1] As shown in Appendix 3, the fuel efficiency for freight trucks can be expressed as 105 ton-miles per gallon and the fuel efficiency for locomotives through the project area was calculated to be approximately 455 ton-miles per gallon.

The predicted CO concentrations as a result of the Single and Double Tunnel Systems would be well below the NAAQS, and no significant adverse impacts with respect to CO levels would occur in the study areas. While the Tunnel Alternative would not result in any significant impacts on CO concentrations in all study areas, traffic impacts would occur and mitigation has been proposed at several locations in the West Maspeth Yard Study Area. Therefore, the CO analysis was also performed with the proposed traffic mitigation to determine the effects of the measures on ambient CO concentrations. As shown in Table 9-9, the largest increase in CO concentrations would occur near the intersection of Grand and Rust Avenues. This is a function of the number of vehicles diverted from Maspeth Avenue, which would be closed as part of the project. The intersection of Vandervoort Ave/Cherry Ave/Meeker Ave would be similarly affected. The results of the analysis with the proposed traffic mitigation are presented in Section E, "Mitigation."

PARTICULATE MATTER ANALYSIS FROM MOBILE SOURCES

Sites in the Bronx, Brooklyn and Queens with the greatest potential for increases in concentrations due to project generated trucks were selected for a detailed analysis of mobile source particulate matter. The results for the No Action and the Tunnel Alternative are shown in Table 9-10.

Annual and 24-hour average PM_{10} concentrations were predicted for the No Action, Single Tunnel System, and Double Tunnel System for the West Maspeth Yard site. In Brooklyn and the Bronx only the No Action Alternative was modeled, since the Tunnel Alternative would generate an insignificant number of trucks at those sites and would not increase PM_{10} concentrations in any measurable way. Therefore, the PM_{10} concentration with the Tunnel Alternative at the Brooklyn and Bronx sites would be the same as the No Action Alternative. The resulting maximum increase in annual average PM_{10} concentration due to the Single Tunnel System would be 0.5 $\mu g/m^3$ at West Maspeth Yard and for the Double Tunnel System, the maximum increase would be 0.8 $\mu g/m^3$, also at West Maspeth Yard. The maximum increase in 24-hour average PM_{10} concentration due to Single Tunnel System would be 0.8 $\mu g/m^3$ and for the Double Tunnel System, the maximum increase would be 2.5 $\mu g/m^3$. These measures would not significantly impact PM_{10} levels in the West Maspeth area and would not result in concentrations exceeding the NAAQS for PM_{10}.

An additional air quality analysis was undertaken to estimate and evaluate the potential impacts of project-generated vehicular traffic at the West Maspeth Yard site, on both local and neighborhood-scale $PM_{2.5}$ concentrations. The site, located at the intersection of Rust Avenue and Grand Avenue, was chosen for analysis because it resulted in the highest increases in PM_{10} and CO concentrations due to project-generated truck traffic.

Table 9-9
Future (2025) Maximum Predicted 8-Hour Average Carbon Monoxide Concentration for the No Action and Tunnel Alternative New Jersey Alignment (parts per million)

Site ID	Area	Site Location	Time Period	No Action	Double Tunnel System	Single Tunnel System
1	65th Street Yard	65th St./3rd Ave.	AM/PM	2.7	2.7	2.7
2		60th St./3rd Ave.	AM	3.8	3.8	3.8
3		38th St./4th Ave.	AM	3.6	3.6	3.6
4	West Maspeth Yard	LIE Service Rd./Maurice Ave.	PM	4.0	3.9	3.9
5		Maurice Ave./Maspeth Ave./58th St./56th Terr.	AM/PM	2.6	2.4	2.4
6		Grand Ave./Rust Ave.	PM	3.1	3.4	3.4
7		Grand Ave./Vandervoort Ave.	PM	3.1	3.0	3.0
8		Vandervoort Ave./Cherry Ave./Meeker Ave.	PM	3.7	3.8	3.7
9		Grand Ave./LIE Service Road	AM	4.0	4.0	4.0
10		Grand Ave./Page Place	AM/PM	2.4	2.6	2.6
11		Vandervoort Ave./Maspeth Ave.	AM	2.5	2.6	2.6
12	Harlem River Yard	Willis Ave./E. 135th St.	AM/PM	2.6	2.6	2.6
13		St. Ann's Avenue/135th St.	AM/PM	2.7	2.8	2.8
14	Oak Point Yard	Leggett Ave./Bruckner Blvd.	AM/PM	3.3	3.3	3.3
15		Hunts Point Ave./Bruckner Blvd.	PM	3.8	3.8	3.8

Note: 1. 8-hour standard is 9 ppm.

2. Above results include background value of 2.0 ppm, as obtained from memorandum issued on March 9, 1998 by New York City Department of Environmental Protection, Office of Environmental Planning and Assessment.

Table 9-10
On Street PM_{10} Results for No Action Alternative and Tunnel Alternative ($\mu g/m^3$)
New Jersey Alignment - 2025

Site ID	Borough	Area	Site Location	No Action		Single Tunnel System		Double Tunnel System	
				24-Hour ($\mu g/m^3$)	Annual ($\mu g/m^3$)	24-Hour ($\mu g/m^3$)	Annual ($\mu g/m^3$)	24-Hour ($\mu g/m^3$)	Annual ($\mu g/m^3$)
2	Brooklyn	65th St Yard	60th St./3rd Ave.	82.5	34.3	82.5	34.3	82.5	34.3
6	Queens	West Maspeth Yard	Rust Ave/Grand Ave	65.5	31.9	66.3	32.4	68.0	32.7
15	Bronx	Oak Point Yard	Hunts Point Ave./Bruckner Blvd.	70.7	31.4	70.7	31.4	70.7	31.4

Notes:
Background concentration for Brooklyn: 24-Hour = 48 $\mu g/m^3$, Annual = 24 $\mu g/m^3$
Background concentration for Queens: 24-Hour = 50 $\mu g/m^3$, Annual = 26 $\mu g/m^3$
Background concentration for Bronx: 24-Hour = 55 $\mu g/m^3$, Annual = 25 $\mu g/m^3$
24-Hour and annual standards are 150 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively.

The resulting maximum incremental $PM_{2.5}$ concentrations, shown in Table 9-11, are less than the NYCDEP interim guidance criteria (a maximum annual average of 0.1 $\mu g/m^3$ and 24-hour average of 5.0 $\mu g/m^3$). These increments were determined by analyzing the No Action Alternative, Single Tunnel System, and Double Tunnel System.

Table 9-11
Maximum Predicted Increases in $PM_{2.5}$ Concentrations
West Maspeth Yard - 2025

Alternative	24 Hour Average ($\mu g/m^3$)	Annual Mean Neighborhood Scale ($\mu g/m^3$)
Single Tunnel System	0.13	0.02
Double Tunnel System	0.13	0.02

Based on comparisons to the $PM_{2.5}$ interim guidance criteria, no potential significant adverse impacts on $PM_{2.5}$ concentrations from vehicular-related sources were predicted from either the Single or Double Tunnel Systems. Increases in concentrations due to vehicular traffic at other locations throughout the West Maspeth study area would be much less than those predicted at Rust and Grand Avenues and would be insignificant.

BARGES

Due to the nominal change expected in barge operations with the Expanded Float Operations Alternative and the TSM Alternative, as well as the distance to sensitive receptors from the float bridges, these alternatives were not explicitly modeled. The expected impact from barge emissions is negligible and would be much less than those shown for the emissions of diesel locomotives near the tunnel portals.

PORTALS, RAIL LINES AND TUNNEL VENTILATION SYSTEMS

Analysis Locations

69th Street Pier Ventilation Structure. The tunnel would include ventilation structures on each side of the Upper New York Harbor. Since the 69th Street Pier site is closer to tall residential buildings and ground level public access locations, this site was chosen to represent a worst case analysis for the ventilation structures. A conservative assumption was made calculating the emissions based on the train frequencies from the New Jersey alignment.

Brooklyn Portal Area. Both the New Jersey and the Staten Island tunnel alignments have a Brooklyn-side portal located in the right-of-way between 62nd St., 61st St., Fort Hamilton Parkway 10th Avenue, and 11th Avenue. This Brooklyn portal represents a worst-case scenario for the portals, due to the proximity of residential buildings to this site. The Greenville Yards portal is located in a predominantly industrial area, therefore, the modeling of pollutants emitted from the tunnel and the passing locomotives in the area adjacent to the Brooklyn-side portal can be treated as a worst-case for the Greenville Yards portal as well. The Brooklyn portal results include emissions for the tunnel portal itself and from the passing trains.

Staten Island Portal Area. For the Staten Island alignment, modeling was performed for the area adjacent to the Staten Island portal, and extending along the Staten Island Railroad. This site represents a worst case for the Staten Island Railroad, and includes both portal and rail line emissions.

East New York Tunnel Portal Areas. The East New York Tunnel is an existing rail tunnel located between East New York Avenue and Evergreen Avenue along Segment 4 of the Bay Ridge Branch. As part of the Tunnel Alternative, the East New York Tunnel would be reconfigured into two tubes, as explained in Chapter 16, "Construction and Construction Impacts." Ventilation in the reconfigured tunnel would be natural ventilation, based on meteorological effects and the train induced motion of air through the tunnel (known as "piston action") resulting in the locomotive emissions within each tube being exhausted from the portal in the direction of the motion of the train. The combined impact of predicted emissions from the tunnel portal and the adjacent open rail lines was modeled in both the northern and southern portal areas. The modeling was performed based on the train frequencies for the Double Tunnel System. Emissions under the Single Tunnel System would be slightly less due to reduced train frequency.

Bay Ridge Branch – Livonia Avenue and East 16th Street Areas. In addition to the lines adjacent to the above mentioned portal sites, modeling was conducted for two locations along the Bay Ridge Branch: a section of Segment 3 in the vicinity of 16th Street, and a section of Segment 4 in the vicinity of Livonia Avenue. The two selected sites represent a worst-case scenario, for both the absolute number of trains expected on the line (as discussed in Chapter 2, "Project Alternatives") and the relative expected increase in relation to the No Action Alternative, as well as the proximity of sensitive receptors to the rail right-of-way. The rail line at 16th Street is oriented in an east-west direction, whereas the rail line at Livonia Avenue is in a north-south orientation. The two sites thus represent two distinct cases, each with a different relative orientation of the prevailing wind directions to the source and receptor locations. The two models result in estimates of predicted impacts that are higher than would be expected in most areas of the alignment.

New Lots – Kings Highway and 93rd Street Areas. Two additional sites were selected for modeling for the Single Tunnel System only. As discussed in Chapter 2, "Project Alternatives,"

the New Lots sidings would include two 10,000-foot sidings along Segment 4 of the Bay Ridge Branch, extending from East 43rd Street to East 98th Street. Under the Single Tunnel System, these sidings would be more actively used as waiting tracks and to temporarily store rail cars headed to local destinations. Such activity would result in idling of trains. To account for these additional emissions, two sites were selected as worst-case locations for the New Lots sidings area, both include residential locations in close proximity to the tracks: Kings Highway and 93rd Street. Under the Double Tunnel System, a lesser level of activity is expected at the New Lots sidings.

Greenville Branch – Jersey City. Although increase in train passbys along this branch would not be as high as those along the Bay Ridge Branch, the close proximity of some residences in this area to the rail line and the existing New Jersey Turnpike (an existing background source) could potentially lead to increased pollutant concentrations. Therefore, air quality along the Greenville Branch was analyzed.

Predicted Concentrations - Single Tunnel System

The values presented in Table 9-12 are the maximum predicted contributions from the modeled sources at the receptor with the highest results for each site. Not all sites listed above were simulated under the Single Tunnel System, since train passbys at these sites would be considerably lower than under the Double Tunnel System. For these sites, it can be assumed that concentrations would therefore be lower than those predicted under the Double Tunnel System. As described earlier, the analysis uses the maximum predicted train frequencies (presented in Chapter 2, "Project Alternatives") with emission factors predicted for 2015 to ensure a worst-case analysis. After 2015, emissions from diesel locomotives would be further reduced as older, higher-polluting locomotives are retired and replaced with newer, less polluting engines. The predicted fleet-wide locomotive emissions in 2025 would be 87 percent and 85 percent of the corresponding 2015 emissions for NO_x and PM respectively. These percentages can be used to compare the estimated reduction in air pollutant concentrations from the year 2015 to the year 2025. The predicted concentrations at most of these sites would be proportionately lower.[1]

Predicted PM_{10} contributions from the Single Tunnel System at the analyzed rail segments were almost entirely negligible, with minor contributions in the New Lots sidings area. The calculated daily average $PM_{2.5}$ contributions were lower than the NYCDEP interim guidance levels, and would be considered insignificant. The predicted local maximum annual average $PM_{2.5}$ concentration at near the Brooklyn Portal and the New Lots – Kings Highway site were at the NYCDEP threshold level of 0.3 $\mu g/m^3$. At all other locations, the maximum annual $PM_{2.5}$ was lower than the NYCDEP threshold.

In addition to the results shown in Tables 9-11 and 9-12, annual average $PM_{2.5}$ concentrations on a neighborhood scale were calculated to be 0.06 $\mu g/m^3$ at the New Lots sidings area – lower than the interim guidance level of 0.1 $\mu g/m^3$. Due to the lower train frequencies for the Single Tunnel System, the annual average predicted neighborhood scale $PM_{2.5}$ concentration at other sites, would be lower than those computed for the Double Tunnel System, presented below. Those levels were lower than the interim guidance criterion. These neighborhood scale contributions would be considered insignificant.

[1] These percentages cannot be applied to the sidings at New Lots, since emissions at that location would include a component of idle emissions.

Table 9-12
Maximum Predicted Local Increase in Pollutant Concentrations Due to Locomotive Engine Emissions (µg/m^3)
Single Tunnel System, 2015

Pollutant	PM_{10}		$PM_{2.5}$		NO_2 [1]	SO_2 [0.5%] [2]		
Averaging Time	Daily	Annual	Daily	Annual	Annual	3-hour	Daily	Annual
NAAQS	*150*	*50*	*65*	*15*	*100*	*1300*	*365*	*80*
Brooklyn Portal Area	1.0	0.30	1.0	0.30	6.1	21.0	7.3	2.1
Bay Ridge Branch – Livonia Ave.	0.8	0.28	0.8	0.28	5.6	17.5	5.7	2.0
Bay Ridge Branch – E. 16th St.	0.8	0.26	0.8	0.26	5.2	22.7	5.6	1.8
Staten Island Portal Area	0.4	0.12	0.4	0.12	2.4	12.0	3.0	0.9
69th Street Pier Vent Area	0.3	0.05	0.3	0.05	1.0	19.8	2.5	0.3
New Lots – Kings Highway	3.0	0.31	3.0	0.31	4.9	60.3	9.6	1.7
New Lots – 93rd Street	0.8	0.12	0.8	0.12	9.5	518.9	70.3	3.3

Notes:
All concentrations are in µg/m^3
[1] Extreme value based on 75% conversion of NO to NO_2. Actual engine emissions contain approximately 10% NO_2, and the conversion in tunnel and en route to receptors is estimated not to exceed 30%.
[2] - No decay factor.
- Based on sulfur fuel content of 0.5% by weight. Locomotive fuels currently contain between 0.2% and 0.5%
Both of these assumptions result in higher predicted values.

Predicted concentrations of all other pollutants would be below their respective criteria. For purposes of comparison, the increases in pollutant contributions are presented in this paragraph as a percentage of the NAAQS. Predicted SO_2 contributions were mostly lower than one percent of the NAAQS. Higher contributions of SO_2 were predicted at the New Lots sidings area, but these increases are clearly not expected to cause violations of NAAQS (see totals below). The SO_2 increment would be 60 percent lower using low-sulfur fuel, and would be negligible if the fuel is replaced with ultra-low-sulfur fuel (currently being introduced for trucks). NO_2 contributions from the project could range from one percent of the maximum standard level at residential locations near the 69th Street pier ventilation shaft of the Staten Island tunnel alternative, to a maximum of six percent near the Brooklyn-side portal area, at the nearest residential receptor on 61st Street. A higher maximum increase, on the order of 9.5 percent of the NAAQS, was predicted at a discrete location in the New Lots sidings area.

Total predicted concentrations at the modeled locations, presented in Table 9-13, include the current background levels for each location. Future NO_2 and SO_2 levels may be lower due to lower sulfur content and enhanced engine performance dictated by future diesel fuel and engine regulations.

Table 9-13
Total Predicted Maximum Concentrations (µg/m^3)
Single Tunnel System, 2015

Pollutant	PM_{10}		$PM_{2.5}$		NO_2	SO_2 [0.5%]		
Averaging Time	**Daily**	**Annual**	**Daily**	**Annual**	**Annual**	**3-hour**	**Daily**	**Annual**
NAAQS	***150***	***50***	***65***	***15***	***100***	***1,300***	***365***	***80***
Brooklyn Portal Area	49.0	24.3	NA	NA	74	167	97	26
Bay Ridge B. Livonia Ave.	48.8	24.3	NA	NA	74	163	95	26
Bay Ridge B. E. 16th St.	48.8	24.3	NA	NA	73	169	95	26
Staten Island Portal Area	50.4	19.1	NA	NA	72	136	66	17
69th Street Pier Vent Area	48.3	24.0	NA	NA	69	166	92	24
New Lots – Kings Highway	51.0	24.3	NA	NA	73	211	100	26
New Lots – 93rd Street	48.8	24.1	NA	NA	77	718	167	28

Notes:
NA – Not Applicable. Official $PM_{2.5}$ background values are not available at this time. Preliminary data indicate that annual background levels may be slightly higher than the NAAQS, and 24-hour averages are significantly lower than the NAAQS. Determination of significance for $PM_{2.5}$ was based on comparing the increments (Table 9-11 above) with the threshold guidance values.
All concentrations are in µg/m^3
* 3-year average annual $PM_{2.5}$ background concentrations are unavailable at this time

Predicted Concentrations - Double Tunnel System

Results from the emissions and dispersion modeling at the sites under the Double Tunnel System are presented in Table 9-14.

The increase in $PM_{2.5}$ concentrations resulting from emissions within the East New York Tunnel (along Segment 4 of the Bay Ridge Branch) would be significant relative to the criteria. The maximum contributions of $PM_{2.5}$ at the southern portal would be lower than the 24-hour NYCDEP interim guidance threshold level of 5 µg/m^3, but higher than the level of 0.3 µg/m^3 threshold on an annual average. Based on preliminary background data, total 24-hour average concentrations, including background levels, would not exceed the NAAQS. By the northern portal, the predicted levels would be higher by approximately a factor of ten. Average 24-hour $PM_{2.5}$ concentrations and NO_2 concentration by the northern portal could potentially exceed the NAAQS.

The dispersion model of emissions from the East New York Tunnel is conservatively high. This is due to the fact that the ISC model fails when simulating dispersion of a jet release at close proximity to the source. The jet in this model is presented at a volume source, which does not take into account the turbulent mixing and motion of the air released from the tunnel and the motion of the train. The predicted concentrations are similar in magnitude to the concentrations predicted to be emitted from the portal itself, due to the fact that the model does not calculate the dispersion of air with initial concentrations, but rather the dispersion of the total mass of pollutant released. Although the magnitude of the impact is conservatively high, a significant adverse impact on $PM_{2.5}$ concentrations at this site is probable under the modeled conditions. Mitigation of this impact is discussed in Section E, "Mitigation" below.

Table 9-14
Maximum Predicted Local Increase in Pollutant Concentrations Due to Locomotive Engine Emissions (µg/m^3) Double Tunnel System, 2015

Pollutant	PM_{10}		$PM_{2.5}$		NO_2[1]	SO_2 [0.5%] [2]		
Averaging Time	Daily	Annual	Daily	Annual	Annual	3-hour	Daily	Annual
NAAQS	*150*	*50*	*65*	*15*	*100*	*1300*	*365*	*80*
East N.Y. Tunnel – Northern Portal	38.1	8.3	38.1	8.3	168	NA	118.3	25.9
East N.Y. Tunnel – Southern Portal	4.4	0.7	4.4	0.7	13.5	NA	13.7	2.1
Greenville Branch – Jersey City[3]	1.4	0.4	1.4	0.4	8.3	NA	4.3	1.3
Brooklyn portal area	1.8	0.5	1.8	0.5	11.0	37.9	13.2	3.9
Bay Ridge Branch Livonia Ave.	1.1	0.4	1.1	0.4	8.0	24.9	8.1	2.8
Bay Ridge Branch E. 16th St.	1.2	0.4	1.2	0.4	8.3	36.1	8.9	2.9
Staten Island portal area	0.7	0.2	0.7	0.2	4.1	28.1	5.0	1.4
69th Street Pier vent area	0.6	0.1	0.6	0.1	1.7	37.5	4.4	0.6

Notes:
All concentrations are in µg/m^3
3-hour Averages were not predicted for the E. NY Tunnel and Greenville Branch sites.
[1] Extreme value based on 75% conversion of NO to NO_2. Actual engine emissions contain approximately 10% NO_2, and the conversion in tunnel and en route to receptors is estimated not to exceed 30%. East New York Tunnel model assumed 40% conversion, due to the close proximity of the source to receptors (see discussion in text).
[2] - No decay factor.
- Based on sulfur fuel content of 0.5% by weight. Locomotive fuels currently contain between 0.2% and 0.5%
[3] Due to the lack of data for modeling NO_x and SO_2 from the NJ Turnpike which is a background source in this model, and because other models indicate that PM is the only pollutant with potentially high contributions from the railways, only PM was modeled for this site.
Both of these assumptions result in higher predicted values.

The maximum calculated $PM_{2.5}$ contributions at sites other than the East New York Tunnel were 3.0 percent of the daily and 3.8 percent of the annual maximum standard level. If compared to the NYCDEP interim guidance levels, the 24-hour average increments are not significant, and when added to background levels would not cause exceedance of the 24-hour standard level. The maximum local predicted annual increments at the Brooklyn Portal site and at sites along the Bay Ridge Branch were 0.5 and 0.4 µg/m^3 respectively. These increases are higher than the NYCDEP interim criterion of 0.3 µg/m^3, and in that context could be considered a significant adverse impact on $PM_{2.5}$ concentrations at discrete locations along the Bay Ridge Branch. Similarly, nearby residential receptors along the Greenville Branch would also be significantly impacted by $PM_{2.5}$ emissions under the Double Tunnel System. The neighborhood scale average concentration near the Brooklyn portal was predicted to be 0.11 µg/m^3, which is slightly higher than the NYCDEP criterion of 0.10 µg/m^3, and would be considered significant. All other sites on the Bay Ridge Branch were predicted to experience neighborhood scale increases of 0.04 µg/m^3 or less, which would be considered insignificant. A maximum neighborhood scale increase of 0.06 µg/m^3 was predicted from the Brooklyn ventilation structure, which would be considered insignificant.

Other than the East New York Tunnel sites (discussed above), the forecast PM_{10} contributions were all within 1.3 percent of the daily and 1.1 percent of the annual NAAQS. At the northern portal of the East New York Tunnel predicted PM_{10} concentrations would be higher, but did not exceed the NAAQS. Predicted SO_2 contributions at sites other than the East New York Tunnel were 3.2 percent, 4.0 percent, and 5.4 percent of the three-hour, eight-hour and daily NAAQS

levels at most. By the northern portal of the East New York Tunnel, the maximum predicted concentration of SO_2 would be higher, but still well below the NAAQS. If lower sulfur fuel is used the SO_2 increment would be up to 60 percent lower using low-sulfur fuel, currently in use, and would be negligible if the fuel is replaced with ultra-low-sulfur fuel, as is currently being introduced for trucks. NO_2 contributions from the project could range from 1.9 percent of the maximum standard level at residential locations near the 69th Street pier ventilation shaft of the Staten Island tunnel alternative, to a maximum of 12.1 percent near the Brooklyn-side portal area, at the nearest residential receptor on 61st Street.

Total predicted concentrations at the modeled locations, presented in Table 9-15, include the current background levels for each location. Future NO_x and SO_2 levels may be lower due to lower sulfur content and enhanced engine performance dictated by the new diesel fuel and engine regulations. Exceedances were not predicted for any pollutant in any of the locations modeled. Although the predicted local increases in $PM_{2.5}$ concentrations resulting from the project were low, the total annual $PM_{2.5}$ concentrations are expected to be high, based on initial monitoring data that indicates high annual $PM_{2.5}$ concentrations in the entire region. The precise total $PM_{2.5}$ values are not presented here due to the lack of the necessary three years of monitoring data. $PM_{2.5}$ is discussed further below.

Table 9-15
Total Predicted Maximum Concentrations (µg/m^3)
Double Tunnel System, 2015

Pollutant	PM_{10}		$PM_{2.5}$		NO_2	SO_2 [0.5%]		
Averaging Time	Daily	Annual	Daily	Annual	Annual	3-hour	Daily	Annual
NAAQS	***150***	***50***	***65***	***15***	***100***	***1,300***	***365***	***80***
East N.Y. Tunnel – Northern Portal	88	34	NA	NA	219	NA	86	18
East N.Y. Tunnel – Southern Portal	59	26	NA	NA	82	NA	99	26
Greenville Branch – Jersey City**	81**	32**	NA	NA	NA	NA	77	27
Brooklyn portal area	50	25	NA	NA	79	182	102	28
Bay Ridge B. Livonia Ave.	49	24	NA	NA	76	169	97	27
Bay Ridge B. E. 16th St.	49	24	NA	NA	76	180	98	27
Staten Island portal area	51	19	NA	NA	74	151	68	17
69th Street Pier vent area	49	24	NA	NA	70	181	93	25

Notes:
All concentrations are in µg/m^3
* 3-year average annual $PM_{2.5}$ background concentrations are unavailable at this time
** These values include additional modeled contributions from the NJ Turnpike of 2.77 and 0.85 µg/m^3 on a 24-hour and annual average basis, respectively.

RAIL YARDS

Of the rail yards included in the Tunnel Alternative, the maximum local impacts on air quality would be expected near Fresh Pond Yard and West Maspeth Yard, due to the proximity of residential buildings to the yard, and to the high intensity of the yard activity. Other yards would have less train activity and are further from any sensitive land uses.

Fresh Pond Yard

Since the activity at Fresh Pond Yard under the Single Tunnel System would be almost equivalent to the Double Tunnel System, the results from the Double Tunnel System are assumed as the worst-case scenario.

Results from the emissions and dispersion modeling of Fresh Pond Yard under the Tunnel Alternative are presented in Table 9-16. The values presented are the maximum predicted contributions from the modeled sources at the receptor with the highest results. As mentioned above for other train-related sources, the analysis uses the maximum predicted train frequencies with 2015 emission factors to ensure a worst-case analysis. In later years, emissions from diesel locomotives would be further reduced as older, higher-polluting locomotives are retired and replaced with newer, less polluting engines.

Table 9-16
Maximum Increase in Pollutant Concentrations Near Rail Yards Double Tunnel System, 2015
(µg/m^3)

Pollutant	Averaging time	NAAQS	Fresh Pond Yard	West Maspeth Yard (Sidewalk Receptors)	West Maspeth Yard (Residential Receptors)
PM_{10}	Daily	150	5.1	3.5	2.9
	Annual	50	1.5	1.2	0.5
$PM_{2.5}$	Daily	65	5.1	3.5	2.9
	Annual	15	1.5	1.2	0.5
NO_2	Annual	100	17.3	13.3	6.6

The maximum predicted project-related increase in local PM_{10} would be 3.4 percent and 3.0 percent of the daily and annual NAAQS respectively. Maximum expected incremental $PM_{2.5}$ concentrations would be 7.8 percent of the NAAQS averaged daily and 10.0 percent annually and are higher than the NYCDEP interim guidance threshold levels, and are therefore considered significant. Maximum NO_2 contributions are expected to be 17.3 percent of the NAAQS, which would be considered a sizeable increase in NO_2 emissions, resulting in an adverse impact.

The maximum contribution would occur near the southern boundary of the yard, by the intersection of Otto Road and 68th Street. Annual $PM_{2.5}$ concentrations higher than 1 µg/m^3 are expected at 5 homes in this location, decreasing to 0.15 µg/m^3 at a maximum distance of 400 meters along Otto Road.

The total predicted maximum concentrations near Fresh Pond Yard are presented in Table 9-17. The maximum predicted NO_2 concentration would be 85.3 µg/m^3, compared to the NAAQS of 100 µg/m^3. As previously described in Section A, the NO_2 contribution is conservatively calculated at a level of 40 percent of total NO_x emitted from the locomotives. The initial emissions would be estimated to contain 10 percent NO_2, and the close proximity of the receptors to the sources would result in very little conversion of NO to NO_2. Although the predicted total NO_2 concentration would be lower than the NAAQS, this is a large increase in an area where background levels are high. Predicted PM_{10} concentrations are 36 percent and 51 percent of the daily and annual NAAQS respectively. The contribution of yard activity to regional $PM_{2.5}$ concentrations is addressed below.

Table 9-17
Maximum Pollutant Concentrations Near Rail Yards
Double Tunnel System, Worst-Case Scenario ($\mu g/m^3$)

Pollutant	Averaging time	NAAQS	Fresh Pond Yard	West Maspeth Yard (Sidewalk Receptors)	West Maspeth Yard (Residential Receptors)
PM_{10}	Daily	150	53.1	53.5	52.9
	Annual	50	25.5	27.2	26.5
$PM_{2.5}$	Daily	65	NA *	NA *	NA *
	Annual	15	NA *	NA *	NA *
NO_2	Annual	100	85.3	64.3	57.6

Notes: * Annual $PM_{2.5}$ background concentrations are not available.

The significant increase in NO_2 and $PM_{2.5}$ concentrations predicted near Fresh Pond Yard would be mostly the consequence of intense activity performed by switcher locomotives rearranging train cars within the yard. Of the total emissions predicted in the yard, 76 percent of the particulate matter and 78 percent of the NO_2 would be emitted from switcher locomotives. Mitigation measures are discussed in Section E, "Mitigation," below.

West Maspeth Yard

In addition to the West Maspeth Yard mobile source analysis presented above, an analysis of the activity within the rail yard was performed. The maximum predicted increase in annual average $PM_{2.5}$ concentrations near West Maspeth, presented in Table 9-16 above, would be higher than the NYCDEP interim guidance threshold level. The predicted increase in 24-hour average $PM_{2.5}$ concentrations would be lower than the threshold level. Total predicted PM_{10} concentrations, presented in Table 9-17 above, would be lower than the NAAQS, as would the total NO_2 concentration. The highest predicted increases would be at the sidewalk receptors, directly north of the proposed yard and intermodal operations area. Emissions are predicted to be lower at the residential receptors, which are located to the east of the yard and farther from the area of operations. Mitigation of the impacts from West Maspeth Yard is discussed in Section E, "Mitigation," below.

E. MITIGATION

MOBILE SOURCE ANALYSIS

As discussed above, while neither the Single nor the Double Tunnel System would result in any significant impacts on CO concentrations in any of the study areas, traffic impacts would occur and mitigation has been proposed at several locations in the West Maspeth Yard study area. The CO analysis was therefore repeated with the proposed traffic mitigation. These results are shown in Table 9-18 and 9-19 below. As shown in the table, all of the maximum 8-hour average concentrations would be well below the NAAQS of 9 ppm.

Table 9-18
Future (2025) Maximum Predicted 8-Hour Average Carbon Monoxide Concentration for the Single Tunnel System with Mitigation (parts per million)

Site ID	Area	Site Location	Time Period	No Action	Single Tunnel System	Single Tunnel System with Mitigation
6	West Maspeth Yard	Grand Ave./Rust Ave.	PM	3.1	3.4	3.1
7		Grand Ave/Vandervoort Ave	PM	3.1	3.0	3.0
8		Vandervoort Ave./Cherry Ave./Meeker Ave.	PM	3.7	3.7	3.6
9		Grand Ave/LIE Service Road	AM	4.0	4.0	4.0
10		Grand Ave/Page Place	AM/PM	2.4	2.6	2.8
11		Maspeth Ave/Vandervoort Ave	AM	2.5	2.6	2.8
Note: 8-hour standard is 9 ppm.						

Table 9-19
Future (2025) Maximum Predicted 8-Hour Average Carbon Monoxide Concentration for the Double Tunnel System with Mitigation (parts per million)

Site ID	Area	Site Location	Time Period	No Action	Double Tunnel System	Double Tunnel System with Mitigation
6	West Maspeth Yard	Grand Ave./Rust Ave.	PM	3.1	3.4	3.2
7		Grand Ave/Vandervoort Ave	PM	3.1	3.0	3.0
8		Vandervoort Ave./Cherry Ave./Meeker Ave.	PM	3.7	3.8	4.0
9		Grand Ave/LIE Service Road	AM/PM	4.0	4.0	3.7
10		Grand Ave/Page Place	AM/PM	2.4	2.6	2.8
11		Maspeth Ave/Vandervoort Ave	AM	2.5	2.6	2.8
Note: 8-hour standard is 9 ppm.						

FRESH POND YARD

To reduce the impact of the activity at Fresh Pond Yard on air quality in the nearby residential neighborhood that would result from the Tunnel Alternative, the best available new low-emission switchers would be purchased for the yard at the time of the project implementation. It is assumed at this time that the purchase and use of a low-emission switcher would be incorporated into the operating contract specifications for the operator at Fresh Pond Yard. New locomotive technologies, aimed at reducing emissions and enhancing efficiency, are currently being tested. One such prototype, a microturbine engine hybrid switcher, has been leased by Union Pacific Railroad Company and is now based in Roseville, California. This model is expected to have an overall capital cost savings of around 30 percent, and achieve about an 80 to 90 percent reduction in NO_x, and a similar reduction in PM. Another engine type being tested is the gas the turbine locomotive fueled by compressed natural gas. These engines are expected to reduce NO_x emissions by 99 percent and virtually eliminate PM emissions. These engines could potentially be introduced as switchers as well.

Assuming a reduction of 80 percent in switcher NO_x and PM emissions, the project-related contributions to these pollutants will be approximately 40 percent of the values calculated above. The highest NO_2 contribution, experienced at the nearest receptor, would be reduced from 19 $\mu g/m^3$ to 8 $\mu g/m^3$, leading to a total of 76 $\mu g/m^3$ including the background concentrations. Similarly, $PM_{2.5}$ would be reduced from 5.3 $\mu g/m^3$ daily and 1.5 $\mu g/m^3$ annually, to 2.1 $\mu g/m^3$ daily and 0.6 annually. Daily increase in $PM_{2.5}$ less than the 5.0 $\mu g/m^3$ NYCDEP would be considered insignificant. An annual local increase on the order of 0.6 $\mu g/m^3$ would not be negligible, but would be expected to reduce the neighborhood scale increase to below the 0.1 $\mu g/m^3$ threshold level, and would therefore be a very local increase. If clean engines become available (such as the above mentioned gas turbine locomotive, purportedly reducing PM emissions to negligible levels), reductions of PM may be larger than 80 percent. These technologies will be investigated further for use at Fresh Pond Yard.

Additionally, procedures and technologies available for reduction in long duration locomotive engine idling will be investigated for use in the yard. Locomotives in rail yards usually idle their engines when not in use for a variety of reasons, such as maintaining engine operating temperature during cold weather to avoid engine freezing (most locomotive engines do not have anti-freeze), maintaining immediate engine availability, preventing start-up engine damage and maintaining air brake pressure. An idle reduction technology consists of the use of an alternative energy source in lieu of the main engine or a device designed to reduce long duration idling. Some of these technologies are mobile and attach onto the locomotive as auxiliary power units, and provide heat or electrical power. Other technologies involve electrifying parking spaces and modifying the locomotive. In general, this involves installing electric powered heating systems on locomotives which connect to the electrical grid and provide energy to operate on-board equipment.

WEST MASPETH YARD

The significant increase in $PM_{2.5}$ concentrations predicted near West Maspeth Yard would be emitted from a range of sources. The largest source is the various diesel operated container handling lift trucks. Smaller sources of the same magnitude are diesel powered hostling tractors, diesel trucks delivering and picking up containers, arriving and departing locomotives and switcher locomotives.

Mitigation for this site would address as many of these sources as practicable. Possible mitigation could include any combination of the following measures:

- Low-emitting container handling lift trucks and/or hostlers, either new or retrofit with emission reduction devices;
- Reduction or replacement of container handlers with an electric overhead crane system;
- The use of low-emitting switchers and long term locomotive idle reduction (see Fresh Pond Yard above)
- Management procedures that would minimize switching operations in the yard

Mitigable emissions at West Maspeth Yard would comprise approximately 83 percent of the total emissions. Existing technologies for reducing PM emissions have been shown to reduce emissions by more than 90 percent. If an overall 80 percent reduction is assumed from all of those sources, the predicted increase in $PM_{2.5}$ concentrations could be reduced by 67 percent, resulting in substantially lower concentrations in the nearby area.

EAST NEW YORK TUNNEL

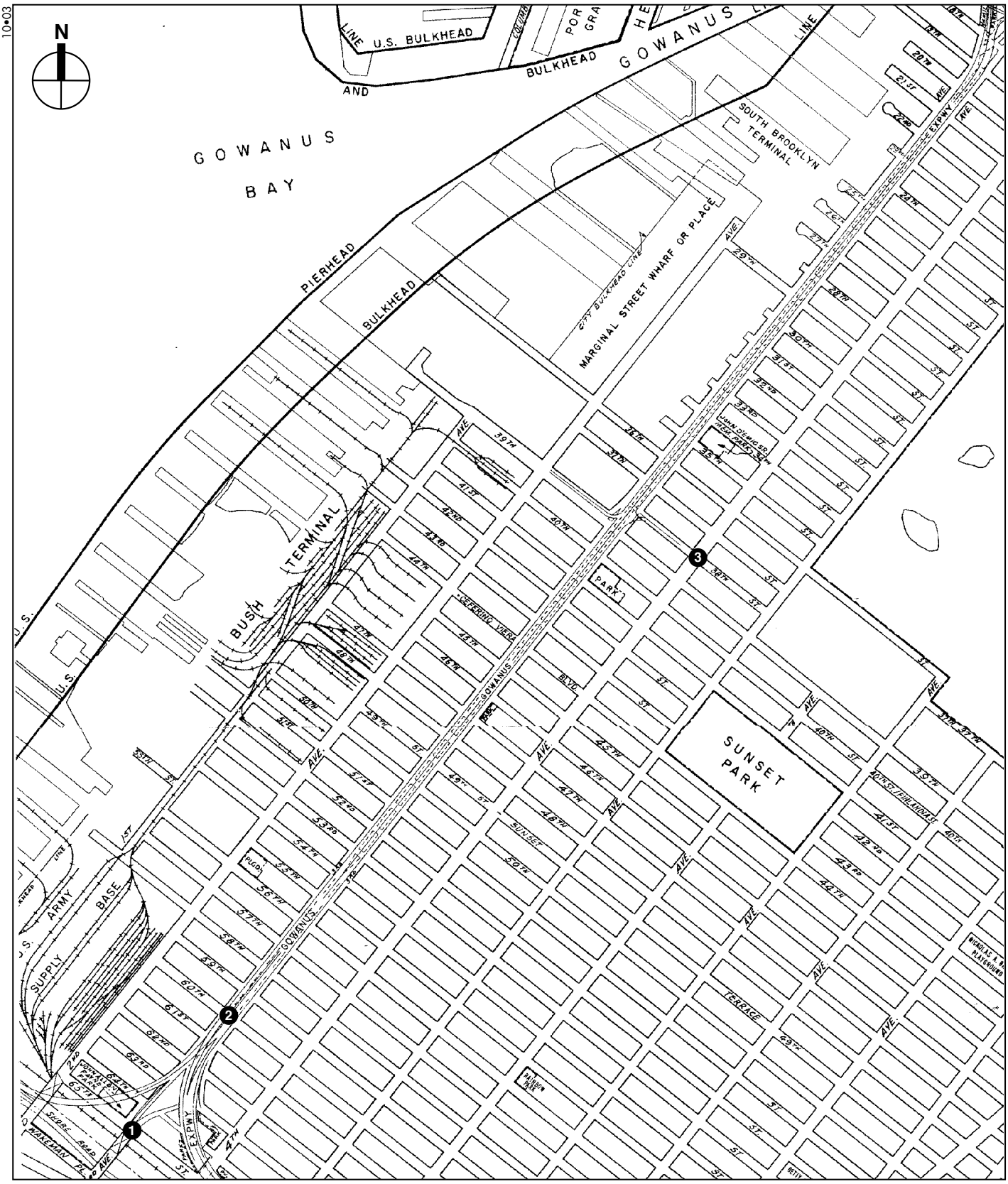
Based on initial modeling of the dispersion of pollutants emitted from the East New York Tunnel, currently planned to operate with natural ventilation only (meteorological and train induced), significant adverse impacts on $PM_{2.5}$ and NO_2 could occur at the residences adjacent to the tunnel portals and exceedances of the NAAQS are possible. These sites will be further investigated before the FEIS to better estimate what impacts would occur, including a more in-depth assessment of locomotive emissions in the tunnel and the complex dispersion of pollutants at this site, which may entail advanced mathematical or physical modeling (e.g., CFD modeling).

Should significant adverse impacts at these sites be confirmed between the time of the DEIS and the FEIS, mitigation measures would be developed to ensure that no significant adverse impacts occur, and such measures would be presented in the FEIS. Mitigation could include: extending the tunnel to relocate portal sites to locations further distanced from residences; introduction of mechanical ventilation to enhance dilution; relocation of the tunnel exhaustion point to maximize dispersion and dilution; and/or construction of an anti-recirculation wall. Other mitigation measures aimed at reducing emissions all along the rail lines, such as improved engine performance or cleaner fuels, would have a positive mitigating impact at this site as well.

RAIL LINES

Without mitigation, annual average $PM_{2.5}$ concentrations along the Bay Ridge Branch would be considered potential significant adverse impacts with respect to the NYCDEP interim guidance criteria. Similar impacts of a somewhat lower level could be expected along the Montauk Branch West and Chemical Coast Line (from Staten Island Rail Road to Greenville Branch). At all of these locations, the impacts would be local impacts along the right-of-way. Potential mitigation measures could include incorporating cleaner locomotive engines into the locomotive fleet and use of clean fuels and/or particle removal technology. The incorporation of lower sulfur fuel would lower SO_2 emissions in direct proportion to the sulfur content, and would in itself lower PM emissions. Greater reductions in PM emissions can be achieved by the use of newer, more efficient engines and particle removal technology. Air monitoring may be proposed at certain sensitive receptors near rail lines and/or train yards where exceedences of the $PM_{2.5}$ interim criteria are predicted. Since sufficient background data for $PM_{2.5}$ is not currently available, and since the $PM_{2.5}$ impact is measured as a project-specific increase and not as a total concentration, a proposed monitoring plan would need to include several years of background data collection prior to project commencement.

Additionally, as needed as an interim mitigation measure, the number of trains traveling along certain rail lines may be reduced in order to remain in compliance with the interim guidance criteria. It is anticipated that any necessary mitigation measures for air quality will be developed as the project proceeds and as $PM_{2.5}$ regulations are finalized. Mitigation could be adjusted and implemented as needed based on air quality monitoring results. ✷

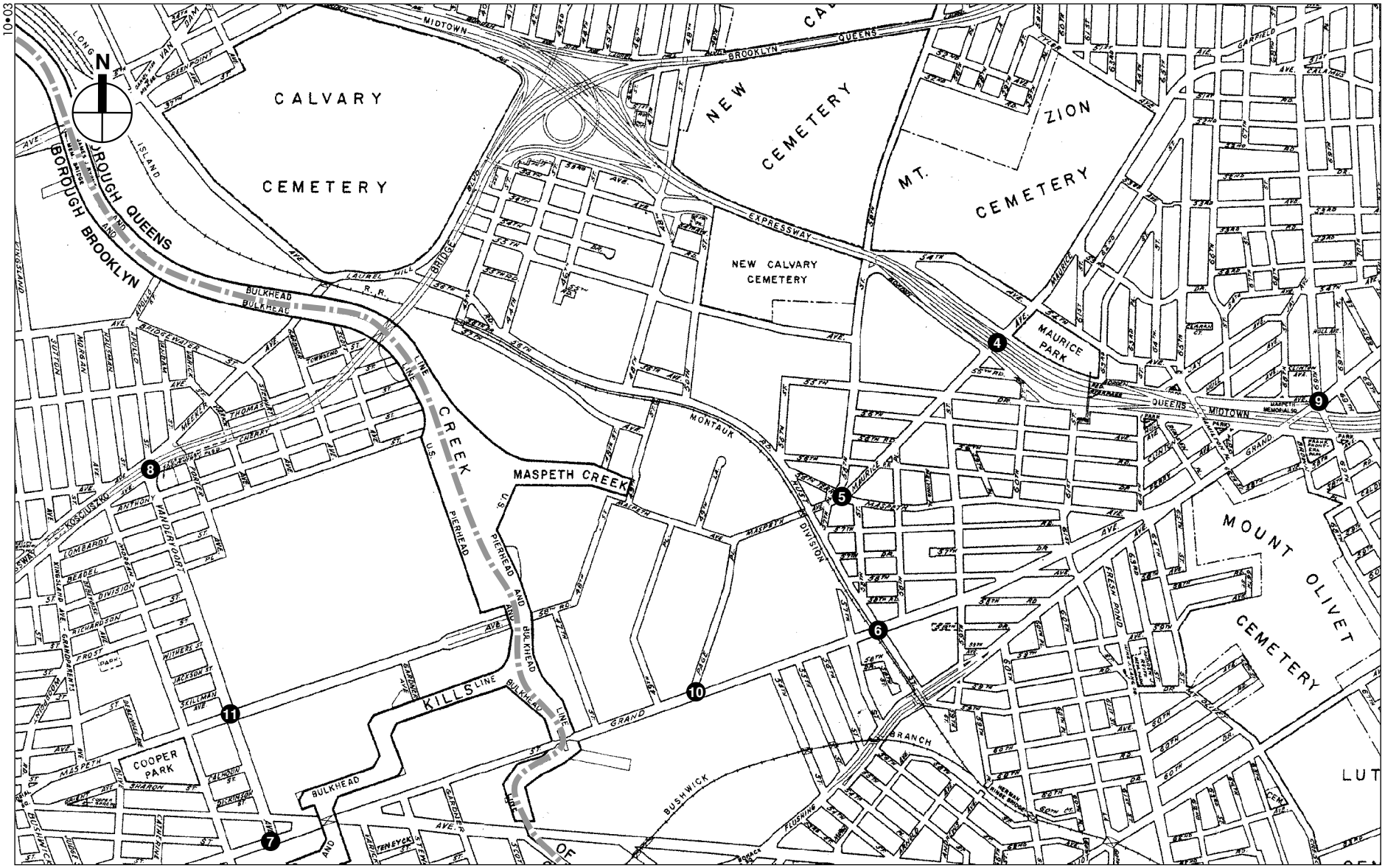


1 Air Quality Receptor Location (see Table 9-3)

Figure 9-1

Mobile Source Air Quality Receptor Locations – Brooklyn

CROSS HARBOR FREIGHT MOVEMENT PROJECT

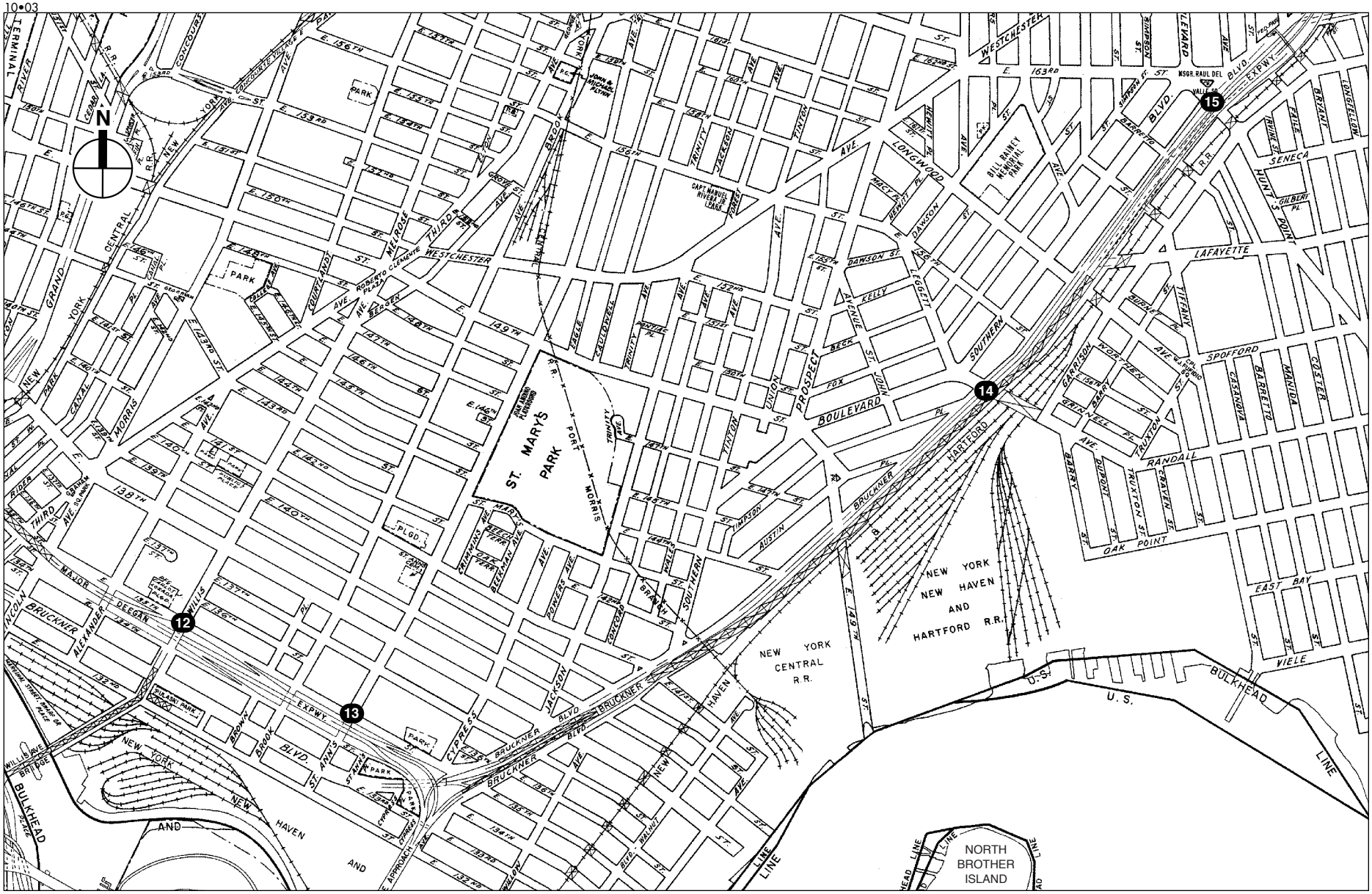


1 Air Quality Receptor Location (see Table 9-3)

Figure 9-2

Mobile Source Air Quality Receptor Locations – Queens

CROSS HARBOR FREIGHT MOVEMENT PROJECT



❶ Air Quality Receptor Location (see Table 9-3)

0 500 1000 FEET
SCALE

Figure 9-3

Mobile Source Air Quality Receptor Locations – Bronx

CROSS HARBOR FREIGHT MOVEMENT PROJECT

A. INTRODUCTION

This chapter assesses the potential for noise and vibration impacts from operational activities associated with the Cross Harbor Freight Movement Project. Noise and vibration during construction are assessed separately in Chapter 16, "Construction and Construction Impacts."

Operational activities could affect noise and vibration levels in a number of ways. Noise from rail freight operations would increase along at-grade, elevated, or depressed sections of the potential train routes. These increases in noise would be most perceptible along rights-of-way that currently experience little or no activity, such as along the Staten Island Railroad or the Bay Ridge Branch in Brooklyn. Vibration and ground-borne noise would also increase in the vicinity of the landside portion of the tunnel. Noise from increased yard operations may also result in higher ambient levels at locations adjacent to these facilities. Noise from vehicular sources, specifically trucks and employee vehicles, would increase in the areas surrounding the intermodal or transloading locations as well. Finally, mechanical equipment that is used for tunnel ventilation would have the potential for increasing noise at locations immediately adjacent to the facilities.

Each of these issues is addressed in the following sections of the chapter. This chapter examines the potential for impacts related to noise and vibration in two sections: B, "Noise," and C, "Vibration and Ground-Borne Noise." Each of these sections includes a discussion of methodology and an evaluation of existing conditions and the future conditions predicted for the no action and project alternatives.

B. NOISE

INTRODUCTION

The noise analysis for the project was performed using procedures from FTA and other applicable guidance. The Federal Transit Administration (FTA) guidance manual, *Transit Noise and Vibration Impact Assessment*, April 1995 was used to assess noise impacts from rail operations. This FTA guidance document provides a three-step process for analysis: a noise screening procedure, a general noise assessment methodology, and a detailed noise analysis methodology. The screening procedure is used to determine whether any noise sensitive receptors are within distances where impacts are likely to occur. The general noise assessment methodology is used when the screening procedures show the potential for impacts and to determine locations where noise levels are likely to exceed FTA impact criteria (i.e., locations where impacts would be likely to occur absent mitigation). The detailed noise analysis methodology is used to predict impacts at locations with the potential for impacts and evaluate the effectiveness of mitigation with greater precision. For this project, in terms of rail noise, noise receptors are located in close proximity to the existing rail lines and several of the rail yards. Consequently, rail noise was evaluated using the general and detailed noise assessment

methodologies. The effects of increased locomotive horn noise in the vicinity of at-grade crossings was based on the FRA's Grade Crossing Noise Model.

A noise screening from vehicular sources was assessed using the proportional modeling techniques in *City Environmental Quality Review (CEQR) Technical Manual* and impact criteria based on FTA and CEQR for sites in New York City.

The following sections discuss noise fundamentals, standards, and impact criteria; general noise assessment methodology; detailed noise analysis methodology; existing noise levels, and noise levels for the no action and project alternatives.

NOISE FUNDAMENTALS, STANDARDS, AND IMPACT CRITERIA

NOISE FUNDAMENTALS

Quantitative information on the effects of airborne noise on people is well documented. If sufficiently loud, noise may adversely affect people in several ways. For example, noise may interfere with human activities, such as sleep, speech communication, and tasks requiring concentration or coordination. It may also cause annoyance, hearing damage, and other physiological problems. Several noise scales and rating methods are used to quantify the effects of noise on people. These scales and methods consider such factors as loudness, duration, time of occurrence, and changes in noise level with time. It must be remembered that all the stated effects of noise on people vary greatly with the individual.

Sound is a fluctuation in air pressure. Sound pressure levels are measured in units called "decibels" (dB). The particular character of the noise that we hear (a whistle compared with a French horn, for example) is determined by the speed, or "frequency," at which the air pressure fluctuates, or "oscillates." Frequency defines the oscillation of sound pressure in terms of cycles per second. One cycle per second is known as one Hertz (Hz). People can hear over a relatively limited range of sound frequencies, generally between 20 and 20,000 Hz, and the ear does not perceive all frequencies equally well. High frequencies (that whistle, for example) are more easily discerned and therefore more intrusive than many of the lower frequencies (the lower notes on the French horn, for example).

"A"-Weighted Sound Level (dBA)

To bring a uniform noise measurement that simulates people's perception of loudness and annoyance, the decibel measurement is weighted to account for those frequencies most audible to the human ear. This is known as the A-weighted sound level, or "dBA," and it is the most often used descriptor of noise levels where community noise is the issue. As shown in Table 10-1, the threshold of human hearing is defined as 0 dBA; very quiet conditions (as in a library, for example) are approximately 40 dBA; levels between 50 dBA and 70 dBA define the range of acceptable daily activity; levels above 70 dBA would be considered noisy, loud, intrusive, and deafening as we move up the scale to 130 dBA. In considering these values, it is important to note that the dBA scale is logarithmic, meaning that each increase of 6 dBA describes a doubling of sound pressure. Thus, the background noise in an office, at 50 dBA, is perceived as

Table 10-1
Common Noise Levels

Sound Source	(dBA)
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 500 meters	100
Freight train at 30 meters	95
Train horn at 30 meters	90
Heavy truck at 15 meters	
Busy city street, loud shout	80
Busy traffic intersection	
Highway traffic at 15 meters, train	70
Predominantly industrial area	60
Light car traffic at 15 meters, city or commercial areas or residential areas close to industry	
Background noise in an office	50
Suburban areas with medium density transportation	
Public library	40
Soft whisper at 5 meters	30
Threshold of hearing	0

Note: A 10 dBA increase in level appears to double the loudness, and a 10 dBA decrease halves the apparent loudness.

Sources:
Cowan, James P. Handbook of Environmental, Acoustics. Van Nostrand Reinhold, New York, 1994.
Egan, M. David, Architectural Acoustics. McGraw-Hill Book Company, 1988.

twice as loud as a library at 40 dBA. A change of 3 dBA is needed for most people to perceive an increase in noise. A change of 5 dBA is generally readily noticeable.*

It is also important to understand that combinations of different noise sources are not arithmetically additive. For example, two noise sources, a vacuum cleaner operating at approximately 72 dBA and a telephone ringing at approximately 58 dBA, do not combine to

* Average ability to perceive changes in noise levels from Bolt Beranek and Neuman, Inc., *Fundamentals and Abatement of Highway Traffic Noise, Report No. PB-222-703.* Prepared for the Federal Highway Administration, June 1973.

create a noise level of 130 dBA. That is the equivalent of a jet airplane or air raid siren, as shown in Table 10-1. In fact, the person vacuuming may simply not hear the phone ringing. When addition is performed on the logarithmic scale, the combination of these two noise sources would yield a dBA level of 72.2.

Effects of Distance on Noise

Noise varies with distance from the source. For example, a diesel locomotive at-grade traveling at 50 mph will typically produce sound levels of approximately 92 dBA at 50 feet. The same noise will measure approximately 87.5 dBA at a distance of 100 feet. This decrease is known as "drop-off." The outdoor drop-off rate for moving noise sources, such as traffic or rail transit, is a decrease of 4.5 dBA for every doubling of distance between the noise source and receiver for noise propagation over soft ground. For stationary noise sources, such as amplified rock music, the outdoor drop-off rate is a decrease of 6.0 dBA for every doubling of distance between the noise source and receiver.

Noise Descriptors Used in Impact Assessment

Because the sound pressure level unit of dBA describes a noise level at just one moment and very few noises are constant, other ways of describing noise over more extended periods have been developed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific period as if it had been a steady, unchanging sound. For this condition, a descriptor called the "equivalent sound level," L_{eq}, can be computed. L_{eq} is the constant sound level that, in a given situation and period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted as $L_{eq(24)}$), conveys the same sound energy as the actual time-varying sound. Statistical sound level descriptors such as L_1, L_{10}, L_{50}, L_{90}, and L_x are sometimes used to indicate noise levels that have exceeded 1, 10, 50, 90, and x percent of the time, respectively.

A descriptor for cumulative 24-hour exposure is the day-night sound level, abbreviated as L_{dn}. This is a 24-hour measure that accounts for the moment-to-moment fluctuations in A-weighted noise levels due to all sound sources during 24 hours, combined. Mathematically, the L_{dn} noise level is the average of all $L_{eq(1)}$ noise levels over a 24-hour period, where nighttime noise levels (10 PM to 7 AM) are increased by 10 dBA before averaging to account for increased sensitivity during sleeping hours.

For rail generated noise, the maximum 1-hour equivalent sound level ($L_{eq(1)}$) or the day-night sound level (L_{dn}) is used for impact assessment, depending on land use category as described below. For vehicular traffic, $L_{eq(1)}$ is used to determine potential impacts.

NOISE STANDARDS AND CRITERIA

FTA Criteria

In April 1995, FTA issued its report, *Transit Noise and Vibration Impact Assessment*, as a guideline for the evaluation of noise and vibration levels resulting from mass transit projects, and the assessment of impacts that result. The noise analysis methodology in the FTA report determines operational noise impacts that result from mass transit projects based on peak-hour $L_{eq(1)}$ and 24-hour L_{dn} noise levels, depending on the land use category of the affected areas near mass transit projects. As described in Table 10-2, Categories 1 and 3, which include land uses that are noise sensitive, but where people do not sleep, require examination of a one-hour L_{eq} for the noisiest peak hour. For Category 2, which includes residences, hospitals, and other locations where nighttime sensitivity to noise is very important, use of L_{dn} is required.

Table 10-2
FTA's Land Use Category and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq(h)}$	Tracts of land in which quiet is an essential element in the intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor $L_{dn(h)}$	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels, where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq(h)}$	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important—such as medical offices, conference rooms, recording studios, and concert halls—fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks, and recreational facilities are also included.

Note: L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
Source: *Transit Noise and Vibration Impact Assessment,* FTA, April 1995.

For each land use category and its associated noise descriptor, the FTA impact criteria are keyed to the noise level generated by the project (called "project noise exposure") for various existing ambient noise levels. As shown in Figure 10-1, two types of impacts are defined for each land use category, depending on existing ambient noise levels. Thus, where existing background noise levels are 40 dBA for land use Categories 1 and 2, the respective L_{eq} and L_{dn} noise exposure from the project would create impacts if they were above approximately 50 dBA and would create severe impacts if they were above approximately 55 dBA. For Category 3, a project noise exposure level above approximately 55 dBA would be considered an impact and above approximately 60 dBA would be considered a severe impact. The difference between "severe impact" and "impact" is that the former denotes a change in noise level that a significant percentage of people would find annoying, while the latter is indicative of a change in noise level noticeable to most people, but not necessarily sufficient to result in strong adverse reactions from the community.

Federal Highway Administration (FHWA) Standards

FHWA noise criteria are contained in 23 CFR 772, Procedures for Abatement of Highway Traffic and Construction Noise. These criteria have two components: a "fixed" noise criteria, and a "relative" noise criteria. The fixed noise criteria, FHWA Noise Abatement Criteria (NAC), are shown in Table 10-3. These NAC depend on task interference due to noise interruption of various activities involving speech, which vary by land use. The second type of FHWA criteria is relative to existing noise levels. Substantial relative noise impacts occur when predicted traffic-noise levels increase by more than a prescribed limit (which individual states may set) above existing noise levels. These criteria apply to all Type I projects, which are defined by 23 CFR 772 as Federal or Federal-aid highway projects for the construction of a highway on a new

Table 10-3
FHWA Fixed Noise Criteria

Activity Category	L_{eq}	Description of Activity
A	57 Outdoors	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 Outdoors	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 Outdoors	Developed lands, properties, or activities not included in Categories A or B above.
D	None	Undeveloped lands.
E	52 Interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes. The proposed project would not constitute a Type I project, and therefore, these regulations would not be applicable.

NYSDOT Standards

NYSDOT has adopted the noise criteria of the FHWA for use on projects subject to their jurisdiction. According to NYSDOT criteria, impacts occur with either of the following two conditions: (1) predicted future traffic noise levels approach within one decibel or exceed the FHWA NAC shown above in Table 10-3, and/or; (2) when future predicted traffic noise levels substantially exceed the existing levels by six or more decibels.*

If a traffic impact is identified, noise abatement measures must be examined for all areas where traffic noise impacts are determined to occur. This examination should consider the effectiveness, feasibility, reasonableness, and costs of such measures. While the criteria stated above determine whether traffic noise impacts are predicted to occur, because an impact is predicted to occur does not necessarily mean that the impact is a "significant" noise impact. Significance is determined based upon the context of the project.

NYSDEC Criteria

New York State Department of Environmental Conservation (NYSDEC) published a guidance document entitled *Assessing and Mitigating Noise Impacts* (October 6, 2000). This document states that increases from 0-3 dBA should have no appreciable effect on receptors, increases of 3-6 dBA may have the potential for adverse impact only in cases where the most sensitive of receptors are present, and increases of more than 6 dBA may require a closer analysis of impact potential depending on existing noise levels and the character of surrounding land use and receptors. It goes on to say that in terms of threshold values, the addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dBA, and ambient noise levels in industrial or commercial areas may exceed 65 dBA with a high end

* To achieve an increase in noise level of this magnitude, assuming no changes in traffic speeds and vehicle mix, it takes more than a threefold increase in traffic volume.

of approximately 79 dBA. Projects that exceed these guidance levels should explore the feasibility of implementing mitigation.

NJDOT Standards

The New Jersey Department of Transportation (NJDOT) has adopted the noise criteria of the FHWA for use on projects subject to their jurisdiction. According to NJDOT criteria, impacts occur with either of the following two conditions: (1) predicted future traffic noise levels approach within one decibel or exceed the FHWA NAC shown above in Table 10-3, and/or; (2) when future predicted traffic noise levels substantially exceed the existing levels by ten or more decibels.

NJDEP Standards

The New Jersey Department of Environmental Protection (NJDEP) promulgated noise regulations to control noise from stationary commercial and industrial sources in 1974, pursuant to the Noise Control Act of 1971, N.J.S.A. 13:1G-1 et seq. These regulations establish noise level standards at residential property lines of 50 dBA during nighttime (10:00 p.m. to 7:00 a.m.) and 65 dBA during daytime, and at non-residential property lines of 65 dBA during both daytime and nighttime.

New York City Standards and Criteria

New York City Noise Code. The New York City Noise Control Code contains ambient noise quality criteria and standards based on existing land use zoning designations. Conformance with the noise levels contained in the Code is determined by considering noise emitted directly from stationary source activities within the boundary of a project. Construction activities and noise sources outside the boundaries of a project are not included within the provisions of the Code. Table 10-4 summarizes the ambient noise quality criteria contained in the Code. The Code also contains sound-level standards for motor vehicles, air compressors, and paving breakers; requires that all exhausts be muffled; prohibits all unnecessary noise adjacent to schools, hospitals, and courts; and limits construction activities to weekdays between 7 AM and 6 PM.

Table 10-4
City of New York Ambient Noise Quality Zone Criteria (dBA)

Ambient Noise Quality Zone (ANQZ)	Daytime Standards* (7AM-10PM)	Nighttime Standards* (10PM-7AM)
Low-Density Residential (R1 to R3) Land Uses (N1)	60	50
High-Density Residential (R4 to R10) Land Uses (N2)	65	55
Commercial (C1 to C8) and Manufacturing (M1 to M3) Land Uses (N3)	70	70

Note: * $L_{eq(1)}$
Source: City of New York Local Law No. 64.

CEQR Thresholds. The *CEQR Technical Manual* contains noise exposure guidelines for use in New York City environmental impact review. If the No Action noise level is 60 dB(A) $L_{eq(1)}$ or less, a 5 dB(A) $L_{eq(1)}$ or greater change should be considered significant. If the No Action noise level would be 62 dB(A) $L_{eq(1)}$ or more, a 3 dB(A) $L_{eq(1)}$ or greater change should be considered significant. At nighttime, a change of 3 dB(A) $L_{eq(1)}$ would typically be considered significant.

RAIL NOISE ANALYSIS METHODOLOGY

NOISE SCREENING PROCEDURE AND GENERAL NOISE ASSESSMENT

Rail Lines

Noise Screening Procedure. The FTA methodology begins with a noise screening procedure to determine whether any noise-sensitive receivers are within a distance where an impact is likely to occur. According to the FTA screening method, the distance for commuter rail mainline is 750 feet from the track centerline if unobstructed or 375 feet from the track centerline if obstructed.

Potential noise impacts due to the project were evaluated along each rail line segment, as shown in Table 10-5, which could be potentially affected by the project. Based on information provided by the land use assessment (see Chapter 3) and aerial photographs, noise sensitive land uses exist within 375 feet from the track center line for all rail line segments. In addition to the rail lines shown in Table 10-5, the project would add trains to four long and heavily-traveled mainline freight and/or commuter lines in New Jersey—the Northeast Corridor, Lehigh Mainline, River Line, and Southern Tier. For purpose of the noise screening procedure, it was assumed that there are sensitive receptors within 375 feet of the track centerline for these rail lines.

Table 10-5
Rail Line Segments

Rail Line	Rail Line Segment
New Jersey	
Greenville Branch	Lehigh Valley Drawbridge to NJ Tpke Extension
National Docks – Segment 1	N. Bergen Yard to Croxton Yard
National Docks – Segment 2	Croxton Yard to Greenville Branch
P & H Line	Croxton Yard to Greenville Branch
Chemical Coast Line-Segment 1	Staten Island Railroad to Greenville Branch
Chemical Coast Line –Segment 2	Port Reading Secondary to Staten Island Railroad
New York	
Staten Island Railroad -Segment 1	Arlington Yard to Nicholas Avenue
Staten Island Railroad -Segment 2	Nicholas Avenue to Alaska Street
Bay Ridge Branch –Segment 2/3	Tunnel Portal at 10th Avenue to Albany Avenue
Bay Ridge Branch –Segment 4	Albany Avenue to BK/QNS Border
Bay Ridge Branch –Queens Portion	BK/QNS Border to Fresh Pond Yard
Montauk Branch West	Fresh Pond Yard to West Maspeth Yard
Montauk Branch East	Fresh Pond Yard to Jamaica Station
Fremont Secondary –Segments 1 & 2	Fresh Pond Yard to Merge with Hell Gate Line
Fremont Secondary –Segment 3	Merge with Hell Gate Line to QNS northern border

General Noise Assessment. Since there are sensitive receptors within the screening distance, a general noise assessment analysis was conducted to evaluate potential freight passbys under the project using the procedures contained in the FTA guidance manual. The project alternative generating the largest potential number of passbys, the Tunnel Alternative, was used in the analysis. Both the New Jersey and Staten Island alignments were analyzed under the Single

Tunnel System and the Double Tunnel System. According to FTA's guidance document, the potential for noise impacts at sensitive land use locations would occur if the project-generated $L_{eq(1)}$ noise levels for land use Categories 1 and 3 and the project-generated L_{dn} noise levels for land use Category 2 exceed the FTA's allowable levels based on land use category (see Figure 10-1).

The general noise assessment methodology consists of determining the project noise exposure at 50 feet from the centerline of track and comparing the calculated levels with allowable levels based on land use categories. Since the general noise assessment is used as a screening methodology to determine which locations would require detailed investigation, it was assumed that somewhere along the existing rail lines, all three land use categories may be present within 50 feet of the track centerline. For purposes of this assessment, existing noise levels were estimated using the FTA methodology based on roadways and railroad lines (i.e., Table 5-7, "Estimating Existing Noise Exposure for General Assessment," contained in the FTA guidance document, *Transit Noise and Vibration Impact Assessment*).

As shown in Table 10-6, based on FTA's general noise assessment, the Tunnel Alternative has the potential to create significant noise impacts along many rail segments in the study area. These segments were therefore assessed using the FTA's detailed noise assessment methodology.

Although the General Noise Assessment predicts impacts for the Southern Tier, Northeast Corridor, River Line, and Lehigh Mainline, the change in noise levels would be less than 3 dB(A). These rail lines are heavily used passenger and/or freight lines and the project would be adding few additional train trips. An incremental noise level change of less than 3 dB(A) is widely recognized as being not perceptible. Furthermore, the General Noise Assessment is conservative. On this basis, these rail lines were not subjected to a detailed noise assessment.

No analysis was performed for the bored or cut and cover portions of the rail tunnel in Jersey City, Staten Island, or Brooklyn since the issue in these areas would be related to vibration and ground-borne noise, which is analyzed in Section C below.

Rail Yards

Noise Screening Procedure. As discussed in Chapter 2, "Project Alternatives," the project would involve increased operations at several new or existing rail yards in the study area. The FTA's screening procedures were used to determine if any noise-sensitive receptors are near enough to the yards to be potentially impacted by future rail operations. For active rail yards, the screening distances are 2,000 feet in obstructed areas and 1,000 feet where there are no intervening buildings between the rail yard and the receptors. Table 10-8 shows each rail yard, the nearest noise-sensitive receptor, and the results of the screening assessment. As shown in the table, 65th Street Yard, Fresh Pond Yard, and the West Maspeth Yard require further analysis and were subjected to a general noise assessment. The smaller West Maspeth Yard under the Expanded Float Alternative does not require further analysis because there are no sensitive receptors within 2,000 feet of the site. Note that no rail traffic would stop at Arlington Yard (trains would travel directly past the yard on the Staten Island Railroad) and therefore this yard is not analyzed separately; rather, impacts near the yard would be based on the rail line analysis for the Staten Island Railroad provided above.

Table 10-6
General Noise Assessment for Rail Lines – Tunnel Alternative
Land Use Category 1&3, L_{eq}, 50 Feet from Track Centerline

Segment	Potential Impacts of the Single Tunnel System (by Land Use Category)		Potential Impacts of the Double Tunnel System (by Land Use Category)	
	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel
New Jersey				
Greenville Branch	Impact (1)	Impact (1)	Impact (1)	Impact (1)
National Docks (Segment 1)	Impact (1)	Impact (1)	Impact (1)	Impact (1)
National Docks (Segment 2)	No Impact	Impact (1)	Impact (1)(3)	Impact (1)(3)
P & H Line	Impact (1)(3)	Impact (1)	Impact (1)(3)	Impact (1)(3)
Chemical Coast Line (Segment 1)	Impact (1)	Impact (1)(3)	Impact (1)	Impact (1)(3)
Chemical Coast Line (Segment 2)	Impact (1)	Impact (1)(3)	Impact (1)(3)	Impact (1)
Lehigh Mainline	Impact (1)	Impact (1)	Impact (1)(3)	Impact (1)(3)
River Line	Impact (1)	Impact (1)	Impact (1)	Impact (1)
Southern Tier	No Impact	No Impact	No Impact	No Impact
Northeast Corridor	No Impact	No Impact	No Impact	No Impact
New York				
Staten Island Railroad	NA	Impact (1)(3)	NA	Impact (1)(3)
Bay Ridge Branch	Impact (1)(3)	Impact (1)(3)	Impact (1)(3)	Impact (1)(3)
Montauk West	Impact (1)(3)	Impact (1)(3)	Impact (1)(3)	Impact (1)(3)
Montauk East	No Impact	No Impact	Impact (1)(3)	Impact (1)(3)
Fremont Secondary (Segment 1 & 2)	Impact (1)	Impact (1)	Impact (1)(3)	Impact (1)(3)
Fremont Secondary (Segment 3)	No Impact	No Impact	Impact (1)(3)	Impact (1)(3)

Table 10-7
General Noise Assessment for Rail Lines – Tunnel Alternative
Land Use Category 2, L_{dn}, 50 Feet from Track Centerline

Segment	Potential Impacts of the Single Tunnel System (by Land Use Category)		Potential Impacts of the Double Tunnel System (by Land Use Category)	
	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel
New Jersey				
Greenville Branch	Impact	Impact	Impact	Impact
National Docks (Segment 1)	No Impact	No Impact	No Impact	No Impact
National Docks (Segment 2)	No Impact	Impact	Impact	Impact
P & H Line	Impact	No Impact	No Impact	No Impact
Chemical Coast Line (Segment 1)	Impact	Impact	Impact	Impact
Chemical Coast Line (Segment 2)	Impact	Impact	Impact	Impact
Lehigh Mainline	Impact	Impact	Impact	Impact
River Line	No Impact	Impact	No Impact	No Impact
Southern Tier	No Impact	No Impact	Impact	Impact
Northeast Corridor	Impact	Impact	Impact	Impact
New York				
Staten Island Railroad	NA	Impact	NA	Impact
Bay Ridge Branch	Impact	Impact	Impact	Impact
Montauk West	Impact	Impact	Impact	Impact
Montauk East	Impact	Impact	Impact	Impact
Fremont Secondary (Segment 1 & 2)	Impact	Impact	Impact	Impact
Fremont Secondary (Segment 3)	Impact	Impact	Impact	Impact

Table 10-8
Noise Screening Procedure for Rail Yards – Tunnel Alternative

Yard	Nearest Receptor	Distance (Feet)	Intervening Buildings	Requires Further Analysis
Greenville	Princeton Avenue	2600	No	No
65th Street	2nd Avenue	500	Yes	Yes
Fresh Pond	Otto Road	500	Yes	Yes
West Maspeth	55 Avenue	900	Yes	Yes
Harlem River	Timpson Pl	1100	Yes	No
Oak Point	E. 132 Street	1300	Yes	No

General Noise Assessment. For purposes of the general noise assessment analysis, the nearest land use for each category was determined at each yard site that requires further analysis. In each case the nearest sensitive receptor is residential and therefore, FTA Land Use Category 2 applies and the impacts are assessed using the L_{dn} metric. Existing noise levels were estimated using the FTA methodology based on roadways (i.e., Table 5-7, "Estimating Existing Noise Exposure for General Assessment," contained in the FTA guidance document, *Transit Noise and Vibration Impact Assessment*). The project alternative with the potential to generate the largest noise impact, the Tunnel Alternative, was used in the analysis. For the purposes of performing a conservative noise screening, it was assumed that these rail yards would be expanded as described under the Double Tunnel System. As summarized in Table 10-9, based on the results of the general noise assessment, the Double Tunnel System would result in potential impacts for FTA Land Use Category 2 at Fresh Pond Yard and the West Maspeth Yard**.** The geographic extent of the impacts is represented by the last column, "Distance from Railyard for Onset of Impacts (in feet)."

Table 10-9
General Noise Assessment for Rail Yards
Double Tunnel System

Yard	FTA Land Use Category*	Noise Descriptor	Estimated Existing Ambient Noise Level**	Land Use Category Threshold of Impact	Project Noise Exposure (dBA)	Potential Noise Impact	Distance from Railyard for Onset of Impacts (ft)
65th Street Yard	2	L_{dn}	65	60.8	58.8	No Impact	0
	3	L_{eq}	65	65.8	54.2	No Impact	0
West Maspeth Yard	2	L_{dn}	65	60.8	62.9	Impact	634
	3	L_{eq}	65	65.8	61.7	No Impact	0
Fresh Pond Yard	2	L_{dn}	65	60.8	65.3	Impact	840
	3	L_{eq}	65	65.8	57.8	No Impact	0

Note: * See Table 10-2 for FTA Land Use Category Description

DETAILED RAIL NOISE ANALYSIS METHODOLOGY

Introduction

At the rail segments and rail yards where the general noise assessment indicated the potential for impacts, a detailed noise analysis was performed in compliance with the procedures contained in the FTA guidance manual. The purpose of a detailed analysis is to make a prediction of impacts and an assessment of the effectiveness of mitigation with greater precision than can be achieved with the general assessment methodology.

Based on the results of the general noise assessment, a detailed noise analysis was carried out for all rail segments and the West Maspeth Yard and Fresh Pond Yard.

Noise Prediction Methodology

In general, the methodology utilized for the detailed rail noise analysis contained the following steps: at each of the analysis receptor locations, representative noise-sensitive receptors sites, which were near and adjacent to the rail line right-of-way or rail yard, were selected using Geographical Information Systems (GIS), aerial photographs, and field studies; noise measurement was performed at each representative receptor site to establish existing conditions; existing noise levels were calculated at each representative receptor site using the calculation procedures contained in the FTA guidance document; the total future noise levels for the No Action Alternative at each receptor site were calculated by adding No Action Alternative rail noise to existing noise levels; project impacts were determined by using the FTA impact criteria shown in Figure 10-1; and, finally, at representative receptor sites where impacts or severe impacts were predicted to occur, the feasibility of possible mitigation measures was examined.

For the No Action and project alternatives, rail noise from train operations was calculated based on the FTA guidance manual procedures and formulas. Using the FTA methodology, $L_{eq(1)}$ and L_{dn}, noise levels for free-field acoustic conditions (no reflections above ground) from fixed-rail sources were determined based on a variety of factors, including the Sound Exposure Level (SEL) of train, number of rail cars, train speed, distance to receptor, the surrounding terrain, and the number of diesel locomotives and for rail yards, the number of train movements and trucks operating within the yard. For future conditions, noise levels from non-rail sources were assumed to be unchanged from existing conditions.

Selection of Noise Receptor Sites

<u>*Rail Line Noise*.</u> As shown in Figures 10-2 through 10-8, and in Table 10-10, 18 receptor sites, adjacent to noise sensitive land uses, were selected for the rail line noise analysis. These sites are representative of other locations in the immediate area, and are generally the locations where maximum project impacts would be expected. Noise measurements were typically made at locations that were on public streets rather than on private property and adjusted based upon distance from the track to reflect the noise levels at the closest sensitive receptor site to the rail line right-of-way. They were initially selected based on an examination of GIS and land use data for the rail segments which were identified as having the potential for project impacts. Field studies were then performed to confirm that each site has a sensitive land use, that rail noise is the dominant noise source, and that each site is generally the closest sensitive receptor location to the rail tracks. Based on the above criteria, each receptor site should yield maximum project

Table 10-10
Rail Line Monitoring Locations

Noise Receptor Sites	Representative Rail Line Segment	Rail Line Segment Description	Noise Monitoring Location	Nearest Sensitive Receptor Type/Location	FTA Land Use Category	Distance to Railroad Tracks from Monitoring Location	Approximate Track Elevation Near Monitoring Location	Other Major Noise Sources Near Monitoring Location	Figure Number
EAST HUDSON RIVER									
1e	Staten Island Railroad – Segment 1/ Arlington Yard	Arlington Yard to Nicholas Avenue	Linden Avenue between maple Parkway and Van Pelt Avenue	Residence at 60 feet	2	60 feet	Depressed 25 feet		10-6
2e	Staten Island Railroad – Segment 2	Nicholas Avenue to Alaska Street	Sharpe Avenue between Larkin Street and Grove Avenue	Residence at 50 feet	2	50 feet	Elevated 20 feet		10-6
3e	Bay Ridge Branch – Segment 2/3	Tunnel Portal at 10th Avenue to Albany Avenue	61st Street between 11th and 12th Avenues	Residence @ 170 feet	2	170 feet	Depressed 30 feet	Subway and traffic on 61st Street	10-7
4e	Bay Ridge Branch – Segment 3	Tunnel Entrance at 13th Avenue to Albany Avenue	The dead end of East 22nd Street between Campus Road and Avenue I	Residence/Brooklyn College @ 55 feet	2 & 3	55 feet	Depressed 30 feet		10-7
5e	Bay Ridge Branch – Segment 4	Albany Avenue to BK/QNS Border	Dumont and Van Sicklen Avenues	Residence/Institute @ 80 feet	2 & 3	80 feet	At Grade	Subway and local traffic	10-7
6e	Bay Ridge Branch – Queens Portion	BK/QNS Border to Fresh Pond Yard	Felix Avenue between Woodward and Cypress Avenues	Residence/School @ 110 feet	2	110 feet	Elevated 15 feet		10-8
10e	Montauk Branch West	Fresh Pond Yard to Potential Maspeth Yard	The dead end of 60th Place between 60th Drive and 62nd Avenue	Residences @ 100 feet	2	100 feet	Depressed 30 feet		10-6
11e	Montauk Branch East	Fresh Pond Yard to Jamaica Station	Crossing on 73rd Street between Central Avenue and Lutheran Cemetery	Residences @ 45 feet	2	45 feet	At Grade		10-8
12e	Montauk Branch East	Fresh Pond Yard to Jamaica Station	Bessemer Street between 114th and 115th Streets	Residence @ 60 feet	2	120 feet	Elevated 20 feet		10-8
7e	Fremont Secondary – Segments 1&2	Fresh Pond Yard to Merge with Hell Gate Line	The dead end of 62nd Avenue between 70th and 71st Streets	Residence/Park/School @ 110 feet	2 & 3	110 feet	Depressed 35 feet		10-8
8e	Fremont Secondary – Segments 1&2	Fresh Pond Yard to Merge with Hell Gate Line	72nd Street between 41st and Woodside Avenues	Residence/Church @ 80 feet	2 & 3	80 feet	Depressed 30 feet	BQE	10-8

Table 10-10 (continued)
Rail Line Monitoring Locations

Noise Receptor Sites	Representative Rail Line Segment	Rail Line Segment Description	Noise Monitoring Location	Nearest Sensitive Receptor Type/Location	FTA Land Use Category	Distance to Railroad Tracks from Monitoring Location	Approximate Track Elevation Near Monitoring Location	Other Major Noise Sources Near Monitoring Location	Figure Number
EAST HUDSON RIVER (continued)									
9e	Fremont Secondary – Segment 3	Fresh Pond Yard to Merge with Hell Gate Line	19th Street between 22nd Drive and 22nd Road	Residence/Park under tracks	2 & 3	Under tracks	Elevated 80 feet		10-8
WEST HUDSON RIVER									
4w	Greenville Branch	Lehigh Valley Drawbridge to NJ Tpke Extension	Catherine Court adjacent to tracks, Jersey City	Residence @ 120 feet from tracks	2	120 feet	Elevated on 15 foot berm	New Jersey Turnpike	10-2
1w	National Docks – Segment 1	N. Bergen Yard to Croxton Yard	41Street between Dell and Tonnelle Avenues, West NY	Residence @ 320 feet from tracks	2	320 feet	At Grade	Traffic noise from Route 1/9	10-3
3w	National Docks – Segment 2	Croxton Yard to Greenville Branch	Wayne Street between Ristaino Drive and Chopin Ct, Jersey City	Residence @ 50 feet from tracks	2&3	80 feet	Elevated @ 15 feet above grade		10-3
2w	P&H Line	Croxton Yard to Greenville Branch	Roanoke Avenue between Hawkins and Vincent Streets, Newark City	Residence @ 100 feet from the tracts	2	100 feet	Elevated on a 15 foot berm	Traffic noise from Viaduct Street	10-4
5w	Chemical Coast Line – Segment 1	Staten Island Railroad to Greenville Branch	Zamorski Drive between BRD Avenue and Second Avenue, Elizabeth City	Residence @ 120 feet from tracks	2	120 feet	At Grade	New Jersey Turnpike	10-5
6w	Chemical Coast Line – Segment 2	Port Reading Secondary to Staten Island Railroad	Dead end of Elm Street, Carteret	Residence @ 80 feet from tracks	2	80 feet	Depressed	New Jersey Turnpike	10-5

impacts (i.e., other potential receptor sites along the rail line segments of the selected receptor sites would be expected to have equal or smaller project impacts than the selected receptor sites). In addition, the 18 sites were selected to provide geographic coverage of the areas that may potentially be impacted by the project (i.e., they were spread over the various segments of the rail line potentially impacted by the project).

Rail Yard Noise. As shown on Table 10-11, two receptor sites were selected to measure noise from the two rail yards that require detailed analysis: the West Maspeth Yard and Fresh Pond Yard (see Figure 10-8).

Table 10-11
Rail Yard and Vehicular Monitoring Locations

Rail Yard	Noise Monitoring Location	Nearest Sensitive Receptor Type/Location	FTA Land Use Category	Distance to Center of Rail Yard from Monitoring Location	Figure Number
West Maspeth Yard	56th Terrace between 58th Street and 56 Road	Residence @ 1000 feet from center of yard	2	1,000 feet	10-8
Fresh Pond Yard	Otto Road between 67th Place and 68th Street	Residence @ 500 feet from center of yard	2	500 feet	10-8
Note: Fresh Pond is not an intermodal yard; therefore, no vehicular assessment was conducted.					

Noise Monitoring Methods

At each of the receptor sites noise levels were measured to determine existing L_{dn} and/or L_{eq} noise levels. Measurements were made from January 14 through June 28, 2002. Full 24-hour measurements were made during a typical weekday, between noon Monday and noon Friday.

The instrumentation used for the noise measurements was a Brüel & Kjær Noise Level Analyzer Type 4427, a Brüel & Kjær Sound Level Calibrator Type 4230, a Brüel & Kjær ½-inch microphone Type 4189, and a Brüel & Kjær microphone preamplifier Type 2619. The Analyzer was calibrated before and after readings with a Brüel & Kjær Type 4230 sound-level calibrator using the appropriate adaptor. Measurements at the location were made on the A-scale (dBA). The data were digitally recorded by the Analyzer and displayed at the end of each 60 minute measurement period in units of dBA. Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, and L_{90}. A windscreen was used during all sound measurements, except for calibration. All measurement procedures conformed with the requirements of ANSI Standard S1.13-1971 (R1976).

VEHICULAR NOISE ASSESSMENT METHODOLOGY

Noise Prediction Methodology

Noise levels due to project-generated autos and trucks in New York City (no additional trips were generated in New Jersey) were calculated using the proportional modeling techniques in the *CEQR Technical Manual* (since FHWA/NYSDOT regulations do not apply) to identify whether there are any roadways with traffic volume increases generated by the project alternatives that could potentially result in a significant noise impact**.** At the West Maspeth Yard, where the proportional modeling indicated there was a potential for significant impacts, a detailed noise analysis was performed using the FTA model.

Selection of Noise Receptor Sites

The sites that would generate truck or auto trips under the project alternatives are the West Maspeth Yard site, 65th Street Yard, Harlem River Yard, Oak Point Yard, and Greenville Yard (Expanded Float Operations Alternative only). Greenville Yard would generate a very small number of new employee trips under the Expanded Float Operations Alternative in an industrial area and therefore was not analyzed. The number of trucks and employee vehicles generated by 65th Street Yard, Oak Point Yard, and Harlem River Yard was also small under any alternative (the highest number being 10 truck trip ends and 10 employee auto trip ends during the peak hour at 65th Street Yard under the Tunnel Alternative). These sites, located in primarily industrial areas near heavily used transportation corridors, have high background noise levels and therefore were screened based on *CEQR Technical Manual* methodologies.

A residential receptor site was selected to assess project-generated truck noise along roadways in the vicinity of the West Maspeth Yard site (see Table 10-11 and Figure 10-8). It is the location where the maximum project impacts would be most likely to occur. The cumulative impacts of vehicular noise and noise generated by the rail yard were assessed at this site.

EXISTING CONDITIONS

Existing noise levels measured at each noise monitoring location are presented in Tables 10-12 and 10-13. The measured noise levels at residential locations ranged between 58.5 dBA L_{dn} and 85.1 dBA L_{dn}. These existing noise levels are considered "very noisy" under FTA characterizations. At locations where noise levels are highest, contributing factors include the density of existing rail operations and highways in the study area. Several of the 18 residential locations measured greater than 75 dBA L_{eq} —approaching the USEPA-identified threshold noise level of 75 dBA L_{eq} (24-hour) to protect public health and welfare (USEPA-550/9-74-004, March 1974).

PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

The following discussion analyzes possible noise impacts that could result from operation of the No Action and project alternatives.

NO ACTION ALTERNATIVE

Future noise levels for the No Action Alternative were calculated using the methodology previously described. Table 10-14 shows the number of train passbys that would occur along each rail line segment under existing conditions and the No Action Alternative, only for those rail line segments that would experience a change in the number of trains between the two conditions. On all other rail lines, no change is expected between existing and No Action Alternative conditions. Table 10-15 shows the calculated No Action Alternative noise levels and existing noise levels for these rail lines. (Details are provided in Appendix 4.) As shown in Table 10-15, there would be an increase in L_{dn} values along the P & H Line of 0.1 dBA and an increase in $L_{eq(1)}$ values along the Chemical Coast Line (Segment 2) of 0.8 dBA when comparing No Action Alternative conditions to existing conditions. However, along the National Docks Secondary (Segment 2), there would be a decrease in L_{dn} values by 0.1 dBA due to slightly reduced train numbers traveling along the line, resulting from the development of the Waverly

Table 10-12
Existing Noise Levels at Rail Line Monitoring Locations

Noise Receptor Site	Rail Line Segment	Noise Monitoring Location	Measured Total Noise Level L_{dn}	Measured Total Noise Level L_{eq}
New Jersey				
4w	Greenville Branch	Catherine Court adjacent to tracks	69.1	65.1
1w	National Docks (Segment 1)	41Street between Dell and Tonnelle Avenues, West NY	66.4	63.3
3w	National Docks (Segment 2)	Wayne Street between Ristaino Drive and Chopin Ct	68.8	64.6
2w	P & H Line	Roanoke Avenue between Hawkins and Vincent Streets	76.3	72.5
5w	Chemical Coast Line (Segment 1)	Zamorski Drive between BRD Avenue and Second Avenue	75.5	69.2
6w	Chemical Coast Line (Segment 2)	Dead end of Elm Street adjacent to tracks	74.2	71.1
New York				
1e	Staten Island Railroad (Segment 1)/Arlington Yard	Linden Ave between Maple Pkwy and Van Pelt Avenue	66.8	63.4
2e	Staten Island Railroad, (Segment 2)	Sharpe Avenue between Larkin Street and Grove Avenue	63.0	62.5
3e	Bay Ridge Branch (Segment 2)	61st Street between 11th and 12th Avenues	71.3	70.4
4e	Bay Ridge Branch (Segment 3)	The dead end of East 22nd Street between Campus Road and Avenue I	58.5	61.8
5e	Bay Ridge Branch (Segment 4)	Dumont and Van Sicklen Avenues	85.1	82.0
6e	Bay Ridge Branch (Segment 4/Queens Portion)	Felix Avenue between Woodward and Cypress Avenues	65.9	64.7
10e	Montauk Branch – West	The dead end of 60th Place between 60th Drive and 62nd Avenue	61.4	65.0
11e	Montauk Branch -East	Crossing on 73rd Street between Central Avenue and Lutheran Cemetery	69.2	71.6
12e	Montauk Branch – East	Bessemer Street between 114th and 115th Streets	61.2	59.4
7e	Fremont Secondary (Segment 1)	The dead end of 62nd Avenue between 70th and 71st Streets	61.1	60.1
8e	Fremont Secondary (Segment 2)	72nd Street between 41st and Woodside Avenues	64.7	60.5
9e	Fremont Secondary (Segment 3)	19th Street between 22nd Drive and 22nd Road	71.1	70.5

Loop that would divert trains to the P & H Line, among other factors. In general, the No Action Alternative would not result in any significant changes in noise levels and would not result in any noise impacts.

Table 10-13
Existing Noise Levels at Rail Yard and Vehicular Monitoring Locations

Rail Yard	Noise Monitoring Location	Measured Total Noise Level L_{dn}	Measured Total Noise Level L_{eq}
Fresh Pond Yard (no vehicular)	Otto Road between 67th Place and 68th Street	69.1	68.1
West Maspeth Yard	56th Terrace between 58th Street and 56 Road	71.9	70.0

Table 10-14
Existing and No Action Train Passbys by Rail Segment

Segment	Site No.	Existing			No Action Alternative		
		7 AM to 10 PM	10 PM to 7 AM	Peak Hour	7 AM to 10 PM	10 PM to 7 AM	Peak Hour
New Jersey							
Greenville Branch	4w	11	5	2	9	5	2
National Docks (Segment 1)	1w	21	9	2	23	9	2
National Docks (Segment 2)	3w	7	3	1	5	3	1
P & H Line	2w	18	9	1	22	9	1
Chemical Coast Line (Segment 1)	5w	9	1	2	13	1	3
Chemical Coast Line (Segment 2)	6w	8	4	2	10	8	3

Note: These numbers may differ slightly from those presented in the Chapter 8, "Transportation" and other chapters. However, the differences do not affect the conclusions of the impact analysis.

Table 10-15
Impact Evaluation of Noise from the No Action Alternative

Segment	Site No.	Category 2		Category 3	
		Existing Noise Level (L_{dn})	No Action Noise Level (L_{dn})	Existing Noise Level (L_{eq})	No Action Noise Level (L_{eq})
New Jersey					
Greenville Branch	4w	69.1	69.1	65.1	65.1
National Docks (Segment 1)	1w	66.4	66.4	63.3	63.3
National Docks (Segment 2)	3w	68.8	68.7	64.6	64.6
P & H Line	2w	76.3	76.4	72.5	72.5
Chemical Coast Line (Segment 1)	5w	75.5	75.5	69.2	69.2
Chemical Coast Line (Segment 2)	6w	74.2	74.2	71.1	71.9

TSM ALTERNATIVE

There would be no increase in rail, freight, or barge traffic under the TSM Alternative with the exception of one additional roundtrip train on the Hudson Line and Fremont Secondary. These are active rail lines, and the addition of one roundtrip train is not expected to result in significant changes in noise levels or significant noise impacts.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

The Expanded Float Operations Alternative would generate one additional roundtrip train on the following train lines: in New Jersey, the Greenville Branch, National Docks Secondary, P & H Line, and Chemical Coast Line; in New York, the Bay Ridge Branch, Fremont Secondary, and Hudson Line. These are active rail lines, and the addition of one roundtrip train is not expected to result in significant changes in noise levels or significant noise impacts. In addition, there would be an increase in noise generated at Greenville Yard and 65th Street Yard and vicinity due to increased rail operational activities, barge traffic (16 roundtrips per day as compared to 2 roundtrips per day under the No Action Alternative), and employee vehicles. These rail yards are in predominantly industrial areas and are separated from residential areas by major highways. These rail yards were screened in the General Noise Assessment for the Tunnel Alternative, which would generate greater activity. Therefore, the Expanded Float Operations Alternative is not expected to result in significant changes in noise levels or significant noise impacts.

TUNNEL ALTERNATIVE

Rail Lines

Future noise levels along rail lines under the Tunnel Alternative (New Jersey tunnel alignment and Staten Island tunnel alignment) were calculated using the methodology previously described.

Single Tunnel System. Table 10-16 shows the number of train passbys that would occur along each rail line segment under each tunnel alignment of the Single Tunnel System. Table 10-17 shows the calculated Land Use Category 2 noise levels under each tunnel alignment and existing noise levels, and Table 10-18 shows the calculated Land Use Category 3 noise levels under each tunnel alignment and existing noise levels. (Details are provided in the Appendix 4.) The analysis for Category 1 is not provided below because no known Category 1 sites exist near the rail lines with the exception of Snug Harbor, which would be adjacent to the underground portion of the tunnel. No analysis was performed for the underground portions of the rail tunnel in Jersey City, Staten Island, or Brooklyn since the issue in these areas would be related to vibration and ground-borne noise, which is analyzed in Section C below.

The maximum increase in Land Use Category 2 L_{dn} values would be 13.8dBA at Site 4e along the Bay Ridge Branch (Segment 3) when comparing noise generated under the tunnel alignments for the Single Tunnel System to existing conditions, and the maximum increase in Land Use Category 3 L_{eq} values would be 9.2 dBA at Site 2e along the Staten Island Railroad (Segment 2) when comparing noise generated under the tunnel alignments for the Single Tunnel System to existing conditions.

Table 10-16
Train Passbys by Rail Segment
Tunnel Alternative (Single Tunnel System)

Segment	Site No.	Existing			NJ Tunnel			SI Tunnel		
		7AM to 10PM	10PM to 7AM	Peak Hour	7AM to 10PM	10PM to 7AM	Peak Hour	7AM to 10PM	10PM to 7AM	Peak Hour
New Jersey										
Greenville Branch	4w	11	5	2	28	14	3	13	7	3
National Docks (Segment 1)	1w	21	9	2	27	11	3	25	11	3
National Docks (Segment 2)	3w	7	3	1	5	3	2	11	5	2
P & H Line	2w	18	9	1	27	12	4	23	10	2
Chemical Coast Line (Segment 1)	5w	9	1	2	14	2	3	25	7	4
Chemical Coast Line (Segment 2)	6w	8	4	2	11	9	3	13	11	4
New York										
Staten Island Railroad (Segments 1&2/Arlington Yard)	1e-2e	0	0	0	NA	NA	NA	21	13	3
Bay Ridge Branch (Segments 2&3)	3e-4e	1	1	0	22	14	4	18	14	3
Bay Ridge Branch (Segment 4/Queens Portion)	5e-6e	1	1	0	31	23	4	27	23	4
Fremont Secondary (Segment 1&2)	7e-8e	4	2	1	8	2	2	6	2	2
Fremont Secondary (Segment 3)	9e	33	5	5	37	5	6	35	5	6
Montauk – West	10e	3	3	1	13	11	2	11	11	2
Montauk – East	11e	4	2	1	9	5	1	9	5	1
Montauk – East	12e	4	2	1	9	5	1	9	5	1

For Land Use Category 2 under the New Jersey tunnel alignment for the Single Tunnel System (see Table 10-17), there would be no impacts at locations adjacent to the following rail segments: National Docks Secondary (Segments 1 & 2), P&H Line, Chemical Coast Line (Segment 1), Bay Ridge Branch (Segment 2), Montauk Branch East (12e), and Fremont Secondary (Segment 3). "Impacts" or "Severe Impacts" would occur at locations adjacent to the Chemical Coast Line (Segment 2), Greenville Branch, Bay Ridge Branch (Segments 3 & 4/Queens Portion), Montauk Branch West, Montauk Branch East (11e), and Fremont Secondary (Segments 1 & 2).

For Land Use Category 2 under the Staten Island tunnel alignment of the Single Tunnel System (see Table 10-17), there would be no impacts at locations adjacent to Greenville Branch, National Docks Secondary (Segment 1), P&H Line, Chemical Coast Line (Segment 1), Bay Ridge Branch (Segment 2), Montauk Branch East (12e), and Fremont Secondary (Segment 3). "Impacts" or "Severe Impacts" would occur at locations adjacent to the National Docks Secondary (Segment 2), Chemical Coast Line (Segment 2), Staten Island Railroad (Segment 1 Arlington Yard), Staten Island Railroad (Segment 2), Bay Ridge Branch (Segments 3 & 4/Queens Portion), Montauk Branch West, Montauk Branch East (11e), and Fremont Secondary (Segments 1 & 2).

For Land Use Category 3 under the New Jersey tunnel alignment for the Single Tunnel System (see Table 10-18), there would be no impacts at locations adjacent to the Greenville Branch, National Docks Secondary (Segments 1 & 2), P&H Line, Chemical Coast Line (Segments 1 & 2), Bay Ridge Branch (Segments 2 & 4), Montauk Branch West, Montauk Branch East (11e &

Table 10-17
Impact Evaluation of Noise - Land Use Category 2, L_{dn}
Tunnel Alternative (Single Tunnel System)

Noise Site	Segment	Existing	Allowable Project Noise Exposure Level[b]		Predicted Project Noise Exposure Level[c]		Result		Ambient Noise Level with Project		Affected Area (feet)	
			Impact	Severe Impact	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	Obstructed (Shielding)	Unobstructed (No-Shielding)
New Jersey												
4w	Greenville Branch	69.1	63.7	68.9	65.4	60.1	Impact	No Impact	70.7	69.6	0	155
1w	National Docks (Segment 1)	66.4	61.8	67.1	49.5	48.9	No Impact	No Impact	66.5	66.5	0	0
3w	National Docks (Segment 2)	68.8	63.5	68.7	<45	64.4	No Impact	Impact	68.8	70.2	0	91
2w	P & H Line	76.3	65.0	74.2	63.7	58.8	No Impact	No Impact	76.6	76.4	0	0
5w	Chemical Coast Line (Segment 1)	75.5	65.0	73.6	55.8	63.3	No Impact	No Impact	75.6	75.8	0	0
6w	Chemical Coast Line (Segment 2)	74.2	65.0	72.5	65.9	65.1	Impact	Impact	74.8	75.1	0	92
New York												
1e	Staten Island Railroad, (Segment 1/ Arlington Yard)	66.8	62.0	67.3	NA	70.9	NA	Severe Impact	NA	72.4	108	234
2e	Staten Island Railroad, (Segment 2)	63.0	59.5	65.0	NA	73.9	NA	Severe Impact	NA	74.3	210	452
3e	Bay Ridge Branch (Segment 2)	71.3	65.0	70.4	61.8	61.6	No Impact	No Impact	71.7	71.7	0	0
4e	Bay Ridge Branch (Segment 3)	58.5	57.0	62.7	72.1	71.9	Severe Impact	Severe Impact	72.3	72.2	260	560
5e	Bay Ridge Branch (Segment 4)	85.1	65.0	75.0	68.6	68.5	Impact	Impact	85.2	85.2	0	153
6e	Bay Ridge Branch (Segment 4/Queens Portion)	65.9	61.4	66.7	66.7	66.6	Impact	Impact	69.3	69.3	115	248
10e	Montauk Branch – West	61.4	58.6	64.1	69.6	69.5	Severe Impact	Severe Impact	70.2	70.1	251	541
11e	Montauk Branch - East	69.2	63.7	68.9	67.3	67.3	Impact	Impact	71.3	71.3	0	78
12e	Montauk Branch – East	61.2	58.5	64.0	57.1	57.1	No Impact	No Impact	62.6	62.6	0	0
7e	Fremont Secondary (Segment 1)	61.1	58.4	64.0	58.6	58.4	Impact	Impact	63.0	63.0	0	113
8e	Fremont Secondary (Segment 2)	64.7	60.6	66.0	61.1	60.9	Impact	Impact	66.3	66.2	0	86
9e	Fremont Secondary (Segment 3)	71.1	65.0	70.2	61.4	61.1	No Impact	No Impact	71.5	71.5	0	0

Notes:
[a] For definition of land use categories, see Table 10-2.
[b] See Figures 10-2 through 10-8 and Table 10-12 for locations
[c] Definitions of noise exposure levels, etc., are found in Figure 10-1.
[d] 0/0 = NJ Tunnel onset of impact distance / SI Tunnel onset of impact distance

Table 10-18
Impact Evaluation of Noise - Land Use Category 3, L_{eq}
Tunnel Alternative (Single Tunnel System)

Noise Site	Segment	Existing	Allowable Project Noise Exposure Level[b]		Predicted Project Noise Exposure Level[c]		Result		Ambient Noise Level with Project		Affected Area (feet)	
			Impact	Severe Impact	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	Obstructed (Shielding)	Unobstructed (No-Shielding)
New Jersey												
4w	Greenville Branch	65.1	65.9	71.3	59.9	59.9	No Impact	No Impact	66.8	66.8	0	0
1w	National Docks (Segment 1)	63.3	64.7	70.2	49.7	49.7	No Impact	No Impact	63.5	63.5	0	0
3w	National Docks (Segment 2)	64.6	65.6	71.0	45.9	63.1	No Impact	No Impact	64.6	67.0	0	0
2w	P & H Line	72.5	70.0	76.3	66.9	62.3	No Impact	No Impact	73.6	72.9	0	0
5w	Chemical Coast Line (Segment 1)	69.2	68.8	73.9	58.1	59.9	No Impact	No Impact	69.5	69.8	0	0
6w	Chemical Coast Line (Segment 2)	71.1	70.0	75.3	62.6	64.4	No Impact	No Impact	71.7	72.4	0	0
New York												
1e	Staten Island Railroad (Segment 1/ Arlington Yard)	63.4	64.8	70.2	NA	68.1	NA	Impact	NA	69.4	0	100
2e	Staten Island Railroad (Segment 2)	62.5	64.2	69.7	NA	71.1	NA	Severe Impact	NA	71.7	66	143
3e	Bay Ridge Branch (Segment 2)	70.4	69.7	74.8	58.6	58.6	No Impact	No Impact	70.7	70.7	0	0
4e	Bay Ridge Branch (Segment 3)	61.8	63.8	69.3	66.8	66.8	Impact	Impact	68.0	68.0	0	110
5e	Bay Ridge Branch (Segment 4)	82.0	70.0	80.0	64.5	64.5	No Impact	No Impact	82.1	82.1	0	0
6e	Bay Ridge Branch (Segment 4/Queens Portion)	64.7	65.6	71.0	68.9	68.9	Impact	Impact	70.3	70.3	0	99
10e	Montauk Branch – West	65.0	65.8	71.2	65.6	65.6	No Impact	No Impact	68.3	68.3	0	0
11e	Montauk Branch - East	71.6	70.0	75.6	57.9	57.9	No Impact	No Impact	71.6	71.6	0	0
12e	Montauk Branch – East	59.4	62.5	68.1	47.7	47.7	No Impact	No Impact	61.4	61.4	0	0
7e	Fremont Secondary (Segment 1)	60.1	62.8	68.4	61.4	61.4	No Impact	No Impact	63.8	63.8	0	0
8e	Fremont Secondary (Segment 2)	60.5	63.1	68.7	64.6	64.6	Impact	Impact	66.0	66.0	0	101
9e	Fremont Secondary (Segment 3)	70.5	69.7	74.8	64.8	64.8	No Impact	No Impact	71.5	71.5	0	0

Notes:
[a] For definition of land use categories, see Table 10-2.
[b] See Figures 10-2 through 10-8 and Table 10-12 for locations
[c] Definitions of noise exposure levels, etc., are found in Figure 10-1.
[d] 0/0 = NJ Tunnel onset of impact distance / SI Tunnel onset of impact distance

12e), and Fremont Secondary (Segments 1 & 3). "Impacts" or "Severe Impacts" would occur at locations adjacent to the Bay Ridge Branch (Segments 3 & 4/Queen Portion), and Fremont Secondary (Segment 2).

For Land Use Category 3 under the Staten Island tunnel alignment for the Single Tunnel System (see Table 10-18), there would be no impacts at locations adjacent to all rail line segments in New Jersey. There would be no impacts in New York at locations adjacent to Bay Ridge Branch (Segments 2 & 4), Montauk West, Montauk East, and Fremont Secondary (Segments 1 & 3). "Impacts" or "Severe Impacts" would occur at locations adjacent to the Staten Island Railroad (Segment 1/Arlington Yard), Staten Island Railroad (Segment 2), Bay Ridge Branch (Segments 3 & 4/Queens Portion), and Fremont Secondary (Segment 2).

For National Docks Secondary (Segment 2), this assessment may be overly conservative. With the construction of the Waverly Loop connecting the P & H Line and Greenville Branch, trains headed to the tunnel (either alignment) from the north would have the option of using the National Docks or P & H Line and fewer may choose the National Docks Secondary than what has been analyzed.

Tables 10-17 and 10-18 also provide distances for affected areas. These distances represent the noise-impacted area measured from the center of the rail line outward. For example, an affected area of 150 feet for residential land uses would mean that residents located within 150 feet of the rail centerline would likely experience a noise impact. For Land Use Category 2, primarily residential uses, the "obstructed" distances should be used for all portions of the rail line segment that are not elevated and the "unobstructed" distances for elevated (either on an embankment or viaduct) portions of the rail line segment. Land Use Category 3 contains community facilities within buildings, such as schools, and outdoor facilities such as parks. For community facility buildings along non-elevated portions of the rail line segment, the "obstructed" distances should be used, while the "unobstructed" distances should be used for these buildings along elevated portions. For parks, the "unobstructed" distances should be used for all rail line segments.

Double Tunnel System. Table 10-19 shows the number of train passbys that would occur along each rail line segment under each tunnel alignment of the Double Tunnel System. Table 10-20 shows the calculated Land Use Category 2 noise levels under each tunnel alignment and existing noise levels, and Table 10-21 shows the calculated Land Use Category 3 noise levels under each tunnel alignment and existing noise levels. (Details are provided in the Appendix 4.)

The maximum increase in Land Use Category 2 L_{dn} values would be 18.3 dBA at Site 4e along the Bay Ridge Branch (Segment 3) when comparing noise generated under the tunnel alignments for the Double Tunnel System to existing conditions, and the maximum increase in Land Use Category 3 L_{eq} values would be 10.8 dBA at Site 2e along the Staten Island Railroad (Segment 2) when comparing noise generated under the tunnel alignments for the Double Tunnel System to existing conditions.

For Land Use Category 2 under the New Jersey tunnel alignment (see Table 10-20), there would be no impacts at locations adjacent to the following rail segments: National Docks (Segments 1 & 2), P & H Line, and Chemical Coast Line (Segments 1 & 2). "Impacts" or "Severe Impacts" would occur at locations adjacent to the Greenville Branch, Bay Ridge Branch (Segments 2, 3 & 4/Queens Portion), Montauk Branch West, Montauk Branch East, and Fremont Secondary (Segments 1, 2 & 3).

Table 10-19
Train Passbys by Rail Segment
Tunnel Alternative (Double Tunnel System)

Segment	Site No.	Existing			NJ Tunnel			SI Tunnel		
		7AM to 10PM	10PM to 7AM	Peak Hour	7AM to 10PM	10PM to 7AM	Peak Hour	7AM to 10PM	10PM to 7AM	Peak Hour
New Jersey										
Greenville Branch	4w	11	5	2	36	22	3	18	14	2
National Docks (Segment 1)	1w	21	9	2	34	0	2	32	0	2
National Docks (Segment 2)	3w	7	3	1	18	8	2	14	10	2
P & H Line	2w	18	9	1	26	4	2	30	2	2
Chemical Coast Line (Segment 1)	5w	9	1	2	24	4	2	48	8	3
Chemical Coast Line (Segment 2)	6w	8	4	2	14	4	2	16	6	2
New York										
Staten Island Railroad (Segments 1&2/Arlington Yard)	1e-2e	0	0	0	NA	NA	NA	19	45	4
Bay Ridge Branch (Segments 3&4)	3e-6e	1	1	0	30	42	5	30	42	5
Fremont Secondary (Segment 1&2)	7e-8e	4	2	1	6	14	2	6	14	2
Fremont Secondary (Segment 3)	9e	33	5	5	35	17	12	35	17	12
Montauk – West	10e	3	3	1	29	23	4	29	23	4
Montauk – East	11e	4	2	1	9	7	3	9	7	3
Montauk – East	12e	4	2	1	9	7	3	9	7	3

For Land Use Category 2 under the Staten Island tunnel alignment (see Table 10-20), there would be no impacts at locations adjacent to Greenville Branch, National Docks Secondary (Segment 1), P & H Line, and Chemical Coast Line (Segments 1 & 2). "Impacts" or "Severe Impacts" would occur at locations adjacent to the National Docks Secondary (Segment 2), Staten Island Railroad (Segment 1/Arlington Yard), Staten Island Railroad (Segment 2), Bay Ridge Branch (Segments 2, 3 & 4/Queens Portion), Montauk Branch West, Montauk Branch East, and Fremont Secondary (Segments 1, 2 & 3).

For Land Use Category 3 under the New Jersey tunnel alignment (see Table 10-21), there would be no impacts at locations adjacent to the Greenville Branch, National Docks Secondary (Segments 1 & 2), P&H Line, Chemical Coast Line (Segments 1 & 2), Bay Ridge Branch (Segment 2 & 4), and Fremont Secondary (Segment 3). "Impacts" or "Severe Impacts" would occur at locations adjacent to the Bay Ridge Branch (Segment 3 & Segment 4/Queens Portion), Montauk West, Montauk East, and Fremont Secondary (Segments 1 & 2).

Similarly, for Land Use Category 3 under the Staten Island tunnel alignment (see Table 10-21), there would be no impacts at locations adjacent to all rail line segments in New Jersey. There would be no impacts in New York at locations adjacent to the Bay Ridge Branch (Segments 2 & 4) and Fremont Secondary (Segment 3). "Impacts" or "Severe Impacts" would occur in New York at locations adjacent to the Staten Island Railroad (Segment 1/Arlington Yard), Staten Island Railroad (Segment 2), Bay Ridge Branch (Segment 3 & Segment 4/Queens Portion), Montauk Branch West, Montauk Branch East, and Fremont Secondary (Segments 1 & 2).

Table 10-20
Impact Evaluation of Noise - Land Use Category 2, L_{dn}
Tunnel Alternative (Double Tunnel System)

Noise Site	Segment	Existing	Allowable Project Noise Exposure Level[b]		Predicted Project Noise Exposure Level[c]		Result		Ambient Noise Level with Project		Affected Area (feet)	
			Impact	Severe Impact	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	Obstructed (Shielding)	Unobstructed (No-Shielding)
New Jersey												
4w	Greenville Branch	69.1	63.7	68.9	66.4	63.6	Impact	No Impact	71.0	70.2	0	181
1w	National Docks (Segment 1)	66.4	61.8	67.1	44.0	42.3	No Impact	No Impact	66.4	66.4	0	0
3w	National Docks (Segment 2)	68.8	63.5	68.7	63.0	65.4	No Impact	Impact	69.8	70.5	0	108
2w	P & H Line	76.3	65.0	74.2	62.1	58.6	No Impact	No Impact	76.5	76.4	0	0
5w	Chemical Coast Line (Segment 1)	75.5	65.0	73.6	58.0	64.3	No Impact	No Impact	75.6	75.8	0	0
6w	Chemical Coast Line (Segment 2)	74.2	65.0	72.5	58.0	55.8	No Impact	No Impact	74.3	74.2	0	0
New York												
1e	Staten Island Railroad, (Segment 1/ Arlington Yard)	66.8	62.0	67.3	NA	75.2	NA	Severe Impact	NA	75.8	209	450
2e	Staten Island Railroad, (Segment 2)	63.0	59.5	65.0	NA	78.2	NA	Severe Impact	NA	78.3	404	871
3e	Bay Ridge Branch (Segment 2)	71.3	65.0	70.4	66.5	66.5	Impact	Impact	72.5	72.5	0	232
4e	Bay Ridge Branch (Segment 3)	58.5	57.0	62.7	76.8	76.8	Severe Impact	Severe Impact	76.8	76.8	580	1249
5e	Bay Ridge Branch (Segment 4)	85.1	65.0	75.0	72.6	72.6	Impact	Impact	85.3	85.3	142	307
6e	Bay Ridge Branch (Segment 4/Queens Portion)	65.9	61.4	66.7	70.7	70.7	Severe Impact	Severe Impact	71.9	71.9	230	496
10e	Montauk Branch – West	61.4	58.6	64.1	71.8	71.8	Severe Impact	Severe Impact	72.2	72.2	354	763
11e	Montauk Branch - East	69.2	63.7	68.9	75.7	75.7	Severe Impact	Severe Impact	76.6	76.6	134	288
12e	Montauk Branch – East	61.2	58.5	64.0	65.5	65.5	Severe Impact	Severe Impact	66.9	66.9	167	361
7e	Fremont Secondary (Segment 1)	61.1	58.4	64.0	69.4	69.4	Severe Impact	Severe Impact	70.0	70.0	276	595
8e	Fremont Secondary (Segment 2)	64.7	60.6	66.0	71.9	71.9	Severe Impact	Severe Impact	72.6	72.6	207	447
9e	Fremont Secondary (Segment 3)	71.1	65.0	70.2	72.0	72.0	Severe Impact	Severe Impact	74.6	74.6	108	233

Notes:
[a] For definition of land use categories, see Table 10-2.
[b] See Figures 10-2 through 10-8 and Table 10-12 for locations
[c] Definitions of noise exposure levels, etc., are found in Figure 10-1.
[d] 0/0 = NJ Tunnel onset of impact distance / SI Tunnel onset of impact distance

Table 10-21
Impact Evaluation of Noise - Land Use Category 3, L_{eq}
Tunnel Alternative (Double Tunnel System)

Noise Site	Segment	Existing	Allowable Project Noise Exposure Level[b]		Predicted Project Noise Exposure Level[c]		Result		Ambient Noise Level with Project		Affected Area (feet)	
			Impact	Severe Impact	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	NJ Tunnel	SI Tunnel	Obstructed (Shielding)	Unobstructed (No-Shielding)
New Jersey												
4w	Greenville Branch	65.1	65.9	71.3	62.1	60.1	No Impact	No Impact	66.8	66.3	0	0
1w	National Docks (Segment 1)	63.3	64.7	70.2	48.1	48.1	No Impact	No Impact	63.4	63.4	0	0
3w	National Docks (Segment 2)	64.6	65.6	71.0	61.5	61.5	No Impact	No Impact	66.3	66.3	0	0
2w	P & H Line	72.5	70.0	76.3	61.5	61.6	No Impact	No Impact	72.8	72.8	0	0
5w	Chemical Coast Line (Segment 1)	69.2	68.8	73.9	58.3	63.3	No Impact	No Impact	69.5	70.2	0	0
6w	Chemical Coast Line (Segment 2)	71.1	70.0	75.3	64.9	62.9	No Impact	No Impact	72.0	71.7	0	0
New York												
1e	Staten Island Railroad (Segment 1/ Arlington Yard)	63.4	64.8	70.2	NA	69.9	NA	Impact	NA	70.8	61	132
2e	Staten Island Railroad (Segment 2)	62.5	64.2	69.7	NA	72.9	NA	Severe Impact	NA	73.3	88	189
3e	Bay Ridge Branch (Segment 2)	70.4	69.7	74.8	61.0	61.0	No Impact	No Impact	70.9	70.9	0	0
4e	Bay Ridge Branch (Segment 3)	61.8	63.8	69.3	69.2	69.2	Impact	Severe Impact	69.9	69.9	77	165
5e	Bay Ridge Branch (Segment 4)	82.0	70.0	80.0	67.1	67.1	No Impact	No Impact	82.1	82.1	0	0
6e	Bay Ridge Branch (Segment 4/Queens Portion)	64.7	65.6	71.0	71.5	71.5	Severe Impact	Severe Impact	72.3	72.3	71	153
10e	Montauk Branch – West	65.0	65.8	71.2	68.4	68.4	Impact	Impact	70.0	70.0	0	149
11e	Montauk Branch - East	71.6	70.0	75.6	73.2	73.2	Impact	Impact	75.5	75.5	0	74
12e	Montauk Branch – East	59.4	62.5	68.1	63.0	63.0	Impact	Impact	66.2	66.2	0	131
7e	Fremont Secondary (Segment 1)	60.1	62.8	68.4	64.4	64.4	Impact	Impact	65.8	65.8	0	153
8e	Fremont Secondary (Segment 2)	60.5	63.1	68.7	67.6	67.6	Impact	Impact	68.4	68.4	0	161
9e	Fremont Secondary (Segment 3)	70.5	69.7	74.8	69.5	69.5	No Impact	No Impact	73.0	73.0	0	0

Notes:
[a] For definition of land use categories, see Table 10-2.
[b] See Figures 10-2 through 10-8 and Table 10-12 for locations
[c] Definitions of noise exposure levels, etc., are found in Figure 10-1.
[d] 0/0 = NJ Tunnel onset of impact distance / SI Tunnel onset of impact distance

As discussed above in the Single Tunnel System, the National Docks Secondary (Segment 2) assessment may be overly conservative, due to the construction of the Waverly Loop connecting the P & H Line and Greenville Branch.

The New Jersey tunnel alignment under the Single Tunnel System, "Impacts or "Severe Impacts" would occur in nine rail line segments for Land Use Category 2, and three rail line segments for Land Use Category 3. For the Staten Island alignment under the Single Tunnel System, "Impacts" or "Severe Impacts" would result in eleven rail line segments for Land Use Category 2, and five line segments for Land Use Category 3. Therefore, the number of rail line segments resulting in "Impacts" or "Severe Impacts" would be fewer with the New Jersey tunnel alignment versus the Staten Island tunnel alignment under the Single Tunnel System.

The New Jersey tunnel alignment under the Double Tunnel System, "Impacts" or "Severe Impacts" would occur in eleven rail line segments for Land Use Category 2, and seven rail line segments for Land Use Category 3. For the Staten Island alignment under the Double Tunnel System, "Impacts" or "Severe Impacts" would occur in thirteen rail line segments for Land Use Category 2, and nine rail line segments for Land Use Category 3. Similar to the Single Tunnel System, the number of rail line segments resulting in "Impacts" or "Severe Impacts" would be fewer with the New Jersey tunnel alignment versus the Staten Island tunnel alignment under the Single Tunnel System.

Absent mitigation, both the Single Tunnel System and the Double Tunnel System would result in significant noise impacts over large distances. However, the project sponsors are committed to developing and implementing mitigation measures to reduce and alleviate these impacts. Mitigation measures are currently being explored and a variety of potential measures to eliminate or reduce impacts are discussed in "Mitigation Measures" below.

Rail Yard and Vehicular Noise

Future noise levels generated by the West Maspeth Yard and Fresh Pond Yard were calculated using the methodology contained in the FTA guidance document. At each of the analysis receptor locations selected, which were near or adjacent to the rail yard, noise measurements were performed to establish existing conditions. Based on FTA calculation procedures and formulas, L_{dn} noise levels were determined based on a variety of factors including; distance to nearest residences, number of rail trains idling, number of train movements (i.e., cranes and container movement) and trucks operating within the yard, and truck and employee vehicle traffic along streets adjacent to the receptor. Table 10-22 shows the calculated project noise levels and existing noise levels for these rail yards using the Double Tunnel System. For the West Maspeth Yard site, impacts at the nearest residence include rail and truck activity within the yard, plus truck and employee vehicle traffic along streets adjacent to the receptor. Since Fresh Pond Yard is not an intermodal yard, no significant levels of truck traffic are generated. (Further details are provided in Appendix 4.)

Using the Double Tunnel System, the L_{dn} noise levels with the project would not increase compared to existing levels at the nearest residences adjacent to the West Maspeth Yard site. The project-generated L_{dn} noise level would be 55.3 dBA, which would be below the FTA impact criteria value of 65.0 dBA. Therefore, at the nearest residences adjacent to the West Maspeth Yard site, project-generated noise would not result in any impacts. At the nearest residences adjacent to Fresh Pond Yard, the L_{dn} noise level with the project would increase 1.6 dBA compared to existing levels. The project-generated L_{dn} noise level would be 65.6 dBA,

Table 10-22
Detailed Noise Analysis for Rail Yards and Vehicular Tunnel Alternative

Yard	Land Use Category	Noise Description	Existing Noise Level	Allowable Project-Generated Noise Level		Predicted Project-Generated Increment Noise Level	Result	Build Noise Level	Affected Area from Yard Center (feet)
				Impact	Severe Impact				
Double Tunnel System									
West Maspeth Yard*	2	L_{dn}	71.9	65	70.9	55.3	No Impact	71.9	NA
Fresh Pond Yard	2	L_{dn}	69.1	63.7	68.9	65.6	Impact	70.7	500
* Noise levels in Maspeth Yard include rail and vehicular noise.									

which would be above the FTA impact criteria value of 63.7 dBA, but below the FTA severe impact criteria value of 68.9 dBA. Therefore, at the nearest residences adjacent to the Fresh Pond Yard, the project would result in noise impacts**.** Activity at Fresh Pond Yard would be similar for either alignment of the Single or Double Tunnel System, therefore this noise impact would occur with any of the Tunnel Alternative options.

Ventilation Shafts

Tunnel ventilation shafts would be located at near Greenville Yard, NJ and at 65th Street Yard, Brooklyn for the New Jersey tunnel alignment; and at Pier 2, Staten Island and 69th Street pier for the Staten Island tunnel alignment. The shafts would include noise-mitigating equipment such as silencers to ensure that the noise levels at the nearest sensitive receptors would meet all federal, state and local standards. This technology is readily achievable.

MITIGATION MEASURES

As described above, the Tunnel Alternative would result in noise impacts at a large number of locations in the corridor adjacent to the rail right-of-way. Mitigation measures that would reduce and, where possible, eliminate these impacts will be an important part of implementing the Tunnel Alternative. This would be done in accordance with FTA guidelines, which recommend examining three categories of noise control approaches: source treatments; path treatments; and, receiver treatments. Each of these categories of noise control has been and are being considered for this project.

Source treatment measures to reduce the intensity of the noise source. They include stringent vehicle and equipment noise specifications, operational restrictions, wheel treatments (i.e., resilient or damped wheels, spin-slide control, maintenance procedures such as wheel truing and rail grinding), vehicle treatments (i.e., vehicle shirts, and undercar absorption), guideway controls on turns, operational restrictions such as speed reductions and alternative warning devices, etc. The analysis presented above assumed some of these measures (i.e., stringent vehicle and equipment specification, wheel truing and rail grinding, etc.) It also assumed that silencers would be used for the ventilation shafts.

Path treatment measures interrupt the path between the noise source and receiver, thereby reducing noise levels at the receiver. They include sound barriers, enclosures, alteration of

alignments, alteration of design of at-grade or aerial guideways to include ballast and/or resilient track support, etc. In general, depending upon the source/receptor/barrier height and the material of the barrier, sound barriers can provide up to approximately 15-20 dBA of attenuation. For a sound barrier to be effective, the barrier must be high enough to break the line-of-sight between the receptor and the noise source. Consequently, sound barriers are most effective in reducing in noise levels at 1st floors of buildings, and generally typical 10-20 foot tall barriers have little effect in reducing noise levels at receptors located on the 3rd floor or higher on buildings that have a direct line-of-sight to the rail right-of-way. For receptors located on the 3rd floor or higher on buildings that have a direct line-of-sight to the rail right-of-way, no feasible or reasonable mitigation measures exist.

On a preliminary basis, use of sound barriers is being assessed for all non-industrial locations where significant impacts are predicted to occur except along elevated rail viaducts. Tables 10-23 and 10-24 and Figures 10-9 through 10-13 show areas along rail lines that could be partially mitigated through the use of noise walls. Table 10-25 shows the estimated number of residential units that fall within the noise-impacted area. As stated above, the noise impacts on residential units located above the second story may not be mitigated. For the Single Tunnel System, areas that may be mitigated using noise barriers include non-elevated locations along the Staten Island Railroad (Segment 1), Greenville Branch, National Docks Secondary (Segment 2), Bay Ridge Branch (Segment 3, Segment 4, and Queens Portion), Montauk Branch West, and Montauk Branch East. Non-elevated locations that may be mitigated using noise barriers with the Double Tunnel System include portions of: National Docks Secondary (Segment 2), Greenville Branch, Staten Island Railroad (Segment 1), Bay Ridge Branch (Segments 2, 3 & 4/Queens Portion), Montauk Branch West, Montauk Branch East, and Fremont Secondary (Segments 1 & 2).

Sound barriers are not being proposed for sections of these rail lines along elevated viaducts where significant impacts are predicted to occur because they would be ineffective due to openings in the track support structure, and because the track support structure could not support the weight of the barriers without significant and costly structural improvements. At such locations, significant modifications or replacement of the guideway structure to provide a solid guideway would be needed. For the Single Tunnel System, the Staten Island Railroad (a portion of Segment 2) and a portion of the National Docks Secondary (Segment 2) are locations with elevated viaducts where significant impacts are predicted to occur which are unmitigable. Locations with elevated viaducts where significant impacts are predicted to occur for the Double Tunnel System, include the National Docks Secondary (portions of Segment 2), Staten Island Railroad (a portion of Segment 2), and Fremont Secondary (a portion of Segment 2 and all of Segment 3). Significant noise impacts at these locations would be unmitigable, since no reasonable mitigation measures exist for noise due to the elevated viaducts. The feasibility and effectiveness of installing sound barriers and implementing other path treatment measures is being evaluated, and the results of that evaluation will be presented in the FEIS.

Receiver treatment measures include measures that reduce the noise intensity at the receiver. They include building noise reduction measures (i.e., building insulation, window treatment, and alternative ventilation), acquisition of property rights for construction of sound barriers, etc. Building reduction measures are effective in reducing noise levels but, are very costly, and except for limited cases, where receptors are located on the 3rd floor or higher on buildings that have a direct line-of-sight to the rail right-of-way, would typically not be a desirable mitigation measure. In general, such measures are most applicable for reducing noise levels at public

Table 10-23
Single Tunnel System
Impacted Areas and Potential for Mitigating Impacts

Segment	Affected Area (feet)				Mitigation
	New Jersey Tunnel		Staten Island Tunnel		
	Non-Elevated Areas (Shielding)	Elevated Areas (No Shielding)	Non-Elevated Areas (Shielding)	Elevated Areas (No Shielding)	
New Jersey					
Greenville Branch	0	155	0	0	Noise barriers if implemented could mitigate 2 stories
National Docks (Segment 2)	0	0	0	91	Noise barriers if implemented could mitigate 2 stories; however portion on viaduct is unmitigable
New York					
Chemical Coast Line (Segment 2)	0	92	0	81	Noise barriers if implemented could mitigate 2 stories
Staten Island Railroad (Segment 1)/Arlington Yard	NA	NA	108	234	Noise barriers if implemented could mitigate 2 stories
Staten Island Railroad, (Segment 2)	NA	NA	210	452	Unmitigable; rail line is on a viaduct
Bay Ridge Branch (Segment 3)	260	560	252	543	Noise barriers if implemented could mitigate 2 stories
Bay Ridge Branch (Segment 4)	0	153	0	151	Noise barriers if implemented could mitigate 2 stories
Bay Ridge Branch (Segment 4/Queens Portion)	115	248	113	244	Noise barriers if implemented could mitigate 2 stories
Montauk Branch – West	251	541	247	533	Noise barriers if implemented could mitigate 2 stories
Montauk Branch –East (11e)	0	78	0	78	Noise barriers if implemented could mitigate 2 stories
Fremont Secondary (Segment 1)	0	113	0	0	Noise barriers if implemented could mitigate 2 stories
Fremont Secondary (Segment 2)	0	86	0	84	Noise barriers if implemented could mitigate 2 stories; however portion on viaduct is unmitigable

Table 10-24
Double Tunnel System
Impacted Areas and Potential for Mitigating Impacts

Segment	Affected Area (feet)				Mitigation
	New Jersey Tunnel		Staten Island Tunnel		
	Non-Elevated Areas (Shielding)	Elevated Areas (No Shielding)	Non-Elevated Areas (Shielding)	Elevated Areas (No Shielding)	
New Jersey					
Greenville Branch	0	181	0	0	Noise barriers if implemented could mitigate 2 stories
National Docks (Segment 2)	0	0	0	108	Noise barriers if implemented could mitigate 2 stories; however portion on viaduct is unmitigable
New York					
Staten Island Railroad (Segment 1)/Arlington Yard	NA	NA	209	450	Noise barriers if implemented could mitigate 2 stories
Staten Island Railroad, (Segment 2)	NA	NA	404	871	Unmitigable; rail line is on a viaduct
Bay Ridge Branch (Segment 2)	0	213	0	232	Noise barriers if implemented could mitigate 2 stories
Bay Ridge Branch (Segment 3)	531	1145	580	1249	Noise barriers if implemented could mitigate 2 stories
Bay Ridge Branch (Segment 4)	130	281	142	307	Noise barriers if implemented could mitigate 2 stories
Bay Ridge Branch (Segment 4/Queens Portion)	211	455	230	496	Noise barriers if implemented could mitigate 2 stories
Montauk Branch – West	354	763	354	763	Noise barriers if implemented could mitigate 2 stories
Montauk Branch –East (11e)	134	288	131	282	Noise barriers if implemented could mitigate 2 stories
Montauk Branch –East (12e)	167	361	164	353	Noise barriers if implemented could mitigate 2 stories
Fremont Secondary (Segment 1)	276	595	276	595	Noise barriers if implemented could mitigate 2 stories
Fremont Secondary (Segment 2)	207	447	207	447	Noise barriers if implemented could mitigate 2 stories; however portion on viaduct is unmitigable
Fremont Secondary (Segment 3)	108	233	108	233	Unmitigable; rail line is on a viaduct

purpose buildings, such as schools and hospitals. The receiver treatment will be provided at all schools (no significant impacts have been identified at hospitals) with significant noise impacts if no other mitigation such as noise barriers is made available or if other mitigation is not effective. Since the above impact assessment relies on representative receptor sites, a final determination on the need for mitigation at these school sites will be based on further testing.

Table 10-25
Estimated Number of Residential Units Impacted by Noise

Segment	TUNNEL ALTERNATIVE		Tunnel Alignment
	Single Tunnel System No. Units Affected	Double Tunnel System No. Units Affected	
National Docks (Segment 2)	1,610	1,930	SI alignment only
Greenville Branch	980	1,135	NJ alignment only
Staten Island Railroad (Segment 1)/Arlington Yard	910	1,645	SI alignment only
Staten Island Railroad, (Segment 2)	590	1,080	SI alignment only
Bay Ridge Branch (Segment 2)	0	535	SI & NJ alignments
Bay Ridge Branch (Segment 3)	6,680	13,300	SI & NJ alignments
Bay Ridge Branch (Segment 4)	160	1,445	SI & NJ alignments
Bay Ridge Branch (Segment 4/Queens Portion)	545	1,560	SI & NJ alignments
Montauk Branch – West	268	2,110	SI & NJ alignments
Montauk Branch –East (11e)	174	705	SI & NJ alignments
Montauk Branch – East (12e)	0	790	SI & NJ alignments
Fremont Secondary (Segment 1)	320	3,375	SI & NJ alignments
Fremont Secondary (Segment 2)	345	3,850	SI & NJ alignments
Fremont Secondary (Segment 3)	0	1,885	SI & NJ alignments

However, the feasibility and cost-effectiveness of building noise reduction measures is being evaluated for both public purpose buildings and private residences, and the results of that evaluation will be presented in the FEIS.

C. VIBRATION AND GROUND-BORNE NOISE

INTRODUCTION AND METHODOLOGY

Fixed railway operations have the potential to produce high vibration levels, since railway vehicles contact a rigid steel rail with steel wheels. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Train wheels rolling on the steel rails create vibration energy that is transmitted into the track support system. The amount of vibrational energy is strongly dependant on factors, such as how smooth the wheels and rails are and the vehicle suspension system. The vibration of the track structure "excites" the adjacent ground, creating vibration waves that propagate through the various soil and rock strata to the foundations of nearby buildings. As the vibration propagates from the foundation through the remaining

building structure, certain resonant, or natural, frequencies of various components of the building may be excited.

In extreme cases, vibration can cause damage to buildings. The vibration of floors and walls may cause perceptible vibration, rattling of such items as windows or dishes on shelves. The movement of building surfaces and objects within the building can also result in a low-frequency rumble noise. The rumble is the noise radiated from the motion of the room surfaces, even when the motion itself cannot be felt. This is called ground-borne noise.

VIBRATION FUNDAMENTALS

Vibrations consist of rapidly fluctuating motions in which there is no "net" movement. When an object vibrates, any point on the object is displaced from its initial "static" position equally in both directions so that the average of all its motion is zero. Any object can vibrate differently in three mutually independent directions; vertical, horizontal, and lateral. It is common to describe vibration levels in terms of velocity, which represents the instantaneous speed at a point on the object that is displaced. In a sense, the human body responds to an average vibration amplitude, which is usually expressed in terms of the root mean square (rms) amplitude.

All vibration levels in this document are referenced to $1x10^{-6}$ inches per second. "VdB" (referenced to 1×10^{-6} inches per second) is used for vibration decibels to reduce the potential for confusion with noise decibels.

Effect of Propagation Path

Vibrations are transmitted from the source to the ground, and propagate through the ground to the receiver. Soil conditions have a strong influence on the levels of ground-borne vibration. Stiff soils, such as some clay and rock, can transmit vibrations over substantial distances. Sandy soils, wetlands, and groundwater tend to absorb movement and thus reduce vibration transmission. Because subsurface conditions vary widely, measurement of actual vibration conditions, or transfer mobility, at the site can be the most practical way to address the variability of propagation conditions.

Human Response to Vibration Levels

Although the perceptibility threshold for ground-borne vibration is about 65 VdB, the typical threshold of human annoyance is 72 VdB. As a comparison, buses and trucks rarely create vibration that exceeds 72 VdB unless there are significant bumps in the road, and these vehicles are operating at moderate speeds. Vibration levels for typical human and structural responses and sources are shown in Table 10-26. Background vibration is usually well below the threshold of humanperception, and is of concern only when the vibration affects very sensitive manufacturing or research equipment. Electron microscopes, high-resolution lithography equipment, recording studios, and laser and optical benches are typical of equipment that is highly sensitive to vibration.

VIBRATION STANDARDS AND CRITERIA

With the construction of new rail rapid transit systems in the past 20 years, considerable experience has been gained about how communities would react to various levels of building

Table 10-26
Typical Levels of Ground-Borne Vibration

Human/Structural Response	Velocity Level (VdB)	Typical Sources (@ 50 feet)
Threshold, minor cosmetic damage fragile buildings	100	Blasting from construction projects
		Bulldozers and other heavy tracked construction equipment
Difficulty with vibration-sensitive tasks, such as reading a video screen	90	
	85	Locomotive powered freight train
Residential annoyance, infrequent events	80	Rapid Transit Rail, upper range
		Commuter Rail, typical range
Residential annoyance, frequent events		Bus or Truck over bump
	70	Rapid Transit Rail, typical range
Limit for vibration-sensitive equipment. Approximate threshold for human perception of vibration		Bus or truck, typical
	60	
		Typical background vibration
	50	

Source: U.S. Dept of Transportation, FTA, *Transit Noise and Vibration Impact Assessment,* April 1995.

vibration. This experience, combined with the available national and international standards, represents a good foundation for predicting annoyance from ground-borne noise and vibration in residential areas.

The FTA-developed criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single event. The impact criteria are defined in the FTA guidance manual and are shown in Table 10-27. The criteria for acceptable ground-borne vibration are expressed in terms of rms velocity levels in decibels and the criteria for acceptable ground-borne noise are expressed in terms of A-weighted sound level. The limits are specified for the three land use categories defined below:

- **Vibration Category 1: High Sensitivity**—Buildings where low ambient vibration is essential for the operations within the building, which may be well below levels associated with human annoyance. Typical land uses are vibration-sensitive research and manufacturing, hospitals, and university research operations.
- **Vibration Category 2: Residential**—This category covers all residential land uses and any buildings where people sleep, such as hotels and hospitals. No differentiation is made between different types of residential areas. This is primarily because ground-borne vibration and noise are experienced indoors and building occupants have practically no means to reduce their exposure. Even in a noisy urban area, the bedrooms often will be quiet in buildings that have effective noise insulation and tightly closed windows. Hence, an occupant of a bedroom in a noisy urban area is likely to be just as sensitive to ground-borne noise and vibration as someone in a quiet suburban area.
- **Vibration Category 3: Institutional**—This category includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

Table 10-27
Ground-Borne Vibration and Noise Impact Criteria

Vibration Category	Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dBA re 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
1	65 VdB[3]	65 VdB[3]	—[4]	—[4]
2	72 VdB	80 VdB	35 dBA	43 dBA
3	75 VdB	83 VdB	40 dBA	48 dBA

Notes:
[1] "Frequent Events" are defined as those with more than 70 vibration events per day. Most rapid transit projects fall into this category.
[2] "Infrequent Events" are defined as those with fewer than 70 vibration events per day. This category includes most commuter rail systems.
[3] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
[4] Vibration-sensitive equipment is not sensitive to ground-borne noise.
Source: *Transit Noise and Vibration Impact Assessment,* FTA, April 1995, pages 8-2 through 8-3.

There are some buildings, such as concert halls, TV and recording studios, and theaters that can be very sensitive to vibration and ground-borne noise, but do not fit into any of these three categories. Special vibration level thresholds are defined for these land uses. In addition, FTA has established vibration criteria for fragile buildings (100 VdB) and very fragile buildings (95 VdB). The operational activities associated with the project would not reach these levels and therefore, these criteria are only evaluated in the construction impacts assessment (see Chapter 16, "Construction and Construction Impacts").

IMPACT ASSESSMENT METHODOLOGY

The vibration analysis for the project alternatives was performed using the procedures described in the FTA guidance manual, *Transit Noise and Vibration Impact Assessment*, April 1995. To examine potential impacts during operation, the FTA guidance document (similar to the approach for assessing noise) lays out a three-step approach for the analysis of vibration and ground-borne noise: a screening procedure, a general assessment methodology, and a detailed analysis methodology. The screening procedure is used to determine whether any noise-sensitive receivers are within distances where impacts are likely to occur; the general assessment methodology is used to determine locations or rail segments where there is the potential for impacts; and the detailed analysis methodology is used to predict impacts and evaluate the effectiveness of mitigation with greater precision than can be achieved with the general assessment.

The procedures outlined in the FTA guidance manual for preparing a general vibration and ground-borne noise assessments were used for this impact analysis. The general vibration assessment estimates the vibration level at specific locations, based on generalized ground

surface vibration curves that yield vibration levels as a function of distance from the track centerline, and a series of adjustment factors affecting the vibration source (i.e., train speed, crossovers and other special track work, type of transit structure, etc.), factors affecting the vibration path (i.e., geologic conditions that affect vibration propagation), and factors affecting the vibration receiver (i.e., floor-to-floor attenuation, amplification due to resonances of floors, walls, and ceilings, and radiated sound). In order to determine ground-borne noise, these vibration velocity levels were converted to A-weighted sound levels.

The detailed vibration analysis methodology requires rail-system-specific and site-specific data on the specific vibration levels generated by the proposed rail equipment (referred to as "force density," since they represent the actual force applied to the ground by the train); the effects of site-specific geology at the project alignment on the propagation of vibration (referred to as "transfer mobility"); and the ability of specific building foundations to transmit that vibration and ground-borne noise (which depends on the building "coupling" or connection to the ground). These factors are determined through detailed field measurements, which are typically not required at the DEIS stage. This level of analysis would be performed as part of the FEIS or design process, after a preferred alternative is selected and if the general vibration assessment prepared as part of the DEIS indicates potential significant impacts.

ASSESSMENT INPUT DATA

Based upon the FTA methodology, the existing and the project-generated frequency of train passby events and train speeds were used for the vibration analysis. These input data are presented in Table 10-28, and apply to both the Single Tunnel System and Double Tunnel System.

EXISTING CONDITIONS

Currently, with the exception of the Staten Island Railroad (currently inactive), there are rail activities along the existing rail lines that would be expected to produce high ground-borne vibration and noise levels at 50 feet from the tracks. In general, based upon the results of the General Vibration Assessment, at sensitive receptors located along "frequent event" rail lines or rail lines with speeds over 50 mph, the existing vibration levels would exceed FTA criteria for all track conditions at 50 feet the from the tracks for all three Land Use Categories. Table 10-29 shows the typical general vibration assessment results for an infrequent event branch (Bay Ridge Branch/portions that don't parallel subway lines) in New York and an infrequent event branch (Greenville Branch) in New Jersey (the results for other branches are provided in Appendix 4). Per FTA impact criteria for Category 1, existing vibration levels at sensitive receptors would exceed FTA criteria for all track conditions with the exception of the elevated track condition. For Category 2, existing vibration levels at sensitive receptors would exceed FTA criteria on at-grade, open cut, and crossover rail conditions for the Bay Ridge Branch, and existing vibration levels at sensitive receptors would exceed FTA criteria on crossover track conditions for the Greenville Branch. For Category 3, existing vibration levels at sensitive receptors would exceed FTA criteria only on crossover track conditions for the Bay Ridge Branch.

Table 10-28
Assessment Project Rail Input Data—
Existing Conditions and Tunnel Alternative

Rail Branch	Existing Conditions		Project	
	Vibration Event*	Speed (mph)	Vibration Event* (Project Increment)	Speed (mph)
New Jersey				
Lehigh Mainline	Frequent	55	Infrequent	55
River Line	Infrequent	50	Infrequent	50
Southern Tier	Frequent	45	Infrequent	45
Northeast Corridor	Frequent	80	Infrequent	80
Greenville Branch	Infrequent	10	Infrequent	45
National Docks (Segment 1)	Infrequent	25	Infrequent	25
National Docks (Segment 2)	Infrequent	25	Infrequent	25
P & H	Infrequent	25	Infrequent	25
Chemical Coast Line	Infrequent	30	Infrequent	30
New York				
Staten Island Railroad	Inactive	0	Infrequent	50
Bay Ridge Branch (portions that parallel subway lines)	Frequent	30	Infrequent	40
Bay Ridge Branch (other portions)	Infrequent	15	Infrequent	40
Montauk West	Infrequent	15	Infrequent	15
Montauk East	Infrequent	15	Infrequent	15
Fremont Secondary (Segment 1 & 2)	Infrequent	15	Infrequent	15
Fremont Secondary (Segment 3)	Infrequent	30	Infrequent	30

Notes: * "Frequent Event" and "Infrequent Event" are defined as more than 70 vibration events per day and fewer than 70 vibration events per day, respectively.

PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE, TSM ALTERNATIVE, EXPANDED FLOAT OPERATIONS ALTERNATIVE

Under the No Action, TSM, and Expanded Float Operations Alternatives, there would be no affect on peak vibration or ground-borne noise due to operational activities, since new rail service is not being introduced where it does not already exist. Particularly at locations adjacent to existing operating rail rights-of-way, existing vibration and ground-borne noise levels exceed FTA criteria, and would continue to do so.

Table 10-29
Existing Ground-Borne Vibration/Noise Levels at 50 feet

Rail Line	FTA Land Use Category[1]	Track Condition	FTA Impact Criteria[2]		Existing Exposure Level		Threshold Exceeded
			Vibration (VdB)	Noise (dBA)	Vibration (VdB)	Noise (dBA)	
Bay Ridge Branch (portions that don't parallel subway lines) (Infrequent)	1	At-Grade	65	N/A	75.7	N/A	Vibration
		Elevated			64.4	N/A	No Impact
		Open Cut			76.0	N/A	Vibration
		Crossover			85.7	N/A	Vibration
	2	At-Grade	80	43	80.9	45.9	Vibration/Noise
		Elevated			69.7	34.7	No Impact
		Open Cut			81.0	46.0	Vibration/Noise
		Crossover			90.9	55.9	Vibration/Noise
	3	At-Grade	83	48	75.7	40.7	No Impact
		Elevated			64.4	29.4	No Impact
		Open Cut			76.0	41.0	No Impact
		Crossover			85.7	50.7	Vibration/Noise
Greenville Branch (Infrequent)	1	At-Grade	65	N/A	72.2	N/A	Vibration
		Elevated			60.9	N/A	No Impact
		Open Cut			72.5	N/A	Vibration
		Crossover			82.2	N/A	Vibration
	2	At-Grade	80	43	77.4	42.4	No Impact
		Elevated			66.2	31.2	No Impact
		Open Cut			77.5	42.5	No Impact
		Crossover			87.4	52.4	Vibration/Noise
	3	At-Grade	83	48	72.2	37.2	No Impact
		Elevated			60.9	25.9	No Impact
		Open Cut			72.5	37.5	No Impact
		Crossover			82.2	47.2	No Impact

Notes:
[1] See Table 10-2 for a description of FTA Land Uses.
[2] Vibration impact criteria are 65 VdB for Category 1, 72 VdB for Category 2, and 75 VdB for Category 3. Ground borne noise impact criteria are 35 dBA for Category 2, 40 dBA for Category 3, and no specified impact level for Category 1.

TUNNEL ALTERNATIVE

Rail Lines Not Within the Underground Tunnel

Based upon the general vibration assessment results, with the exception of the Bay Ridge Branch (portions with existing infrequent events), Greenville Branch, and Staten Island Railroad which is inactive, there are no vibration or ground-borne noise impacts along rail lines under the Tunnel Alternative. This is because the project vibration levels would be 5 decibels less than the existing vibration levels for infrequent event rail lines, and the project vibration levels would not be higher than the existing vibration levels for frequent event rail lines.

Table 10-30 shows the general vibration assessment results for the Bay Ridge Branch (portions with existing infrequent events) and Greenville Branch, where the existing vibration levels substantially exceed the FTA impact criteria. Per FTA methodology, there would be a significant impact if the project vibration levels would be 5 decibels less than existing vibration levels and the existing vibration levels already exceed the FTA impact criteria. Consequently, for Category 1, project vibration levels at sensitive receptors would be impacted for all track conditions with the exception of the elevated track condition along the Bay Ridge Branch. For Category 2, project vibration levels at sensitive receptors would be impacted for all track conditions with the exception of the elevated track condition. For Category 3, project vibration levels at sensitive receptors would be impacted on crossover track conditions (i.e., locations where trains change tracks). This is because the project speeds would increase from 10 mph to 40 mph along the Bay Ridge Branch, and from 10 mph to 45 mph along the Greenville Branch.

Table 10-30
Ground-Borne Vibration/Noise Levels at 50 feet
Tunnel Alternative

Rail Line	FTA Land Use Category[1]	Track Condition	FTA Impact Criteria[2]		Existing Exposure Level		Project Exposure Level		Threshold Exceeded	Drop-off Distance in feet (Vibration Noise)
			Vibration (VdB)	Noise (dBA)	Vibration (VdB)	Noise (dBA)	Vibration (VdB)	Noise (dBA)		
Bay Ridge Branch (portions that don't parallel subway lines) (Infrequent)	1	At-Grade	65	N/A	75.7	N/A	76.3	N/A	Vibration	45/0
		Elevated			64.4	N/A	64.9	N/A	No Impact	0/0
		Open Cut			76.0	N/A	76.6	N/A	Vibration	45/0
		Crossover			85.7	N/A	86.3	N/A	Vibration	45/0
	2	At-Grade	80	43	80.9	45.9	81.4	46.4	Vibration/ Noise	50/50
		Elevated			69.7	34.7	70.2	35.2	No Impact	0/0
		Open Cut			81.0	46.0	81.6	46.6	Vibration/ Noise	45/45
		Crossover			90.9	55.9	91.4	56.4	Vibration/ Noise	45/45
	3	At-Grade	83	48	75.7	40.7	76.3	41.3	No Impact	0/0
		Elevated			64.4	29.4	64.9	29.9	No Impact	0/0
		Open Cut			76.0	41.0	76.6	41.6	No Impact	0/0
		Crossover			85.7	50.7	86.3	51.3	Vibration/ Noise	45/45
Greenville Branch (Infrequent)	1	At-Grade	65	N/A	72.2	N/A	77.3	N/A	Vibration	N/A
		Elevated			60.9	N/A	66.0	N/A	No Impact	10/0
		Open Cut			72.5	N/A	77.6	N/A	Vibration	N/A
		Crossover			82.2	N/A	87.3	N/A	Vibration	100/0
	2	At-Grade	80	43	77.4	42.4	82.4	47.4	No Impact	N/A
		Elevated			66.2	31.2	71.2	36.2	No Impact	0/0
		Open Cut			77.5	42.5	82.6	47.6	No Impact	N/A
		Crossover			87.4	52.4	92.4	57.4	Vibration/ Noise	100/100
	3	At-Grade	83	48	72.2	37.2	77.3	42.3	No Impact	N/A
		Elevated			60.9	25.9	66.0	31.0	No Impact	0/0
		Open Cut			72.5	37.5	77.6	42.6	No Impact	N/A
		Crossover			82.2	47.2	87.3	52.3	No Impact	35/35

Notes:
1 See Table 10-2 for a description of FTA Land Uses.
2 Vibration impact criteria are 65 VdB for Category 1, 72 VdB for Category 2, and 75 VdB for Category 3. Ground borne noise impact criteria are 35 dBA for Category 2, 40 dBA for Category 3, and no specified impact level for Category 1.

As inicated in Table 10-30, in Staten Island (Staten Island tunnel alignment only), there would be impacts on Category 1 land uses for all track conditions; impacts on Category 2 land uses for all track conditions except along elevated sections; and impacts on Category 3 land uses on crossover condition only. There are no known Category 1 land uses in the study areas with the exception of Snug Harbor. Since the tunnel would be underground at Snug Harbor, this assessment does not apply to this site (see assessment below on underground tunnel portions).

For Category 2 and 3 land uses, in general, except at crossovers, the affected areas would be small. For Category 2 land uses, the affected area would be less than 50 feet from the track for all track conditions except crossovers. For Category 3, there would be no effects except at crossovers.

Underground Tunnel Sections

Cut-and-Cover and Bored Tunnel Sections. Ground-borne noise and vibration impacts are predicted for the Staten Island and Brooklyn underground (bored and cut and cover) tunnel sections. No significant impacts would occur at the underground tunnel section in Jersey City because it is an industrial area.

There would be significant ground-borne noise impacts over a small area that includes five residential uses and one Category 3 land use in Staten Island and 29 residential uses in Brooklyn. The Staten Island tunnel alignment would affect the following residences in Brooklyn: 18 along Wakeman Place, four along 67th Street, six along Bergen Place, and one along Ridge Boulevard. In Staten Island, two affected uses (one residence and the Category 3 land use) are located along Richmond Terrace and four residences are located along Van Buren Street. There would be significant vibration impacts at one of these sensitive receptors—the Category 3 land use on Richmond Terrace in Staten Island. The maximum ground-borne noise level would exceed the FTA criteria by 7.4 dB, and the maximum vibration level would exceed FTA criteria by 5.4 dB. These impacts will be fully mitigated as described in "Mitigation Measures" below. The New Jersey tunnel alignment would not cause any significant ground-borne noise or vibration impacts. Supporting calculations and figures depicting the affected structures can be found in Appendix 4, "Noise and Vibration."

East New York Tunnel. As part of the Tunnel Alternative, the existing East New York Tunnel will be reconfigured. The East New York Tunnel comprises a portion of Segment 4 of the Bay Ridge Branch. No significant vibration or ground-borne noise impacts are predicted. Three properties (a two-story residence on Eastern Parkway Extension, a two-story residence on De Sales Place, and a church on Furman Avenue) are predicted to have vibration levels and ground-borne noise levels close to, but below, the respective thresholds. The reconfiguration of the East New York Tunnel would include use state-of-the art materials, which would reduce vibration and ground-borne noise levels. If necessary, resilient fasteners or ballast mats can be used to substantially reduce and/or eliminate vibration and ground-borne noise impacts.

MITIGATION MEASURES

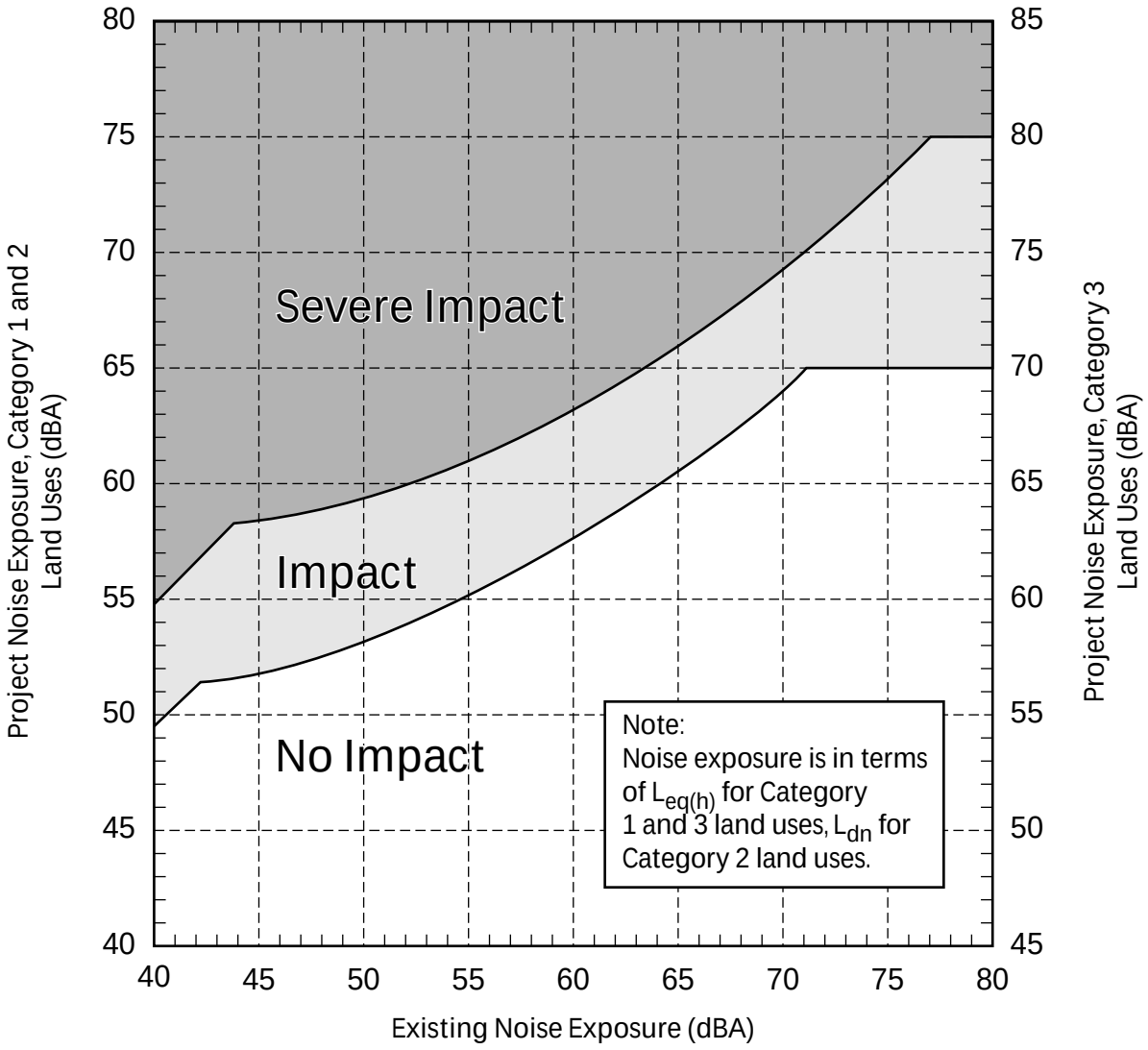
As described above, the Staten Island alignment of the Tunnel Alternative would result in ground-borne vibration and ground-borne noise impacts at a number of locations adjacent to the bored and cut and cover sections of the tunnel in Staten Island and Brooklyn and adjacent to crossovers along the rail right-of-way in Staten Island. At a number of these locations, a reduction of 5 dB or less in vibration levels would be required to mitigate potential impacts. At those locations, high resilience fasteners or ballast mats would provide sufficient mitigation to

eliminate potential impacts. At some locations, up to approximately 10 dB reduction in vibration levels would be needed to eliminate potential impacts. Ballast mats or resiliently supported ties would provide up to 10 dB of mitigation. At a few locations, approximately 10 dB or more reduction in vibration levels would be needed to eliminate potential impacts. This would require special engineering designs incorporating a variety of special features. With these types of vibration mitigation options employed, there would be no vibration or ground-borne vibration noise impacts from the Tunnel Alternative (see Table 10-31).

Table 10-31
Ground-Borne Vibration/Noise Levels at 50 feet In Staten Island
Tunnel Alternative

FTA Land Use Category[1]	Track Condition	FTA Impact Criteria[2]		Existing Exposure Level		Threshold Exceeded	Drop-off Distance in feet (Vibration Noise)
		Vibration (VdB)	Noise (dBA)	Vibration (VdB)	Noise (dBA)		
1	At-Grade	65	N/A	78.2	N/A	Vibration	170/0
	Elevated			66.9	N/A	Vibration	0/0
	Open Cut			78.5	N/A	Vibration	170/0
	Crossover			88.2	N/A	Vibration	590/0
2	At-Grade	80	43	83.4	48.4	Vibration/Noise	30/45
	Elevated			72.2	37.2	No Impacts	0/0
	Open Cut			83.5	48.5	Vibration/Noise	30/45
	Crossover			93.4	58.4	Vibration/Noise	180/210
3	At-Grade	83	48	78.2	43.2	No Impacts	0/0
	Elevated			66.9	31.9	No Impacts	0/0
	Open Cut			78.5	43.5	No Impacts	0/0
	Crossover			88.2	53.2	Vibration/Noise	40/0

As part of the implementation of a preferred alternative, a detailed vibration analysis that includes the use of project-specific and site-specific measured data will be undertaken to refine the general vibration analysis results presented above. It is possible that at some of the locations identified above where the general vibration assessment predicts that FTA impact criteria would be exceeded, the more detailed analysis will predict lower ground-borne vibration and noise values that will no longer exceed the FTA impact criteria. Based on the results of this more detailed analysis, site-specific decisions will be made on which mitigation measures should be incorporated into the project's design. Developing and implementing measures to mitigate ground-borne vibration and noise impacts will be an important component in the implementation of the preferred alternative. ✷



Source: Transit Noise and Vibration Impact Assessment, DOT-T-95-16, April 1995

Figure 10-1
FTA's Noise Impact Criteria for Transit Projects
CROSS HARBOR FREIGHT MOVEMENT PROJECT

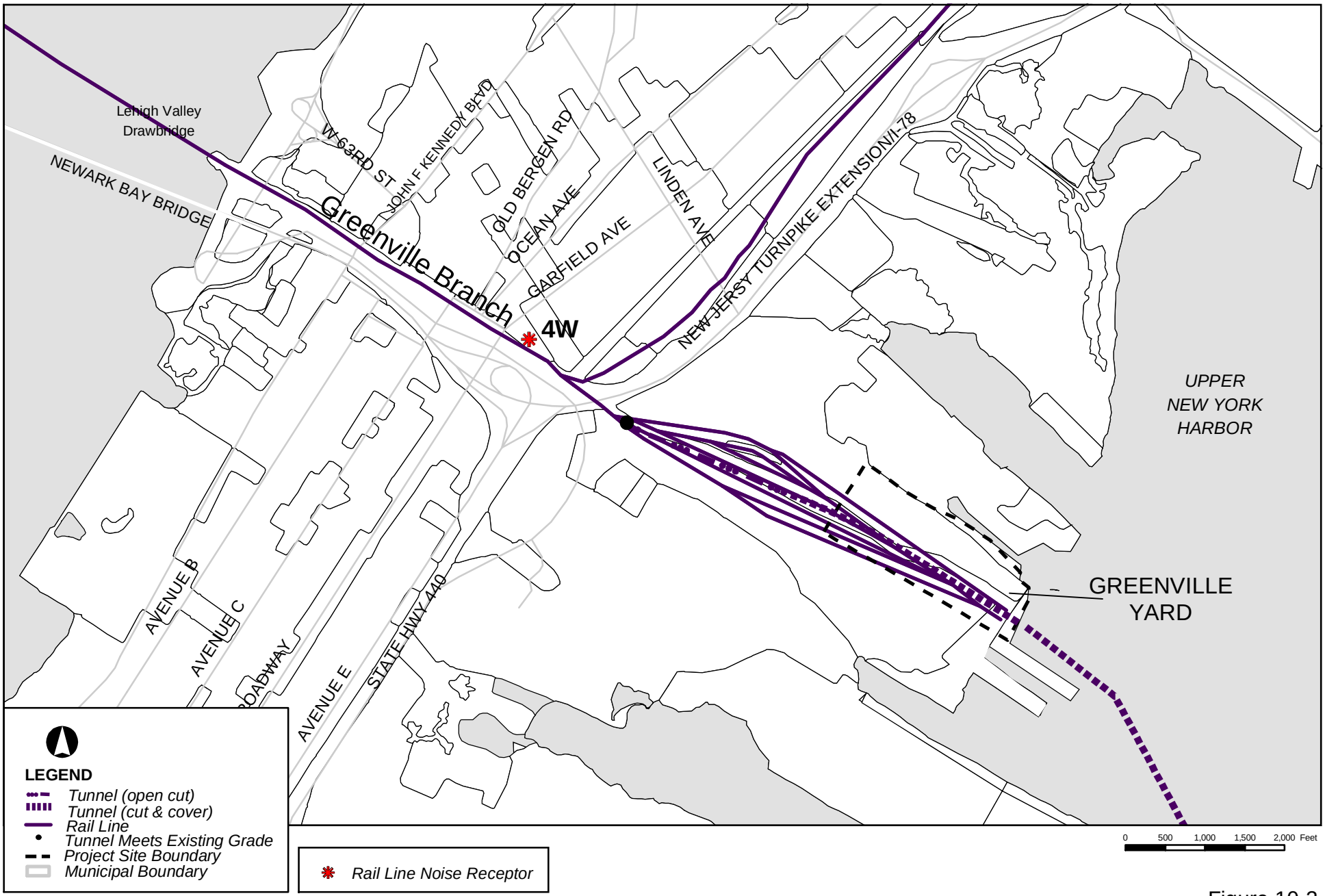


Figure 10-2
Greenville Branch Noise Monitoring Location
CROSS HARBOR FREIGHT MOVEMENT PROJECT



Figure 10-3
National Docks Secondary Study Area Noise Monitoring Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

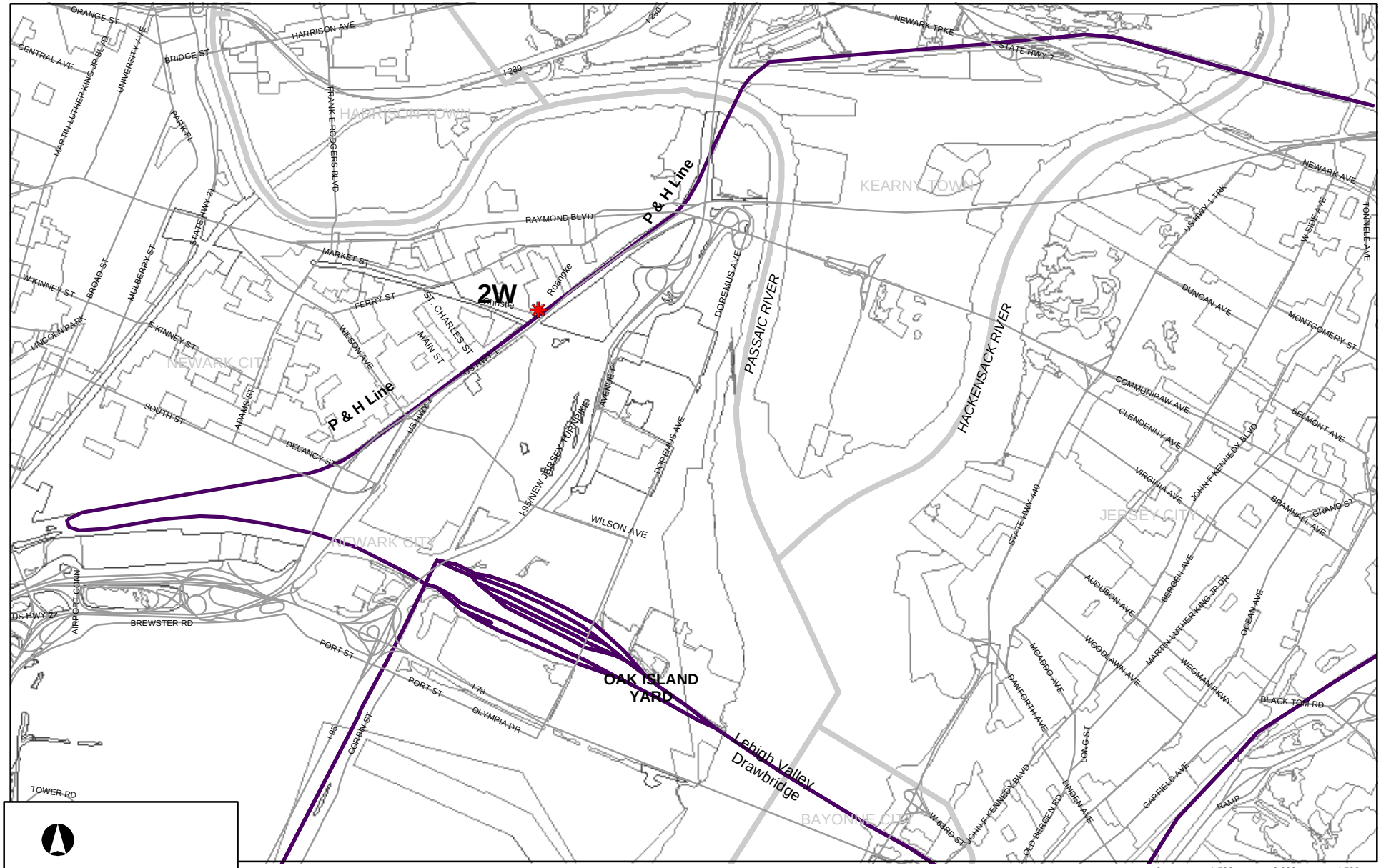


Figure 10-4
P & H Line Study Area Noise Monitoring Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

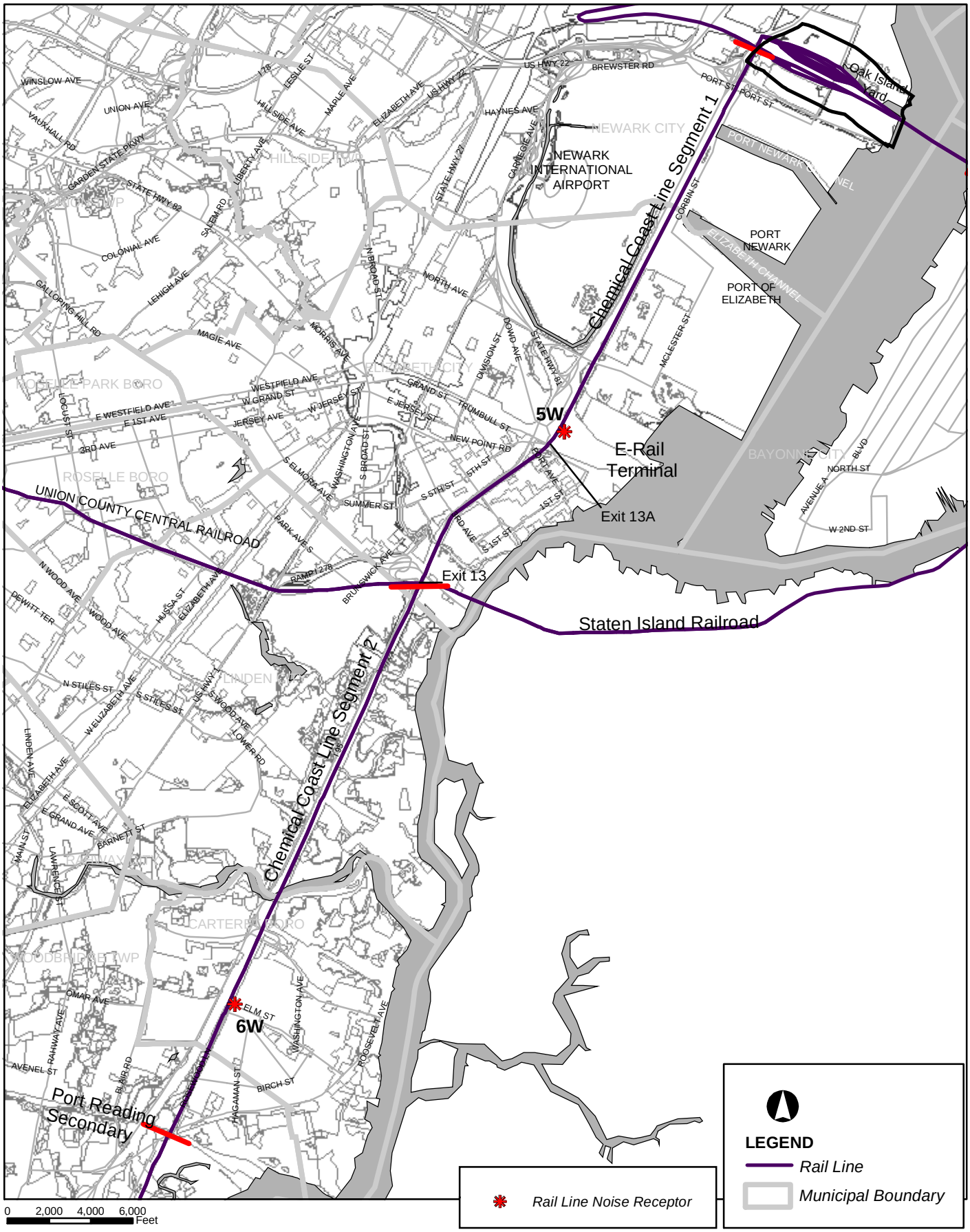


Figure 10-5
Chemical Coast Line Study Area Noise Monitoring Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

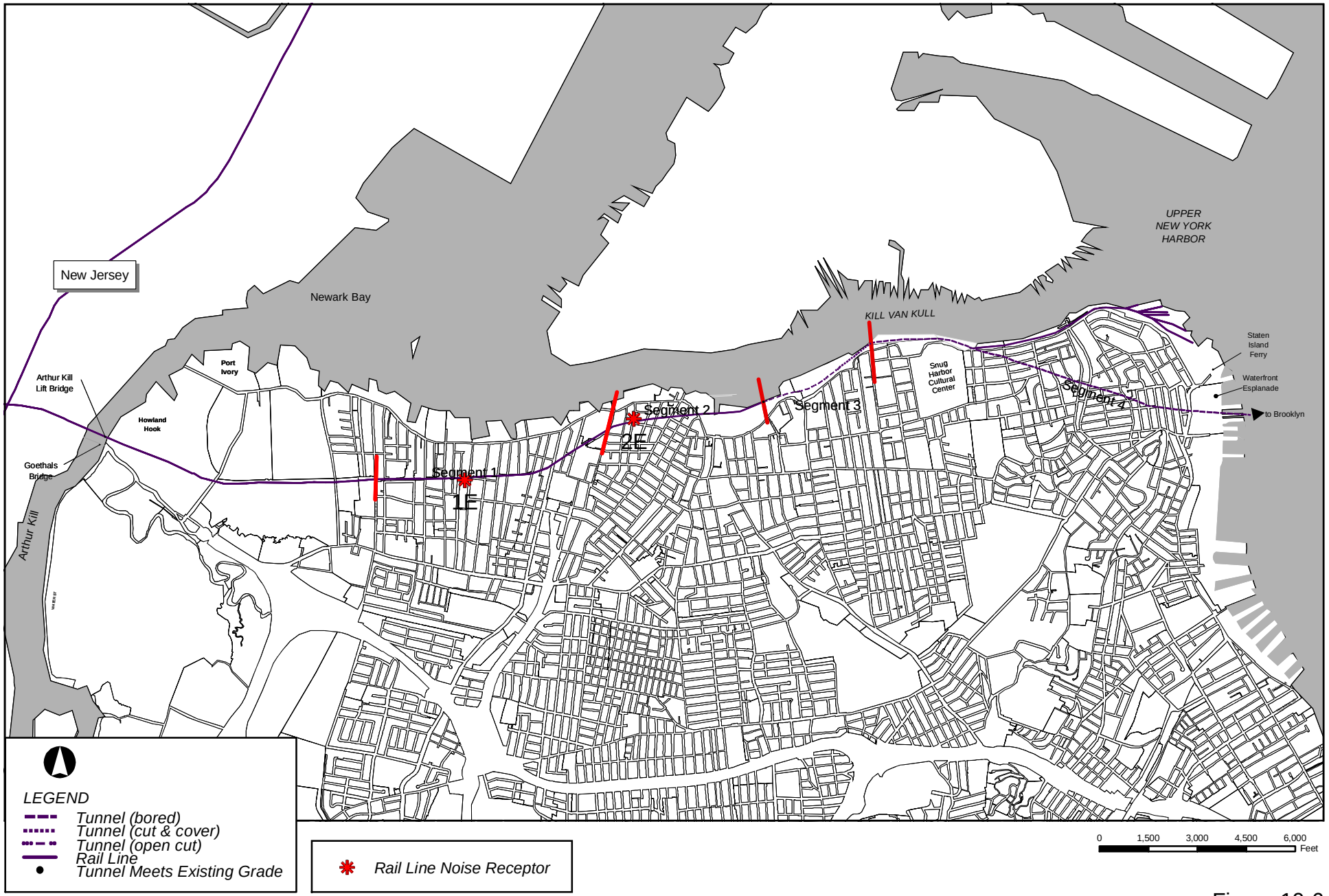


Figure 10-6
Staten Island Noise Monitoring Locations

CROSS HARBOR FREIGHT MOVEMENT PROJECT

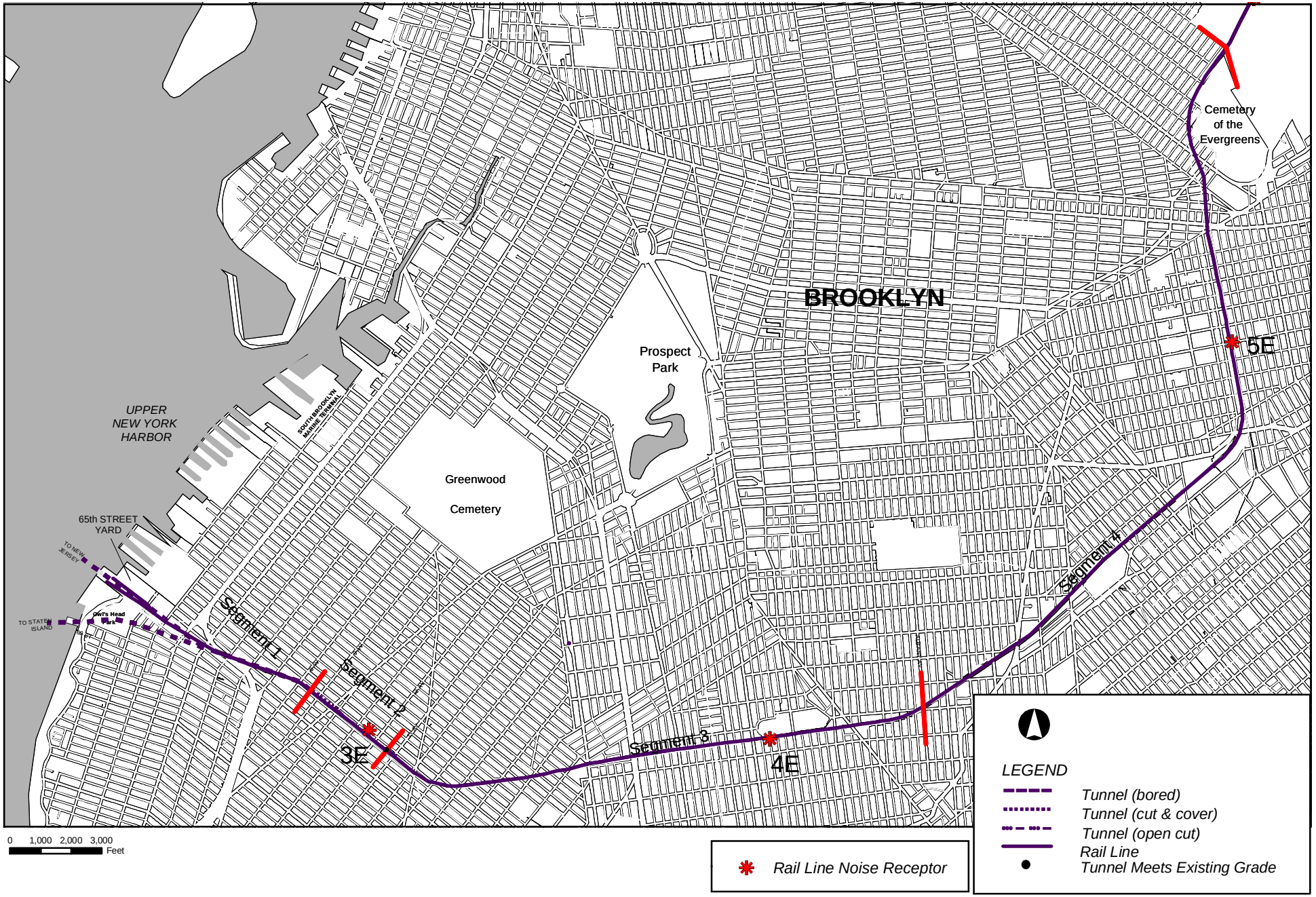


Figure 10-7
Brooklyn Noise Monitoring Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

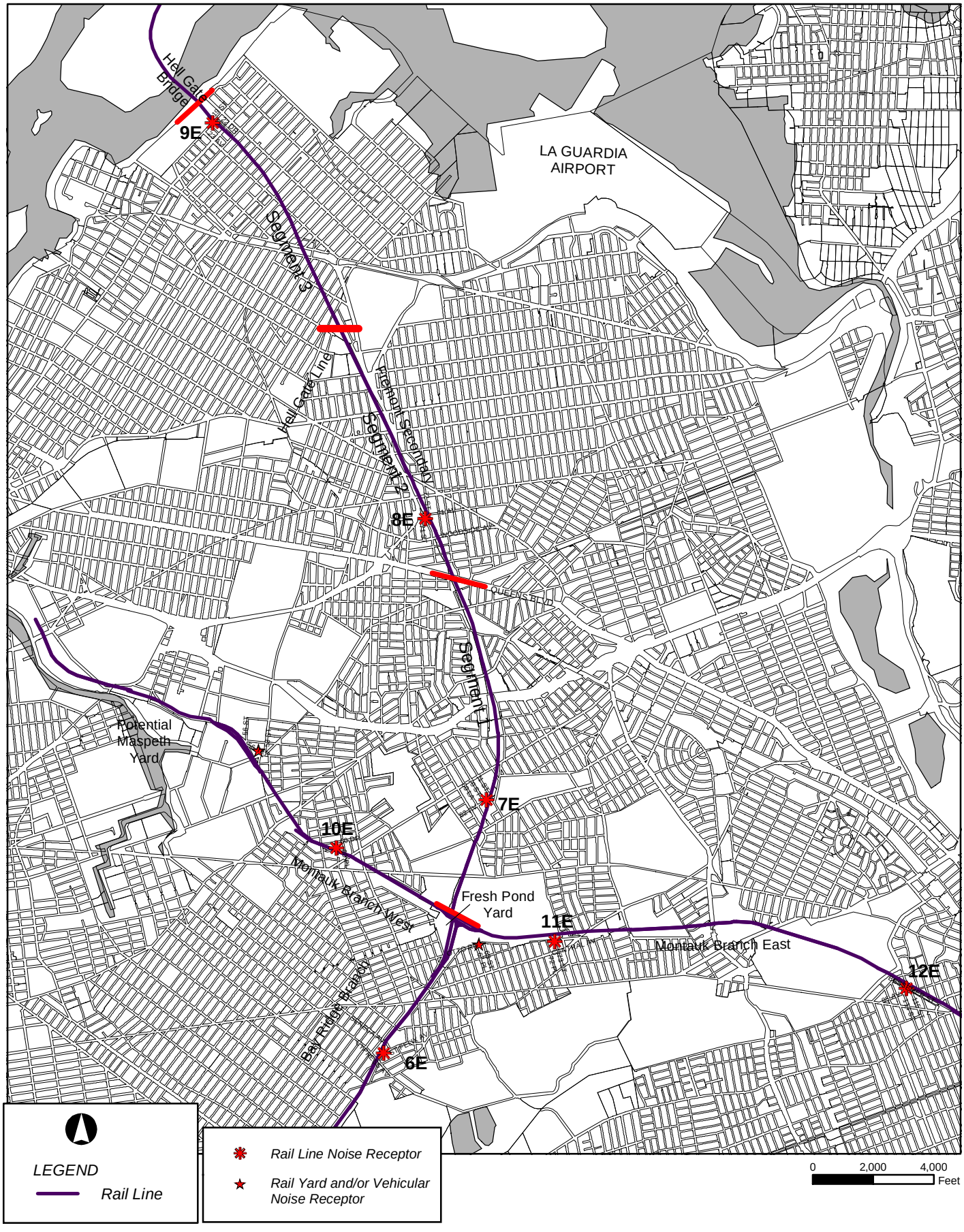


Figure 10-8
Queens Noise Monitoring Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

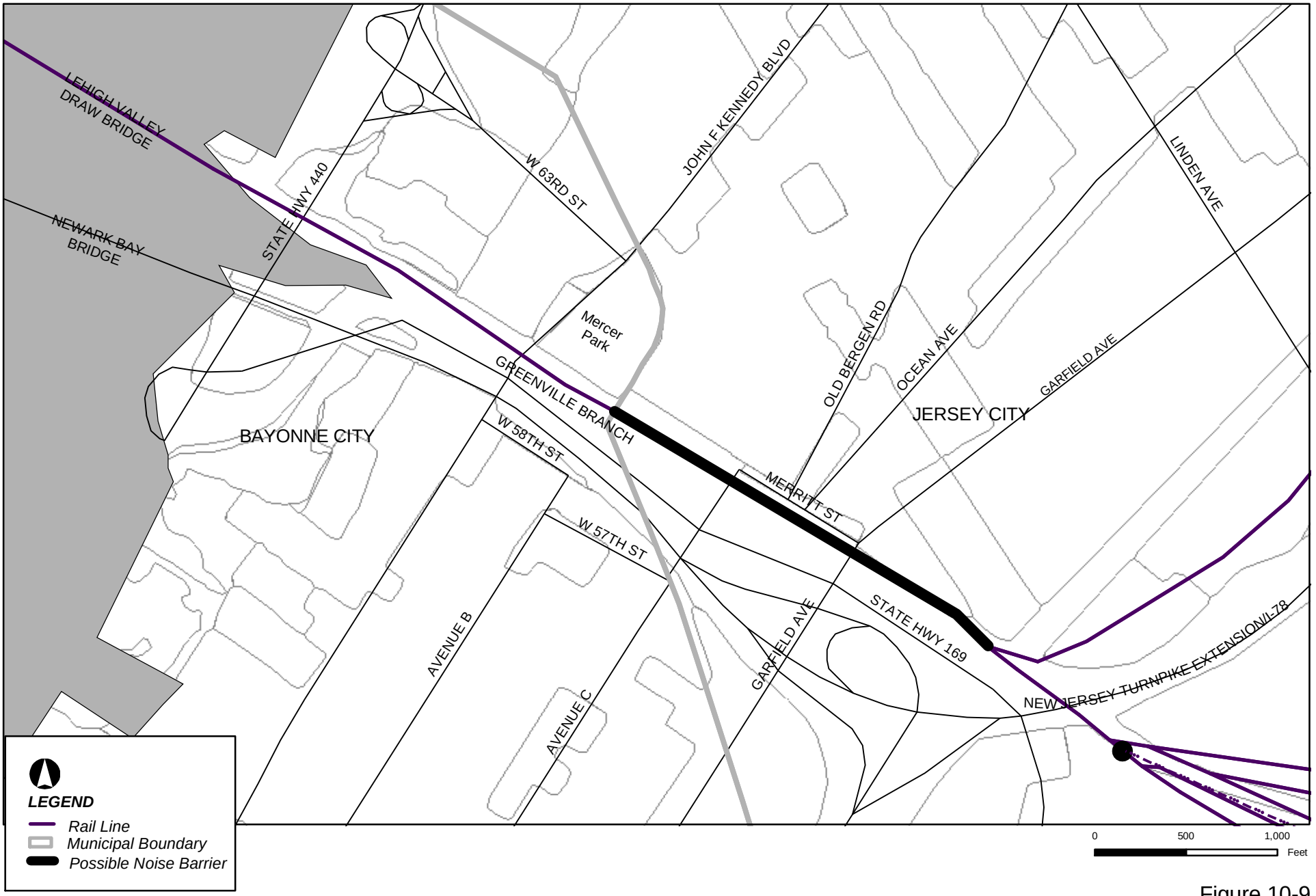


Figure 10-9
Greenville Branch Study Area Potential Noise Barrier Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

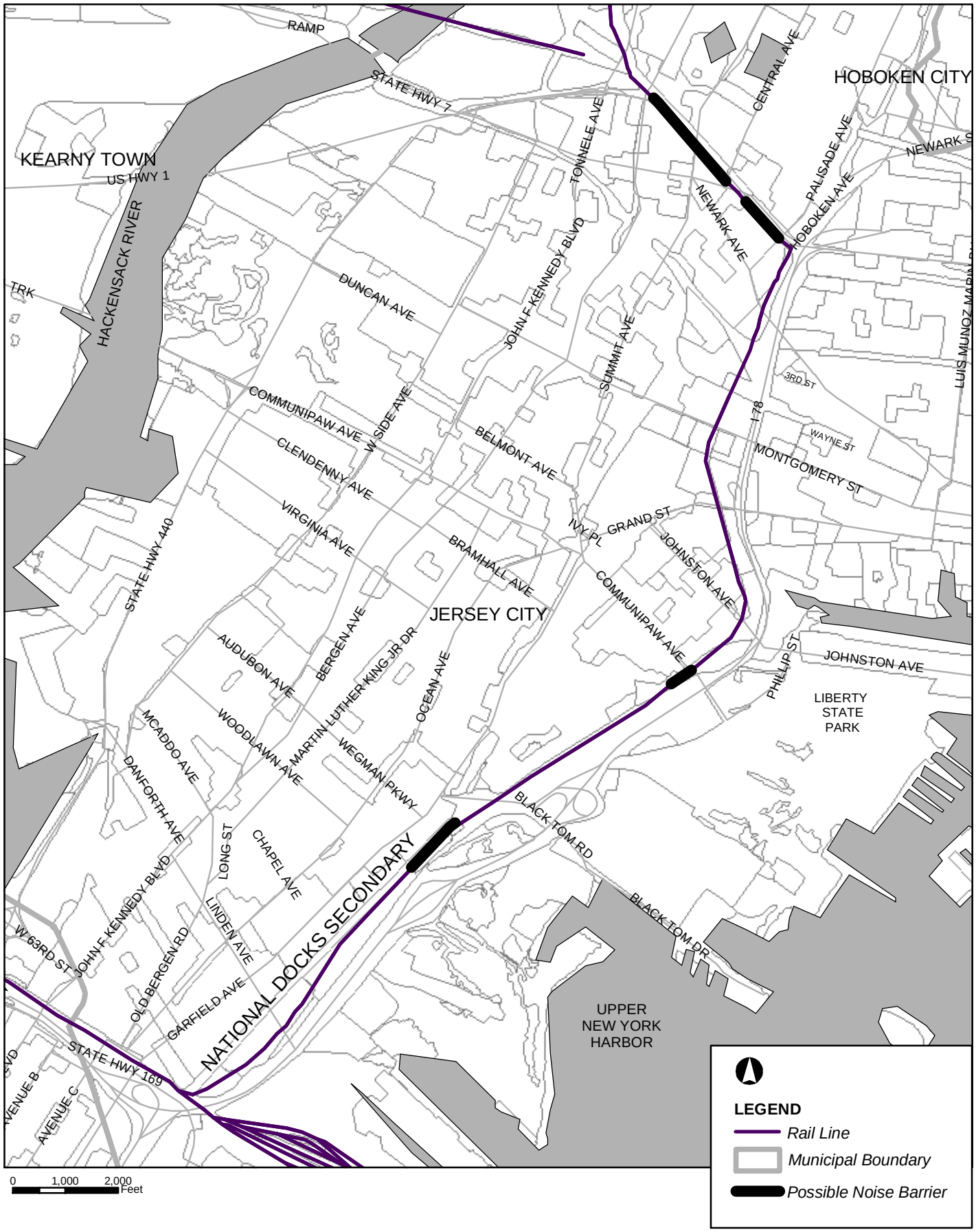


Figure 10-10

National Docks Secondary Study Area-Segment 2 Potential Noise Barrier Locations

CROSS HARBOR FREIGHT MOVEMENT PROJECT

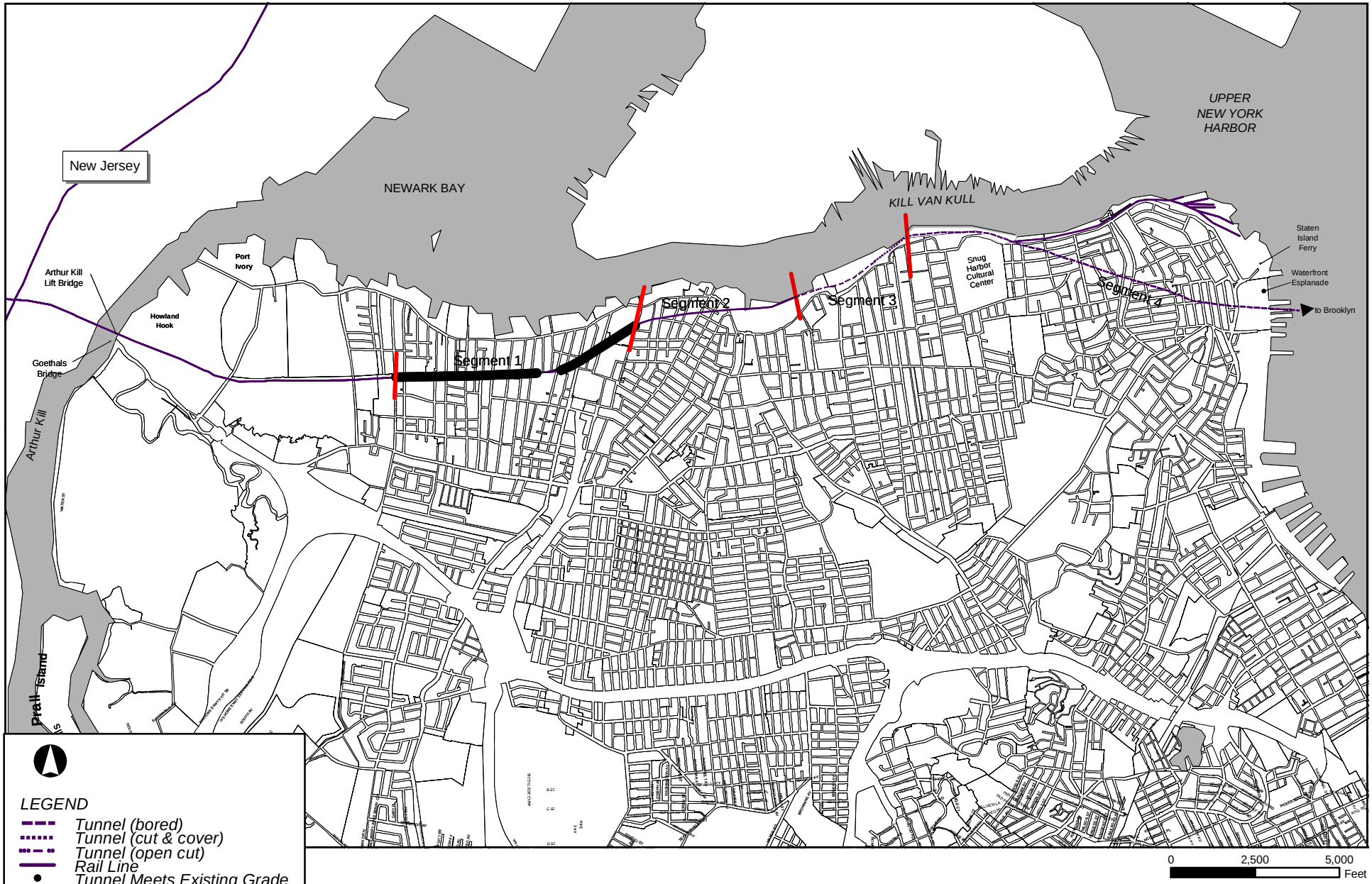


Figure 10-11
Staten Island Potential Noise Barrier Locations

CROSS HARBOR FREIGHT MOVEMENT PROJECT

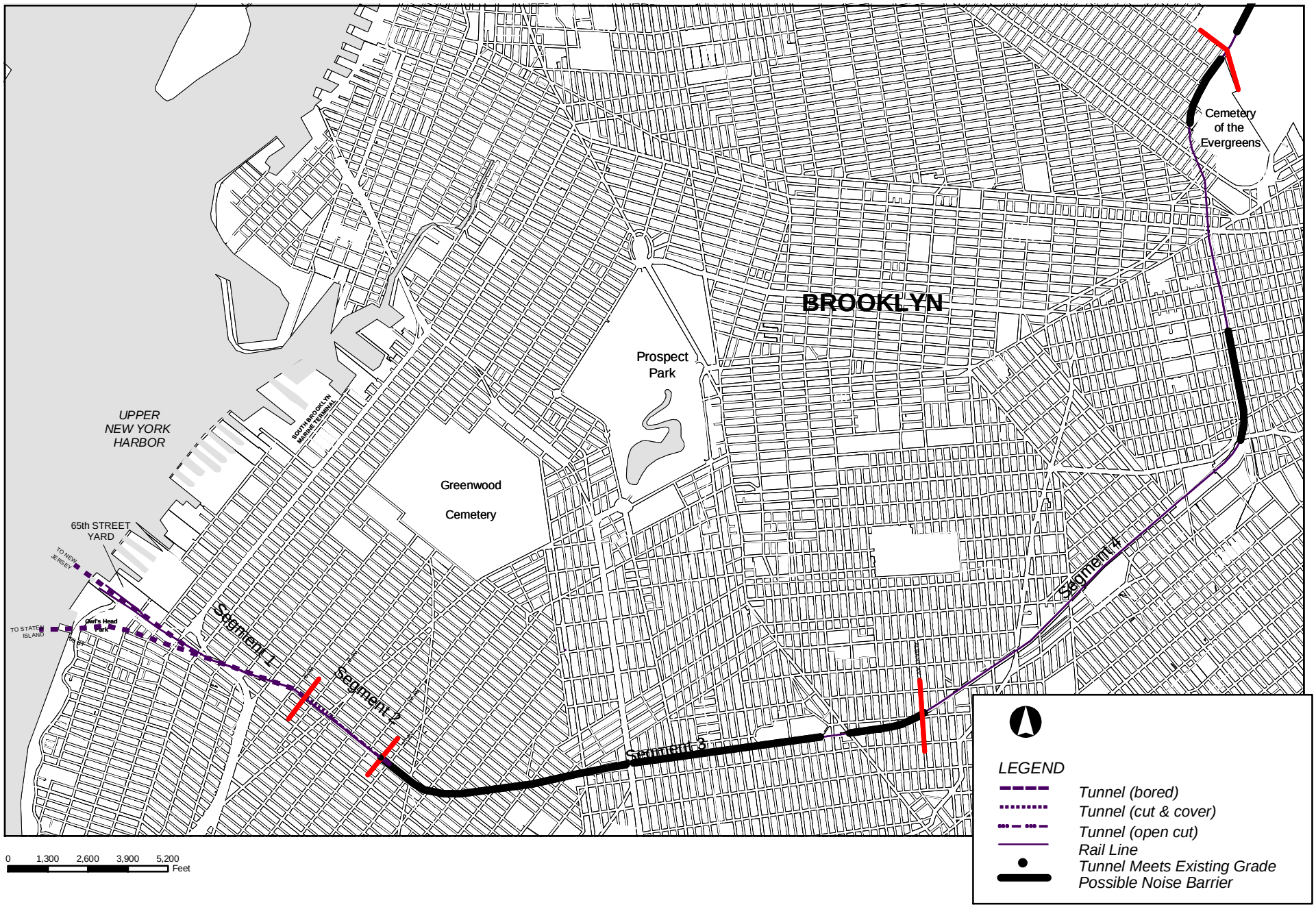


Figure 10-12

Brooklyn Potential Noise Barrier Locations

CROSS HARBOR FREIGHT MOVEMENT PROJECT

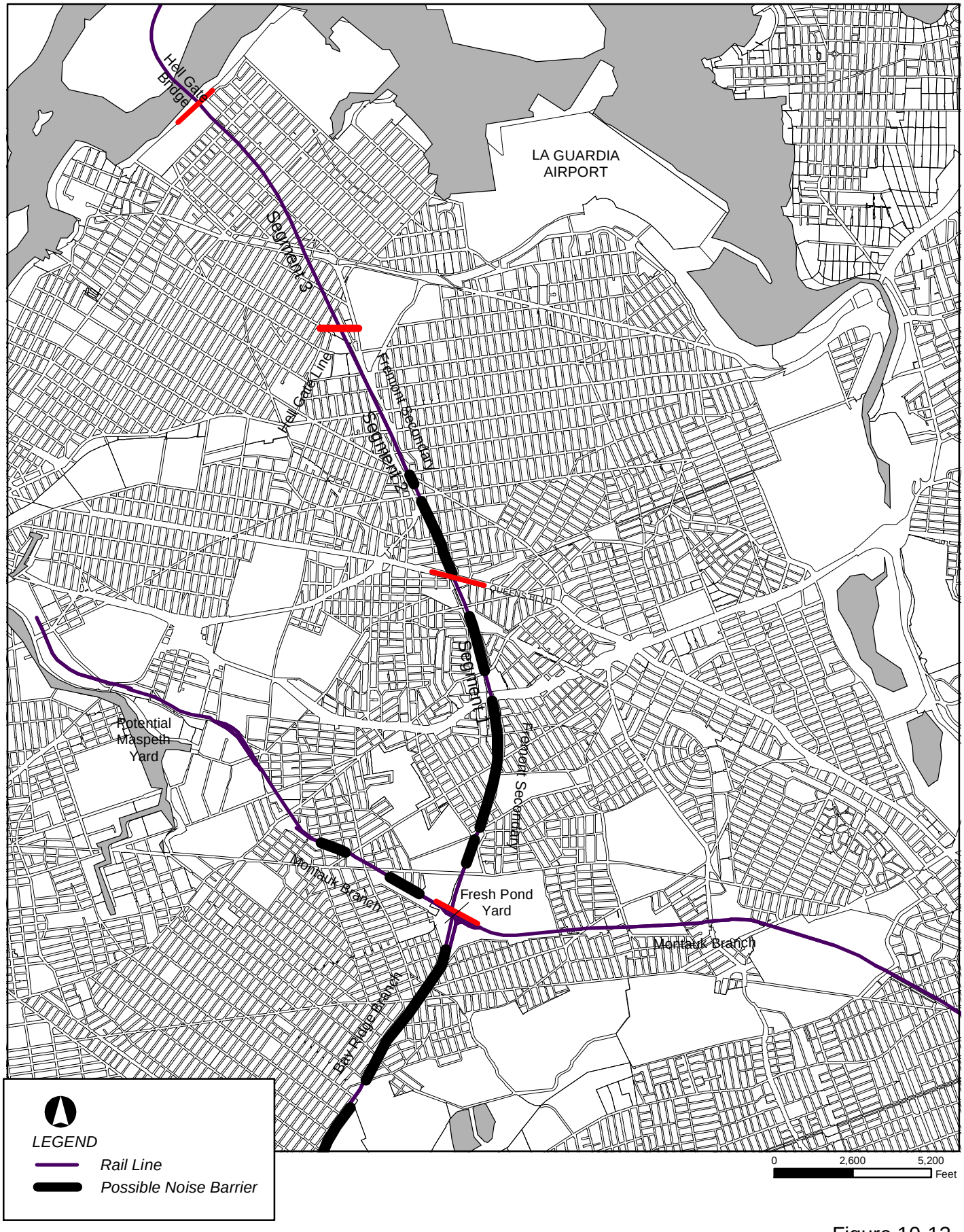


Figure 10-13
Queens Potential Noise Barrier Locations
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 11: Energy

A. INTRODUCTION

This chapter compares the direct energy expenditures and savings associated with the Tunnel Alternative and Expanded Float Operations Alternative. Direct energy expenditure is the energy required by vehicles operating on roadways and to operate the trains in the greater New York Metropolitan region and in the rest of the United States. Energy savings are generated by the diversion of trucks from the region's roadways.

B. REGULATIONS AND METHODOLOGY

REGULATORY CONTEXT

FRA guidance recommends that an assessment of irreversible and irretrievable energy resource commitment and the potential for energy conservation be performed for the proposed project. Consistent with Executive Order 12185, the assessment should focus on alternatives with the potential to conserve petroleum and/or natural gas. FHWA and NEPA guidelines require a discussion of major direct energy (e.g., energy consumed by vehicles using a proposed facility) and/or indirect energy (e.g., construction energy, change in automobile uses) impacts as well as the energy conservation potential of each alternative. In addition, the guidelines state that consistency with a State and/or regional energy plan, as applicable, should be discussed.

The NYSDOT energy guidance was prepared in 1981 and is outlined in the NYSDOT's Environmental Procedures Manual (EPM). As stated in the EPM, FHWA adopted the procedural approach described in the EPM. The NYSDOT guidance is currently being revised and should be released in 2004. Based on the 1981 NYSDOT energy guidance, an analysis of direct and indirect energy impacts of project alternatives is required. As defined in this guidance, direct energy impacts consist of the impacts of operating a facility subsequent to its construction, and include the energy consumed by vehicles using the facility. Indirect energy impacts include the energy associated with construction and maintenance of the facility, along with any substantial impacts to energy consumption related to project induced land use changes and mode shifts, vehicle operation, manufacturing, or maintenance due to increased automobile use. As stated in the EPM, "The impacts of a proposed action should be judged by comparing the relative energy consumption of the build and no-build alternatives." For transit and rail actions, the guidance recommends consideration of items such as vehicle energy use, terminal energy use, passenger load factors, trip diversion, energy conservation, and energy used during construction. The guidance document also states, "The level of effort relevant to energy analysis should be based on the anticipated impact the project will have on energy use. If the project is not likely to significantly affect energy consumption, it should be analyzed using more generalized procedures." The NYSDOT energy analysis guidance was applied to this analysis as appropriate for a FHWA/FRA rail freight transportation project. As explained in the "Methodology" section below, the energy analysis focused on the trip diversion that would result from the project and

calculated the energy that would be conserved by removing freight trucks from the region's roadways as well as the energy that would be consumed by the rail freight locomotives. If the new NYSDOT energy analysis guidelines are issued prior to the FEIS, this analysis will be adjusted accordingly.

The New Jersey State Development and Redevelopment Plan (SDRP) prepared in 1992 by the New Jersey State Planning Commission summarizes nine essential elements of the Statewide Policies for Energy Resources. These policies were set forth to ensure adequate energy resources through conservation, facility modernization and cogeneration; to continue economic growth while protecting the environment; and to modify energy consumption patterns to capitalize on domestic rather than imported energy supplies.

METHODOLOGY

In order to assess the energy-related impacts of each Cross Harbor Freight Movement project alternative as compared to the No Action Alternative in 2025, the projected increase in fuel usage due to the project was compared to the potential for energy savings. The fuel usage for the operation of the Expanded Float Operations Alternative, the Single Tunnel System, and the Double Tunnel System would consist primarily of the fuel consumed by additional freight trains. For the Single and Double Tunnel Systems, the energy to be used for the tunnel ventilation system was added to the increase in fuel usage due to additional freight train operations. For the Expanded Float Operations Alternative, it was assumed that the additional energy consumed by the tug boats over a short distance would be small in comparison to the fuel consumed by the additional trains and the fuel saved by reduced truck traffic. For all alternatives, the potential for energy savings can be estimated using the reduction in fuel that would result from reduced truck traffic in the region. In other words, the net energy consumption was calculated as follows:

Energy consumed by increased freight train operation due to project

\+ Energy consumed by tunnel ventilation system (Tunnel Alternative only)

\- Energy saved by reduced truck traffic due to freight diversion from truck to rail

= Net energy use in 2025 compared to No Action Alternative

A discussion of indirect energy impacts during construction is provided in Chapter 16, "Construction and Construction Impacts."

As explained in Chapter 9, "Air Quality," Chapter 4, "Economics," and Appendix 3, "Air Quality Appendix," many of the project benefits stem from the diversion of freight from trucks to rail. This commodity truck diversion was analyzed to determine the project's economic and environmental benefits. The FHWA's Surface Transportation Efficiency Analysis Model (STEAM) was developed to evaluate transportation investments and policies from an economic perspective. The model also provides quantitative estimates of natural resource usage, such as energy consumption, and environmental impacts, such as air pollutant emissions. For this project, the 2025 forecasts from the NYMTC model served as inputs to STEAM. STEAM was then used to estimate the reduction in air pollutant emissions and economic benefits, as discussed in previous sections of this EIS. This energy analysis used the following STEAM outputs: (1) reductions in highway fuel consumption and (2) increase in locomotive fuel consumption. These fuel consumption outputs are shown in the analysis below. Additional information regarding the STEAM outputs is provided in Appendix 3.

C. EXISTING CONDITIONS

Gross energy use in the United States in 1999 was estimated at an equivalent of 92.78 quadrillion British Thermal Units, or BTUs. Of that total energy, 26.09 quadrillion BTUs is applied to the transportation sector, representing approximately 28.1 percent of the total (source: *National Transportation Statistics 2000*, U.S. Department of Transportation, BTS01-01, April 2001). This includes Petroleum products, coal, natural gas, electricity, and electrical system energy losses. Petroleum products are the source of 97.3 percent of the energy used by the transportation sector. Fifty-two percent of the ground-based transportation energy is used by trucks. Freight rail energy represents two percent of the transportation related energy demand. Approximately 874 trillion BTUs of energy are used for ground transportation in New York State each year.

D. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

TSM ALTERNATIVE

The expected truck-to-rail diversions, and increase in the use of trains for freight transport resulting from the TSM Alternative are expected to be extremely minor. As such, the implementation of the TSM Alternative would not be expected to introduce a substantial decrease of energy usage as compared to that of the No Action Alternative.

EXPANDED FLOAT OPERATIONS AND TUNNEL ALTERNATIVE

As presented in Chapter 8, "Transportation," both tunnel alignments would increase the total freight train Vehicle Miles Traveled (VMT) and reduce the freight truck VMT (see Table 8-7 in Chapter 8, "Transportation"). The Expanded Float Operations Alternative would also increase total freight train VMT and reduce freight truck VMT, although to a lesser degree than the Tunnel Alternative. As presented in Table 11-1, a comparison of energy expended versus energy savings results in a net reduction in fuel consumption for the Tunnel Alternative and the Expanded Float Operations Alternative.

The Tunnel Alternative would also include a ventilation system, which would consume energy. The power draw of the ventilation system for the Double Tunnel System is expected to be 19.1 million BTU/hr (5.6 MW) for the New Jersey alignment and 27.6 million BTU/hr (87.1 MW) for the Staten Island alignment. These values can also be assumed as worst-case energy consumption for the Single Tunnel System since, under maximum operation conditions, the Single Tunnel System would utilize the same number of ventilation fans. Constant operation of the vent fans (i.e., 8,760 hours per year) was assumed in Table 11-1, also as a worst-case scenario.

Overall, no adverse energy impacts would occur under any of the alternatives. Compared with the No Action Alternative, both of the tunnel alignments would result in considerable energy savings.

Table 11-1
Net Annual Energy Consumption for Tunnel Alternative and Expanded Float Operations Alternative (2025)

		Single Tunnel System		Double Tunnel System		Expanded Float Operations Alternative
		New Jersey Alignment	Staten Island Alignment	New Jersey Alignment	Staten Island Alignment	
New York Metropolitan Region						
Reduction in truck traffic	Fuel consumption (million of gallons)	-7.5	-7.3	-15.6	-15.3	-0.2
	Energy use (billion BTUs)	-1,027.5	-1,000.1	-2,137.2	-2,096.1	-27.4
Increase in freight train operation	Fuel consumption (million of gallons)	1.6	1.5	3.3	3.2	0.1
	Energy use (billion BTUs)	219.2	205.5	452.1	438.4	13.7
Increased energy use for vent system	Energy use (billion BTUs)	167	234	167	234	N/A
Net energy use as compared to No Action Alternative	**Energy use (billion BTUs)**	**-641.3**	**-560.6**	**-1,518.1**	**-1,423.7**	**-13.7**
Outside of New York Metropolitan Region						
Reduction in truck traffic	Fuel consumption (million of gallons)	-43.6	-39.0	-91	-81.5	-1.8
	Energy use (billion BTUs)	-5,973.2	-5,343.0	-12,467	-11,165.5	-246.6
Increase in freight train operation	Fuel consumption (million of gallons)	10.3	8.8	21.6	18.4	0.5
	Energy use (billion BTUs)	1,411.1	1,205.6	2,959.2	2,520.8	68.5
Increased energy use for vent system	Energy use (billion BTUs)	167	234	167	234	N/A
Net energy use as compared to No Action Alternative	**Energy use (billion BTUs)**	**-4,395.1**	**-3,903.4**	**-9,340.8**	**-8,410.7**	**-178.1**

E. MITIGATION MEASURES

Neither the TSM nor the Tunnel Alternative would cause adverse energy impacts. Both alternatives would save energy by decreasing the amount of transit-related energy consumption. Therefore, no mitigation measures are required. ✷

A. INTRODUCTION AND METHODOLOGY

This chapter examines the potential for impacts related to contaminated materials including contaminated soil and groundwater. It assesses the soil and groundwater conditions for those project sites that would be subject to construction activities under the proposed alternatives (i.e., tunnel alignments, rail yards, rail lines, and clearances).

For each site that would be affected by the project, the analysis begins by considering the location, type, and extent of contaminated materials that may be present in the soil or groundwater because of past or present uses either on or adjacent to the site. As described below, this assessment was conducted through a review of historic maps, regulatory records, and site visits. The analysis considers the project's potential to encounter any potentially contaminated soil and groundwater. This evaluation focuses on construction activities since the construction work for the project would disturb the soil and, in some locations, the groundwater. Construction activities are considered with respect to soil and groundwater conditions to assess any potential risks to public health, safety, and the environment. The chapter describes mitigation measures to be employed to avoid potential impacts related to contaminated materials and discusses how those measures would avoid potential impacts associated with contaminated materials once the project is completed and operational.

POTENTIAL CONTAMINANTS OF CONCERN

Soil and groundwater beneath a site can become contaminated because of past or present uses on the site or adjacent properties. Most of the sites affected by the project are currently or were historically in railroad use. Normal operations at rail yards—including maintenance and routine operations—can over time lead to contamination from spills. Along rail lines, common contaminants include volatile and semi-volatile organic compounds, heavy metals, pesticides, and herbicides. The project areas may also have been contaminated by past or current uses of neighboring properties, particularly since many of the affected sites are located in largely industrial and manufacturing areas. In addition, some of the sites are built on fill material, which often contains contaminants such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals. Some of the potential common contaminants of concern for the project sites and adjacent uses are discussed below.

- Polychlorinated Biphenyls (PCBs). Commonly used as a dielectric fluid in train-mounted or yard transformers, PCBs are of special concern at rail yards and train maintenance locations.
- Heavy metals, including lead, cadmium, chromium, and mercury. These have been widely used in many industries, including printers, foundries, and metal working facilities, and are found in paint, ink, petroleum products, and coal ash. Lead is also a common component of paint on bridges or other steel structures, and can be found in elevated concentrations in soil near roadways as a result of the historic use of leaded gasoline.

- Volatile Organic Compounds (VOCs). These include aromatic compounds (such as benzene, toluene, ethyl benzene, and xylene [BTEX]), which are found in petroleum products used in fuels, vehicle repair and metal works, as well as many other industries; and chlorinated compounds (such as tricholoroethene and tetrachloroethene, common ingredients in solvents and cleansers) used in degreasing, dry cleaners, and other industrial facilities. Groundwater can become contaminated with VOCs and vapors can be released, especially during excavation activities. In addition, some VOCs can be flammable if the vapors are confined.
- Semivolatile Organic Compounds (SVOCs). These include PAHs (which are common constituents of partially combusted coal or petroleum-derived products); coal-derived products such as creosote used as a protective coating on rail ties; and coal and coal ash used as fill material.
- Pesticides and Herbicides. These are commonly used to control rodents and/or insects, and vegetation in rail yards and along rail lines, particularly between the tracks.
- Fuel Oil and Gasoline Storage Tanks. Many of the rail yards, businesses, and industries once located in the project areas contained aboveground storage tanks (ASTs) or underground storage tanks (USTs) for fuels. Some of these tanks may have been removed. In some locations, spills and leaks associated with such tanks may have occurred. Other tanks, although no longer in use, may remain buried in place in the project areas. Existing businesses and gasoline stations neighboring the rail yards, rail lines, and other project sites may have petroleum storage tanks that are in active use. The soils and groundwater in proximity to fuel oil and gasoline storage tanks may be contaminated because of ongoing or past leaks or spills. Fuel oil and gasoline from off-site sources may have migrated to the project sites, contaminating soil and groundwater on-site.
- Asbestos. Potentially asbestos-containing materials may be located within buildings or on underground steam pipes, or existing float lifts where box cars are transferred from rail to barge, or at illegal dumping sites on the rail yards and rail lines.

METHODOLOGY

For each location where construction activities could disturb potentially contaminated materials, a preliminary site assessment (commonly known as a "Phase I" Environmental Assessment) was conducted. Each Phase I employed a four-part investigation—past and current land use review, contaminated materials database and records research, a site inspection, and review of previous investigations conducted on the project site when available—to determine the potential presence of contaminated materials on, below, or adjacent to the site.

PHASE I ENVIRONMENTAL ASSESSMENT METHODOLOGY

The review of past and current land use began with research to determine the past uses on or within 400 feet of each site. The research involved examining historic maps (Sanborn real estate atlases and fire insurance maps dating back to late 1800s or early 1900s, or historical aerial photographs when Sanborn maps were unavailable) for such uses as gasoline stations, electric substations, gasworks, chemical works, and other uses that could have resulted in contamination of underlying soil and groundwater.

Federal and state database and regulatory records and databases were reviewed—including listings of hazardous materials spills, petroleum storage facilities, and state and federally listed

hazardous waste sites—to determine the regulatory status of each site, adjacent properties, and properties within 400 feet of the site. For the rail lines, some database listings were excluded from this review because of the minimal potential for impacts to the project sites. The listings that were excluded include small spills of hazardous materials or petroleum (less than 50 gallons), spills and tanks associated with residential property storage tanks of 2,000 gallons or less, closed status spills (i.e., those cleaned up to the satisfaction of the regulatory agency), surface water and air releases, and hazardous waste notifiers (facilities that did not report hazardous waste generation, transport, or disposal).

A visual inspection of all accessible areas of each yard was performed to determine potential sources of contamination, including USTs; ASTs; objects that could potentially contain polychlorinated biphenyls (PCBs), such as transformers; and areas where hazardous materials are or were used, stored, treated, generated and/or disposed, such as maintenance facilities, debris piles, and areas of illegal dumping. The inspection also identified any staining, odors, or lack of vegetation, which can be signs of contamination.

Previous environmental studies, where available, were also reviewed. Phase II Investigation reports, which include soil and groundwater sampling results, were reviewed and summarized for Arlington Yard, the Phelps Dodge portion of the West Maspeth Yard site, and Fresh Pond Yard. With the exception of these three sites, no other soil or groundwater sampling data were available. The levels of various chemical constituents in soil and groundwater at these three sites were compared to various regulatory limits and guidelines, as appropriate for industrial sites[*]. These values serve as screening levels, with contamination identified at levels below the screening level not requiring further evaluation, and contamination above the screening level indicating the need for additional information and/or mitigation. The criteria used to evaluate contaminants are described below and listed in Table 12-1. In addition, as described later in this chapter, any material that must be removed from the project for disposal off-site (e.g., tunneling spoils) will undergo a separate evaluation of contamination to meet off-site disposal requirements.

Phase I data and available Phase II reports were evaluated, focusing on whether the project could lead to exposure of contaminated materials that would result in an increased threat or risk to workers, public health, or the environment. Where the potential for significant impacts was identified, reasonable and conservative remediation goals were developed. Health and safety concerns during construction would be separately addressed by a construction health and safety plan.

METHODOLOGY FOR ADDITIONAL INVESTIGATION

For the rail lines and tunnel alignments, based on the contaminated materials assessment methodology, sites adjacent to the rail lines were rated as: (1) requires further investigation; (2) unlikely to require further investigation; or (3) further investigation not recommended. Regardless of category, the entire project will be conducted under a health and safety plan with contingencies for encountering contaminated soil, groundwater, drums, or tanks.

[*] Health-based criteria developed for residential areas and standards for drinking water were not used, since these are not appropriate for these project sites, which would be industrial in nature and not accessible to the general public on a regular basis.

Table 12-1
Evaluation Criteria

State	Matrix	Action	Regulation
New York	Non-residential soil	Clean Up Criteria	NA – case by case
	Residential soil	Clean Up Criteria	NYSDEC TAGM 4046
	Dewatering	Sewer Discharge	Local sewer ordinance
	Dewatering	Surface Water Discharge	NY SPDES Permit
New Jersey	Non-residential soil	Clean Up Criteria	N.J.A.C. 7:26D NRSCC
	Residential soil	Clean Up Criteria	N.J.A.C. 7:26D RSCC
	Dewatering	Sewer Discharge	Local sewer ordinance
	Dewatering	Surface Water Discharge	NJPDES Permit

Notes:
NYSDEC TAGM 4046 - New York State Department of Environmental Conservation Technical and Administrative Guidance Memorandum (4046) health-based or background-based criteria, but these are not appropriate for a site that is not accessible to the general public.
NY SPDES – New York State Pollutant Discharge Elimination System
NJPDES – New Jersey Pollutant Discharge Elimination System

Further investigation would entail additional research to evaluate the potential for individual sites to affect the project site and a protocol would be prepared for any subsurface soil or groundwater testing that might be required. Below is a list of uses and their respective rating category (see Table 12-2). Note that this is not an exhaustive list and some uses along the rail lines may not be listed.

Table 12-2
Uses by Impact Category

Further Investigation Not Recommended	Unlikely to Require Further Investigation	Requires Further Investigation
Telephone Utility	Substation	Known Active Spill >50gal
Vacant Lot	Vacant Lot w/ Dumping	Batteries
Car Wash	Scrap Metal/Scrap Yard	Auto Wrecking
Finishing	Auto Repair	Gas Station
Printing	UST – Fuel Oil	Lead on Overpass/Bridge
Lighting	Metal Working	UST – Gasoline
Lumber Yard	Radio & Mica Manufacturing	Known Contaminated Soil or Groundwater
Coal yard	Rubber Goods	Lead Smelter
Closed SPILLS	Electric Facilities	Drycleaner
Painting	Glass Manufacturing	Anodizing
Transformers	Cleaning Supplies	

Groundwater flow direction and proximity to the project site were not considered in the assessment. This analysis is therefore conservative since potential contamination in any direction is considered. If an alternative is selected that may be affected by these uses, the listed sites would be reevaluated based on these additional factors during final design and, if necessary, subsurface investigations would be performed. Sites located upgradient of the rail lines with respect to groundwater have a greater potential to impact the project site because contaminants may travel downgradient in the groundwater. Those sites located downgradient of the rail lines with respect to groundwater are less likely to have a potential to impact the project site. Proximity to the rail line is also an important factor in determining potential for impact. All other

factors being equal, the closer a listed site is to the project site, the more likely it is to have a potential to impact it.

B. EXISTING CONDITIONS

The following assessment summarizes conditions at and adjacent to the project sites, based on the results of the Phase I investigations and review of previous Phase II investigations. More information is provided in the Phase I and Phase II investigation reports and other studies that are supporting documents to this environmental impact statement (EIS).

NEW JERSEY STUDY AREAS

GREENVILLE YARD/POTENTIAL TUNNEL ALIGNMENT STUDY AREA

Site Description and History

The 33-acre Greenville Yard site serves as the marine terminal for a railcar float service to and from Bush Terminal in Brooklyn, NY. The yard currently has four railcar float bridges (only one of which is currently in operation), numerous tracks, a forklift, a gantry crane, several trailers used as storage sheds, office space, and an unpaved parking area. The site is built on fill material and is bulkheaded. Areas of concern include five storage containers with unknown contents, one 550-gallon kerosene tank, and the lift building on the operating float bridge. The lift building is suspected to contain asbestos-containing wall and ceiling boards. A large switchboard was observed in the second floor control room that may contain PCBs. Hydraulic oil is used in the screw lift operations and staining and spills were noted on all levels of the lift building. The site operator has reportedly received violations relating to improper sludge storage and landfilling on the site. An investigation by the New Jersey Department of Environmental Protection (NJDEP) is ongoing.

The site was used as a rail yard beginning in 1904. Structures previously present on the site include a transformer house, manufacturing operations, warehouse operations, transportation buildings, a float bridge and lift house, the Steers contracting engineers maintenance yard, numerous tracks, and a junkyard. Historical Sanborn atlases indicate that the surrounding neighborhood has been primarily commercial and industrial for almost 90 years. Many of the adjacent sites were once part of a larger Greenville Yard. The Tide Water Oil Company tanks and pump house adjacent to the west side of the property were noted on historic maps from 1950 through 1995. Three tanks were shown at the pumping station and 10 tanks of approximately 4 million gallons capacity each were shown further south on the Tide Water Oil property.

Records Review

The Greenville Yards site (see Figure 12-1) is listed on NJDEP's "Known Contaminated Sites List" (No. NJD982737819). In addition, Conrail Greenville Yards Jersey City Redevelopment Agency (JCRA) is listed on the database as a "Known Contaminated Site," but with an address of 9 Linden Avenue, which is not consistent with the site location. No further information was found regarding the nature of the contamination. A state and federal regulatory database review identified a number of nearby sites that may have impacted the project site. A north-adjacent property at 1 Linden Avenue East is listed as a New Jersey State Hazardous Waste Site. A leaking underground gasoline tank and contaminated soil were removed from a north-adjacent property on Linden Avenue. A release was listed at an auto impound lot, to the northwest of the site, across from Linden Avenue. Contaminated soil was reportedly dumped on another property

north of the project site. A number of other releases were reported for Linden Avenue between Princeton Avenue and the New Jersey Turnpike to the north of Greenville Yard. Within the Jersey City Industrial Park southwest of the site, several areas of concern include: soil contamination related to a 4,000-gallon UST removal at Industrial Drive & Harbor; numerous motor oil spills from used cars at Colony Road and Port Jersey Boulevard; several diesel fuel spills at a fuel distributor on Colony Road; contaminated soil and groundwater from a leaking oil waste tank at 20 Colony Road; and soil contaminated with arsenic and fuel at sites along Port Jersey Boulevard. There are four sites just south of the yard listed as "Known Contaminated Sites" in New Jersey.

GREENVILLE BRANCH STUDY AREA

Site Description and History

The rail line is on an embankment to the east and is elevated to the west. As the rail line is elevated and relatively inaccessible, it is unknown whether dumping has occurred on it.

Records Review

A review of regulatory databases and historic Sanborn maps and a site visit revealed that the portion of the line west of Kennedy Boulevard includes a large gasoline storage facility as well as auto-related uses. The portion of the line east of Kennedy Boulevard to Greenville Yard is on an embankment bordered by residential structures interspersed with automotive uses and commercial businesses. The properties adjacent to the Greenville Branch have a 100-year history of primarily residential use with some gasoline stations, including USTs. Fuel oil contaminated soil was reportedly discovered during UST removal at a salvage facility located at Ocean Avenue adjacent to Greenville Branch.

ARTHUR KILL LIFT BRIDGE/CHEMICAL COAST LINE STUDY AREA

The Arthur Kill Lift Bridge/Chemical Coast Line Study Area is the area within 400 feet of the following areas: 15,000 feet along the Chemical Coast Line north of its planned connection to the Staten Island Railroad; and the Staten Island Railroad from the Chemical Coast Line over the Arthur Kill Lift Bridge to Arlington Yard in Staten Island.

The study area is in a heavily industrial area with the exception of a portion of the Chemical Coast Line. On the New Jersey side, land uses include oil refineries, chemical manufacturing plants and the New Jersey Turnpike. On the Staten Island side, the site is bounded by Howland Hook Marine Terminal to the north and Old Place Creek and associated wetlands to the south. The Staten Island side of the bridge is located within the former Howland Hook Marine Terminal.

STATEN ISLAND

For a discussion of the Arthur Kill Lift Bridge Study Area, see the section under "New Jersey" above.

ARLINGTON YARD STUDY AREA

Site Description and History

The Arlington Yard project site is located on the northwestern portion of what was once a larger rail yard. Grasses and brush cover most of the site, while heavily wooded areas are located along the southern boundary of the rail yard. Several large piles of unknown fill and construction debris were noted on the central portion of the yard, along with materials such as dark sand, gravel, and three plastic trash bags of suspect asbestos-containing building material.

The yard was historically used to fuel, service, maintain, and switch railroad equipment. Two tracks of the Staten Island Railroad have run through the site since the late 1800s. The site became a yard in approximately 1937 and was in use until the late 1960s. During this time, the yard contained many tracks and several small buildings. In the late 1980s, the owner of the site, CSX, sold the northern portion of the site (the current Arlington Yard) to the City of New York and leased the southern portion to A&A Landfill. The current Arlington Yard site has remained vacant since the late 1960s. The portion of the former Arlington Yard that is not part of the project site contained the main yard buildings, including a freight building, diesel service building, and former steam room. This area became the A&A Landfill in the late 1980s, was discovered to be operating without a permit, and was closed in September 1988. Manufacturing and industrial facilities have been located to the east and west of the site since approximately 1905 through the present.

An oil distributor and a large factory are located along Arlington Avenue on the northeast corner of the project site. Dumping was observed at the southern end of Arlington Avenue between the oil distributor and the large factory. Historically, a lumberyard, an extract manufacturer, and a machine shop occupied these properties. The former A&A Landfill was fenced and contained two large plateaus. During the site visit, several 55-gallon drums and an abandoned gasoline tanker truck were noted on the landfill. Groundwater monitoring wells were located on all sides of the landfill and were being sampled at the time of the site visit.

Records Review

Regulatory databases contained no listings for the project site. Records were also reviewed for the study area. According to the Petroleum Bulk Storage and SPILLS Database, the oil distribution facility on Arlington Avenue has a combined total capacity of approximately 115,000 gallons of oil in aboveground tanks and is listed in the SPILLS database. The substation located southeast of Arlington Yard is listed as a hazardous waste generator of PCB-containing wastes, and is listed in the SPILLS Database for releasing PCB-containing oils. The Proctor and Gamble site to the northwest has extensive listings relating to petroleum and hazardous materials. The Proctor and Gamble site was listed as a hazardous substance waste disposal site, a major oil storage facility, a hazardous waste generator, a chemical bulk storage facility, a toxic release inventory site, a wastewater discharge site, and an air discharge site and had multiple listings in the SPILLS Information Database. Chemicals used on the Proctor and Gamble site included sodium hydroxide, potassium hydroxide, ammonium hydroxide, toluene, sulfuric acid, and petroleum.

The A&A Landfill site (see Figure 12-2) was originally listed on the State Inactive Hazardous Waste Disposal Inventory and a Phase II investigation was completed. Based on the results of the Phase II, the site was de-listed and referred to the NYSDEC Division of Solid Waste in 1991.

The study indicated that garbage, asbestos, and medical wastes were disposed of in addition to construction and demolition debris.

Phase II Studies Conducted of the Adjacent Sites

Several studies* of the former A&A Landfill conducted during the 1990s indicated the presence of contaminated soil and groundwater as well as the possible presence of PCB-containing dielectric fluids. According to the reports, solid waste in the landfill included construction and demolition debris, garbage, asbestos-containing materials, medical waste, and, possibly, liquids and sludge. Approximately 500,000 cubic yards of waste were placed in four large pits and filled to form two 20-foot-tall plateaus.

Ten groundwater monitoring wells were installed on and around the landfill and have been monitored quarterly since 1990. An investigation was conducted as part of a 1993 Consent Order between the site's owners and NYSDEC. This study's findings indicated that the most commonly found compounds detected in the groundwater between 1992 and 1994 were BTEX and chlorinated solvents. Low levels of PAHs were detected in the groundwater samples as well as some elevated levels of pesticides. The study of the landfill concluded that the impact to soil and groundwater from this landfill is not unlike other non-hazardous construction and demolition debris landfills. Testing of sediment piles in 1993 indicated elevated levels of SVOCs (particularly PAHs); however, the SVOCs did not exceed 50 ppm for any one SVOC or 500 ppm for total SVOCs. Metals were detected at concentrations typical of soils in the eastern United States.

Additional detail regarding the Phase II investigation of this site can be found in Appendix 5.

NORTHERN STATEN ISLAND STUDY AREA

The study area has been divided into four segments. A records review and site inspection were performed for Segment 1, the area where excavation would be needed to increase clearance heights, and Segment 3, the cut and cover and open cut portions of the potential tunnel alignment. No construction activities, other than placing tracks along the existing right-of-way, would occur in Segment 2. No assessment was performed for Segment 4, the bored portion of the tunnel, because the tunnel would be at least 65 feet below grade in this location and the area is not likely to have been impacted by uses and activities above it. Potential contamination issues associated with the ventilation and construction shaft site at Pier 2 are discussed in Chapter 13, "Water Quality and Aquatic Resources."

Segment 1

This study area along the rail line contains a mix of uses. In the westernmost portion is an industrial area with a factory building that has been subdivided to accommodate a variety of smaller commercial and industrial uses. From Lockman Avenue to Lake Avenue, it is largely residential with some industrial uses concentrated along the railroad right-of-way. Industrial uses include construction supply companies and warehouses, and auto-related uses. From Lake Avenue to Nicholas Avenue, the uses become more industrial.

A review of regulatory databases and historic Sanborn maps and a site visit revealed 21 sites with potential petroleum or hazardous materials contamination. Appendix 5 of this document

* Performed by Eder Associates

provides a map of these locations. Of these 21 sites, six sites would require further investigation (see Table 12-3 below). These include an oil facility, dumped leaking batteries, a scrap yard, lead paint removal from Bayonne Bridge, a filling station, and known contaminated soil.

Table 12-3
Staten Island Railroad: Segment 1
Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
3	Oil facility with storage tanks Former extract manufacturing. (1937-1962)	PBS and SPILLS Database, Sanborn Map	Petroleum
7	100 leaking car batteries	SPILLS Database	Battery acid, lead
10	Contractors yard/scrap yard (1983 –2000) Former auto wrecking yard (1937-1963)	Site Visit, Sanborn Maps	Petroleum and/or Hazardous waste
18	Lead paint removal on Bayonne Bridge	RCRA Hazardous Waste Generator	Lead, benzene
19	Petroleum contaminated soil	SPILLS Database	Petroleum
20	Auto repair facility Former Gasoline station with petroleum contamination	Site Visit SPILLS Database	Petroleum

Segment 3

The uses immediately adjacent to the potential tunnel alignment are mostly industrial along Richmond Terrace. The uses north of Richmond Terrace are larger-scale, including some maritime uses. The south side of Richmond Terrace is mixed, with a number of industrial, commercial, and warehouse uses, auto repair facilities, former fuel oil companies and dry docks, and a former utility substation. The area south of Richmond Terrace is residential. A review of regulatory databases and historical Sanborn Maps and a site visit revealed 23 sites with potential petroleum or hazardous materials contamination (see Appendix 5 for a map of these sites.) Of these sites, seven would require further investigation including gas stations and former electric utilities, as shown in Table 12-4.

BROOKLYN STUDY AREAS

65TH STREET YARD STUDY AREA

Site Description and History

The 33-acre site has recently been rehabilitated, but is currently unused. Trees and low brush are found throughout the yard, especially along the boundaries. The area north of the tracks and the float bridge is largely vacant, and the northeast area is occupied by temporary ferry parking.

Table 12-4
Staten Island Railroad: Segment 3
Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
1	Former fuel company (1962-1990)	Historical Sanborn Maps, Site Visit	Petroleum and/or hazardous waste
2	Former Gasoline Station	Site Visit	Petroleum and/or hazardous waste
15	Former dry dock and ship repair (1962-1990)	SPILLS and PBS Database, RCRA Hazardous Waste generator, Waste water discharge facility, Historical Sanborn Maps, Site Visit	Petroleum, Sandblast and ignitable wastes, solvents, benzene, PCBs
16	Former Oil Distributor (1962-1990)	PBS Database, Historical Sanborn Maps, Site Visit	Petroleum
20	Gasoline station under construction	SPILLS Database, 1983-1990 Sanborn Map, Site Visit	Petroleum
21	Former Service Station	PBS Database, Site Visit, 1990 Sanborn Map	Petroleum
23	Former Electric Utility Service Center (1962-1990)	PBS Database, SPILLS Database, RCRA Hazardous Waste Generator, Site Visit, Sanborn Maps	Petroleum, mercury, TCE, ignitable waste, antifreeze, paint, solvents, MTBE

Stained soil, asphalt debris and tires were noted on the western end of this fenced-in parking area. Generators for temporary lighting were observed throughout the on-site parking area. The site is built on fill material and is bulkheaded.

The yard has a history of use as a rail yard and transfer facility that dates back more than 100 years. Four float bridges occupied the shoreline from the turn of the century until the late 1970s/early 1980s. It is likely that metal containing paints, oils, and degreasers associated with the maintenance of train cars and the transfer facility were used extensively on the site since its earliest development. Historical aerial photographs indicate that most structures on the property were demolished by 1992; only the pump house remains today. The neighboring Brooklyn Army Terminal was a former U.S. Army supply base used for the storage and shipment of military supplies from before 1926 to the 1980s. A small incinerator was located at the Brooklyn Army Terminal on its southern boundary with 65th Street Yard, from before 1951 to approximately 1991. Three large oil tanks were historically located on Pier 1A (currently the NYPD Harbor Unit) from approximately the 1920s through the 1990s. Structures labeled as paint, oil, and cask oil storage were shown on the maps east of the oil tanks.

Records Review

Regulatory databases contained no significant listings for the project site or study area.

BAY RIDGE BRANCH STUDY AREA

The study area has been divided into four segments. A records review and site inspection was performed for Segment 2, the cut and cover and open cut portions of the potential tunnel alignment, and Segments 3 and 4, the area where excavation would be needed to increase clearance heights. No assessment was performed for Segment 1, the bored portion of the tunnel,

because the tunnel would be at least 65 feet below grade in this location and the area is not likely to have been impacted by uses and activities above it. Potential contamination issues associated with the ventilation shaft site at 69th Street pier are discussed in Chapter 13, "Water Quality and Aquatic Resources."

Segment 2

Two mixed-use blocks (extending north to 60th Street between 7th and 13th Avenues) frame the length of the Bay Ridge Branch to the north. These blocks transition the area from more industrial and commercial uses along the rail line to predominantly residential uses to the north. Mixed uses also front the rail line to the south. The southeastern portion of the study area, to the east of Fort Hamilton Parkway, is predominantly residential with some commercial and industrial uses along 62nd and 63rd Streets. The southwestern section, west of Fort Hamilton Parkway, is predominantly industrial.

A review of regulatory databases and historical Sanborn Maps and a site visit revealed 21 sites with potential petroleum or hazardous materials contamination (see Appendix 5 for a map of the sites). Of these sites, six require further investigation, including three former gasoline stations, a dry cleaner, an automotive wrecking facility, and a former silver refiner as shown in Table 12-5 below.

Table 12-5
Bay Ridge Branch Segment 2:
Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
1	Former Silver Refiner (1926-1951)	Sanborn Maps	Petroleum and/or Hazardous Wastes
4	Former Gasoline Station (1951-1970)	Sanborn Maps	Petroleum and/or Hazardous Wastes
8	Auto Wrecking (1970-2001)	Sanborn Maps	Petroleum and/or Hazardous Wastes
17	Dry Cleaner	RCRA Hazardous waste generator	Spent halogenated solvents
18	Former Gasoline Station	SPILLS Database	Petroleum contaminated soil
19	Former Gasoline Station 1970	Historical Sanborn Maps	Petroleum and/or Hazardous Wastes

Segment 3

The uses along the rail line in the westernmost portion of Segment 3 between 12th and 16th Avenues are mixed. Uses to the north of the rail line are industrial, residential, and commercial uses. South of the rail line, a pocket of heavier industrial uses is located between New Utrecht and 16th Avenues. The remainder of the study area, between 16th and Albany Avenues, is predominantly residential with some industrial (warehouses, parking lots, and auto-related uses) and commercial uses located along the avenues with concentrations along 16th, Ditmas, 19th, MacDonald, Coney Island, Nostrand, and Flatbush Avenues.

A review of regulatory databases and historical Sanborn Maps, and a site visit revealed 116 sites with potential petroleum or hazardous materials contamination (see Appendix 5 for a map of these locations). Of these 116 sites, 34 sites require further investigation, including filling stations, drycleaners, other auto-related uses, and known contaminated soil and groundwater (see

Table 12-6). There are seven distinct clusters of sites identified along the length of Segment 3. There is a large cluster of approximately 20 sites between New Utrecht Avenue and 17th Avenue that are almost exclusively auto-related uses. Approximately 12 sites that include auto-related uses, a dry cleaner, and historic manufacturing are located at 18th Avenue. There are two small clusters of auto-related uses at 18th Avenue and at McDonald Avenue. There is another large cluster of sites at Nostrand Avenue that include filling stations, drycleaners, other auto related uses, and known contaminated soil and groundwater. There are two small clusters of approximately 10 sites each located at the easternmost end of Segment 3 that include historic manufacturing, coal yards, and auto related uses.

Table 12-6
Bay Ridge Branch Segment 3:
Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
3	Unknown petroleum contamination	SPILLS Database	Petroleum Contaminated Soil
4	Gasoline Station and Auto Repair Shop	SPILLS Database; PBS Database	Petroleum Contaminated Soil, Unleaded Gasoline
12	Filling Station (1929 – 2001)	Sanborn Maps	Petroleum and/or Hazardous Waste
13	Former Filling Station (1929-1970)	Sanborn Maps	Petroleum and/or Hazardous Waste
28	Filling Station and Car Service Center (1929-2001)	Sanborn Maps; PBS Database	Petroleum and/or Hazardous Waste
29	Former Filling Station (1950)	Sanborn Map	Petroleum and/or Hazardous Waste
35	Former Service Station and Filling Station (1929-1989)	PBS Database, Sanborn	Unleaded Gasoline, Leaded Gasoline and Used Oil
37	Dry Cleaner	RCRA Hazardous Waste Generators	Spent Non-halogenated Solvents, Ignitable Waste
43	Filling Station (1929-2001)	Sanborn Map	Petroleum and/or Hazardous Waste
57	Dry Cleaners	RCRA Hazardous Waste Generator	Spent Halogenated Solvents
59	Funeral Parlor (1969-2001)	SPILLS Database, Sanborn Maps	Fuel Oil Contaminated Soil
60	Service Station	SPILLS Database	Gasoline Contaminated Soil
62	Service Station (1969-2001)	PBS Database, Sanborn Maps	Unleaded Gas, Leaded Gas, Fuel Oil, Used Oil and/or Hazardous Waste
63	Service Station (1969-2001)	PBS Database, Sanborn	Unleaded Gas, Leaded Gas, Fuel Oil, Used Oil and/or Hazardous Waste
66	Auto Repair Garages/Auto Sales/ Filling Stations (1930-2001)	Sanborn Maps	Petroleum and/or Hazardous Waste
69	Dry Cleaners	RCRA Hazardous Waste Generator	Spent Halogenated Solvents
70	Dry Cleaners	RCRA Hazardous Waste Generator	Spent Halogenated Solvents
71	Police Precinct	SPILLS Database	Petroleum Contaminated Soil
73	Filling Station (1950-2001)	Sanborn Maps	Petroleum and/or Hazardous Waste
75	School (1950-2001)	SPILLS Database, PBS Database, Sanborn Maps	Petroleum Contaminated Soil and Groundwater, Fuel Oil, Unleaded Gas, Diesel
77	Auto Repair Garages, and Filling Station (1930-2001)	Sanborn Maps	Petroleum and/or Hazardous Waste
78	Service Station; Oil Distributor (1930-2001)	PBS Database, Sanborn Maps; RCRA Hazardous Waste Generator	Fuel Oil, Unleaded Gasoline and/or Hazardous Wastes; Ignitable Waste
80	Dry Cleaners	RCRA Hazardous Waste Generator	Spent Halogenated Solvents
84	Car Wash and Gas Station (1990-2001)	Site Visit; Sanborn Maps	Petroleum and/or Hazardous Waste

Table 12-6 (cont'd)
Bay Ridge Branch Segment 3:
Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
86	Former Auto Repair Garages and Filling Stations (1930-1979)	Sanborn Maps	Petroleum and/or Hazardous Waste
89	Service Station	SPILLS Database; PBS Database	Gasoline and Gallium Trichloride in Soil and Groundwater; Diesel, Unleaded Gasoline
90	Service Station (1950-2001)	PBS Database, RCRA Hazardous Waste Generator, Sanborn Maps	Unleaded Gasoline and Leaded Gasoline; Ignitable Waste
91	Dry Cleaners	RCRA Hazardous Waste Generator	Spent Halogenated Solvents
92	Former Filling Station and Garages (1930-1950)	Sanborn Maps	Petroleum and/or Hazardous Waste
93	Former Filling Station (1930-1950)	Sanborn Maps	Petroleum and/or Hazardous Waste
95	Anodizing	RCRA Hazardous Waste Generator; Toxic Release Inventory Sites	Solvents; Sulfuric Acid, Phosphoric Acid, Nitric Acid
100	Former Dry Cleaner (1968-1979)	Sanborn Maps	Petroleum and/or Hazardous Waste
107	Filling Station/Auto Repair (1930-2001)	Sanborn Maps	Petroleum and/or Hazardous Waste
114	Former Filling Station (1968)	Sanborn Maps	Petroleum and/or Hazardous Waste

Segment 4

A review of regulatory databases and historic Sanborn maps, and a site visit revealed 84 sites with potential petroleum or hazardous materials contamination. See Appendix 5 for a map of these locations. Of these 84 sites, 47 require no further investigation. Thirty two are unlikely to require further investigation and five sites require further investigation including a former coal yard with petroleum contaminated soil, a drycleaner, and three former gasoline stations. Table 12-7 provides a list of the sites which require further investigation and includes the location, contaminant of concern, source of contamination, and data reference.

Table 12-7
Bay Ridge Branch Segment 4:
Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
3	Dry Cleaner; Auto Body Shop (1928-1979)	Historical Sanborn Maps	Solvents, Petroleum and/or Hazardous Waste
32	Truck Parking; Former Coal Yard (1928-1950)	Site Visit; Historical Sanborn Maps	Petroleum Contaminated Soil
33	Truck Depot; Former gasoline station/auto yard	Site Visit; Historical Sanborn Maps	Petroleum Contaminated Soil, Unleaded Gasoline
49	Former Gasoline Station (1928-2001)	Historical Sanborn Maps	Petroleum and/or Hazardous Waste
71	Former Gasoline Station 1979	Historical Sanborn Maps	Petroleum and/or Hazardous Waste

QUEENS STUDY AREAS

FRESH POND YARD STUDY AREA

Site Description and History

The West Yard and East Yard portions of Fresh Pond Yard contain numerous tracks running in an east-west direction. East Yard also contains the main office of the New York and Atlantic Railroad (NY&A), a small freight railroad, which occupies a doublewide trailer in the center of the yard, a parking lot, and two small storage sheds. Separating West and East Yards is the New York City Transit M subway line. The site is nearly devoid of vegetation, except for some brush along the boundaries. Just west of the Fremont Secondary Line bridge overpass along the north side of the Yard is a Buckeye Pipeline test line access box and an oil fill for the NY&A office trailer. Several piles of debris and dumped material, including 55-gallon drums of unknown content, were observed throughout the site. Lead paint may be present on the Fremont Secondary Line bridge overpass on the west side of the east yard. Since the painted surfaces of the overpass were in poor condition and peeling, elevated concentrations of lead may be present in soil under this structure. The neighborhood surrounding Fresh Pond Yard is primarily residential. However, a paper products facility and food processing company are located southeast of East Yard, and warehouses and manufacturing buildings are to the south of West Yard.

The site has been in railroad usage since the late 19th century. Aerial photographs from 1954 indicate that the southern end of East Yard was approximately ten tracks across. Aerial photographs from 1966 indicate that warehouses were built over some tracks on the south end of East Yard, leaving approximately five tracks still in use. Historical Sanborn atlases indicate the surrounding neighborhood as being primarily residential with some commercial and industrial use to the south and east.

Records Review

Regulatory databases contained no listings for the project site. A records review for the project area revealed a spill from a 1,000-gallon fuel oil tank at the Nabisco Plant at 6611 Otto Road, southeast of the rail yard in August 2000. This spill is still considered “active” by NYSDEC, indicating that it may not be fully remediated. The Brenner Paper Products Company located at 6631 Otto Road, southeast of Fresh Pond Yard, is listed as a U.S. Environmental Protection Agency (USEPA) RCRA Small Quantity Hazardous Waste Generator and has two violations listed. Con Edison located at Otto Road and 67th Place, southeast of the rail yard is listed as a RCRA facility.

Phase II Studies Conducted of the Project Site

As part of the Final EIS for the Metropolitan Transportation Authority (MTA)/LIRR East Side Access Project, soil sampling was conducted on this site. Six soil borings to 3 feet below grade were advanced and soil samples analyzed. Elevated levels of VOCs (up to 23 ppm total) consisting of tricholoroethene and dichloroethene, common chlorinated solvents used in degreasing, were found at one boring location at the eastern portion of the parking lot.

MONTAUK BRANCH STUDY AREA

From Metropolitan Avenue at the border of Fresh Pond Yard to Flushing Avenue, which is the area where excavation would be needed to increase clearance heights, the rail line is

below-grade with steep embankments on either side. The land uses closest to the rail line tend to be industrial with a few manufacturing and commercial facilities including auto-related services, such as repair, detailing, and parts. The easternmost portion, between Metropolitan Avenue, Fresh Pond Road and Eliot Avenue is a mixed-use area with commercial and industrial uses along these main thoroughfares including multiple auto-related uses. It is likely that the soil and/or groundwater in this area have been impacted by petroleum and/or other contamination due to the numerous auto related facilities in this area. Between Eliot Avenue and 60th Street the land uses adjacent to the rail are generally industrial and warehousing, with residential uses beyond the industrial area.

A review of regulatory databases and historic Sanborn maps, and a site visit revealed 36 sites with potential petroleum or hazardous materials contamination (see Appendix 5 for a map of these locations). Of these 36 sites, 16 have been categorized as unlikely to require further investigation, mostly auto-related uses. The 14 sites that require further investigation are primarily filling stations (as shown in Table 12-8 below). Most of the sites were clustered along Metropolitan Avenue between 64th Street and 60th Place.

Table 12-8
Montauk Branch Potential Sources of Contaminants Likely to Require Further Investigation

Number	Source	Reference	Potential Contaminant
1	Auto Service	SPILLS Database	Gas Contaminated Soil
2	Service Station	PBS Database; RCRA Hazardous Waste Generator	Unleaded and Gas, Used Oil, Fuel Oil and/or Other Hazardous Wastes; ignitable waste
10	Gas Filling Station and Auto Repair (1936-2001)	Sanborn Maps	Petroleum and/or Hazardous Wastes
11	Gas Filling Station and Service (1936-2001)	Sanborn Maps	Petroleum and/or Hazardous Wastes
15	Service Station	PBS Database	Unleaded Gas, Fuel Oil and/or Hazardous Wastes
16	Gasoline Station	PBS Database	Unleaded Gas, Fuel Oil, Diesel and/or Hazardous Wastes
20	Service Station	Site Visit	Petroleum and/or Hazardous Waste
21	Service Station	PBS Database	Unleaded Gas, Used Oil and/or Hazardous Wastes
22	Service Station	Site Visit	Petroleum and/or Hazardous Waste
24	Filling Station (1950 –2001)	Sanborn Maps	Petroleum and/or Hazardous Wastes
25	Former Filling Station (1971-1990)	Sanborn Maps	Petroleum and/or Hazardous Wastes
28	Auto Wrecking(2001)	Sanborn Map	Petroleum and/or Hazardous Wastes
29	Tool Manufacturing with known soil contamination	SPILLS Database, RCRA Hazardous Waste Generator	Fuel oil contaminated soil
36	Former Gasoline Filling Station 1950	Historical Sanborn Maps	Petroleum and/or Hazardous Wastes

WEST MASPETH YARD STUDY AREA

Site Description and History

The West Maspeth Yard site would comprise 35 to 160 acres, depending upon the project alternative. The yard is discussed in two parts: the vacant Phelps Dodge site that occupies approximately 30 acres and the remaining acreage, which is occupied by operating industrial and commercial facilities and approximately 8 to 9 acres of Maspeth and Newtown Creeks.

The portion of the West Maspeth Yard site occupied by the vacant 30-acre Phelps Dodge site is currently inoperable with no structures. Current building and property uses within the remaining portion of the expanded West Maspeth Yard would include commercial storefronts and offices, large transfer facilities, the Montauk Branch of the LIRR, auto repair shops, vacant lots, food and beverage distributors, warehouses, and scrap metal processing. Warehouses and other buildings appeared to be in generally poor to good condition. It is likely that these buildings contain asbestos-containing materials and lead based paint.

According to historical Sanborn maps and previous reports, the Phelps Dodge site was occupied by active industrial uses for more than 100 years until manufacturing operations were discontinued in 1983. Historical uses include a sulfuric acid plant, copper refinery, phosphate works, and bulk acid distribution. The Phelps Dodge Refining Corporation occupied the site until 1983. The facility was a copper refinery and a production facility for copper sulfate pesticides and copper sulfate pentahydrate. Sanborn maps indicate that buildings and structures at the facility included a copper paste plant, an acid tank with a capacity of 700 tons, two 150,000-gallon fuel storage tanks, transformers, stripping rooms, a Bessemer plant, a smelter operation, and tank rooms. The remainder of the site has been in use as industrial, manufacturing or warehouses for the last century. The rail lines on the north end of the site have been in use since the 1870s. Historic uses at the site include a chemical company, an enameling and stamping company, and various other unidentified manufacturing and warehouse uses.

The remainder of the site has been in use as industrial, manufacturing, or warehousing for the last century. The rail lines on the north end of the site have been in use since the 1870s. Historic uses at the site include a chemical company, and enamel and stamping company, and various other unidentified manufacturing and warehouse uses.

Records Review

The Phelps Dodge site is listed as a NYSDEC Inactive Hazardous Waste Disposal Site under the name of the Phelps Dodge Refining Corporation (see *Previous Phase II Investigations and Other Studies Conducted of the Project Site* below) (see Figure 12-3). A review of regulatory databases indicated that the remainder of the West Maspeth Yard site has extensive listings relating to petroleum and hazardous materials. Numerous business and warehouse buildings occupy the site and many of these have multiple listings. Listings include two large transfer stations of residential waste, 26 petroleum bulk storage facilities, 19 hazardous waste generators or disposal facilities, a toxic release inventory site, and multiple air discharge sites. The site also had numerous listings in the SPILLS Database including petroleum contaminated soil and groundwater and hydraulic oil spills in multiple locations. Areas with the greatest number of listings were along Grand Avenue, at the north end of Railroad Place, in the vicinity of Page Place and Maspeth Avenue, and on 49th Street between Galasso Place and 56th Road.

Regulatory database review for the study area revealed multiple SPILLS listings, hazardous waste generators, or transporters, Petroleum Bulk Storage Facilities and air discharge sites within the project area.

Previous Phase II Investigations and Other Studies Conducted of the Project Site

The Phelps Dodge site was used primarily for copper smelting and refining from the 1870s or 1880s until 1983. The NYSDEC and the Phelps Dodge Refining Corporation entered into Consent Orders on February 11, 1987 and July 6, 1999. Numerous investigations have been conducted at the site since 1985 and some contaminated soil has been removed. Approximately 90 site buildings were razed and removed in 1999/2000. In November 2000, a Remedial Investigation (RI) report, was prepared by Conestoga-Rovers & Associates (CRA) to characterize the nature and extent of contamination and summarize all earlier studies and actions. The RI concluded that soil contamination (with metals, PAHs, and PCBs) was present above NYSDEC screening levels (TAGM 4046 RSCOs), that groundwater contamination (with dissolved metals) was also present and that these contaminants could adversely impact Newtown Creek. In addition, exposure to contaminated soil could occur if the current concrete/asphalt cover were removed.

A Feasibility Study for the Phelps Dodge site was submitted in May 2002. A meeting was held on May 3, 2002 between the project team and NYSDEC regarding remediation plans and future use for the Phelps Dodge Site. In January 2003, NYSDEC issued a Record of Decision for the site, which identified the preferred remediation alternative. The selected remediation alternative includes hot spot removal and off-site disposal for soils contaminated with PCBs and petroleum; physical containment and selective capping of the site; groundwater containment, extraction, and treatment system; and long-term monitoring and institutional controls. Remediation activities reportedly began at the site in September 2003. The remediation is anticipated to be completed in 2004, with ongoing groundwater monitoring and treatment.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

POTENTIAL IMPACTS DURING CONSTRUCTION

OVERVIEW

As described above in "Existing Conditions," the preliminary assessment conducted for the project identified the possibility of contaminated soil and groundwater at several locations where construction would be required for the No Action and project alternatives. This section addresses the potential adverse effects from construction of the upland portions of the project. Potential adverse environmental effects from the disturbance, removal, and transport of contaminated sediments are discussed in Chapter 13, "Water Resources."

The hazardous materials assessment undertaken for this EIS identifies contaminated areas, potentially significant impacts, and appropriate mitigation measures. For all project areas, prior to any additional environmental investigation or construction, a site-specific health and safety plan (HASP) would be created to provide guidance related to contaminated or hazardous materials that may be encountered in soil or groundwater. This would include remediation plans, specifications for worker safety, actions to be taken during construction, and contingency plans

if unexpected contamination is encountered. The HASP is discussed in more detail below under "Mitigation Measures."

The presence of hazardous materials can threaten human health or the environment only when exposure to those materials occurs. The greatest potential for exposure to any constituent of concern would be during construction, especially those activities related to excavation, storage, transport and disposal of potentially contaminated soil. Many of the contaminants tend to be bound to the soil and are not particularly mobile, making airborne dust the main pathway for contaminants to reach nearby residents or construction workers. Contaminated groundwater, if encountered during deep excavation or dewatering, would be an additional potential pathway to exposure, particularly for construction workers in the area. Construction activities would include: excavation in soft soil; boring in soft soil; and boring in rock. Work in soil, including grading, digging, excavating, mining, and boring, would have the greater potential to encounter contaminated materials. This could include both contaminated soil and contaminated groundwater. In the areas where construction in hard rock would occur, the project might encounter contaminated groundwater seeping through the rock, but the overall potential to encounter contamination in rock is less than in soil.

After an alternative is selected and the final design phase has begun, additional studies would be undertaken in areas identified that require further investigation. These additional studies would be likely to include subsurface site investigations, which would be designed to characterize the nature and extent of contaminated materials at all construction areas. This would be undertaken to address worker and community safety and to identify any soil or groundwater that would require special handling or off-site disposal. Any asbestos or contaminated materials found in structures to be demolished would be removed prior to demolition, according to all applicable federal, state and local regulations. Since federal, state and local regulations restrict the pumping of contaminated groundwater to surface water bodies or sewers, the project specifications for dewatering would include testing (and, if necessary, treatment) to ensure that regulatory levels are not exceeded.

Preventative measures would be used to avoid the possibility of adverse impacts from any contamination discovered in the areas of concern. As discussed below, standard remediation measures exist for all of the substances likely to be encountered. By implementing such measures, significant adverse impacts would be avoided or mitigated.

NO ACTION ALTERNATIVE

The No Action Alternative would not involve any construction activities as part of the Cross Harbor Freight Project. In the future, remediation of sites already known to regulatory agencies (e.g., listed sites such as the Phelps Dodge site and known petroleum spills) would continue, though potentially at a slower pace than if construction were to occur for the project alternatives at those locations. Remediation of other contaminated sites within the project study areas would most likely not occur unless the contamination was discovered by some other investigation not related to the Cross Harbor Freight Movement Project.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNAITVE

New Jersey

Greenville Yard. Two of the existing Greenville float bridges would be rehabilitated in a similar fashion to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also

include new trackwork. The construction would require the excavation of potentially contaminated soil and possible dewatering. Asbestos and lead-based paint are likely to be encountered in the existing float bridges, which would require assessment and abatement prior to demolition or renovation. These activities would occur in the middle of an industrial area that would limit potential exposure to any sensitive uses (e.g., residences, schools, hospitals, parks, etc.). Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures" below. Environmental impacts related to the disturbance of potentially contaminated sediments during float bridge reconstruction are discussed in Chapter 13, "Water Resources."

New York

Under the TSM Alternative, there would be minor construction activity at the affected New York project sites. These activities would not result in the excavation of large amounts of potentially contaminated soil. In addition, dewatering requirements associated with this construction would be minimal. Construction at 65th Street Yard, like the Greenville Yard, would occur in a primarily industrial area that would limit potential exposure to sensitive uses. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

New Jersey

Greenville Yard. Similar to the TSM Alternative, the construction activities for this alternative would require the excavation of potentially contaminated soil and possible dewatering, and asbestos and lead-based paint are likely to be encountered in the existing float bridges. However, potential exposure to any sensitive uses would be limited. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

New York

65th Street Yard. Two additional float bridges would be constructed at 65th Street Yard similar to those recently constructed, which would require the excavation of potentially contaminated soil and possible dewatering. These activities would occur far from any sensitive uses. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Other Sites. Under the Expanded Float Operations Alternative, there would be minor construction activity at the affected New York project sites similar to that of the TSM Alternative. This activity would be primarily trackwork associated with minor increases to clearances and laying new track along the Bay Ridge Branch and Montauk Branch; and the expansion of the rail yard in West Maspeth, Queens at the Phelps Dodge and existing Maspeth Yard sites.

Construction of new tracks at the Phelps Dodge site would not impede the remedial operations at that site and the tracks and any ancillary facilities would be designed to ensure the integrity of the low permeability surface cap was maintained throughout the construction process. The portion of the site occupied by the Phelps Dodge site is known to be contaminated. However, that site has been extensively investigated and is being cleaned up with NYSDEC oversight. It is likely that the construction required for storage facilities would either be done through pile driving or be shallow and could be accomplished without extensive modifications to the existing

remediation plans. The deed restrictions would need to be strictly adhered to, so that excavated materials (e.g., for new utilities) would be properly handled and disposed of. The proposed low permeability cap would be maintained following construction and the other likely remedial measures (e.g., the groundwater treatment system) would continue to operate. If the decision were made to develop the site as a rail yard prior to the completion of the remedial measures, the remaining measures (e.g., capping) would need to be incorporated into the design of the yard. The use of the Phelps Dodge site as a rail yard would be compatible with NYSDEC's anticipated approach for remediating the site. Additional mitigation measures to avoid adverse impacts from the disturbance of this material are discussed below under "Mitigation Measures."

TUNNEL ALTERNATIVE

Single Tunnel System

New Jersey. In New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur Kill Lift Bridge and additional sidings along the Chemical Coast Line.

Greenville Yard/Potential Tunnel Alignment. From an area just east of the New Jersey Turnpike Extension, tunnel construction would begin as an open cut adjacent to the Greenville Branch. When a depth of 35 feet below existing grade is reached just west of Greenville Yard, the tunnel would be constructed using cut and cover construction through Greenville Yard to the shoreline at a depth of 65 feet where it would be connected to the immersed tube section. The tunnel alignment would require substantial excavation and dewatering. Dewatering would be required for areas below the groundwater table, which is approximately 20 feet below grade in this area. Both contaminated groundwater and soil (including ballast) may be encountered. As shown in Table 12-9, contaminants of concern include metals, PAHs, PCBs, pesticides and herbicides, and petroleum. In addition, if the existing float bridge is demolished or renovated it is likely that asbestos-containing building materials and lead-based paint will be encountered. The industrial nature of the area would limit potential exposure to any sensitive uses. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures" below.

Chemical Coast Line. Under the Staten Island tunnel alignment, 30,000 feet of sidings would be required along this line north of its planned connection to the Staten Island Railroad. These sidings would accommodate trains waiting to cross the Arthur Kill Lift Bridge while it is lifted to allow passage of maritime traffic. This trackwork would not result in the excavation of large amounts of potentially contaminated soil. Groundwater is not likely to be encountered during shallow excavation; therefore, dewatering is not likely to be an issue.

Arthur Kill Lift Bridge. A second span would be constructed adjacent to the south side of the existing Arthur Kill Lift Bridge to accommodate additional rail traffic projected under this alternative. The new span would be identical to the existing span. A viaduct would connect the new span to the Chemical Coast Line. The construction would require the excavation of potentially contaminated soil and possible dewatering. Asbestos and lead-based paint may be encountered in the soil adjacent to the existing bridge, which would require assessment and abatement prior to demolition or renovation. These activities would occur in an industrial area that would limit potential exposure to any sensitive uses (e.g., residences, schools, hospitals, parks, etc.). Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures" below. Environmental impacts related to the

disturbance of potentially contaminated sediments during bridge construction are discussed in Chapter 13, "Water Resources."

Staten Island.

Arthur Kill Lift Bridge. As discussed above, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track. Impacts would be the same as those described above, under "New Jersey."

Arlington Yard. Two new mainline tracks would be constructed through Arlington Yard. This trackwork would not result in the excavation of large amounts of potentially contaminated soil. As shown in Table 12-9, contaminated soil may be encountered. Specific contaminants of concern include PAHs, PCBs, pesticides, herbicides, petroleum, and contaminated ballast. Dumped materials may contain discarded asbestos-containing materials. In addition, this construction would occur in a primarily industrial area that would limit potential exposure to sensitive uses. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Northern Staten Island—Segments 1 and 2. The Staten Island Railroad would be rehabilitated between Arlington Yard and the tunnel entrance at Alaska Street. Two new mainline tracks would replace the existing track. As discussed in Chapter 2, "Project Alternatives," eleven clearances along this segment would be increased to 22 feet, 6 inches by underpinning work at the individual clearances and excavating trenches approximately 40 feet wide and to a final depth of 5 feet. (Note that a portion of the rail line between Nicholas Avenue and Richmond Terrace is elevated and therefore there is no potential for soil or groundwater contamination in this area.)

The work to lay new tracks and provide the necessary clearances for the Staten Island Railroad generally involves shallow excavation. The water table is not likely to be within the area of excavation and therefore, substantial dewatering is not expected to be part of this work, and contamination from adjacent land uses would not be expected to affect the top several feet of soil within the right-of-way. Contaminated soil may be encountered. As shown in Table 12-9, the contaminants of concern include metals (lead), PAHs, PCBs, pesticides/herbicides, petroleum, lead-based paint on bridges, and contaminated ballast. Contamination could have resulted from past rail use and possible illegal dumping along the right-of-way. In some areas, where residential uses are adjacent to the rail right-of-way, additional measures (fugitive dust monitoring during soil disturbance) may be necessary if subsequent testing determines levels of contaminants in the soil that could adversely affect public health. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Northern Staten Island—Segment 3. The Staten Island tunnel alignment would require substantial excavation and dewatering for the open cut and cut and cover construction. Dewatering would be required for areas below the groundwater table, which in this location ranges from approximately 10 to 30 feet below grade. Both contaminated groundwater and soil may be encountered. As shown in Table 12-9, the contaminants of concern include metals (lead), PAHs, solvents, and petroleum. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Table 12-9
Cross Harbor Freight Movement Project
Potential Exposure to Contaminants During Construction by Study Area

State or Borough	Project Site	Segment	Contaminated Soil and Bedrock							
			Other Metals	Lead	PAHs*	PCBs	Pesticide/ Herbicide	Solvents	Petroleum/ Gasoline	Asbestos
New Jersey	Greenville Branch		X		X	X	X			
	Greenville Yard/ Tunnel Alignment		X		X	X	X			
	Tunnel Vent Shafts									
Staten Island	Arthur Kill Lift Bridge									
	Arlington Yard				X	X	X		X	
	Staten Island Railroad/ Potential Tunnel Alignment	1	X	X	X	X	X		X	
		2			X					
		3	X	X	X		X	X	X	
		4								X
	Tunnel Vent Shafts									
Brooklyn	65th Street Yard		X	X	X		X	X	X	
	Tunnel Vent Shafts		X	X	X		X	X	X	
	Bay Ridge Line	1								
		2			X		X	X	X	
		3			X		X	X	X	
		4								
Queens	Bay Ridge Line									
	Fresh Pond Yard				X		X			
	Montauk Branch				X		X	X	X	
	Proposed West Maspeth Yard		X	X	X	X	X		X	

Notes:
* Potential contaminant , but not an issue from this site
** See Water Quality Chapter
*** See Water Quality Chapter for Staten Island Alignment

Table 12-9 (cont'd)
Cross Harbor Freight Movement Project
Potential Exposure to Contaminants During Construction by Study Area

State or Borough	Project Site	Segment	Contaminated Groundwater					Contaminated Sediment	Asbestos-Containing Materials	Lead-Based Paint	Contaminated Ballast
			Petroleum/ Gasoline	Metals	Pesticide/ Herbicide	Solvents	PAH's				
New Jersey	Greenville Branch		X		X		X				X
	Greenville Yard/ Tunnel Alignment		X		X		X		X	X	X
	Tunnel Vent Shafts							X**			
Staten Island	Arthur Kill Lift Bridge										
	Arlington Yard		*		*	*	*		X		X
	Staten Island Railroad/ Potential Tunnel Alignment	1	*	*	*		*			X	X
		2									X
		3	*	*	*		*				X
		4									
	Tunnel Vent Shafts							X**			
Brooklyn	65th Street Yard	*	*	*	*						X
	Tunnel Vent Shafts		X	X	X	X		X***			
	Bay Ridge Line	1									
		2	X	X	X	X	X				X
		3	*		*	*	*				X
		4									X
Queens	Bay Ridge Line										
	Fresh Pond Yard				*		*			X	X
	Montauk Branch		*		*	*	*			X	X
	Proposed West Maspeth Yard		*	*	*		*		X	X	X

Notes:
* Potential contaminant , but not an issue from this site
** See Water Quality Chapter
*** See Water Quality Chapter for Staten Island Alignment

Northern Staten Island—Segment 4. From Davis Avenue southeast to the shoreline at Pier 2, the tunnel would be bored at least 65 feet below the surface. Naturally occurring serpentinite asbestos found in north central Staten Island bedrock may be encountered in the easternmost 12,000 feet of the tunnel alignment. The Staten Island serpentinite is composed of approximately 25 percent chrysotile asbestos. Chrysotile asbestos is a friable form of asbestos, which means it can become airborne when disturbed. Because of the construction methods to be used in this area (i.e., the tunnel boring machine), no significant exposure is likely to occur along the alignment. This material would, however, be removed at the shaft site in the Staten Island cut and cover construction area. Use of the appropriate health and safety precautions for handling this rock, as would be detailed within the HASP, would avoid the potential for significant adverse health effects due to exposure to this material. For example, dust would be suppressed by wetting down the material with water. In addition, the disposal of this asbestos-containing material would be in accordance with local, state, and federal regulations. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Brooklyn.

65th Street Yard. Under the New Jersey tunnel alignment, the tunnel ventilation and construction shaft would also be located on this site. The ventilation and construction shaft would be approximately 230 feet by 150 feet and 75 feet deep and would require substantial excavation. Dewatering would be required for areas below the groundwater table. Both contaminated groundwater and soil may be encountered. As shown in Table 12-9, the contaminants of concern for this excavation include metals (lead), PAHs, pesticides and herbicides, solvents, petroleum, and contaminated ballast. These activities would, however, occur in the middle of an industrial area that would limit potential exposure to any sensitive uses. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Bay Ridge Branch of the LIRR—Segments 1 and 2. The Brooklyn tunnel alignments would require substantial excavation and dewatering for the open cut and cut and cover construction. The open cut excavation would increase in depth from 0 to 35 feet below existing grade, while the cut and cover excavation would increase from 35 to 65 feet below grade. Dewatering would be required for areas below the groundwater table, which in this location ranges from approximately 0 to 10 feet below existing grade. Both contaminated groundwater and soil may be encountered. As shown in Table 12-9, contaminants of concern include metals, PAHs, pesticides, herbicides, solvents, and petroleum. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures" below. Under the Single Tunnel System, two mainline tracks would be constructed from the tunnel portal area through the end of the Bay Ridge Branch. In addition, clearances between 2nd Avenue and 12th Avenue would be increased, requiring minimal excavations of approximately 3 feet.

Bay Ridge Branch of the LIRR—Segments 3 and 4. Two mainline tracks would be constructed along Segments 3 and 4. Clearance heights along these segments would be increased to 22 feet, 6 inches by underpinning work and the excavation of trenches approximately 5 feet deep and 40 feet wide. An additional five clearances would require minimal increases of less than 1.5 feet. In addition, as discussed in Chapter 2, the East New York Tunnel would be reconfigured, and approximately 18 bridges would require replacement.

The work to provide the necessary clearances for these segments of the Bay Ridge Branch generally involves shallow excavation. The water table is not likely to be within the area of excavation and therefore, significant dewatering is not expected to be part of this work, and

contamination from adjacent land uses would not be expected to affect the top several feet of soil within the right-of-way. Contaminated soil may be encountered. As shown in Table 12-9, the contaminants of concern include PAHs, pesticides/herbicides, solvents, petroleum, lead-based paint on bridges, and contaminated ballast. Contamination could have resulted from past rail use and possibly illegal dumping along the right-of-way. In some areas, where residential uses are adjacent to the rail right-of-way, additional measures (fugitive dust monitoring during soil disturbance) may be necessary if subsequent testing determines levels of contaminants in the soil that could adversely affect public health. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Queens.

Fresh Pond Yard. Minimal excavation would be conducted within Fresh Pond Yard. The water table is not likely to be within the area of excavation and significant dewatering is therefore not expected to be part of this work, and contamination from adjacent land uses would not be expected to affect the top several feet of soil. However, contaminated shallow soil may be encountered. As shown in Table 12-9, the contaminants of concern include PAHs, pesticides, herbicides, contaminated ballast and lead-based paint. Dumped materials may include discarded asbestos-containing materials. Lead based paint may be present in the soil beneath bridges in the yard that have peeling paint in poor condition. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Montauk Branch of the LIRR. The work to provide the necessary clearances for the Montauk Branch generally involves shallow excavation. The water table is not likely to be within the area of excavation and therefore, substantial dewatering is not expected to be part of this work, and contamination from adjacent land uses would not be expected to affect the top several feet of

soil within the right-of-way. As shown in Table 12-9, the contaminants of concern that may be encountered in the shallow soil include PAHs, pesticides, herbicides, solvents, petroleum/gasoline, lead-based paint, and contaminated ballast. In some areas, where residential uses are adjacent to the rail right-of-way, additional measures (fugitive dust monitoring during soil disturbance) may be necessary if subsequent testing determines levels of contaminants in the soil that could adversely affect public health. Mitigation measures to avoid adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

West Maspeth Yard. Under the Single Tunnel System, an approximately 108-acre rail yard would be developed at Maspeth. The work planned for West Maspeth Yard includes demolishing warehouses and other commercial and industrial buildings, and laying new track. The yard is still in the design phase, so construction methods are still unknown. Laying new track would require only minimal excavation. On-site buildings likely contain asbestos-containing building materials and lead-based paint that would have to be assessed and removed before building demolition. A full Phase I investigation (in accordance with ASTM E1527-00) should be conducted for each individual property prior to acquisition. Surface soils at the Phelps Dodge site are known to be contaminated with PCBs, PAHs, and metals; subsurface soils may be similarly contaminated. If groundwater is encountered, VOC contamination should be expected at the Phelps Dodge site.

The Phelps Dodge portion of the site is known to be significantly contaminated. However, that site has been extensively investigated and is being remediated with NYSDEC oversight. The deed restrictions would need to be strictly adhered to, so that excavated materials would be properly handled and disposed of. The proposed low permeability cap would be maintained

following construction and the other likely remedial measures (e.g., the groundwater treatment system) would continue to operate. If the decision were made to develop the site as a rail yard prior to the completion of the remedial measures, the remaining measures (e.g., capping) would need to be incorporated into the design of the yard. The use of the Phelps Dodge site as a rail yard would be compatible with NYSDEC's anticipated approach for remediating the site.

Additional mitigation measures to avoid significant adverse impacts from the disturbance of this material are discussed under "Mitigation Measures" below.

Double Tunnel System

Boring of Second Tunnel. The expansion of the Single Tunnel System to the Double Tunnel System would involve the boring of a second tunnel underneath the New York Harbor. Under the New Jersey alignment, the second tunnel would be bored between the ventilation shaft at 65th Street Yard in Brooklyn and the ventilation shaft at the end of the Global Marine Terminal/NEAT pier in New Jersey. Under the Staten Island alignment, the second tunnel would be bored between the Brooklyn shaft site at 8th to 10th Avenues in Brooklyn and the ventilation shaft at Staten Island. A second tunnel would also be bored through rock from the Staten Island ventilation shaft to the cut and cover section along the Staten Island Railroad right-of-way. Under either alignment, the boring of a second tunnel would generate a substantial quantity of material requiring disposal, as discussed in Chapter 16, "Construction and Construction Impacts." Since the boring of the tunnel would at its shallowest be at a depth of approximately 60 feet below the ground surface, the rock, soil, and sediment removed from this depth are not expected to exhibit any significant contamination. However, as discussed under the Single Tunnel System, naturally occurring serpentinite asbestos may be encountered in Staten Island bedrock along the easternmost 12,000 feet of the tunnel alignment. Such material would be removed at the Staten Island shaft site. As described above, the handling of this material would include the appropriate health and safety precautions to be detailed in the HASP, and the disposal of any asbestos-containing material would be in accordance with local, state, and federal regulations. Mitigation measures to avoid significant adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

Additional Rail Lines. Under the New Jersey tunnel alignment, a direct connection would be constructed between the National Docks Secondary and the tunnel. The work to provide this connection would involve mostly shallow excavation. The water table is not likely to be within the area of excavation and therefore, significant dewatering is not expected to be part of this work, and contamination from adjacent land uses would not be expected to affect the top several feet of soil within the right-of-way. Contaminated soil may be encountered and additional measures (fugitive dust monitoring during soil disturbance) may be necessary if subsequent testing determines levels of contaminants in the soil that could adversely affect public health. Mitigation measures to avoid significant adverse impacts from the disturbance of this material are discussed under "Mitigation Measures," below.

West Maspeth Yard. Expansion to the Double Tunnel System would include expansion of West Maspeth Yard to the full 160-acre intermodal rail yard. A storage facility would be built in the center of the site. Construction of the yard would require filling in Maspeth Creek and a portion of Newtown Creek—a total of 8 to 9 acres.

This work would include demolishing additional buildings, laying new track, and constructing buildings for storage and maintenance. The yard is still in the design phase, so construction methods are still unknown, but structures would likely be built on 50-foot-deep piles driven

throughout the yard. As with the Single Tunnel System, laying new track would require only minimal excavation. Buildings likely to contain asbestos-containing building materials and lead-based paint would have to be assessed and removed before building demolition. A full Phase I investigation (in accordance with ASTM E1527-00) should be conducted of each individual property prior to acquisition. Deeper excavations for building foundations or pilings would likely encounter subsurface contamination and groundwater. Surface soils at the Phelps Dodge site are known to be contaminated with PCBs, PAHs, and metals and subsurface soils may be similarly contaminated. If groundwater is encountered, VOC contamination should be expected at the Phelps Dodge site.

It is likely that the construction required for storage facilities would either be done through pile driving or be shallow and could be accomplished without extensive modifications to the existing remediation plans (a similar approach was recently successfully used for Amtrak's new High Speed Rail facilities at Sunnyside Yard in Queens) or extensive delays. The deed restrictions for the Phelps Dodge site would need to be strictly adhered to, so that excavated materials (e.g., for new utilities) would be properly handled and disposed of. The proposed low permeability cap would be maintained following construction and the other likely remedial measures (e.g., the groundwater treatment system) would continue to operate.

Additional mitigation measures to avoid significant adverse impacts from the disturbance of this material are discussed under "Mitigation Measures" below. Environmental impacts related to the disturbance of potentially contaminated sediments during the filling of Maspeth Creek and a portion of Newtown Creek are discussed in Chapter 13, "Water Resources."

POTENTIAL IMPACTS DURING OPERATIONS

Operations of the freight tunnel and the yards would include use of a variety of chemicals, including fuels, lubricants, and other oils. There are numerous applicable city, state, and federal regulations that cover the storage, handling, proper use and disposal of these chemicals. At some sensitive locations, e.g., adjacent to wetlands or surface water bodies, additional procedures would be developed (generally in conjunction with stormwater management plans—see Chapter 13, "Water Resources") to ensure that contaminated materials not impact these sensitive areas.

Furthermore, the new railroad-related facilities constructed as part of the project would comply with all applicable regulations regarding contaminated materials, to avoid creating new contamination at any of the project sites. Discharges from these facilities would meet all applicable discharge permit limits in accordance with regulatory requirements. Overall, operation of the project alternatives would not result in adverse impacts related to contaminated materials.

Under any alternative, transportation of hazardous materials on freight rail lines, is subject to extensive regulation including U.S. Department of Transportation 49 CFR Parts 107, 171, 172, 173, 174, 178, 179 and 180. These regulations include registration and operating requirements for transporters of hazardous materials. They set forth procedures to be followed to protect worker and public health, as well as requirements for shipper's certification and the methods and protective measures to be used to transport the materials. Specifically, the regulations issue requirements for the manifesting, packaging, labeling and placarding of the materials being transported. They also contain provisions regarding emergency response in the event of an accidental spill or release of material as well as worker training. The regulations also include specific conditions for the operation of railcars that carry hazardous materials.

At the Phelps Dodge site (and potentially other sites), ongoing remediation and monitoring would continue to be required by NYSDEC post-construction to ensure that no unacceptable exposures to workers or the community would occur.

For the Tunnel Alternative, it is possible that contaminated groundwater could migrate into the sumps (low points used to collect water and pump it to the sewer system) within the tunnel itself. A testing protocol would be developed as part of the sewer permits/approvals. If any groundwater exceeded local sewer use limitations, the water would need to be treated (by readily available technologies) prior to its disposal to sewer systems. This would not result in adverse impacts to workers or to the water treatment plants.

In summary, no adverse impacts pertaining to contamination would be expected due to operations for the project.

D. MITIGATION MEASURES

The assessment identified numerous sites with the potential to contain contaminated materials. Table 12-10 shows the potential impacts and their associated mitigation. Further investigations would be conducted to confirm the presence of these materials once an alternative is selected and project design has progressed to the point where areas to be disturbed are more specifically defined. If these investigations reveal the presence of contaminated materials, mitigation measures would be implemented prior to and during construction. Standard remediation measures exist for all of the substances likely to be encountered. Therefore, by implementing such measures, adverse impacts would be avoided or mitigated.

The measures to be implemented include the following:

- Further investigations to better delineate the nature and extent of contamination in areas where the project might encounter it; and
- Remediation measures before or during construction to remove and handle contaminated materials.

These are described below.

Table 12-10
Cross Harbor Freight Movement Project
Potential Impacts and Associated Mitigation for Project Alternatives

Potential Impacts and Mitigation			Project Alternatives													
						Tunnel										
Project Phase	Potential Impacts	Associated Mitigation	No Action	TSM	Expanded Float Operations [1]	None	Minimal Excavation	Clearances	Lowering Track	Widening Track	Open Cut	Cut & Cover	Bored Tunnel	Vent Shaft	Bridge Construction	Construction of West Maspeth Yard
Pre-Construction	Contaminated Soil	Soil Sampling/ Testing			X			X	X	X	X	X		X[3]	X	X
	Asbestos-containing building/bridge materials	Asbestos Assessment/ Abatement			X			X			X[2]	X[2]				X
	Lead based paint in building/bridge materials	Lead Testing/ Abatement			X			X								X
	Contaminated groundwater	Groundwater Testing									X	X		X[3]	X	X
During Construction	Contaminated airborne particulates	Dust Suppression			X		X	X	X	X	X	X	X	X[3]	X	X
	Worker and Community Exposure to contaminated materials	Health and Safety Plan		X	X		X	X	X	X	X	X	X	X	X	X
	Contaminated groundwater	Dewatering									X	X	X	X[3]	X	
	Contaminated ballast	Handling of Ballast					X		X	X						X
	Contaminated Soil or Rock	Stockpiling/ Testing			X		X	X	X	X	X	X		X[3]	X	X
Operation	Contaminated groundwater	Dewatering									X	X	X	X[3]	X	
	Exposure and handling of contaminated materials	Operations and Maintenance Plan	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Notes:
[1] See Construction of Intermodal Freight Facility for Proposed Maspeth Yard
[2] See discussion of Staten Island Rail Line for naturally occurring asbestos-containing bedrock
[3] 65th Street Yard Vent Shaft only. For Discussion on other vent shafts see Water Quality.

FURTHER INVESTIGATIONS

During the final design phase for the selected alternative, additional subsurface site investigations will be undertaken for areas of concern described above to delineate the nature and extent of contamination. These investigations would generally include testing of soil and groundwater for a range of constituents. Borings would be advanced to the approximate depth of construction where excavation is required. Soil samples may be taken at a series of depths to determine the extent of any contamination. While the chemical analysis of the soil samples would vary depending upon the contaminant of concern, it would be expected that testing for metals, volatile and semi-volatile organic compounds, PCBs, and pesticides would occur at most locations. Groundwater testing would also generally be performed if construction were to extend below the water table and/or require dewatering (e.g., New Jersey tunnel alignment at the Greenville, Staten Island tunnel alignment in Staten Island and the 65th Street Yard shaft site). In locations where contamination is identified either in the soil or groundwater, additional testing may be performed to further delineate the extent of contamination. The sampling plan would be approved by NYSDEC or NJDEP as applicable prior to implementation.

HEALTH AND SAFETY PLAN

Health and Safety Plans (HASPs) approved by NYSDEC or NJDEP, as applicable, would be developed for the various construction activities associated with the project to reduce the potential for worker or public contact with contamination found in either the soil or groundwater. This plan would address the potential exposure pathways and other safety concerns associated with a variety of construction methods such as a tunnel-boring machine in rock or workers digging in shallow soil at track level. Each HASP would address both the known contamination issues (e.g., the need for air monitoring if excavating in known solvent contaminated soil) as well as contingency items (e.g., if unknown tanks are drums are encountered). The HASP would be developed in accordance with US Occupational Health and Safety Administration (OSHA) regulations and guidelines.

The HASP would be the primary measure used to safeguard construction workers and nearby residents during construction work. This document would describe in detail all air, soil, and water sampling and monitoring that would take place during construction work, planned response to monitoring data, personal protective equipment (PPE) to be used by workers in various parts of the excavation, dust and vapor control measures and emergency procedures. These procedures would include requirements to notify appropriate regulatory agencies as well as procedures to quickly and safely address the various issues. The HASP would also generally include routine monitoring of both air and soil/rock (in place and/or as spoils).

The provisions of the Health and Safety Plan would be mandatory for the contractors and subcontractors engaged in any construction activities that have the potential to expose their personnel to the existing soils or groundwater on the site. In addition, all on-site personnel would be required to follow all applicable local, state, and OSHA construction codes and regulations.

MEASURES DURING OR PRIOR TO CONSTRUCTION

Once contaminated soil or rock is known to exist, a contaminated materials handling plan approved by NYSDEC or NJDEP would be developed to safely remove the contaminated soil or rock generally during, but potentially prior to, construction. This plan would include a HASP as well as procedures for stockpiling, testing, loading, transporting, and disposing of the material in

accordance with all applicable regulations. If contaminated soil or rock is to be bored through, additional procedures would be developed to properly separate contaminated material from non-contaminated material.

Potentially contaminated soils would be excavated and stockpiled until they could be tested and, if necessary, removed for off-site disposal at an appropriate facility. Although this is more costly than the disposal of non-contaminated soil or rock, it is generally a rapid and relatively straightforward process. Depending on the quantities and locations of contaminated soils, other mitigation technologies may be used, such as soil vapor extraction for VOCs and capping for metal contamination. Capping would involve reusing soil on-site and covering it with at least 2 feet of clean soil or other appropriate cap (e.g., paving). During construction, unusual conditions—such as odors or discoloration of the soil—that may indicate unexpected contamination would be checked for. Any contaminated materials encountered during construction would be handled, stored, and disposed of in accordance with all applicable federal, state, and local regulations.

DEWATERING

In some areas, construction would require dewatering and contaminated groundwater may be encountered. If the groundwater exceeded the local sewer use limitations, the water would be treated (by readily available technologies) prior to its disposal to sewer systems. An appropriate testing program where groundwater is known, or suspected to be contaminated would be developed as part of the project's dewatering permit(s), which would be sought from the appropriate regulatory agencies. A similar situation exists if water is pumped directly to a surface water body rather than to a sewer, though the limits and required permits differ. Treatment would be to the levels specified in local sewer ordinances for sewer discharges or applicable water quality regulations for discharges to waterbodies and wetlands. For a discussion of stormwater and groundwater infiltration management, see Chapter 13, "Water Resources."

DEMOLITION OF STRUCTURES

At locations where construction requires demolition or renovation of lift bridges or other structures, a comprehensive asbestos survey of each structure would be conducted in the safe and accessible areas that include the sampling of all suspect materials to determine the presence or absence of asbestos. Based on the findings of the survey, ACMs would be removed in accordance with all local, state, and federal regulations. ✷

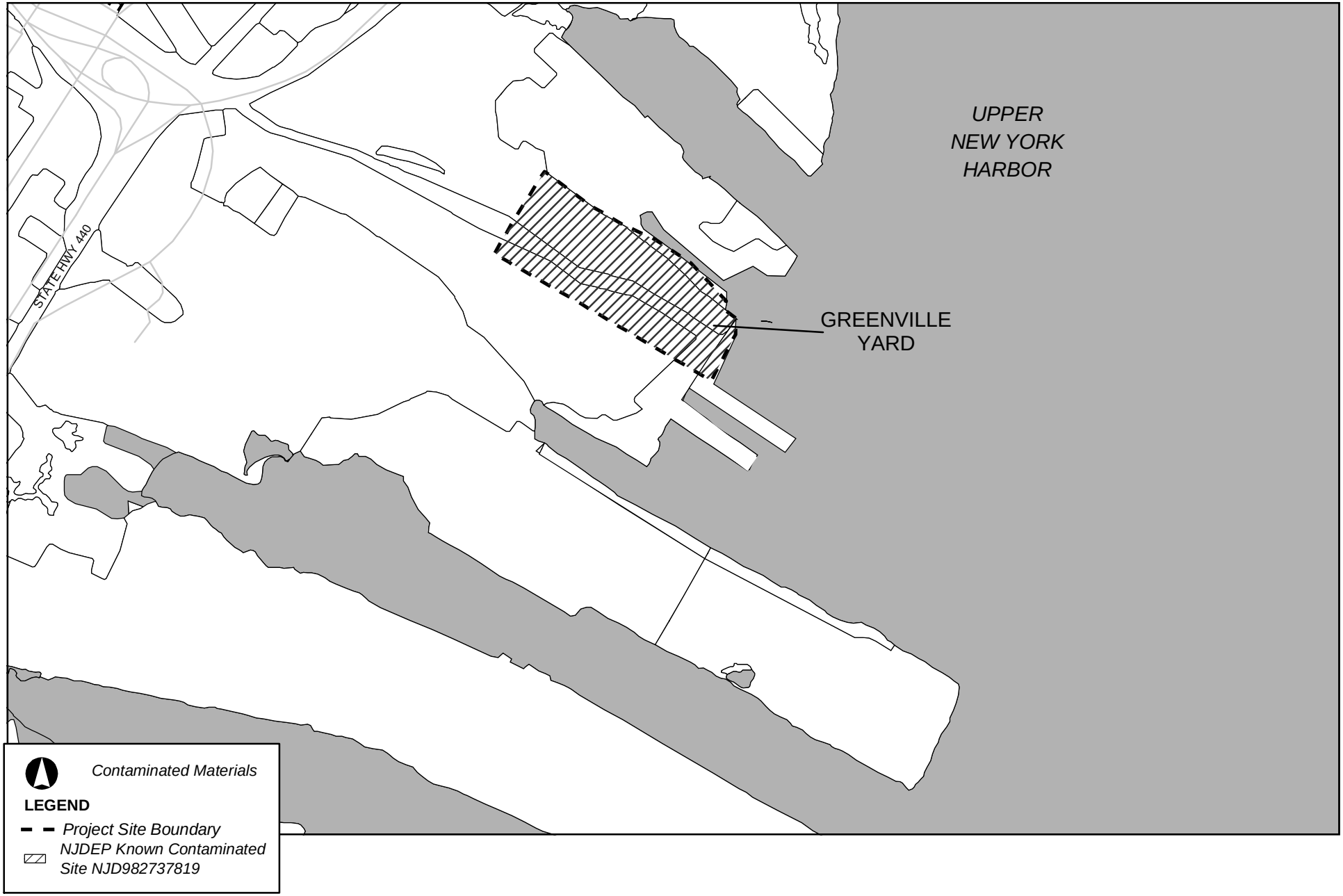


Figure 12-1
Greenville Yard/Potential Tunnel Alignment Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

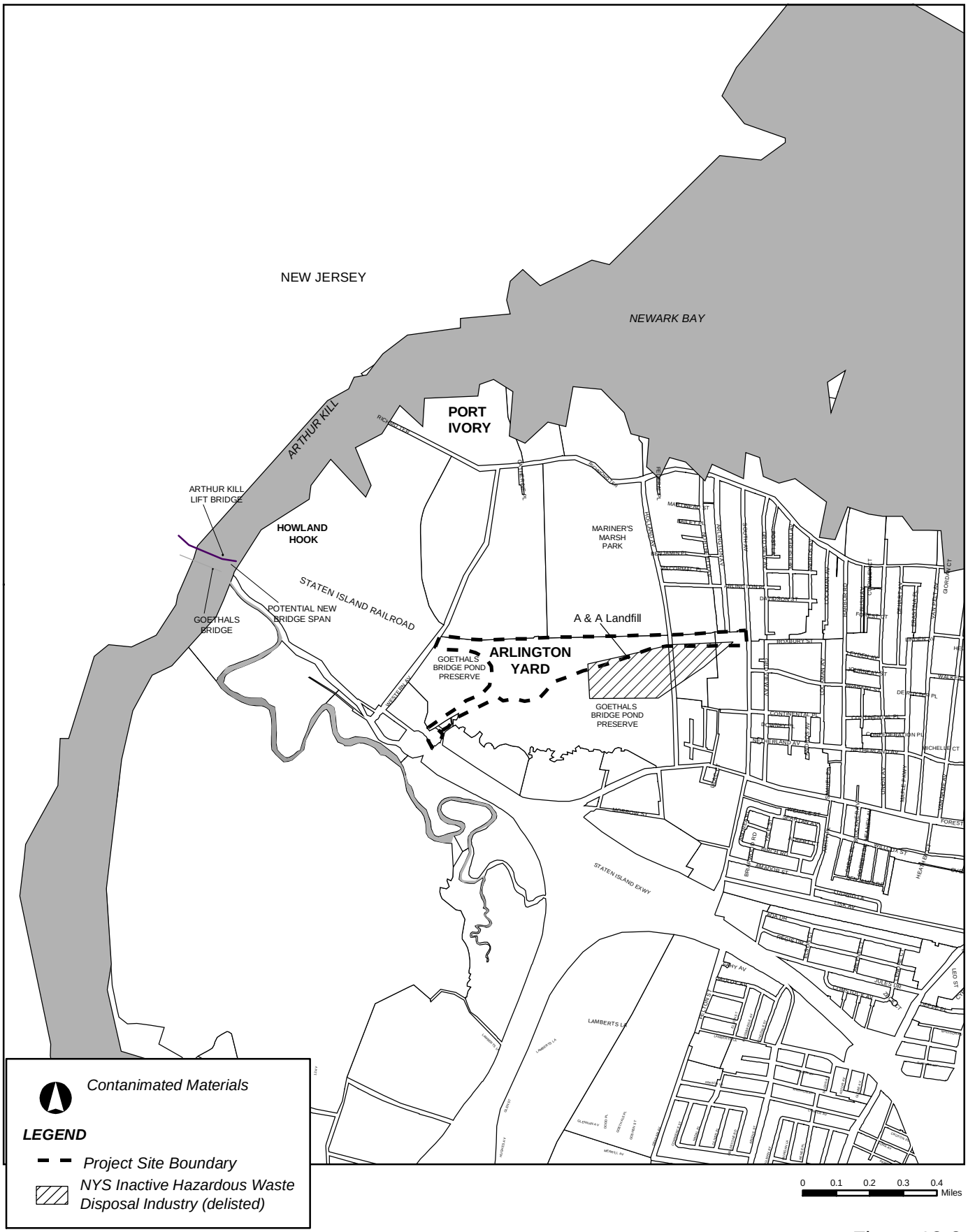


Figure 12-2
Arlington Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

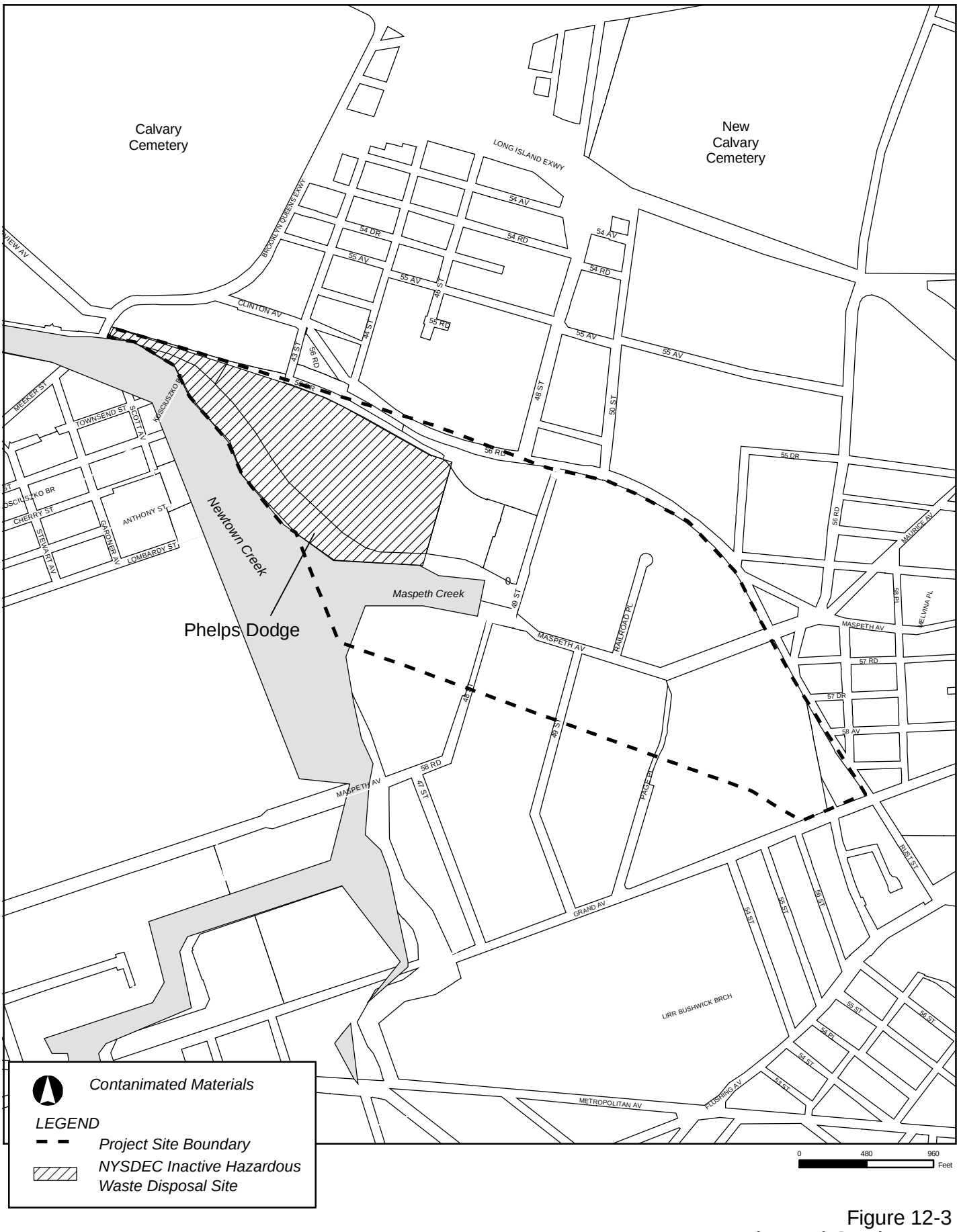


Figure 12-3
West Maspeth Yard Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

A. INTRODUCTION AND METHODOLOGY

Provided in this chapter is a general description of the water resources (i.e., water quality, aquatic resources, and floodplains) of the primary waterbodies within the project study area under existing and No Action conditions; an assessment of the potential impacts to water quality and aquatic resources from the project alternatives; and a description of measures to reduce the potential significant effects to water quality and aquatic organisms.

This chapter is organized into the following sections:

- The regulatory context for the project with regard to the surface waters found within the project study area and the potential project activities in these waters;
- The methodology employed to assess potential impacts to water quality from the project alternatives;
- The methodology employed to assess the potential impacts to aquatic resources from the project alternatives;
- Existing water quality and aquatic resources conditions within the project study area;
- The potential impacts from the project alternatives; and
- Mitigation measures proposed to minimize the potential effects to water quality and aquatic resources.

REGULATORY CONTEXT

This section briefly summarizes the federal and state laws and associated regulations and regulatory programs that may apply to the project alternatives with respect to water quality and aquatic and terrestrial resources that are found within the project study area. The regulations apply to certain activities in coastal areas, surface waters, floodplains, and to the protection of species of special concern. Table 13-1 identifies which regulations and regulatory programs may apply to potential project activities. A more detailed discussion of these federal and state laws and regulations, as well as water quality standards that apply to the surface waters within the project study area, can be found in Appendix 6.

Table 13-1

Federal, State and Local Regulatory Programs that May Apply to Activities in Surface Waters or Wetlands Within the New York-New Jersey Harbor Estuary

Activity	Federal Regulatory Program	New York Regulatory Program	New Jersey Regulatory Program	New York City Regulatory Program
Discharges to surface waters	Sections 301-303, 306, 307, 401, 404 of Clean Water Act Section 305(b) (2)-(4), Magnuson-Stevens Act	Protection of Waters, Article 15, Title 5 of the Environmental Conservation Law (ECL), Implementing Regs. 6 NYCRR Part 608 SPDES Article 17 Title 8, ECL, Implementing Regs. 6 NYCRR Parts 750-757	Water Pollution Control Act, NJSA 13:19, rules at NJAC 7:14A, NJAC 7:8 (Stormwater Management) and NJAC 7:9B (Surface Water Quality Standards) Flood Hazard Area Control Act, NJSA 58:16A, rules at NJAC 7:13 (Stream Encroachment Program)	
Construction of structures in navigable waters	Section 10 of the Rivers and Harbors Act of 1899	Protection of Waters, Article 15, Title 5 of the ECL, Implementing Regs. 6 NYCRR Part 608	Waterfront Development Act, NJSA 12:5-3, rules at NJAC 7:7 (Coastal Permit Program Rules) and 7:7E (Coastal Zone Management Rules)	
Disturbance of stream bank or bed	Section 404 of the Clean Water Act	Protection of Waters, Article 15, Title 5 of the ECL, Implementing Regs. 6 NYCRR Part 608	Flood Hazard Area Control Act, NJSA 58:16A, rules at NJAC 7:13 (Stream Encroachment Program)	
Coastal development	Federal Coastal Zone Management Act of 1972	Protection of Waters, Article 15, Title 5 of the ECL, Implementing Regs. 6 NYCRR Part 608 Coastal Erosion Hazard Areas, Article 34, ECL, Implementing Regs. 6 NYCRR Part 505 NYS Coastal Zone Management Program Administered by NYSDOS	Flood Hazard Area Control Act, NJSA 58:16A, rules at NJAC 7:13 (Stream Encroachment Program) Waterfront Development Act, NJSA 12:5-3, rules at NJAC 7:7 (Coastal Permit Program Rules) and 7:7E (Coastal Zone Management Rules) Tidelands Act, NJSA 12:3-1 Water Pollution Control Act, NJSA 13:19, rules at NJAC 7:14A, NJAC 7:8 (Stormwater Management and NJAC 7:9B (Surface Water Quality Standards) NJ Coastal Zone Management Program administered by NJDEP, Land Use Regulation Program	Waterfront Revitalization Program, Section 197-a, City Charter
Protection of species of special concern	Endangered Species Act of 1973 Fish and Wildlife Coordination Act Section 305(b) (2)-(4), Magnuson-Stevens Act	Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern, ECL, Sections 11-0535[1]-[2], 11-0536 [2], [4], Implementing Regs. 6NYCRR Part 182	Endangered and Nongame Species Act, NJSA 23:2S-2 et seq, rules NJAC 7:25-4	

Table 13-1 (cont'd)
Federal, State and Local Regulatory Programs that May Apply to Activities in Surface Waters or Wetlands Within the New York-New Jersey Harbor Estuary

Activity	Federal Regulatory Program	New York Regulatory Program	New Jersey Regulatory Program	New York City Regulatory Program
Activities that affect wetlands	Section 404 of Clean Water Act	Freshwater Wetlands Act, Article 24, ECL, Implementing Regs. 6 NYCRR Parts 663-665 Tidal Wetlands Act, Article 25, ECL, Implementing Regs. 6NYCRR Part 661	Freshwater Wetlands Protection Act, NJSA 13:9B, rules at NJAC 7:A Flood Hazard Area Control Act, NJSA 58:16A, rules at NJAC 7:13 Wetlands Act of 1970, NJSA 13:9A, rules at NJAC 7:7 and 7:7E Water Pollution Control Act, NJSA 13:19, rules at NJAC 7:14A, NJAC 7:8 (Stormwater Management) and NJAC 7:9B (Surface Water Quality Standards)	

METHODOLOGY

This section describes the methodology used to assess the potential effects on water quality and aquatic resources from the project alternatives, with a focus on major in-water project activities. Various analyses were conducted to determine the likelihood that the project alternatives would adversely affect water quality and the quality of the aquatic environment, and the survival and fitness of aquatic organisms within the project study area.

WATER QUALITY METHODOLOGY

The major potential water quality issues associated with the project alternatives are maintaining the water quality improvements that have occurred in the New York Harbor, minimizing direct runoff to the New York Harbor, resuspension of contaminated sediments into the water column, and the relocation of these sediments up or down the estuary. The method used to assess the potential impacts to water quality included the following:

- Describe the existing and No Action Alternative water quality and sediment conditions within the project study area;
- Assess the potential impacts to water quality from the project alternatives using the results of the physical transport modeling and fate and transport modeling conducted as part of the ecological risk assessment described in the next section, Aquatic Resource Methodology; and
- Develop potential mitigation measures to reduce the potential impacts to water quality and sediment quality from the project alternatives.

A detailed description of this methodology is provided in Appendix 6.

AQUATIC RESOURCES METHODOLOGY

The method used to assess the potential impacts to aquatic resources included the following steps:

- Describe the existing and No Action Alternative aquatic resources within the project study area;
- Assess the potential impacts to aquatic resources from the project alternatives considering the resuspension and transport of sediment contaminants and other changes in water quality such as dissolved oxygen and suspended sediments; and
- Develop potential mitigation measures to reduce the potential impacts to aquatic resources from the project alternatives.

A detailed description of this methodology is provided in Appendix 6, while a brief summary of the Ecological Risk Assessment Methodology follows.

Ecological Risk Assessment Methodology. The risk to the aquatic organisms within the project area from contaminants that may enter the water column from disturbance of the bottom sediment (dredging, construction activities associated with the Tunnel Alternative, construction, and operational activities associated with the TSM and Expanded Float Operation Alternatives) as well as the risk to terrestrial organisms through the aquatic food chain have been assessed through an ecological risk assessment. The risk assessment provides estimates of the potential impacts to the natural resources within the project area associated with contaminants found in the sediments located within the project area. The ecological risk assessment was conducted using the USEPA-approved risk assessment methodology (1998, Guidelines for Ecological Risk Assessment USEPA/630/R-95/002F, Risk Assessment Forum, Washington, D.C.) and the procedures outlined in Cura et al. (1999).

The ecological risk assessment was conducted per the five basic steps of the risk assessment process (Cura et al. 1999). These five steps are summarized below. A detailed description of this ecological risk assessment methodology is provided within the Ecological Risk Assessment report in Appendix 6.

- Problem formulation—A conceptual model was developed that described the contaminants associated with the sediments to be disturbed during in-water construction activities, identified potential contaminants of concern (COC), described how the potential COCs in the sediment could reach aquatic or terrestrial organisms (receptors) as a result of in-water construction activities; and identified the types of organisms that have the potential to come in contact with the contaminants.
- Exposure assessment—This step estimated the magnitude of the potential exposure of an ecological receptor to a COC (such as the concentration in sediment or water, tissue concentration in the receptor, or the dose of a COC to a receptor), the frequency and duration of the exposure, and how the receptor could be exposed to the contaminant (the exposure pathways).
- Toxicity assessment/effects assessment—Available toxicity data for the COCs for the sensitive receptors were evaluated for the potential to cause adverse effects to exposed organisms. Toxicity data were reviewed to determine benchmark concentration that best represents an exposure concentration for the COC, or a dose or tissue concentration, that

results in an adverse effect such as mortality (acute toxicity) or reproductive failure or behavioral changes (chronic toxicity).

- Risk characterization—In this step, risk was quantified or qualitatively described. Risks were characterized by calculating Hazard Quotients (HQ). The HQ is the exposure point concentration divided by the benchmark concentration selected in the toxicity assessment/effects assessment. HQs greater than 1 may suggest potential risk to a receptor.
- Uncertainty analysis—Factors considered in the risk analysis such as assumptions or other information that contribute to some level of uncertainty in the analysis were identified and discussed. Sources of uncertainty for an ecological risk assessment generally relate to the physical and chemical characteristics of the COCs, bioaccumulation potential of the COCs, bioavailability of the COCs, uncertainties in the fate and transport or food chain models, biological characteristics of the sensitive receptors, uncertainties in the selection of toxicity factors, or other factors.

FLOODPLAINS METHODOLOGY

The Federal Emergency Management Agency (FEMA) maps and regulates floodplains and floodways for insurance purposes. Flooding leads to widespread loss of life and property, and the purpose of the regulations and mapping is to minimize these losses. A municipality that becomes part of the program is required to promulgate and enact regulations to prevent inappropriate development in floodplains and floodways. Certain elements of the proposed project alternatives would be located in the 100-year floodplains as mapped by FEMA.

All of the potential project sites are located in areas that are subject to coastal flooding and are not subject to riverine flooding. Riverine flooding is caused by runoff flowing into a river and causing the river to overflow its banks. If the volume of runoff is greater than volume of water that the streambed or floodway can keep within its banks, the water overflows onto the floodplain, where buildings and structures are flooded. Coastal flooding, however, has a different cause. The coastal ocean and bay waters rise because of the tides, storm surge and ocean waves from large area storm systems or hurricanes. The river does not back up and cause flooding, but rather the ocean rises over a large area, flooding the lower lying land areas. At all of the potential project construction sites, no riverbed or floodway exist, only open coastal waters rising because of metrological and oceanic conditions.

The assessment of the project's potential impacts on floodplains is based the following regulations:

Federal Regulations

According to FHWA regulations, pursuant to 23 CFR 650 and Executive Order 11988, any action within the limits of the 100-year floodplain is an "encroachment." FHWA regulates encroachments of roadway projects into the floodplain, and defines a "significant encroachment" as a highway encroachment and any direct support of likely base floodplain development that would involve one or more of the following construction or flood-related impacts:

- Significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route;
- Significant risk; or
- Significant adverse impact on natural and beneficial floodplain values.

A proposed action that includes a significant encroachment requires a finding that it is the "only practicable alternative" before it can be approved. Therefore, a determination must be made regarding whether the proposed Cross Harbor project represents a "significant encroachment" and, if so, whether it is the only practicable alternative.

Similarly, according to FRA's *"Procedure for Considering Environmental Impacts,"* and in accordance with Executive Order 11988 and DOT Order 5650.2, the potential for project alternatives to affect a base floodplain must be determined. If one or more of the alternatives would affect base floodplain, the following issues must be evaluated: any risk associated with each alternative; the impacts on natural and beneficial floodplain values; the degree to which the alternative supports incompatible development in the base floodplain; and the adequacy of the methods proposed to minimize harm.

New York State and New York City Regulations

If a proposed project is located within a floodplain, NYSDEC's Environmental Conservation Law regulations (6 NYCRR 502) require state agencies to consider alternative sites for the project located outside the floodplain. State projects in the 100-year floodplain must be constructed to minimize flood damage. Further, no project may be undertaken unless it is demonstrated that the cumulative effect of the proposed project, when combined with all existing development, will not cause any material flood damage to such existing development. In addition, 6 NYCRR 502 contains requirements for new and replacement water supply and sanitary sewage systems, and specifies that habitable structures must have the lowest floor not less than one foot above the base flood level.

In New York City, Local Law 33 of 1988 regulates construction in the 100-year floodplain, and requires that roadway and utility construction be designed to minimize or eliminate damage from flooding. In addition, habitable structures must have the lowest floor not less than one foot above the base flood level. This local regulation applies to the project.

NYSDEC also requires that in cities with a designated floodway, no portion of the project may be placed within the adopted regulatory floodway to result in any increases in flood levels. FEMA defines the term "floodway" as the area of a waterway where the water is likely to be deepest and fastest and includes a portion of the floodplain that should be reserved and kept free of obstruction in order to allow floodwaters to move downstream. The only regulatory floodway in New York City is the Bronx River, which, as shown in Section C, "Probable Impacts of the No Action and Project Alternatives," is outside the proposed project construction area.

New Jersey Regulations

The NJDEP's Coastal Management Program regulates waterfront development, coastal areas, tidelands (i.e., riparian rights), and stream floodplain encroachment. As part of the Stream Encroachment Program, New Jersey regulates construction in certain floodplains under the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and N.J.A.C. 7:13. These floodplains include "delineated" and "non-delineated" floodplains. Delineated streams within floodplains are officially established and adopted by the State of New Jersey in accordance with N.J.S.A. 58:16A-52. All other floodplains and the watercourses that create them are referred to as non-delineated floodplains. FEMA maps are used to determine the boundaries of floodplains elevations in areas that are not delineated by the state. Construction in a floodplain regulated under the Stream Encroachment Program may require a "major" or "minor" stream encroachment permit, depending upon the type and potential impacts of the proposed activity.

In addition to the Stream Encroachment Program, NJDEP regulates coastal zone activities under N.J.S.A. 12:5, the Waterfront Development Act; N.J.A.C. 7:7, the New Jersey Coastal Permit Program Rules; and N.J.A.C. 7:7E, Coastal Zone Management Policies. Proposed development in undeveloped flood hazard areas may be prohibited depending upon the distance to a navigable water body and whether the development is a water-dependent use. These regulations may apply to the proposed project. Certain activities (e.g., some pier and bulkhead reconstructions) are exempt from some of these regulations.

Potential Impacts of Flooding on Contaminated Materials

As discussed in Chapter 12, "Contaminated Materials," almost all of the proposed project construction sites have been used for industrial purposes in the past and possess the potential to have contaminated materials in the soils and groundwater. During a 100-year flood, these materials could be eroded and released into the surrounding area. In accordance with the actions described in Chapter 12, any necessary remediation will be conducted prior to project construction of the proposed project under the jurisdiction of either NYSDEC or NJDEP. Such remediation, along with any additional paving and construction, would be expected to prevent the erosion of contaminated materials and their release into the surrounding areas.

B. EXISTING CONDITIONS

WATER RESOURCES AND WATER QUALITY

This section provides an overview of water resources in the project study area, describes existing water quality conditions within the project study area, describes current NYSDEC and NJDEP use classifications and associated water quality standards for the primary surface waterbodies in the project study area, and evaluates whether the primary waterbodies currently meet these standards. Section C addresses the potential impacts on water quality from the implementation of each alternative.

WATER RESOURCES IN THE PROJECT STUDY AREA

The waterbodies in the project study area are in the states of New York and New Jersey. New York waters potentially affected by project construction and operational activities include:

- The eastern half of the Arthur Kill;
- The southern half of Kill Van Kull;
- Upper New York Harbor;
- Newtown Creek; and
- Maspeth Creek.

The New Jersey waterbodies potentially affected by project construction and operational activities include:

- The western half of the Arthur Kill;
- The northern half of Kill Van Kull;
- Newark Bay; and

- The western half of Hudson River (including the western half of Upper New York Harbor).

The state boundary between New York and New Jersey runs midway between Arthur Kill, Kill Van Kull, and the Hudson River/Upper Harbor. All waterbodies listed above are considered navigable waters under federal regulations.

The New York-New Jersey Harbor Estuary comprises four large interconnected embayments: Upper and Lower New York Harbor, Newark Bay, and Raritan Bay. Upper New York Harbor and Lower New York Harbor are separated by the Narrows. Newark Bay, the smallest of the four, is linked to the Upper New York Harbor by the Kill Van Kull (tidal strait), and to Raritan Bay by the Arthur Kill (tidal strait). This system of embayments receives high salinity water through its connection to the Atlantic Ocean at its mouth and freshwater from the Hudson River, (the major source) and other bodies of water such as the Raritan River, Passaic River, Hackensack River and Bronx River, as well as discharges from sewage treatment plants, combined sewage overflows (CSO) and stormwater. This mixing of freshwater derived from rivers, with higher salinity water from an ocean, is what characterizes this semi-enclosed system of embayments and tidal straits as an estuary. The watershed area for the Harbor Estuary is approximately 16,266 square miles (USEPA 2001). The average depth of the Harbor Estuary is 21 feet (USACOE 1999a).

The location of the Port of New York and New Jersey (PONYNJ) within the Harbor Estuary has influenced the physical characteristics of the Harbor Estuary through the development and maintenance of federal navigation channels and anchorages (see Figure 13-1) within this naturally shallow estuary. The shallow areas of the Harbor Estuary that are not affected by dredging (shoals), the channel areas, shoreline areas, shallow bays, areas with higher currents such as the East River, tidal rivers, and salt and freshwater tidal marshes provide diverse aquatic habitats that are used by different species on a seasonal basis (USACOE 1998). Salt and freshwater marshes in the Harbor Estuary/New York Bight region cover about 180,000 acres in New Jersey and about 25,000 acres in New York. Most of these wetlands are located in back bays and tributaries to the Harbor Estuary system and are not directly connected to the Harbor embayments (NY/NJ HEP 1996, USACOE 1999a).

The areas where in-water activities could occur as a result of the project alternatives include the following.

- Upper New York Harbor—The Upper New York Harbor is the portion of the Harbor Estuary enclosed by the New York and New Jersey shorelines from the Battery at the tip of Manhattan south to the Verrazano-Narrows Bridge. The shoreline of this portion of the Harbor Estuary is almost entirely developed with bulkheading, piers (usable and dilapidated), pile fields, commercial and industrial waterfront facilities, and military installations (USACOE 1998). Some small wetland areas occur on the west side of Liberty Island, in various interpier areas (between the Global Marine Terminal/Auto Marine Terminal (NEAT) Pier and the Military Ocean Terminal in Bayonne (MOTBY), between MOTBY and Constable Hook, and in a small area north of Caven Point. Mudflats occur along the New Jersey shoreline of Upper New York Harbor, with a large mudflat area between MOTBY and Constable Hook (USACOE 1999b).
- Kill Van Kull—The Kill Van Kull connects Newark Bay with Upper New York Harbor and separates the southern shore of Bayonne, New Jersey from the northern shore of Staten Island, New York. It is approximately five miles long, 800 feet wide, and ranges in depth from 11 to 50 feet (MLW). Because most of this tidal strait is occupied by federal navigation

channel, and the shorelines developed for docks or piers, there is little shallow water habitat, natural vegetation, or intertidal area (USACOE 1998). Some of the shoreline is occupied by industrial facilities, marinas, and non-waterfront-dependent uses, and the remaining areas are undeveloped or abandoned. Derelict vessels, timber, and debris are found outside the navigation channel along both shorelines (Harris 1997).

- Arthur Kill—The Arthur Kill is a tidal strait that connects Newark Bay with Raritan Bay and separates Staten Island from New Jersey. It is approximately 13 miles long, between 800 and 2,800 feet-wide, and has a total surface area of approximately 4.4 square miles. A 500-foot-wide federal navigation channel, maintained at a depth of 35 feet mean low water level (MLW), runs the entire length of the Kill. The features of the New York and New Jersey shorelines of the Kill vary. The large amount of commercial development (petroleum refineries and storage facilities, and electric generating facilities) along the New Jersey shoreline has resulted in much of the shoreline being stabilized by bulkheads and riprap. Large areas of wetland (natural and restored) are found along the New York shoreline, mixed in with oil storage facilities, generating facilities, and the Fresh Kill landfill (USACOE 1999b). Many of the wetlands are disturbed and are dominated by common reed (*Phragmites australis*). Freshwater inputs to the Arthur Kill are primarily on the New Jersey shoreline and include the Rahway and Elizabeth Rivers (USACOE 1999c). The third largest tributary is the Fresh Kill on the Staten Island shoreline, which drains an extensive wetlands complex. Minor tributaries include Old Place Creek, Saw Mill Creek, Neck Creek, and Mill Creek on the Staten Island side, and the Morses Creek, Pile Creek, Smith Creek, Woodbridge Creek on the New Jersey side. Additional freshwater flow is contributed by municipal sewage treatment plants (STP) and combined sewer overflows (CSOs), which is more than twice the combined contribution of the three largest tributaries (USACOE 1998).
- Newtown Creek and Maspeth Creek—Newtown Creek is a federal navigation channel, approximately three miles long from its mouth at the East River to English Kills. Maspeth Creek, also a federal navigation channel, is 2,000 feet long. The authorized depth for Newtown Creek is 23 feet deep up to Maspeth Avenue where the authorized depth for English Kills is 20 feet. The authorized depth for the federal channel in English Kills decreases to 12 feet at Metropolitan Avenue. Maspeth Creek is eight feet deep at the mouth, and approximately two inches deep at mean low water 200 feet upstream from the mouth. At 600 feet upstream from the mouth the sediment is 1.1 feet above the water line. Land uses along Newtown and Maspeth Creeks are primarily industrial in nature.

Regional Hydrology

The Harbor Estuary is a complicated hydrologic and hydraulic system that is influenced by:

- its connection to Long Island Sound through the East River in Upper New York Harbor and through the Harlem River that connects the Lower Hudson River to the East River;
- its connection to the Atlantic Ocean in the Lower New York Harbor;
- discharges from the Lower Hudson River (provides approximately 87 percent of the total riverine flow into New York Harbor (Brosnan and O'Shea 1995);
- discharges from other rivers, sewage treatment plants, and CSOs;
- the westward flowing Kill Van Kull that branches north to Newark Bay and south toward the Arthur Kill;

- the southward flowing Arthur Kill that connects Newark Bay and the Upper Hudson Bay to the north with Raritan Bay to the south.

Additional information regarding the regional hydrology, such as tidal range, salinity, and temperature data is provided in Appendix 6.

EXISTING WATER QUALITY CONDITIONS

Water Quality

New York City, New York State, New Jersey, federal agencies such as USACOE, multi-jurisdictional agencies such as IEC, PANYNJ, and cooperative efforts such as the New York-New Jersey Harbor Estuary Program have implemented programs to improve water quality in the Upper New York Bay. Furthermore, these entities are sponsoring studies to document water and sediment quality conditions in the New York Harbor. These programs have, over time, resulted in water quality improvements documented by monitoring programs such as the New York City Department of Environmental Protection (NYCDEP) New York Harbor Water Quality Survey (Harbor Survey). While water quality is improving, the surrounding and upstream land uses have gradually resulted in the deposition of contaminated sediments in the Harbor. Sediments in the study area contain contaminants including dioxins/furans, PCB Aroclors and congeners, organochlorine pesticides, heavy metals, butyltin, PAHs, and volatile organic carbon, as discussed under *Sediment Quality*, below. A description of the various classes of surface waters and the applicable standards is presented in Appendix 6.

New York Project Surface Waters. The City of New York has monitored New York Harbor water quality with an annual survey (Harbor Survey) for over 90 years. The New York City Department of Environmental Protection (NYCDEP) conducts the survey by collecting water samples at 53 stations in four designated regions: Inner Harbor Area, Upper East River-Western Long Island Sound, Lower New York Bay-Raritan Bay, and Jamaica Bay (NYCDEP 1999). One of these regions, Inner Harbor Study Area, has the potential to be affected by the project alternatives. This region comprises the majority of the major surface waters in the project study area with potential project construction activities.

As part of the Harbor Survey, NYCDEP collects samples to evaluate water quality, sediment characteristics, hydrology, phytoplankton, and macroinvertebrates two to four times in the summer months and once each in October, February, March and April (NYCDEP 1999, 2000, 2001). The results of the annual Harbor Survey are used by NYSDEC to determine use classifications for waterbodies within the Survey. NYCDEP records water quality parameters such as temperature, salinity, density, dissolved oxygen (DO), water clarity, pH, total suspended solids (TSS), nutrients, Chlorophyll a, plankton and coliforms. All pH levels in the New York Harbor Area are in attainment. Every year, NYCDEP produces a report summarizing the results of the current survey and providing a synopsis of recent trends in coliform counts, Chlorophyll a, DO, and secchi transparency. There are no New York State standards for Chlorophyll a or water clarity, but there are standards for DO and coliforms (refer to Appendix 6 for DO, pH, and coliform standards for the use classifications under 6 NYCRR Part 703).

Inner Harbor Area. The Inner Harbor Area includes the Hudson River, the lower portion of the East River up to the Harlem River (including Newtown Creek), New York Harbor to just south of the Narrows, Kill Van Kull and Arthur Kill. This area includes the waters near the following project sites:

- Arthur Kill Lift Bridge;
- Arlington Yard;
- Staten Island Railroad and Staten Island tunnel alignment;
- Chemical Coast Line;
- Greenville Yard and New Jersey tunnel alignment; and
- West Maspeth Yard.

With the exception of Kill Van Kull and Arthur Kill, the waters making up the Inner Harbor Area are NYSDEC Class I saline surface waters. The best usages of Class I waters are secondary contact recreation and fishing; the water quality should be suitable for fish propagation and survival. Kill Van Kull, Arthur Kill, and Newtown Creek (including Maspeth Creek) are Class SD saline surface waters. The best usage of Class SD waters is fishing, and the water quality of these waters should be suitable for fish survival. This classification may be given to waters that cannot meet the requirements for primary and secondary contact recreation and fish propagation.

Implementation of water pollution control programs over the past 20 to 25 years have led to a marked improvement of the water quality in New York Harbor. Indicators of improved water quality include decreases in ambient sewage-indicator bacteria and increases in DO, decreases in PCB concentrations in striped bass tissue, and decreases in lead concentrations in the estuary (Brosnan and O'Shea 1995 in AKRF 1998, IEC 2000, 2001). Additional information regarding the results of recent Harbor Surveys, data for the Inner Harbor Area, and the use classifications is provided in Appendix 6.

New Jersey Project Surface Waters. Surface waters in the project study area within the state of New Jersey are as follows: Arthur Kill, Hudson River and Upper New York Harbor, Kill Van Kull, and Newark Bay. These waters are located near the following project sites:

- Improvements to Greenville Yard;
- Possible improvements to Oak Island Yard, Lehigh Valley Drawbridge, and Greenville Branch; and
- Possible Chemical Coast Line improvements.

NJDEP does not report water quality conditions other than use class for Arthur Kill and Kill Van Kull, and Newark Bay, as they are interstate waters (NJDEP 1998b) under the responsibility of the IEC. Both the 1999 and 2000 IEC 305(b) reports gave general water quality conditions for New Jersey waters without specifying areas of concern for these three waterbodies. They did indicate, however, that hypoxia due to nutrient enrichment from seasonal die-off of plant life, stagnation of scumming matter from point and non-point sources, under-treated effluents, CSOs, untreated discharges and stormwater runoff was a problem in several waterbodies in its district that were historically contaminated (IEC 2000, 2001). The portions of three waterbodies that are within the project study area are all Class SE-3 saline surface waters (described in Appendix 6). The expanded float operation at Greenville Yard, and the immersed tube tunnel at Greenville Yard are the only portions of the project where major construction activities may affect New Jersey waters. These project sites are adjacent to waterbodies that are monitored as part of the

Harbor Survey in the Inner Harbor Area. The Harbor Survey includes measurements of water quality in New Jersey waters, as they are part of the Harbor system.

According to N.J.A.C. 7:9B (NJDEP 1998b), the best usage for Class SE-3 waters is secondary contact recreation. The water quality should be sufficient for fish survival. The Hudson River portion within the project study area, including Upper New York Harbor, is a Class SE-2 surface water. The best usage for this water is secondary recreational contact, and the water quality should support maintenance, migration and propagation of natural and established biota (NJDEP 1998 a and b).

Water Quality Conclusions. While water quality within the project study area waterbodies has improved, it can still be considered degraded. There is evidence that some contaminants in the waters of the project study area have the potential to adversely affect aquatic biota. However, such contamination is not uncommon to major urban areas.

SEDIMENT QUALITY

There are complex flow patterns between the Hudson River Estuary, Long Island Sound, Newark Bay, Upper New York Bay, and Lower New York Bay areas. These complex flow patterns lead to widely variable sediment characteristics throughout the project study area. According to USACOE (1999), sediments within Newark Bay tend to be a fine-grained combination of silts, clays and sands with larger-grained materials present in the southern end of the Bay due to materials introduced by tidal activity. Adams et al. (1998) describes the bottom sediment of Newark Bay as mostly mud (defined as having more than 40 percent silt/clay) with small areas of sand (less than 40 percent silt/clay). Upper New York Bay has the most complex distribution of sediments in the project study area because of variable currents and a high degree of sediment input due to natural and human actions. USACOE (1999) reports that sediments in Upper New York Bay vary from coarse sands and gravels in high energy areas to fine-grained silts and clays in low energy areas. Adams et al. (1998) characterized approximately 60 percent of the bottom sediments (by area) of the Upper Harbor as mud (more than 40 percent silt/clay) and the remainder as sand (less than 40 percent silt/clay).

Regional Sediment Contamination

Typical of any urban watershed, New York Harbor sediments are contaminated due to a history of industrial uses in the area. However, when compared to sediments of other coastal areas on the East Coast (i.e., from Cape Cod to the mouth of the Chesapeake Bay), the Harbor Estuary appears to be heavily and extensively contaminated (Adams et al. 1998). As found by Adams et al. (1988), the mean sediment contaminant concentration for 50 of 59 chemicals measured statistically higher in the Harbor Estuary than other coastal areas on the East Coast. This condition is difficult to improve, as some contaminants may remain within sediment layers for years. PCB concentrations, for example, persist at high levels even though they were banned about 25 years ago (USGS 1998). In addition, New York Harbor receives contaminated sediments from industrial areas upstream, both in the Hudson River and in Newark Bay. Contaminated compounds found in sediments within the project study area include dioxins/furans, PCB Aroclors and congeners, organochlorine pesticides, heavy metals, butyltin, PAHs, and volatile organic compounds. Some of the measured sediment concentrations exceed federal or state water quality standards.

Overall, however, there is evidence that the level of contamination is decreasing in New York Harbor sediments. Older sediments tend to have higher contamination levels than material

deposited more recently. Decreases in sediment contamination from 1960s levels have been documented in certain areas of the Harbor while studies conducted in other areas have proved inconclusive (Bopp et al. 1997, EPA 1993, and NOAA 1995, USACOE 1999).

Sediment Quality in Project Area

Sediment quality data for the Upper New York Harbor, where in-water construction activities would occur as part of the project, were obtained from existing databases and other sources, and sediment samples along the potential Staten Island and New Jersey tunnel alignments were collected and analyzed for contamination (see Figure 13-2). These sediment sampling data as well as sediment sampling location maps are provided in Appendix 6. The existing data showed that sediments of the Upper New York Harbor contain high concentrations of individual and total polycyclic aromatic hydrocarbons (PAHs), mercury, and endrin (Adams et al. 1998). Within the Upper Harbor, exceedances of PAHs and metals occurred near the Staten Island and Brooklyn shorelines, but rarely occurred in the middle of the Harbor (USEPA 1993, USEPA 1991). All of the dioxin levels for the Upper New York Harbor greatly exceeded the New York State water quality standard (NYSDEC 1999).

From the sediment sampling along each tunnel alignment, the sediments were found to be fairly uniform within the upper 40 feet, consisting mostly of silty clay with trace shell and less than 10 percent sand. Exceedances of metals were identified near the New Jersey and Brooklyn shoreline. In the center of the Harbor, deep samples (18 to 20 feet and 35 to 37 feet) indicated a much lower level of contamination. High levels of mercury were detected near the shorelines and in the center of the Harbor.

Generally, sediment samples from the shoreline areas were more contaminated than those from the middle of the Harbor. Also, core samples from the 8 to 10 foot depths usually had higher levels of contamination than shallower (0 to 2 feet) or deeper (18 to 20 feet and 35 to 37 feet) core samples. Both of these observations follow the trend described by USACOE (1999) in the Dredged Material Management Plan draft implementation report. The report states that, "…there is evidence that sediments in the Harbor are getting cleaner." In addition to those observations, the report noted that contamination levels tended to be higher in samples from the shore areas than in samples taken from the middle of the Harbor.

Sediment Quality Conclusions

Overall, sediment quality in the project study areas is improving as new, cleaner sediments are deposited and sediments are removed as a result of dredging activities. However, Upper New York Harbor and the Arthur Kill area both have sediment contamination levels that have the potential to adversely affect biota in the area. Additional information on regional sediment quality, the sources of contamination, and the benchmarks for comparison, can be found in Appendix 6.

AQUATIC RESOURCES

GENERAL HABITAT DESCRIPTION

The Harbor Estuary supports a diverse and productive aquatic community of over 100 species of finfish and more than 100 different invertebrates. Aquatic organisms of commercial or recreational importance found within the Harbor Estuary include striped bass, winter flounder, blue crab, and the northern quahog or hard clam. The waters within the project study area, Upper

New York Harbor, Kill Van Kull, and Arthur Kill provide a variety of aquatic habitats. The characteristics of the Harbor Estuary habitats can be affected by temporal, horizontal, and vertical gradients. Examples of horizontal gradients include increasing salinities toward the mouth of the estuary, and decreasing nutrient concentrations toward the mouth. Examples of vertical gradients include changes in salinity, dissolved oxygen, and nutrients with depth. These vertical and horizontal gradients help define the types of habitats available in this estuarine system that include deep channels, subtidal areas, and intertidal areas, as described below.

- Estuarine Deep Channels -- Deep channels within the project study area include artificially maintained navigation channels (generally between 35 and 45 feet below mean low water (MLW)), interpier berthings areas, turning basins, anchorage areas, and naturally occurring deep-water areas. Although natural water depths in the entire New York and New Jersey Harbor are mostly shallow (less than 20 feet MLW), water depths in some areas exceed 90 feet MLW (e.g., the Narrows located at the southern outlet of the Upper New York Harbor) (USACOE 1999c).

- Estuarine Subtidal Deep Habitats – These are areas of the kill that are below the lowest tide—the bottom is permanently submerged and does not support emergent vegetation. In accordance with the scheme described by Reschke (1990), the subtidal area has two zones, a deepwater zone that includes areas deeper than 6 feet at low tide, and a shallow zone that includes areas that are less than 6 feet deep at low tide that lack rooted aquatic vegetation. Subtidal deep habitats include some shoal areas (extensive shoal areas occur in the Upper New York Harbor, such as the Jersey Flats off the Port Jersey Area, and Bay Ridge Shoals), submerged structures (e.g., pile fields, wrecks) and some underpier and interpier areas that provide habitat that is used by most fish found within the estuary during some time of year or life stage, including juvenile striped bass and winter flounder (Able et al. 1995). Pile fields and interpier habitats are found throughout the Upper New York Harbor. Fish that are characteristic of the deeper subtidal area within New York State include Atlantic tomcod (*Microgadus tomcod*), hogchoker (*Trinectes maculatus*), and rainbow smelt (*Osmerus mordax*) (Reschke 1990). Subtidal shallow areas generally are comprised of unconsolidated sediments of silt or sand and may contain a variety of benthic organisms such as polychaete worms, mud crabs, and other shellfish species (Lerman 1986). Productive shoal and subtidal areas line the Upper New York Harbor to the Arthur Kill, and may serve as foraging or concentration areas for fish, shellfish, and avian species. Shoals and shallow water are also used by a variety of fish species as spawning or nursery areas (USACOE 1999c). Fish that are characteristic of shallow subtidal areas in New York include striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), banded killifish (*Fundulus diaphanus*), spottail shiner (*Notropis hudsonius*), tesselated darter (*Etheostoma olmstedi*), and pumpkinseed (*Lepomis gibbosus*). Fish that occur in both the deepwater and shallow subtidal area include bay anchovy (*Anchoa mitchilli*), blueback herring (*Alosa aestivalis*), white perch (*Morone americana*) and alewife (*Alosa pseudoharengus*)(Reschke 1990).

- Estuarine Intertidal Habitats -- Area between the highest tide level and the lowest tide level. The bottom or substrate is periodically exposed and flooded by semidiurnal tides (two high tides and two low tides per tidal day). This zone includes that portion of the water column between the highest and lowest tide level, and salt marsh, brackish marsh, mudflats, gravel/sand beaches, and rock or riprap shorelines that are periodically exposed. It includes the salt shrub, high salt marsh, low salt marsh, brackish tidal marsh, and brackish intertidal mudflats described by Reschke (1990). Coastal mudflats are exposed at extremely low tides and inundated at high tides with the water table at or near the surface of the substrate. Mud

flats are generally unvegetated expanses of mud, organic material, fine sands, or clay. Piles, logs, and pieces of metal occurring on the mudflat area provide cover for benthic organisms such as mud crabs and polychaete worms and habitat for sessile organisms such as barnacles (USACOE 1999c). Low salt marsh areas provide habitat for invertebrates such as fiddler crabs, and small fish such as mummichog (*Fundulus heteroclitus*) Reschke (1990). Intertidal rock or riprap areas also provide habitat for macroinvertebrates such as barnacles, mussels, crabs.

AQUATIC ORGANISMS

Aquatic organisms found within the Harbor Estuary include phytoplankton, submerged aquatic vegetation, benthic macroalgae, zooplankton, benthic invertebrates, shellfish, and finfish. Phytoplankton are generally microscopic plants whose movements within the waters of the Harbor Estuary are controlled by tides and currents. Submerged aquatic vegetation are vascular plants that live or grow completely underwater or just up to the water surface. Zooplankton are primary grazers on phytoplankton and detrital material (i.e., organic debris formed by decomposition of plants and animals) and are themselves consumed by fish. Benthic invertebrates inhabit the sediments and surfaces of submerged objects such as rock, pilings, or debris, and include soft shell clams and barnacles. Detailed descriptions of these aquatic organisms and the various communities within the Harbor Estuary are provided in Appendix 6.

Endangered Aquatic Organisms

The federally and state-listed endangered shortnose sturgeon (*Acipenser brevirostrum*) is the only threatened or endangered fish species with the potential to occur in the project study area (see Table 13-2). While this anadromous fish can be found throughout the Hudson River system, individuals are only expected to use the portion of the Hudson River within the project study area while migrating to or from their preferred spawning, nursery and overwintering area upriver. While not federally or state-listed, NMFS has expressed concern over the health of the Atlantic sturgeon (Acipenser brevirostrum) fishery (Rusanowsky 2001). The Atlantic sturgeon is the largest sturgeon found in New York, occasionally weighing over 200 pounds and measuring 6 to 8 feet long (Stegemann 1999). This anadromous species occurs within the New York Harbor Estuary (Woodhead 1990), and the Hudson River Estuary. In the Hudson River, Atlantic sturgeon are found in the deeper portions and do not occur further upstream than Hudson, New York. Atlantic sturgeon migrate from the ocean upriver to spawn above the salt front from April to early July (Smith 1985, Stegemann 1999). Female sturgeon move out of the river following spawning but the males may remain in the river until October or November. Additional information regarding these species can be found in Appendix 6.

<u>Essential Fish Habitat (EFH)</u>. Appendix 6 of this EIS presents the Essential Fish Habitat (EFH) assessment. NMFS has identified EFH for the following species within the project study area: red hake (*Urophycis tenuis*), winter flounder (*Pleuronectes americanus*), windowpane flounder (*Scopthalmus aqosus*), Atlantic sea herring (*Clupea harengus*), bluefish (*Pomatomus saltatrix*), butterfish (*Peprilus triacanthus*), Atlantic mackerel (*Scomber scombrus*), summer flounder (*Paralichthys dentatus*), scup (*Stenotomus chrysops*), black sea bass (*Centropristus striata*), spiny dogfish (*Squalus acanthias*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculates*), sandbar shark (*Charcharinus plumbeus*), sand tiger shark (*Odontaspis taurus*), and dusky shark (*Charcharinus obscurus*).

Marine Turtles

Four species of marine turtles, all state and federally listed, are found in the waters surrounding New York City: loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and Atlantic (Kemps) ridley (*Lepidochelys kempii*) (see Table 13-2). Juvenile Kemps ridley and large loggerhead regularly enter the New York Harbor and bays in the summer and fall. The other two species may enter the higher salinity areas of the Harbor. Other turtles include the northern diamondback terrapin (*Malaclemys t. terrapin*), an estuarine species that feeds and nests in salt marshes and adjacent upland and has been observed in the wetlands of Staten Island on the Arthur Kill (USFWS 1997).

Juvenile Atlantic ridley and large loggerhead turtles regularly enter the New York Harbor and bays in the summer and fall. The other two turtle species may enter the higher salinity areas of the New York Harbor Estuary (USFWS 1997). In general, however, these four turtle species mostly inhabit Long Island Sound and Peconic and Southern Bays. They neither nest in the New York Harbor Estuary, nor reside there year-round—arriving in June and July and leaving in October when colder temperatures force them to migrate south. With the exception of the leatherback, all individual turtles in New York waters are juveniles or subadults (Morreale and Standora 1995). Turtles that occur past November often become victims of cold stunning (Meyland and Sadove 1986, Standora et al. 1989, Burke et al. 1990, and Morreale et al. 1992). Additionally, turtles leaving Long Island Sound for the winter usually do so by heading east to the Atlantic Ocean before turning south (Standora et al. 1990) and are unlikely to travel west into the East River and then south through the New York Harbor on their southward migration.

MARINE MAMMALS

The harbor seal (*Phoca vitulina*), although not abundant in the area, is the most common marine mammal observed in the New York Harbor. Harbor seals winter in the Harbor, and haul out onto islands in Jamaica Bay, Staten Island, and the shoreline of Long Island Sound. Grey seals (*Halichoerus grypus*) are less common but are also observed in these same areas. Occasionally individual whales, dolphins, and porpoises occur in the Harbor (USFWS 1997).

Six species of whale, all listed as federal and state endangered species, can be found in New York waters: blue whale, finback whale, humpback whale, right whale, sei whale and sperm whale (see Table 13-2). These are oceanic species and are not expected to occur in the New York Harbor Estuary except for transient individuals.

FLOODPLAINS

Portions of the project study areas are within the FEMA mapped 100-year floodplain. As shown in Figures 13-3 through 13-10, portions of the following study areas are located within the 100-year floodplain:

- Greenville Yard
- Chemical Coast Line
- Arthur Kill Lift Bridge and Northwestern Staten Island Study Area
- Northern Staten Island Study Area—Segment 2

Table 13-2
List of Rare, Threatened, or Endangered Species Recorded Within 1/2 Mile of the Project Alternatives Identified in Correspondence from NYNHP, NJNHP, USFWS, and NMFS

Common Name	Scientific Name	State Status[(1)]	Federal Status[(2)]
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered (NY/NJ)	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered (NY/NJ)	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened (NY) Endangered (NJ)	Threatened
Atlantic (Kemp's) ridley sea turtle	*Lepidochelys kempii*	Endangered (NY/NJ)	Endangered
Green sea turtle	*Chelonia mydas*	Threatened (NY/NJ)	Threatened
Blue whale	*Balaenoptera musculus*	Endangered (NY/NJ)	Endangered
Finback whale	*Balaenoptera novaeangliae*	Endangered (NY/NJ)	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered (NY/NJ)	Endangered
Right whale	*Eubalaena glacialis*	Endangered (NY/NJ)	Endangered
Sei whale	*Balaenoptera borelis*	Endangered (NY/NJ)	Endangered
Sperm whale	*Physeter catodon*	Endangered (NY/NJ)	Endangered

Notes:
(1) State Status:
New York
Endangered—any species meeting one of the following (1) any native species in imminent danger of extirpation or extinction in New York; (2) any species listed as endangered by the U.S. Department of the Interior, as enumerated in the Code of Federal Regulations (CFR) 50 CFR 17.11.
Threatened—any species meeting one of the following (1) any native species likely to become an endangered species within the foreseeable future in New York; (2) any species listed as threatened by the U.S. Department of the Interior, 50 CFR 17.11.
Special concern—those species not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York. These species receive no additional legal protection under Environmental Conservation Law (ECL) section 11-0535.
Protected—wildgame, protected wild birds, and endangered species of wildlife.
Unprotected—species may be taken at any time without limit; but license may be required.
Game—any variety of big game or small game species as stated in the ECL, may have an open season for at least part of the year, and are protected at other times.
New Jersey
Endangered—any species whose prospects for survival within the state are in immediate danger due to one or many factors- a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
(2) Federal Status:
NS—No status.
LE-LT—The taxon is formally listed as endangered in part of its range and threatened in other parts.
PS—Partial status: the species is listed in parts of its range and not in others, or one or more subspecies or varieties is listed, while others are not listed.
Source: Ketcham (2001), Lord (2001), Rusanowsky (2002), Staples (2001), Stilwell (2001).

- Northern Staten Island Study Area—Segment 3
- Northern Staten Island Study Area—Segment 4
- Bay Ridge Branch Study Area—Segment 1
- West Maspeth Yard

The potential impacts of the project on the floodplain are discussed below in Section C.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

A determination of significance is based on a comparison to water quality guidelines presented above in Section A.

NO ACTION ALTERNATIVE

There are several proposed and ongoing projects aimed at improving water quality and aquatic resources in the project study area. In addition, as discussed above under *Sediment Quality*, the trend of improvement in regional sediment quality is expected to continue. The projects that are discussed below are in-water projects. Upland construction activities under the No Action Alternative with the potential to affect water quality and aquatic resources are discussed in Chapter 14, "Wetlands and Terrestrial Resources."

NY/NJ HEP PROJECTS

All of the waterbodies in the project study area are located within the region encompassed by the New York/New Jersey Harbor Estuary Program (NY/NJ HEP). This program was authorized by USEPA as part of the National Estuary Program. Participants in the program include federal, state and local interests, both public and private. These participants conduct work for the NY/NJ HEP on a Harbor-wide basis. For example, NYSDEC sediment sampling of the Harbor included samples from New Jersey waters. The program is a multiyear effort to develop a plan to protect, conserve, and restore the estuary (NYSDEC 2000, NY/NJ HEP 2001a). NY/NJ HEP (1996) established goals in a Comprehensive Conservation Management Plan (CCMP).

Several of the future water quality improvement efforts in the project study area will be coordinated by the NY/NJ HEP. As discussed under existing conditions, the Final CCMP (NY/NJ HEP 1996) for the NY/NJ HEP included a number of goals to improve water quality and aquatic resources in the project study area. To meet these goals, the CCMP outlines objectives for the management of toxic contamination, dredged material, pathogenic contamination, floatable debris, nutrients and organic enrichment, and rainfall-induced discharges. Most of these objectives aim to increase knowledge of the nature and extent of various forms of pollution (e.g., toxic chemicals, sewage overflows, and floatables), reduce inputs of these pollutants, and increase the habitat and human use potential of the Harbor area.

STATE AND REGIONAL PROJECTS

NYSDEC and NJDEP, in coordination with the IEC, will continue to develop total maximum daily loads (TMDLs) and to identify priority waterbodies in biannual 305(b) reports to USEPA. TMDLs, once implemented, will reduce the daily inputs of various contaminants in an effort to improve water quality. The Harbor and the Lower Hudson River, which feeds into the Harbor, were listed as a New York Class I waterbody. Class I watersheds do not meet, or face imminent threat of not meeting, clean water and other natural resources goals, and they are the waterbodies most in need of restoration in the State of New York (NYSDEC 1998). New York State provided $255 million to implement wastewater improvements, nonpoint source abatement and aquatic habitat restoration projects in 1998, and these priority waterbodies will be targeted for water quality remediation efforts by NYSDEC. The State intends to continue water quality improvement projects in the Harbor for the foreseeable future.

NEW YORK CITY PROJECTS

USEPA's National CSO Strategy of 1989 requires states to eliminate dry weather overflows of sewers, meet federal and state water quality standards for wastewater discharges, and minimize impacts on water quality, plant and animal life, and human health. In accordance with this strategy, New York City currently is developing plans for large CSOs to store storm flows that exceed capacity and send them to nearby wastewater treatment plants for treatment. For the smaller CSOs, it is anticipated that developing technologies will make floatables removal possible at most locations, with disinfection added for discharges affecting bathing or shellfishing waters (NY/NJ HEP undated). This should result in some future improvement in coliform, DO, and floatables levels in the Harbor Area. The City of New York also recently completed improvements to its wastewater treatment plants, which should lead to further decreases in coliform counts and floatables levels.

USACOE NAVIGATION PROJECTS

The New York District, USACOE, in conjunction with PANYNJ and other local governments, has several navigation projects planned in the Harbor Area (USACOE 2001) that have the potential to affect water quality through the removal of existing sediment and deposition of sediment during the dredging process (see Table 13-3).

Table 13-3
Existing and Proposed Channel Depths – Harbor Navigation Study

Channel	Existing Depth	Proposed Depth	Year to be Completed	Proposed Depth 50-Foot Deepening Project*	Construction Duration
Ambrose	45	-	-	53	2005 – 2008
Anchorage	45	-	-	50	2006 – 2013
Kill Van Kull	40	45	2004	50	2005 – 2009
Newark Bay	40	45	2004	50	2006 – 2014
Arthur Kill (to Howland Hook)	35	40/41	2005	50	2005 – 2017
Port Jersey	35/38	41	2004	50	2006 – 2011
Bay Ridge	40	-	-	50	2008 – 2012

Note: *The 50-Foot Deepening Project will be completed either in 2017, or, if a compressed schedule is approved, in 2009.
Source: USACOE, NY & NJ Harbor Navigation Study, December 1999, Shea 2002

In the 1999 Final EIS for the New York and New Jersey Harbor Navigation Study, USACOE concluded that the primary adverse environmental impact of the navigation improvements contained in the recommended plan would be the loss of shallow water habitat (6.27 acres of shallow subtidal and 42.52 acres of deeper subtidal habitat) which would be mitigated through shoreline protection measures and the protection and restoration of wetlands within the Harbor Estuary. Benthic fish and invertebrates in the immediate area of channel deepening activities will be impacted. Fish and invertebrates that cannot move out of the construction area may be lost. However, the USACOE (1999c) concluded that the loss of some individuals is expected to be temporary because of the tendency for benthic organisms to rapidly repopulate a disturbed

area. Because of habitat changes from shallower to deeper habitats, permanent changes in fish and benthic invertebrate community composition may occur (USACOE 1999c).

GENERAL ELECTRIC PCB REMOVAL

Upstream from the Harbor, USEPA has ordered General Electric to remove sediments from a 40-mile stretch of the upper Hudson River from Fort Edward downstream to the Federal Dam at Troy. The sediments were contaminated with PCBs from the GE plants in Hudson Falls and Fort Edward between 1947 and 1977. The proposed sediment removals are currently scheduled to take place in the next five to ten years and may have the potential to affect sediment quality in the Harbor as sediments are resuspended in the water column during the dredging process.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

There are two sites located near waterbodies that would have the potential to be affected by the TSM Alternative: Greenville Yard and 65th Street Yard.

GREENVILLE YARD

Two of the existing Greenville float bridges would be rehabilitated similar to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new trackwork. The rehabilitation of the float bridges at Greenville Yard may result in temporary increases in turbidity if these activities result in bottom disturbance. Should the rehabilitation of the existing float bridges be extensive, in-water work may consist of pile driving, removal of the dilapidated piers, and possible dredging. The construction would also potentially include filling and bulkheading work along the shoreline adjacent to the bridges. Because the area of disturbance would be small (confined to the area around the lift bridges), and would be of short duration, suspended sediment conditions would be expected to return to ambient concentrations shortly after bottom disturbing activities have been completed. Increases in concentrations of contaminants contained in the sediments are also projected to be minimal and would not be expected to exceed water quality criteria. Therefore, no potential significant impacts on water quality are expected. (For more information see “Tunnel Alternative” below. The potential impacts to water quality and aquatic resources would be far less extensive than those described in that section for the immersed tube portion of the New Jersey tunnel alignment and are not expected to be significant for the same reasons as described for that alternative.)

The temporary increases in suspended sediment, and noise associated with in-water construction activities could result in temporary impacts to fish and benthic macroinvertebrates. Fish are mobile and would avoid any areas of increases suspended sediment and noise. Fish that normally inhabit environments where suspended sediment levels are relatively high and variable, such as the New York/New Jersey Harbor Estuary, would be expected to be less vulnerable to temporary increases than species associated with waters of low suspended matter concentrations. Estuarine and coastal species have behavioral and physiological mechanisms for dealing with variable concentrations of suspended sediment. Due to avoidance behavior, fish would likely only be exposed to suspended sediment plumes from dredging for a duration of minutes to hours (Clarke and Wilber 2000), not days. Fish also have the ability to expel materials that may clog their gills when they return to cleaner, less sediment-laden waters. The area of impact is small and there is sufficient suitable habitat for fish to move to within the vicinity of the float bridges. There would not be a substantial increase in shading of aquatic habitat as a result of this alternative since the float bridges are being rehabilitated and already shade some aquatic habitat. Potential dredging

may result in the conversion of shallow habitat to deeper habitat. However, because the area to be dredged would be small (less than 5,000 cubic yards), the potential effects of this habitat conversion would not be significant.

The rehabilitation of the float bridges has the potential to adversely affect some individual benthic invertebrates through dredging, the removal of in-water structures that are being used as substrate, and possible removal or disturbance of sediment during rehabilitation activities. Additionally, the possible dredging activities would result in the loss of some macroinvertebrates that cannot move away from the area of activity. The benthic community can be expected to become re-established in the bottom areas affected in a relatively short period of time. In general, the benthic communities found in the fine mobile sediments of estuaries consist of large numbers of a few species that are well adapted to rapid recolonization of sediments that are frequently disturbed. Typical rates of recovery (production of a benthic community similar in composition, density and biomass to what was there prior to disturbance) of the benthic community range from 6 to 8 months for silts or muds, and two to three years for sands and gravels (Newell et al. 1998). Invertebrates attached to hard substrates such as pilings removed through rehabilitation activities may take longer to recover than those associated with the soft substrates. Estuarine macroinvertebrates are adapted to tolerating periods of higher suspended sediment concentrations. No significant impacts would be expected since there would be no significant impacts on water quality and activities would be of short duration and minimal extent. Zooplankton and phytoplankton are also not expected to be impacted since there would be no substantial increase in shading and water quality impacts are expected to be of short duration and minimal extent.

The rehabilitation of the float bridges and portions of the new track work at Greenville Yard would occur within the 100-year floodplain, as shown on Figure 13-3. No new structures would be constructed within the floodplain. As discussed above, this area is subjected to coastal flooding, not riverine flooding, and tracks and ballast would not cause additional flooding because the improvements would not block water from flowing around the area. Therefore, the track work and rehabilitation of existing float bridges (a water-dependent use) would not reduce the ability of the floodplain to store water nor increase flooding risks. The proposed activities would not meet the FHWA's definition of a significant encroachment. Since the proposed activities would not reduce the floodplain value or support incompatible development, this alternative would not have adverse impacts on the base floodplain with respect to the FRA guidance. Best engineering practices would be used to minimize harm in the floodplain.

Greenville Yard is not located within the delineated floodplains regulated by the NJDEP's Stream Encroachment Program. However, the Waterfront Development Act may apply and a Waterfront Development Permit may be required. If this alternative is selected, a pre-application meeting with NJDEP would be required.

65TH STREET YARD

At 65th Street Yard, construction activity would be primarily trackwork. However, the construction and operation of the yard would have the potential to affect water quality in Upper Harbor. These potential changes in water quality have to the potential to impact aquatic invertebrates and fish near the point where surface runoff enters the water. However, the implementation of erosion and sediment control measures, and stormwater management measures during construction and operation in compliance with the SPDES General Stormwater Permit would greatly reduce the possibility of water quality and aquatic resources impacts. As

required for construction activities that disturb five acres or more, a stormwater pollution prevention plan (SWPPP) will be prepared in accordance with established engineering practices. Implementation of best management practices for erosion and sediment control and other measures of the SWPPP would minimize potential water quality and aquatic resources effects associated with the discharge of stormwater during construction and operational activities.

Portions of the construction activity at 65th Street Yard would occur within the 100-year floodplain. As discussed above, this area is subjected to coastal flooding, not riverine flooding, and tracks and ballast would not cause additional flooding because the improvements would not block water from flowing around the area. Since the work would consist primarily of rail track installation, the base floodplain would not be adversely affected and the ability of the floodplain to store water would not be reduced. The proposed activities would not constitute a significant encroachment. In accordance with the NYSDEC and New York City regulations, all construction elements would be designed to minimize or eliminate damage from flooding.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

There are three sites located near waterbodies that would have the potential to be affected by the Expanded Float Operations Alternative: Greenville Yard, 65th Street Yard and West Maspeth Yard.

GREENVILLE YARD

Four Greenville float bridges would be rehabilitated in a similar fashion to those recently constructed at 65th Street Yard. Rehabilitation at the yard would also include new trackwork. In addition, 16 barge trips would arrive and depart from the site each day, up from one roundtrip per day under the No Action Alternative. Potential impacts from the construction of the float bridges would be similar to those described above under the TSM Alternative, but for a slightly greater areal extent. Operation of the additional barges at Greenville Yard has the potential to increase suspended sediment but it is unlikely to be greater than that projected from dredging. The operation of the float bridges will meet state and federal requirements to minimize the potential for fuel spills, including the preparation of a spill response plan.

The rehabilitation of the float bridges and portions of the new track work at Greenville Yard would occur within the 100-year floodplain, as shown on Figure 13-3. No new residential or non-residential structures would be constructed within the floodplain. As discussed above, this area is subjected to coastal flooding, not riverine flooding, and tracks and ballast would not cause additional flooding because the improvements would not block water from flowing around the area. The track work and rehabilitation of existing float bridges (a water-dependent use) would not reduce the ability of the floodplain to store water nor increase flooding risks. The proposed activities would not meet the FHWA's definition of a significant encroachment. Since the proposed activities would not reduce the floodplain value or support incompatible development, this alternative would not have adverse impacts on the base floodplain with respect to the FRA guidance. Best engineering practices would be used to minimize harm in the floodplain.

Greenville Yard is not located within the delineated floodplains regulated by the NJDEP's Stream Encroachment Program, however, the Waterfront Development Act may apply and a Waterfront Development Permit may be required. If this alternative is selected, a pre-application meeting with NJDEP would be required. Therefore, potential water quality and aquatic resources impacts would not be significant.

65TH STREET YARD

Two additional float bridges would be constructed at 65th Street Yard similar to the two recently constructed. Rehabilitation at the yard would also include new trackwork. The construction of the two new float bridges at 65th Street Yard would include pile driving within the footprint of the two bridges (area of approximately 5,800 square feet (0.1 acres)), removal of dilapidated piers on the harbor side of the float bridge locations, and potential dredging of an access channel to the float bridges. The construction would potentially include filling and bulkheading work along the shoreline adjacent to the bridges. In addition, 16 barge trips would arrive and depart from the site each day, up from one roundtrip per day under the No Action Alternative. Potential impacts from the construction and operation of the float bridges would be similar to those described above under Greenville Yard. No impacts are expected even if construction was concurrent with USACOE dredging in Bay Ridge Channel, approximately 2,000 feet away, since the results of the DREDGE modeling suggest that TSS produced by dredging would drop off significantly after 656 feet.

Portions of the construction activity at 65th Street Yard would occur within the 100-year floodplain. As discussed above, this area is subjected to coastal flooding, not riverine flooding, and tracks and ballast would not cause additional flooding because the improvements would not block water from flowing around the area. The two new float bridges and rail track installation would not affect the ability of the floodplain to store water. With respect to FRA and FHWA regulations, the proposed activities would not adversely affect the base floodplain nor constitute a significant encroachment. In accordance with the NYSDEC and New York City regulations, all construction elements would be designed to minimize or eliminate damage from flooding. Therefore, potential water quality and aquatic resources impacts would not be significant.

On-land construction activities and potential impacts would be the same as those discussed in the previous section for the TSM Alternative and are not expected to be significant.

WEST MASPETH YARD

Expansion of the existing rail yard in West Maspeth, Queens would include the construction of new tracks, internal roadways, and paved areas. No construction activities (e.g., filling, bulkheading, rearmoring riprap) are proposed for the shorelines of Maspeth Creek and/or Newtown Creek under this alternative. Minimal excavation and clearing of vegetation would be necessary for work at this project sites.

Similar to the rail yards discussed above, the implementation of erosion and sediment control measures, and stormwater management measures during construction and operation in compliance with the SPDES General Stormwater Permit for Construction Activity would greatly reduce the possibility of water quality and aquatic resources impacts.

The expansion of West Maspeth Yard for the Expanded Float Operations Alternative may include activities within the 100-year floodplain. As discussed above, this area is subjected to coastal flooding, not riverine flooding, and tracks and ballast would not cause additional flooding because the improvements would not block water from flowing around the area. The additional rail tracks would not diminish the ability of the floodplain to retain water. While the site has not yet been designed, the expansion would include the currently vacant Phelps Dodge property, which is undergoing remediation and will be capped and contained as part of NYSDEC's preferred remediation alternative. No buildings would be constructed as part of this

alternative. In accordance with NYSDEC and New York City regulations, the yard would be designed to minimize or eliminate damage from flooding.

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

The Single Tunnel System has the potential to affect water quality and aquatic resources through in-water construction activities, upland construction, and operational activities. In-water construction includes dredging and associated activities for the construction of the immersed tube portion of the New Jersey tunnel alignment. For the Staten Island alignment, this would include the ventilation shaft construction (at Pier 2 in Staten Island and 69th Street pier in Brooklyn), and construction of a second span of the Arthur Kill Lift Bridge. Upland activities include tunnel construction (cut and cover and open cut portions), yard construction and operation, and increasing clearances and other trackwork along rail lines.

In-Water Construction: Dredging And Associated Activities

Dredging has the potential to: increase suspended sediments within the water column for some distance up- and downstream; result in the resuspension and then movement of pollutants attached to sediments and deposition of these contaminated sediments elsewhere; release nutrients; and decrease dissolved oxygen and light penetration within the area of increased suspended sediment (Pennekamp et al. 1996). The following sections provide a list of potentially affected project sites, water quality effects of dredging based on information found in literature and the results of empirical studies, the results of the USACOE DREDGE model, and finally an assessment of potential impacts to water quality from the Tunnel Alternative.

Affected Project Sites. This section evaluates dredging and associated activities for the construction of the immersed tube portion of the New Jersey tunnel alignment and ventilation and construction shaft construction for the Staten Island tunnel alignment (at Pier 2 in Staten Island and 69th Street pier in Brooklyn). These activities are described below:

- *Immersed tube tunnel and vent shaft at Greenville Yard.* The immersed tube would extend in a southeastern direction from the shoreline across Port Jersey for approximately 4,200 feet (0.8 miles) to the vent structure near the corner of the Global Marine Terminal/NEAT pier. The vent structure (230-foot by 150-foot footprint and total height of 80 feet) would be constructed within a cofferdam that would join the bored portion of the tunnel from Brooklyn with the immersed tube portion of the tunnel from Greenville Yard. The construction of the immersed tube portion of the tunnel, as described in Chapter 16, "Construction and Construction Impacts" would require dredging of a trench approximately 300 feet wide at the top, underwater construction, and construction of temporary pilings. Underwater construction would include placement of granular subgrade material within the trench, placement and connection of immersed tube sections, placement of a granular fill (coarse sand to fine gravel) in the trench halfway up the element, then placement of other clean fill material on top of the tunnel sections using a clamshell that is capable of supporting three to four feet of rock that would be placed on top with a clamshell. The dredging would begin two to three months before the first units are brought to the site. The dredging and underwater construction would be conducted over a 76-week period (24 hours a day) with possible breaks in underwater construction activities that would occur over the

winter (from February through the end of May). The vent shaft would be constructed at the completion of the immersed tube.

- *The ventilation shafts for the Staten Island tunnel alignment.* These shafts would be constructed in the Harbor near the seaward ends of Pier 2 in Staten Island and 69th Street pier in Brooklyn. The ventilation shafts' footprints would be approximately 230 by 150 feet (0.8 acre), and they would rise 50 to 60 feet above low to mean tide. During construction of the vent shafts, the bases would serve as a cofferdam to contain the construction area and minimize disturbance to in-water habitat.

Types of Dredge Equipment. Mechanical dredges are a bucket or clamshell operated from a crane or derrick that is mounted on a barge. The material pulled up by the dredge is typically placed on barges or scows and transported to the disposal area. Mechanical dredges are used for removing small volumes of material, where hydraulic dredges cannot work because of the proximity of piers, docks or other structures or where the disposal area is too far from the dredge site.

While conventional clamshell dredges have an open top, the enclosed clamshell is enclosed on the top and sides by welded steel plates and vents on the sides to allow water to escape while the bucket is being dropped and when it is being pulled up. NJDEP requires the use of a closed, watertight clamshell dredge when sediments to be dredged are contaminated at levels warranting concern because it reduces the production of suspended solids at the dredging site. The NJDEP also requires the use of a closed clamshell whenever a "no barge overflow" permit condition is in effect. The "no barge overflow" permit condition is in effect for all projects in the Upper Harbor and would therefore likely be required for the immersed tube tunnel construction off Greenville Yard.

Studies on Water Quality Effects of Dredging.

Suspended Sediment. Dredging usually causes some resuspension of sediment. The increase in suspended sediments is usually restricted to the area immediately around the dredge and decreases rapidly with increasing distance from the dredge as the material settles back to the bottom or is dispersed in the current (Barnard 1978). The effects of suspended sediment due to dredging are generally short term, less than a week after the dredging activity (ABP Research 1999). The amount of material suspended in the water column during a dredging operation is a function of several factors such as the type of substrate, characteristics of the waterbody where dredging is occurring (water depth, current, wave action, salinity and density stratification), type of dredge, and operation of the dredge (Nightingale and Simenstad 2001, Pennekamp et al. 1996). Larger plumes of suspended sediment typically occur at the bottom closer to the dredge and the plume size decreases exponentially moving away from the dredge in both vertical and horizontal directions (Nightingale and Simenstad 2001).

In a study of the effect of dredging on turbidity, Pennekamp et al. (1996) observed that turbidity rarely increased by more than 500 mg/L, and the collapse of the turbidity plume after dredging stopped rarely took more than 1.5 hours. In general, hydraulic dredges (cutterhead, dustpan and hopper dredge) generate less suspended sediment than mechanical dredges, such as bucket dredges, and the spatial extent of the suspended sediment plume is smaller both horizontally and vertically (Havis 1988a, Hayes 1986, La Salle 1990 in Nightingale and Simenstad 2001, LaSalle et al. 1991).

Increases in suspended sediment during dredging with a bucket dredge can be attributed to:

- Sediment resuspended by the impact and withdrawal of the bucket from the bottom, this is typically the greatest source of turbidity for a bucket dredge;
- Bottom sediment washing from the top and sides of the bucket as it is pulled up through the water column;
- Sediment spilling from the bucket as it breaks through the water (conventional bucket only);
- Spilling of sediment as it is loaded on to the barge, or overloading of the barge to increase the barge's effective load (Barnard 1978, Hayes 1986, Havis 1988a, LaSalle 1990 in Nightingale and Simenstad 2001, LaSalle et al. 1991, Pennekamp and Quaak 1990).

While the amount of suspended sediment due to bucket dredge operations varies with operating conditions, sediment type and hydrodynamic conditions, typical plumes from bucket dredges extend 300 meters at the surface and 500 meters at the bottom (Barnard 1978, LaSalle 1990 in Nightingale and Simenstad 2001, LaSalle et al. 1991). Maximum suspended sediment levels within the plume are typically less than 500 mg/L within 100 meters of the dredging activity (Barnard 1978, LaSalle 1990 in Nightingale and Simenstad 2001, LaSalle et al. 1991), and decrease rapidly with distance from the dredging operation due to settling and dilution. Average water column concentrations should be less than 100 mg/L. The visible near-surface plume dissipates within an hour or two after dredging stops (Barnard 1978, LaSalle et al. 1991). For additional information on studies of suspended sediment concentrations observed during bucket dredging operations, see Appendix 6.

Enclosed clamshells have been found to reduce the amount of sediment suspended in the water column between 30 and 75 percent because less material leaks from the bucket (Barnard 1978, Hayes 1986, USACOE 2001). However, studies have also shown that enclosed clamshells increased near-bottom concentrations as much as 50 to 70 percent due to the resuspension of sediment caused by the shock wave of water that precedes the bucket (LaSalle et al. 1991). Hayes (1986) reported suspended sediment concentrations observed during Improvement of Operations and Maintenance Techniques (IOMT) field studies of open bucket clamshell and an enclosed bucket clamshell dredges as shown in Table 13-4.

Table 13-4
Suspended Sediment
Concentrations For Open Bucket And Enclosed Bucket Dredges

Dredge Type	Suspended Sediment Concentration Adjusted for Background Concentration (mg/L)		
	Within 100 feet downstream of dredge	Within 200 feet downstream of dredge	Within 400 feet downstream of dredge
Open Bucket Clamshell Dredge	150-900	100-600	75-350
Enclosed Bucket Dredge	50-300	40-210	25-100

Increases in suspended sediment during dredging with an hydraulic cutterhead dredge can be attributed to the rotation of the cutterhead in the sediment, the amount of sediment disturbed but not picked up, and in low current conditions by the amount of sediment that remains in suspension from the previous cut (Barnard 1978, LaSalle 1990 in Nightingale and Simenstad 2001, LaSalle et al. 1991). The amount of sediment suspended in the water column during the

operation of a cutterhead dredge increases exponentially as the thickness of the cut, rate of swing of the cutterhead, and cutter rotation rate increase (Barnard 1978, LaSalle et al. 1991). Suspended sediment produced by hydraulic cutterhead dredges is typically restricted to the immediate vicinity of the cutterhead (maximum levels within the 3 meters above the cutterhead) and there is little suspension in the water column (Havis 1988a, LaSalle 1990 in Nightingale and Simenstad 2001, LaSalle et al. 1991). However, current speeds above two feet per second (0.6 m/sec) associated with ebb and flood tides can propel suspended sediment higher into the water column (LaSalle et al. 1991). For additional information on studies of suspended sediment concentrations observed during cutterhead dredging operations, see Appendix 6.

Dissolved Oxygen. Although resuspension of typically anoxic sediment has the potential to reduce dissolved oxygen levels in surrounding waters, in general, significant reduction of dissolved oxygen in the water column has not been observed dredging operations (Nightingale and Simenstad 2001). In estuaries and coastal areas, any removal of oxygen from surrounding water caused by the resuspension of anoxic sediment would be localized and would be quickly replenished by tidal exchange such that it would have little effect on aquatic organisms (Bray et al. 1997 in ABP Research 1999) and would not cause the surface waters to fail to meet dissolved oxygen standards. Lunz et al. (1988) recorded less than a 0.2 mg/L reduction of dissolved oxygen during a dredging operation on the Hudson River, and Lunz and LaSalle (1986) reported DO reductions to be no more than 0.1 mg/L even when suspended sediment loads from dredging were as high as 500 mg/L. Other studies have also reported similarly small or no measurable decrease in dissolved oxygen around dredging operations (Slotta et al. 1973 in LaSalle et al. 1991, Markey and Putnam 1976 in LaSalle 1991, Sustar et al. 1976 in LaSalle 1991). However, some investigators have reported decreases in dissolved oxygen during dredging. Brown and Clark (1968 in LaSalle et al. 1991) reported a 16 to 83 percent decrease in dissolved oxygen in the middle and upper water column and nearly 100 percent near-bottom during dredging of a highly industrialized channel in New York using a bucket dredge. Cutterhead dredging in Grays Harbor, Washington (Smith et al. 1976 in LaSalle et al. 1991) caused reductions in bottom water dissolved oxygen by as much as 2.9 mg/L (approximately 35 percent of ambient). These observations of decreased dissolved oxygen may have occurred in areas with restricted tidal exchange.

Sediment Contaminants. In addition to increases in suspended sediment, the liberation of contaminated sediments during dredging is also a concern, particularly with the contaminated sediments of the Harbor. As discussed previously, many of the sediment contaminants such as PCBs, chlorinated pesticides, and dioxin are tightly bound to sediment (especially to the clay fraction and the organic matter) and are not very soluble in water under oxygenated conditions (Burks and Engler 1978, Pennekamp and Quaak 1990). Under equilibrium conditions, concentrations of these contaminants in sediment are generally a thousand times greater than in the water (Pennekam and Quaak 1990; Fulk et al. 1975 in Pennekamp and Quaak 1990). These contaminants have a tendency to remain strongly adsorbed to sediments even after the sediments are resuspended during dredging activities (Havis 1988a).

Heavy metals found within the Upper Harbor sediments (such as cadmium, copper, chromium, lead and zinc) become more soluble when the anoxic sediments (oxygen free) are mixed with oxygenated surface water (Burks and Engler 1978). Therefore, some of the metals found within the Harbor have the potential to go into solution within the water column. However, reduced iron in sediments, once oxidized during resuspension of sediment material, actively scavenges metals and other compounds that may have been released, causing them to settle to the bottom where they are again reduced under anoxic conditions (LaSalle et al. 1991). Nutrients in the

sediment may also increase in the water column due to resuspension of sediment during dredging but the amount released varies. However, the amount of time nutrients and dissolved metals remain elevated over background concentrations is usually short (a matter of minutes) and there are no well-defined plumes of dissolved metals or nutrients at levels significantly greater than background concentrations (Barnard 1978). For additional information on studies of metals concentrations observed during dredging operations, see Appendix 6.

DREDGE Modeling. The USACOE DREDGE model was used as part of the assessment of the potential water quality impacts associated with dredging activities. The model estimates the mass rate at which bottom sediments become suspended into the water column as result of hydraulic (cutterhead) and mechanical (clamshell or bucket) dredges, and the resulting suspended sediment concentrations, contaminant concentrations within the water column, and deposition of sediment. This information is combined with site information to simulate the size and extent of the suspended sediment plume, and estimate particulate and dissolved contaminant concentrations in the water column. Sediment data were obtained from the USACOE (Santangelo 2002) and from sampling conducted as part of the project. Appendix 6 presents a detailed description of the model, the input data and the data sources.

Only the metals known to occur in the sediments based upon the sediment sampling conducted for this project and described earlier in this chapter were selected for modeling because they have the potential to dissolve within the water column. The metals modeled include: arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc. Contaminants that are tightly bound to sediment such as PCB, chlorinated pesticides, and dioxin were not modeled because there is little tendency for these contaminants to dissolve within the water column as a result of resuspension of sediments during dredging.

The model does not provide for the estimation of closed, watertight clamshell dredges. However, to represent the potential effect from these dredges, the projected suspended sediment concentrations for the open clamshell were reduced by 76 percent on the basis of studies conducted by the USACOE.

The DREDGE model was used to project water column and sediment deposition effects for sediment types found in Port Jersey off Greenville Yard and along the Brooklyn shoreline near the 69th Street pier (potential ventilation shaft location) and float bridges at 65th Street Yard (see “Expanded Float Operations Alternative” above). A 76-week period was modeled; however, the dredging required for the Brooklyn shoreline (ventilation shaft and float bridge construction) would be of much shorter duration and therefore the analysis is conservative.

The DREDGE model calculates steady state concentrations of suspended sediment and contaminants over one tidal cycle as a depth-averaged concentration in the water column at 100 meter increments upstream and downstream from the dredge, and at 50 meter (164 feet) increments laterally from the dredge during flood and ebb tide. Tables 13-5 and 13-6 present the results of the modeling within 100 feet of the dredge location for the immersed tube where the suspended sediments would be greatest and the concentration of dissolved metals would be expected to be highest; the modeling results show decreasing concentrations upstream and downstream and across the waterbody from this point. Tables 13-7 and 13-8 present these results for the area off the Brooklyn shoreline.

Table 13-5
Projected Increases in TSS and Metal Concentrations Within 100 Meters of Open Clamshell Dredge Off Greenville Yard During Ebb and Flood Tides

Contaminant	NY Water Quality Standard or Guidance Value/New Jersey Standard	Concentration from Dredging (does not include background)	
		Ebb[3]	Flood[4]
Cadmium (µg/L)	2.7/–[6]	0.0000198	0.0000466
Copper (µg/L)	5.6[1]/5.6[1]	0.003	0.007
Lead (µg/L)	8/–[6]	0.028	0.056
Nickel (µg/L)	8.2[1]/3900[1]	0.000502	0.00118
Zinc (µg/L)	40[2]/–[6]	0.00852	0.0197
TSS (mg/L) Open Clamshell/Closed Clamshell	—[5]	0.5090/0.1222	0.786/0.1886

Notes:
1 Aquatic chronic standard
2 Human health, fish consumption standard
3 Mean ebb tide velocity is 0.14 meters per second
4 Mean flood tide velocity is 0.17 meters per second
5 NY–cannot cause substantial visible contrast to natural conditions, NJ–cannot render unsuitable for designated use
6 Toxic substances cannot be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate to concentrations that exert a toxic effect on that organism or render it unfit for consumption.

Table 13-6
Projected Increases in TSS and Metal Concentrations Within 100 Meters of Cutterhead Dredge Off Greenville Yard During Ebb and Flood Tides

Contaminant	NY Water Quality Standard or Guidance Value/New Jersey Standard	Concentration from Dredging (does not include background)	
		Ebb[3]	Flood[4]
Cadmium (µg/L)	2.7/–[6]	0.000000465	0.00000484
Copper (µg/L)	5.6[1]/ 5.6[1]	0.0000707	0.000735
Lead (µg/L)	8/–[6]	0.000932	0.00832
Nickel (µg/L)	8.2[1]/3900[1]	0.0000117	0.000122
Zinc (µg/L)	40[2]/– [6]	0.000206	0.00212
TSS (mg/L)	—[5]	0.0770	0.2490

Notes:
1 Aquatic chronic standard
2 Human health, fish consumption standard
3 Mean ebb tide velocity is 0.14 meters per second
4 Mean flood tide velocity is 0.17 meters per second
5 NY–cannot cause substantial visible contrast to natural conditions, NJ–cannot render unsuitable for designated use.
6 Toxic substances cannot be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate to concentrations that exert a toxic effect on that organism or render it unfit for consumption

Table 13-7
Projected Increases in TSS and Metal Concentrations Within 100 Meters of Open Clamshell Dredge Off 65th Street Yard During Ebb and Flood Tides

Contaminant	NY Water Quality Standard or Guidance Value	Concentration from Dredging (does not include background)	
		Ebb[3]	Flood[4]
Cadmium (µg/L)	2.7	0.000278	0.000255
Copper (µg/L)	5.6[1]	0.0146	0.0134
Lead (µg/L)	8	0.0146	0.0722
Nickel (µg/L)	8.2[1]	0.00204	0.00187
Zinc (µg/L)	40[2]	0.0389	0.0359
TSS (mg/L)	—[5]	1.45	1.38

Notes:
1 Aquatic chronic standard
2 Human health, fish consumption standard
3 Mean ebb tide velocity is 0.31 meters per second
4 Mean flood tide velocity is 0.28 meters per second
5 NY–cannot cause substantial visible contrast to natural conditions

Table 13-8
Projected Increases in TSS and Metal Concentrations Within 100 Meters of Cutterhead Dredge Off 65th Street Yard During Ebb and Flood Tides

Contaminant	NY Water Quality Standard or Guidance Value	Concentration from Dredging (does not include background)	
		Ebb[3]	Flood[4]
Cadmium (µg/L)	2.7	0.00108	0.0005.93
Copper (µg/L)	5.6[1]	0.0556	0.0308
Lead (µg/L)	8	0.196	0.131
Nickel (µg/L)	8.2[1]	0.00807	0.0044
Zinc (µg/L)	40[2]	0.140	0.0801
TSS (mg/L)	—[5]	2.98	2.16

Notes:
1 Aquatic chronic standard
2 Human health, fish consumption standard
3 Mean ebb tide velocity is 0.31 meters per second
4 Mean flood tide velocity is 0.28 meters per second
5 NY–cannot cause substantial visible contrast to natural conditions

Potential Water Quality Impacts. The results of the DREDGE modeling suggest that the increase in suspended sediment concentration would be greater for the clamshell dredge than for the cutterhead dredge. This is consistent with the empirical studies on suspended sediment produced by different types of dredges presented in the previous section. The amount of sediment suspended in the water column would be reduced by using a closed bucket dredge. Even within the 100 meter area around the dredge that would be the zone of highest concentration, the projected increase in suspended sediment concentration is small compared to the range of suspended sediment concentration recorded by the NYCDEP for the Upper Harbor. Results of the NYCDEP Harbor Survey for 2001 (NYCDEP 2001) for sampling locations within the Upper Harbor suggest TSS concentrations from May through December range from 7.4 to 36

mg/L at the bottom and 2.2 to 13 mg/L on the surface. The small projected increase in TSS within 100 meters of the dredge suggests that the TSS within the vicinity of these in-water activities would not be outside the normal range for the Upper Harbor and would not result in significant adverse impacts to water quality on a short-term or long term basis.

The results of empirical studies presented in the previous section suggest that plumes from dredging generally dissipate in any where from several hours to days. Additionally, the results of the modeling also suggest that the increase in turbidity drops off significantly at 200 meters from the dredge to 0.0180 mg/l ebb and 0.0460 mg/l flood tide for the open bucket dredge. Use of an enclosed bucket dredge would reduce the low projected TSS due to dredging still further. The estuarine turbidity maximum within the Hudson River Estuary, the zone of elevated suspended sediment concentrations located near the George Washington Bridge, can have suspended sediment concentrations that exceed 2,000 mg/l near the bottom. The projected increase in suspended sediment resulting from dredging plus the ambient suspended concentration would be much lower than this naturally occurring zone of elevated suspended sediment concentration.

The increase in metal concentration from dredging projected by the modeling are low within 100 meters of the dredge and suggest that no significant adverse impacts to water quality would occur as a result of dredging activities near Greenville Yard. The projected changes in metal concentration are small compared to applicable water quality standards or guidelines. As with suspended sediment, the increase in concentration of metals decreases significantly from 100 meters to 200 meters. As discussed in the previous section, contaminants such as PCB, dioxin, and chlorinated pesticides known to occur in the sediment are tightly bound to the sediment and would not be expected to occur in the water column at concentrations that exceed water quality standards or guidelines.

Other potential effects associated with dredging such as decreased dissolved oxygen, increased nutrients, and other sediment contaminants are not expected to be significant. Because dredging associated with the tunnel alignments would be conducted where tidal exchange is not restricted, decreases in dissolved oxygen during dredging should not be significant and would not be expected to cause dissolved oxygen concentrations to drop below the standard.

Since the increase in suspended sediment resulting from dredging for the immersed tube would be small, the deposition of sediments would also be minimal. Off Greenville Yard, the results of the modeling suggest that over one tidal cycle, no sediment is projected to be deposited beyond 100 meters upstream or downstream of the dredging location using a closed bucket dredge, the type of dredge most likely to be used at this location because of NJDEP requirements. The maximum depth of sediment projected to be deposited within this period is 0.0005 mm (0.00002 inches) within 100 meters of the dredge. Over a 76-week dredging period, the farthest the sediment is projected to be deposited is 300 meters (984 feet) where the maximum deposition would be 0.0021 mm (0.00083 inches). The highest deposition 0.55 mm (0.02 inches) would occur within 100 meters during flood tide. The edge of the Pierhead Channel (see Figure 13-1) is approximately 92 meters (300 feet) from the easternmost location of the proposed immersed tube. The subtidal deep habitat of the Jersey Flats, described above under “Existing Conditions,” is approximately 290 meters (950 feet) away from the easternmost location of the proposed immersed tube, and would therefore receive minimal or no sediment deposition.

Off the Brooklyn shoreline, the results of the modeling suggest that over one tidal cycle, no sediment is projected to be deposited beyond 400 meters downstream or upstream from a closed bucket dredge. The maximum depth of sediment projected to be deposited within the first 100 meters from the dredge is 0.0020 millimeters (mm) (0.000078 inches) during ebb tide and

0.0019 mm (0.000074 inches) during flood tide. At the end of the 76 week period, the farthest the sediment is projected to be deposited is 800 meters (2625 feet or 0.5 miles) at a depth of approximately 0.0014 mm (0.00005 inches). The highest deposition at the end of 76 weeks would occur within 100 meters of the dredging location and is projected to be approximately 2.0 mm (0.08 inches) during ebb and flood tide. The results using an open bucket dredge would be higher; however, the duration of dredging for activities along the Brooklyn shoreline (vent shaft construction and float bridges under the Expanded Float Operations Alternative) would be of considerably shorter duration.

Since dredging associated with the construction of the immersed tube portion of the tunnel would not result in significant adverse impacts to water quality, less intensive bottom disturbing activities associated with the project alternatives such as vent shaft construction, pile driving, or placement of fill around the immersed tube tunnel elements—which would be for substantially shorter durations and of minimal areal extent—are not expected to adversely impact water quality or sediment quality. The fill material placed around and over the immersed tube tunnel elements once installed in the trench will consist of clean material and would not affect water quality. Operational measures would be implemented to minimize the amount of these materials suspended in the water column during placement on or around the immersed tube tunnel.

In addition, as presented under the No Action Alternative, USACOE has received final approval to conduct the channel deepening projects included under the Harbor Navigation Study. These projects are projected to occur during the period from year 2005 to 2017, within the same time frame as construction of the project alternatives. Channel deepening projects that would occur in the vicinity of the Tunnel Alternative include Anchorage Channel, Bay Ridge Channel, and Port Jersey Channel. USACOE projected no adverse impacts to water quality and concluded that the main aquatic impact from these dredging projects would be the loss of shallow water habitat. No significant adverse water quality impacts are expected as a result of any of the project alternatives. Furthermore, the results of the DREDGE modeling conducted for the New Jersey tunnel alignment suggest that TSS produced by dredging for the immersed tube portion of the tunnel over a 76-week period would drop off significantly at 200 meters (656 feet) from the dredge. Anchorage Channel is more that 4,000 feet away from the potential vent location at the tip of the Global Marine Terminal/NEAT pier which suggests that there should be little cumulative effect to water quality even if both dredging projects were concurrent. Similarly, the results of the DREDGE modeling conducted for dredging within the vicinity of the vent structure off 69th Street pier in Brooklyn for the Staten Island tunnel alignment suggest that TSS produced by dredging over a 76-week period also would drop off significantly after 656 feet. The site of the vent shaft is at the pier line next to Bay Ridge Channel and is, therefore, less than 600 feet away. However, the amount of bottom disturbance that would occur for the construction of the vent structure is small (230 by 150 feet) and would not substantially increase any temporary water quality impacts that would occur from dredging Bay Ridge Channel by USACOE. The vent structure off Pier 2 in Staten Island for the Staten Island tunnel alignment is approximately 3,000 feet from Anchorage Channel and would not be expected to increase the temporary water quality impacts that would occur from USACOE dredging of this channel. Therefore, no potential significant adverse water quality impacts would occur as a result of constructing these two projects concurrently.

Potential Impacts to Aquatic Organisms. As described in Appendix 6, numerous empirical studies have examined potential effects of dredging on benthic macroinvertebrates and fish. These studies suggest that potential impacts to aquatic organisms stem from changes in water

quality such as increased concentrations of suspended sediment, decreased dissolved oxygen, release of contaminants contained in the sediment to the water column, deposition of sediment, entrainment of different life stages by hydraulic dredges, blockage of channels due to suspended sediment plumes or dredging equipment, noise associated with dredging, and loss or change of habitat and benthic organisms used as food to support other invertebrates and fish.

Suspended Sediment. The assessment of potential impacts to water quality presented above concluded that increases in suspended sediment within the water column as a result of dredging with an open bucket dredge, closed bucket dredge, and cutterhead dredge (hydraulic) would be minimal in terms of change in concentration and aerial extent and would not result in significant changes of water quality. Because the increase in suspended sediment would not cause suspended sediment concentrations that were outside the range reported within this portion of the Upper Harbor, significant impacts to fish, benthic macroinvertebrates or plankton would not be expected. As presented in Appendix 6, most estuarine organisms are capable of withstanding variations in suspended sediment concentrations and the increase in concentrations projected by the DREDGE model are far below those shown to cause an effect to aquatic organisms. Fish and mobile benthic macroinvertebrates would be expected to avoid the suspended sediment plume resulting from dredging, as suggested by the empirical studies, and would have sufficient aquatic habitat to escape to within the vicinity of the dredge because the plume is not projected to extend over a large area. Increases in suspended sediment decrease significantly after 200 meters for an open bucket dredge—the dredge with the highest projected increase in suspended sediment.

Sessile macroinvertebrates (non-motile organisms attached to the substrate) are not expected to be adversely affected by increases in suspended sediment concentration near the bottom since adverse impacts to these organisms have only been observed at concentrations far in excess of those that commonly occur from dredging.

Dissolved Oxygen. As discussed under "Potential Water Quality Impacts" significant decreases in dissolved oxygen rarely occur during dredging and are not expected to occur as a result of this alternative because the dredging sites have sufficient tidal exchange.

Sediment Contaminants. Sediment contaminants known to occur in the Upper Harbor include those tightly bound to sediments such as PCBs, chlorinated pesticides, and dioxin with little potential to dissolve in the water column, and heavy metals such as cadmium, copper, chromium, lead, mercury and zinc that are not tightly bound to sediment and have the potential to go into solution within the water column. Because water-soluble fractions of compounds have a greater effect on organisms than sediment-sorbed fractions (LaSalle et al. 1991) the ecological risk assessment presented in Appendix 6 examined the potential risk to aquatic organisms associated with increases in dissolved metals. The projected increase in metals concentrations within the water column was small and would not result in significant adverse impacts to water quality or aquatic organisms.

Sediment Deposition. Deposition of sediment resuspended during dredging operations has been found to adversely affect sessile macroinvertebrates such as bivalves, and adversely affect demersal fish eggs. Mobile benthic macroinvertebrates and fish have not been found to be adversely affected by deposition of sediment associated with dredging. The maximum depth of sediment deposited over a 76-week period projected by the DREDGE model off Greenville Yard was within 100 meters of the closed bucket dredge (0.55 mm) and the farthest the sediment was projected to be deposited was 300 meters. Over one tidal cycle, the maximum depth projected to be deposited was within 100 meters of the dredge (0.0005 mm). The amount projected to be deposited over one tidal cycle is much lower than that found to affect demersal eggs of some fish

species (0.45 mm) and below that found to affect settling of oyster spat. While the amount projected to be deposited over a 76-week period is within the range found to affect hatching of demersal eggs of some fish (0.5 to 1mm) it is not possible for fish eggs to be exposed to this depth of sediment since they would hatch long before the end of the 76 week period. The small amount of material projected to be deposited near the dredging location is not expected to adversely affect burrowing benthic organisms since benthic organisms have been found to be able to burrow through much more than that, as much as 10 to 30 cm (100 to 300 mm), without adverse effects. As discussed above, the benthic organisms within the subtidal deep habitat of the Jersey Flats are well beyond the area of maximum sediment deposition.

The ecological risk assessment examined the potential effects to benthic macroinvertebrates from the deposition of sediments contaminated with metals and PAHs and the potential food chain effects to fish and birds that would consume benthic invertebrates and mammals that would eat aquatic organisms. The major mechanisms by which contaminated sediments and dredged material may adversely affect fish and wildlife is through bioaccumulation of chemicals from sediments through consumption of contaminated prey associated with the sediments. The process requires bioaccumulation (uptake and retention of a chemical by an organisms from water, food, sediment, and air) of the contaminant in the sediment by the benthic macroinvertebrate, consumption of the macroinvertebrate by other invertebrates or fish, and possibly biomagnification (concentration of the contaminant in the tissues of the consumer is higher than in the prey item) (Bridges et al. 1996). Exposure to chemical contaminants dissolved from contaminated dredged material into the water column or to chemicals adsorbed to resuspended sediment is not considered to be a quantitatively important exposure pathway (Bridges et al. 1996). Biomagnification in freshwater and marine food webs typically only occurs with highly hydrophobic chemicals such as PAHs or those bound tightly to tissue macromolecules. The results of the ecological risk assessment do not suggest potential risk to benthic macroinvertebrates, fish or birds or mammals from the deposition of small amounts of sediment contaminated with metals or PAHs.

Entrainment. Entrainment associated with dredging is the uptake of aquatic organisms by the suction field generated by hydraulic dredges (Reine and Clarke 1998). It does not occur with mechanical dredges because mobile organisms can typically escape from the clamshell dredge. As presented in the summary of empirical studies in Appendix 6, entrainment of various life stages of fish and invertebrates is insignificant for bucket dredges, the type of dredge most likely to be used for dredging the trench for the immersed tube portion of the tunnel. Entrainment of fish eggs is unlikely to cause significant adverse impacts to estuarine species since most spawn offshore, away from dredging operations, or to anadromous species such as striped bass since most spawn upriver in freshwater. For other fish species, fish eggs and larvae naturally suffer high mortality such that the loss that may be associated with entrainment by hydraulic dredges would not be significant. Entrainment by hydraulic dredges has the potential to affect demersal fish such as flounder but the results of empirical studies combined with the area to be dredged in relationship to the New York/New Jersey Harbor Estuary suggests the loss of some individuals would not be expected to adversely affect populations of these species within the New York/New Jersey Harbor Estuary. Potential impacts to benthic macroinvertebrates such as crabs likewise are not expected to be significant for similar reasons. Mitigation measures described in the “Mitigation Measures” section can reduce these impacts. Entrainment of phytoplankton and zooplankton would not result in significant adverse impacts to populations of these organisms within the Harbor Estuary.

Channel Blockage. Dredging equipment or the sediment plume have the potential to effect the distribution and movement of juvenile and adult organisms, particularly anadromous fish, turtles and some marine mammals. The results of the DREDGE modeling do not suggest that that dredging with a clamshell (open or closed) or hydraulic dredge within the alignment for the immersed tube section of the tunnel would result in a plume of suspended sediment that would interfere with the migration of fish, particularly anadromous species such as striped bass that would migrate through this portion of the Upper Harbor on the way to freshwater spawning locations. The projected increase in suspended sediment would be within the range of suspended sediment concentrations known to occur within this portion of the Upper New York Harbor.

Noise. Noise from dredging and in-water construction activities associated with the immersed tube portion of the tunnel, as well as the construction of the vent structures have the potential to cause temporary impacts to fish by causing changes in activity patterns. The results of empirical studies suggest that fish would be expected to avoid areas of these activities. However, because suitable habitat would be available within the vicinity of the noise producing equipment, these temporary changes in activity patters are not expected to adversely impact fish populations or those of fish eating birds in the area.

Habitat Loss. Benthic organisms provide important food sources for fish and other benthic organisms. The primary impact to benthic macroinvertebrates from dredging is the loss of the habitat and animals associated with the dredged material (Hirsch et al 1978). It can also result in the conversion of shallow subtidal habitat to deeper subtidal habitat. The frequency of dredging or disturbance of an area affects the invertebrate community and its ability to recover following each dredging event. Short-term, small-scale dredging and dredge disposal projects have been found to impact benthic communities less than long-term, large scale projects (Morton 1977 in Nightingale and Simenstad 2001). In general, benthic communities found in environments with a great deal of variability have higher rates of recovery from disturbance. In general, recovery rates of benthic macroinvertebrate communities following dredging range from only a few weeks or months, to a few years depending upon the type of project, the type of bottom material, the physical characteristics of the environment and the timing of disturbance (Hirsch et al. 1978, LaSalle et al. 1991).

Dredging for the immersed tube has the potential to temporarily remove benthic macroinvertebrates and the food resources they provide to fish, and macroinvertebrate and fish habitat over an area that is approximately 1,260,000 square feet (29 acres - 300 foot wide trench that is 4,200 feet long) over a 72-week period or 76-week period if dredging is prohibited from February 1 through May 31. The vent structure would result in the permanent loss of 34,500 square feet (0.8 acres) of benthic habitat and feeding area for fish. Additionally, once the immersed tube portion of the tunnel is constructed, the benthic habitat within the tunnel alignment which was primarily soft sediment will be permanently changed to a hard substrate composed of rock for a width of no more than 160 feet over the 4,200 foot long length of the immersed tube (672,000 square feet, 15 acres).

The potential loss of benthic macroinvertebrates from the removal of sediment within the 29-acre area occupied by the trench, while it would result in the loss of some individual macroinvertebrates, is not expected to result in significant adverse impacts to populations of these species within the New York/New Jersey Harbor Estuary System. The majority of the bottom habitat and associated benthic macroinvertebrates within the area to be impacted is the soft sediment community which dominates the Upper New York Harbor. Therefore the loss of this area is not expected to adversely impact the populations of the species that make up this

community which appears to be dominated by invertebrates such as the polychaete worm *Streblospio benedicti*, followed by *Lumbrineris fragilis*, members of the family Paraonidae, *Nereis* sp., and members of the family Phyllodocidae and Orbiniidae, and *Glycera* sp., and the bivalves *Mulina lateralis* and *M. edulis*. However, because a portion of this area will be converted to a rock substrate, recolonization of the benthic macroinvertebrate community within the rock substrate has the potential to take longer than the 6 to 8 months typical for silts or muds, since organisms that prefer this type of habitat are not common within the vicinity of the area to be dredged. Additionally, the benthic community within the rock substrate will change over time as it silts it. This may result in a decrease in food resources for fish for a period of time following completion of construction. The portions of the tunnel trench not covered by rock would be expected to recover fairly quickly, within the 6 to 8 month time frame common for these areas. While the benthic community within the trench area following construction may be different than that prior to construction, it will still provide prey items for fish and may provide more prey items in the soft sediment areas during the time period it is dominated by opportunistic species. The loss of prey items for fish from the 29-acre area of the trench during construction would be temporary and suitable forage habitat should be available within the vicinity.

Environmental windows, the time period when dredging is permitted, have been imposed on dredging projects over the last 30 years (over 80 percent of USACOE dredging projects are subject to windows) to protect sensitive biological resources and habitats. However, limiting dredging to certain times of the year to protect certain resources can extend the overall length of time that dredging occurs for specific projects and the recovery period. It may also increase impacts to species of lesser economic or regulatory interest (but not necessarily of lesser ecological importance), whose critical period may coincide with the period allowed for dredging (Grigalunas et al. 2001 in Nightingale and Simenstad 2001). Constraining dredging to critical spring and summer months places it within migration, spawning and nesting periods.

Within the New York District of USACOE, dredging operations may be restricted in the winter months and the spring (February 1 to May 31) to protect striped bass, American shad, Atlantic tomcod (spawning), and winter flounder (spawning and hopper dredge entrainment). However summer and fall dredging has the potential to affect weakfish (Reine et al. 1998). Conducting the dredging and underwater construction without a break over the winter and early spring (72-week schedule) has the potential to result in temporary impacts to overwintering striped bass and American shad, and spawning of Atlantic tomcod and winter flounder over one season, potentially affect fish that may use the area in the summer and fall but would result in a shorter period of disruption and allow the habitat to recover faster than if dredging and construction were halted from February through the end of May. Imposing a window where dredging is permitted only outside the February through May period would result in potential impacts during two summer and two fall periods. Individual fish that would use the area within and adjacent to the trench over the 72- or 76-week period would be displaced but should be able to find suitable habitat within the Upper Harbor such that populations of these species within the New York/New Jersey Harbor Estuary would not be significantly impacted by this temporary loss of habitat. Furthermore, the vent structure at the tip of the Global Marine Terminal/NEAT pier would be constructed near the least tern nesting habitat and environmental windows for fish species may need to be coordinated with the least tern nesting period between April to August (see Chapter 14, “Wetlands and Terrestrial Resources”).

The construction of the two vent structures along the Staten Island tunnel alignment, one off Staten Island and the other off Brooklyn, would result in the permanent loss of approximately

34,500 square feet of subtidal habitat and water column for each structure (total of 69,000 square feet or 1.6 acres), and the benthic macroinvertebrates associated with the bottom sediment removed from within each structure. The loss of these macroinvertebrates and this small area of subtidal habitat would not adversely affect macroinvertebrate populations or fish populations. Sufficient subtidal habitats would be available within the vicinity of the vent structures to use as foraging habitat by fish. Additionally, the vent structures would provide additional hard substrate for attachment by benthic macroinvertebrates and to use as shelter areas by fish. Potential impacts to aquatic organisms associated with water quality changes that may occur as a result of the construction of the vent structures would be much less than those associated with dredging for the immersed tube or the float bridges, which are not projected to be significant.

Endangered Or Threatened Species. As presented previously in Table 14-22, one state and federally-listed fish, the shortnose sturgeon, four sea turtles listed as threatened or endangered, and six marine mammals (whales) have the potential to occur within 1.2 mile of the project alternatives. The dredging of the trench and underwater construction would not result in significant adverse impacts to these species. The shortnose sturgeon and Atlantic sturgeon would only move through the area to spawning grounds using the deeper channel areas that run parallel to the main channel of the Hudson River, which would not be affected by the dredging and in-water construction associated with the project alternatives. Suspended sediment associated with dredging and in-water construction activities would not result in water quality impacts that would be expected to affect migration of sturgeon.

The four endangered or threatened marine turtles found in the waters surrounding New York City, loggerhead, green, leatherback and Atlantic (Kemps) ridley are primarily found within Long Island Sound, Peconic and Southern Bays and would not be expected to occur within the vicinity of the immersed tube portion of the tunnel. Therefore, sea turtles would not be expected to be affected by the project alternatives.

The six endangered whales known to occur within the New York City region are oceanic and would not occur within the areas affected by the project alternatives. Adverse impacts would not occur to these species.

Essential Fish Habitat. Appendix 6 provides a detailed discussion of the potential impacts to Essential Fish Habitat for the species identified for the project study area. EFH within the area of the immersed tube section New Jersey tunnel would be temporarily adversely impacted by dredging and underwater construction activities over the 72-week or 76-week construction schedule and possible longer term loss of some EFH due to the placement of rock material over the immersed tube portion of the tunnel. Adverse impacts to EFH species would also be temporary and most individuals would be expected to find suitable habitat elsewhere within the Upper New York Harbor. The 72-week dredging and underwater activity schedule would reduce the number of seasons that would be affected and allow restoration of the habitats to occur sooner than a 76-week schedule with breaks in dredging during the winter period. Potential impacts to aquatic organisms associated with other construction activities for the project alternatives would be much less than those associated with dredging for the immersed tube portion of the tunnel. Mitigation measures to address the potential impacts to fish habitat are presented in "Mitigation Measures" below. On the basis of the DREDGE model results, the results of the ecological risk assessment, and review of empirical studies, no adverse impacts to EFH would be expected to occur to those habitats outside the immediate vicinity of the immersed tube portion of the tunnel.

In-Water Construction: Construction of Second Span of the Arthur Kill Lift Bridge

Potential Water Quality Impacts. Under the Staten Island tunnel alignment of the Single Tunnel System, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. A viaduct would connect the new span to the Chemical Coast Line. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track.

On the New Jersey side, on the basis of conceptual plans, the new pier caps would be adjacent to the existing pier cap in the Arthur Kill, approximately 165 feet east of the New Jersey shoreline. An area of subtidal habitat approximately 150 feet long by 75 feet wide (approximately 11,250 square feet (0.26 acre)) would be disturbed by the placement of the bridge foundation, pier caps and fender. A small area of bulkeaded New Jersey shoreline would be disturbed south of the existing bridge. On the Staten Island side, an area of salt marsh within the Old Place Creek tidal wetland system would be displaced south of the existing bridge for construction of the eastern bridge footing, pier caps and fender (approximately 150 feet long by 75 feet wide). Part of this disturbance would be in the Arthur Kill within subtidal habitat.

The construction of the new track from Arlington Yard to the new lift bridge will require the existing railroad embankment to be extended to the south. The size of the potential embankment has not been determined, but is expected to occupy a 50-foot-wide band immediately south of the southern toe of the existing embankment. The embankment would cross through the Old Place Creek salt marsh system for a distance of approximately 2,295 feet then cross through the portion of Bridge Creek salt marsh west of Western Avenue and south of the rail tracks for a distance of approximately 500 feet, and finally through a portion of the Bridge Creek salt marsh system east of Western Avenue for a distance of approximately 1,100 feet.

Old Place Creek has been identified by New York City as part of the Special Natural Waterfront Area along western Staten Island (NYC 2001). In addition, this area has been the site of a wetland restoration project, and is proposed as a site for potential wetland restoration by the USACOE. The NY/NJ HEP has identified Old Place Creek and its marsh as an area where habitat loss may occur should a second span be constructed for the Goethals Bridge and the associated widening of the Staten Island Expressway (NY/NJ HEP 2001b).

The in-water activities associated with the construction of the bridge have the potential to affect water quality through the increase of suspended sediment caused by bottom disturbance from filling, bulkheading, pile driving, and other activities. Because the area to be disturbed is small and the disturbance would be of a short duration, suspended sediment conditions would be expected to return to ambient concentrations shortly after bottom disturbing activities have been completed. The potential impacts to water quality would be far less extensive than those described above for the immersed tube portion of the New Jersey tunnel alignment and are not expected to be significant for the same reasons as described for that construction. For upland impacts associated with the construction and operation of the viaduct and embankment, a stormwater pollution prevention plan (SWPPP) will be prepared in compliance with the SPDES General Stormwater Permit (see "On-Land Construction Activities" below).

Potential Impacts to Aquatic Organisms. The construction of the Arthur Kill lift bridge would result in the loss of subtidal habitat and benthos within the area of the bridge foundation, pier caps and fender. The permanent loss of bottom habitat and the macroinvertebrates associated with this area would not adversely impact the population of benthic macroinvertebrates, nor would it adversely affect fish populations through the loss of prey species. The bridge

foundation would provide hard substrate that could be used as attachment areas by benthic macroinvertebrates, and could also provide shelter for fish. Disturbance of bottom areas within the vicinity of the bridge foundations would result in temporary impacts to benthic macroinvertebrates possibly due to the loss of bottom material but these areas would be expected to quickly recolonize.

The DREDGE modeling conducted for the immersed tube portion of the New Jersey Tunnel Alternative suggests that water quality impacts associated with the construction of the bridge would be minimal and temporary, and adverse impacts to aquatic organisms associated with the disturbance of bottom material would also be small.

On-Land Construction Activities

Upland activities include tunnel construction (open cut and cut and cover portions); yard construction and operation; increasing clearance heights; and other trackwork along rail lines. Construction activities on land associated with this alternative would have the potential to result in temporary water quality impacts along the Brooklyn shoreline, Newtown Creek shoreline, and Arthur Kill and Kill Van Kull shorelines. These potential changes in water quality have the potential to temporarily impact aquatic invertebrates and fish near the point where surface runoff enters the water. However, the implementation of erosion and sediment control measures, and stormwater management measures during construction and operation in compliance with the SPDES General Stormwater Permit would reduce these impacts. As required for construction activities that disturb five acres or more, a stormwater pollution prevention plan (SWPPP) will be prepared in accordance with good engineering practices. Implementation of best management practices for erosion and sediment control and other measures of the SWPPP would minimize potential water quality and aquatic resources effects associated with the discharge of stormwater during these construction and operational activities.

Floodplains

Federal Regulations

As described above, according to FHWA regulations, a "significant encroachment" occurs when a roadway project and any direct support of likely development within the 100-year floodplain would involve one or more of the following construction- or flood-related impacts:

- Significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or provides a community's only evacuation route;
- Significant risk; or
- Significant adverse impact on natural and beneficial floodplain values.

If the proposed activities constitute a significant encroachment, FHWA requires that the action is the "only practicable alternative" before it can be approved. Similarly, FRA guidance requires an evaluation of alternatives that would affect a base floodplain, including the risks associated with the alternative; the impacts on natural and beneficial floodplain values, the degree to which the alternative supports incompatible development in the base floodplain; and the adequacy of the methods proposed to minimize harm.

The tunnel portals in New Jersey and Brooklyn would be located in areas that are above the 100-year floodplain. This would prevent flooding of the tunnel in the event of a 100-year flood. As shown in Figures 13-3 and 13-10, the open-cut and cut and cover portions of the tunnel

construction in Greenville Yard (for the New Jersey tunnel alignment) and 65th Street Yard would occur outside of the 100-year and 500-year floodplains. In the case of the Staten Island tunnel alignment, the tunnel portal on Staten Island would be within the existing rail right-of-way, which is within the 100-year floodplain. The location of the portal is controlled by the required tunnel grades and geographic limitations. Due to this location within the floodplain, a flood-proofing system would be required around the tunnel portal. The system would be designed so as not to require human intervention or mechanical actions. These measures, in addition to the overall tunnel drainage system, would prevent flooding of the tunnel in the event of a 100-year flood.

The Single Tunnel System would not have a significant potential for interrupting or terminating emergency vehicle access, nor pose a significant construction- or flood-related risk. The proposed construction activities would occur primarily within existing rail line rights-of-way and rail yards. The majority of the proposed project's corridor is already fully developed and paved. This alternative would not support or encourage incompatible floodplain development. The new construction elements within the floodplain would include the ventilation shafts, new rail track, and the cut and cover and open cut portions in Staten Island (for the Staten Island tunnel alignment). Most of the properties that would be acquired for the expansion of West Maspeth Yard are currently paved and developed. While the site has not yet been fully designed, the expansion would include the currently vacant Phelps Dodge property, which is undergoing remediation and will be capped and contained as part of NYSDEC's preferred remediation alternative. This expansion would not substantially affect the ability of the floodplain along Newtown and Maspeth Creek to store water and would not reduce the overall floodplain value. Overall, the proposed activities would not constitute a significant encroachment.

New York State and City

In accordance with NYSDEC and New York City regulations, the Single Tunnel System would be constructed to minimize flood damage. No regulatory floodways would be affected. As discussed above, this area is subjected to coastal flooding, not riverine flooding, and tracks and ballast would not cause additional flooding because the improvements would not block water from flowing around the area. The cumulative effect of the proposed project would not cause material flood damage to existing developments. Electrical and mechanical control devices would be positioned to avoid flooding. Additionally, the project would replace, in kind, utilities, water supply lines, and sewer lines that are encountered during construction. Also in accordance with NYSDEC regulations, alternate sites for the proposed intermodal rail yard at West Maspeth were considered, but were discarded for the reasons discussed in Chapter 2, "Project Alternatives."

New Jersey Floodplain Management

Confirmation from NJDEP will be required to determine if any riverine flooding issues exist near the Chemical Coast Line. If so, NJDEP may require a Stream Encroachment Permit for the construction of rail sidings along the Chemical Coast Line. A Waterfront Development Permit may be required for the open cut, cut and cover, and immersed tube tunnel segments located in Greenville Yard.

Changes to the existing ground levels within the project sites boundaries would be limited and would not result in increased flooding. No habitable structures would be located within the floodplain. As shown in Table 13-1, under federal regulations (Section 404 of the Clean Water Act) and state regulations (6NYCRR 502), the project sponsor would apply for any required

state permits (e.g., NJDEP Stream Encroachment Permit) to build structures (e.g., vent shafts, railroad tracks) within the floodplain. In sum, the Single Tunnel System would not have significant adverse impacts on floodplains and the proposed project would not be considered a significant encroachment.

DOUBLE TUNNEL SYSTEM

The expansion of the Tunnel Alternative to the Double Tunnel System would result in additional impacts on water quality and aquatic resources beyond those presented in the Single Tunnel System through additional upland construction, in-water filling, and operational activities. Upland activities would include yard expansion and operation, increasing clearances, and other trackwork along rail lines. In-water activities would include filling associated with the expansion of West Maspeth Yard.

In-Water Construction: Filling For Expansion of West Maspeth Yard

Potential Water Quality Impacts. The expansion of West Maspeth Yard would include the filling of Maspeth Creek and a portion of Newtown Creek, for a total filling of eight to nine acres. The placement of clean fill material in Maspeth Creek has the potential to result in temporary adverse impacts to the water quality of Newtown Creek due to increased suspended sediment concentrations while the material is being put in place. The potential impacts to water quality would be far less extensive than those described above for the immersed tube portion of the New Jersey tunnel alignment under the Single Tunnel System, and are not expected to be significant as described for that construction. Mitigation measures, such as the use of silt curtains, would be implemented to minimize water quality impacts. For upland impacts associated with the construction and operation of the yard, a stormwater pollution prevention plan (SWPPP) will be prepared in compliance with the SPDES General Stormwater Permit.

Potential Impacts to Aquatic Organisms. Maspeth Creek has been restricted by bulkheading and other activities associated with the waterfront development of this portion of the City. The upper reaches of the creek were filled in the 1940s. NYSDEC classifies Maspeth Creek and Newtown Creek as tidal wetlands, littoral zone. The US Fish and Wildlife Service's National Wetland Inventory (NWI) classifies them as E1UBLx, estuarine subtidal unconsolidated bottom. The placement of fill in Maspeth Creek and Newtown Creek would result in the loss of subtidal habitat. Both Maspeth Creek and Newtown Creek are considered impaired due to fecal coliform and low DO.

While existing information on the aquatic resources of the Maspeth Creek is currently not available, wading birds were observed feeding within the creek at the time of the fall 2001 and early spring 2002 site visits. This suggests that benthic macroinvertebrates and fish may be present within the creek. Maspeth Creek and the upper portion of Newtown Creek are scheduled to be sampled by NYCDEP as part of the Harbor Survey within the next year or two.

The loss of eight to nine acres of subtidal habitat resulting from the placement of fill in Maspeth Creek and small portion of Newtown Creek would be a significant adverse impact to aquatic resources and wetlands (see Chapter 14, "Wetlands and Terrestrial Resources"). Additionally, the placement of fill has the potential to temporarily impact aquatic resources in Newtown Creek from the increase in suspended sediment that may result during the placement of clean fill. Measures to mitigate for the habitat loss and potential temporary water quality impacts are described in the "Mitigation Measures" section.

On-Land Construction Activities

Additional upland activities beyond those that would be completed under the Single Tunnel System include yard expansion and the construction of additional rail tracks and increased clearances. These activities would have the potential to temporarily impact water quality along the Newtown Creek shoreline and Kill Van Kull shorelines. As discussed above, aquatic invertebrates and fish could be affected near the point where surface runoff enters the water. However, the implementation of erosion and sediment control measures and stormwater management measures (including SWPPP where required) would reduce these impacts.

Floodplains

Proposed activities within the floodplain under the Double Tunnel System would be essentially the same as under the Single Tunnel System, which is discussed in the section above. Additional project elements within the floodplain would include the construction of the container storage building in West Maspeth Yard. In accordance with New York City requirements, the lowest floor of the container storage building would be greater than one foot above the base flood level. The structure would be open-sided on the ground level to allow incoming trains to pass underneath the structure and be serviced by overhead cranes.

As with the Single Tunnel System, the tunnel portals would either be located in an area that is above the 100-year floodplain or, in the case of the Staten Island portal, would have a special drainage and pumping system. These measures would prevent flooding of the tunnel in the event of a 100-year flood.

D. MITIGATION MEASURES

DREDGING

Based on the above analyses and a comparison to the applicable water quality standards, there would be no significant adverse water quality impacts for dredging activities associated with the project alternatives. However, measures will be developed in consultation with USACOE, NJDEP, and NYSDEC to minimize potential effects. These involved agencies will specify the BMPs to be used when issuing permits for dredging projects. Increases in suspended sediment resulting from cutterhead hydraulic dredges and mechanical dredges can be reduced by improving operational techniques such as proper selection of cutter rotation speed, ladder swing speed, and depth of cut for cutterhead dredges, and reducing the speed at which the crane lowers the empty clamshell bucket through the water column and raises the full bucket, using watertight clamshell buckets (Barnard 1978, Hayes 1986, Havis 1988a). NJDEP (1997) has identified BMPs that should be used to minimize the potential for and magnitude of adverse environmental impacts from dredging operations. BMPs identified by NJDEP include:

- Using hydraulic dredging when feasible;
- Using a closed clamshell (required for dredging in Upper New York Harbor);
- Implementing certain dredging practices to reduce suspended sediments when using a clamshell dredge such as maximizing the size of the bite taken by the clamshell, slowly withdrawing the clamshell through the water column, not hosing down or rinsing sediments of the sides and gunwales of the barge;
- No barge overflow (this is required for dredging in Upper New York Bay);

- Shunting, which is the active pumping of free water in a barge to the bottom of the water column at the dredging site used as an alternative to barge-overflow in reducing the volume of water in the barge;
- Seasonal restrictions to minimize potential adverse impacts to anadromous or other migratory finfish, nesting shorebirds, etc.;
- In certain semi-enclosed waterbodies, dredging only during incoming tide to allow additional time for suspended sediment to settle and reduce the dispersal of contaminated sediments;
- On-board independent dredging inspectors certified by USACOE to observe dredging operation and ensure compliance with permit conditions; and
- Silt curtains in waters where currents are less than 1 knot

Silt curtains can be used in currents less than 50 cm/sec (1 knot) to reduce the concentration of suspended sediment in the water column. A silt curtain is an impervious (flexible, nylon-reinforced polyvinyl chloride (PVC)) fabric floating barrier that extends vertically from the water surface to a certain depth. It has flotation devices on the top and a ballast chain at the bottom. The silt curtain can be placed either downcurrent from or around the dredging operation. When they function properly, silt curtains can reduce the suspended sediment in the water column outside the curtain by as much as 75 to 90 percent compared to levels inside the curtain (Barnard 1978, Bray et al. 1997 in ABP Research 1999). Turbid water may flow under the curtain but is not suspended in the upper part of the water column. Silt curtains are not recommended in open ocean, in currents greater than 1 knot (Barnard 1978, Bray et al. 1997), or in areas exposed to frequent high winds and large breaking waves (these high energy environments tend to cause the bottom of the curtain to flare which reduces the effective skirt depth), or around hopper or cutterhead dredges where the silt curtain would have to be moved frequently (Barnard 1978). Peak flood velocity and peak ebb velocity recorded by the USACOE (2002) in the vicinity of the Brooklyn shoreline are 1.1 knots and 1.22 knots respectively, which suggests that silt curtains may not be a feasible mitigation measure during dredging activities near this area. Peak flood and ebb velocities recorded by the USACOE (Santangelo 2002) near Greenville Yard are 0.67 knots and 0.55 knots, respectively, which suggest that silt curtains might be feasible for use during construction of the immersed tube portion of the tunnel.

In addition to the measures associated with dredging, mitigation measures associated with installation of the tunnel sections will be implemented to minimize suspended sediment in the water column during placement of any fill material or the rock layer. These measures may include moderating the speed at which the material is brought to the bottom to reduce suspension.

Mitigation for temporary habitat loss during dredging of the immersed tube portion of the tunnel and the change in habitat type from soft bottom to hard bottom within the area above the immersed tube portion of the tunnel will be developed in coordination with USACOE, NMFS, USEPA, NJDEP, NYSDEC, and any other involved agencies. Potential mitigation measures may include habitat enhancement or improvement within the area affected, or other portion of the Upper Harbor as identified by state and federal agencies. Potential impacts associated entrainment of fish and macroinvertebrates by hydraulic dredges can be minimized through operational measures such as positioning the cutterhead close to the bottom.

WEST MASPETH YARD

If the Double Tunnel System were constructed, mitigation would be required for the permanent loss of eight to nine acres of subtidal habitat for expanding West Maspeth Yard. Such mitigation would be developed in coordination with the NYSDEC, USACOE, USEPA, NMFS and other interested agencies. Potential mitigation measures may include restoration or enhancement of other subtidal habitats in or near Newtown Creek or as identified by government agencies.

Best management procedures (BMPs) such as the use of silt curtains would be implemented during the placement of fill in Maspeth Creek and Newtown Creek to minimize the suspension of material into the water column. These measures would be developed in consultation with the NYSDEC and USACOE.

ON-LAND CONSTRUCTION ACTIVITIES

As required for construction activities that disturb five acres or more, a stormwater pollution prevention plan (SWPPP) will be prepared in accordance with established engineering practices. Implementation of best management practices for erosion and sediment control and other measures of the SWPPP would minimize potential water quality and aquatic resources effects associated with the discharge of stormwater during upland construction and operational activities. ✷

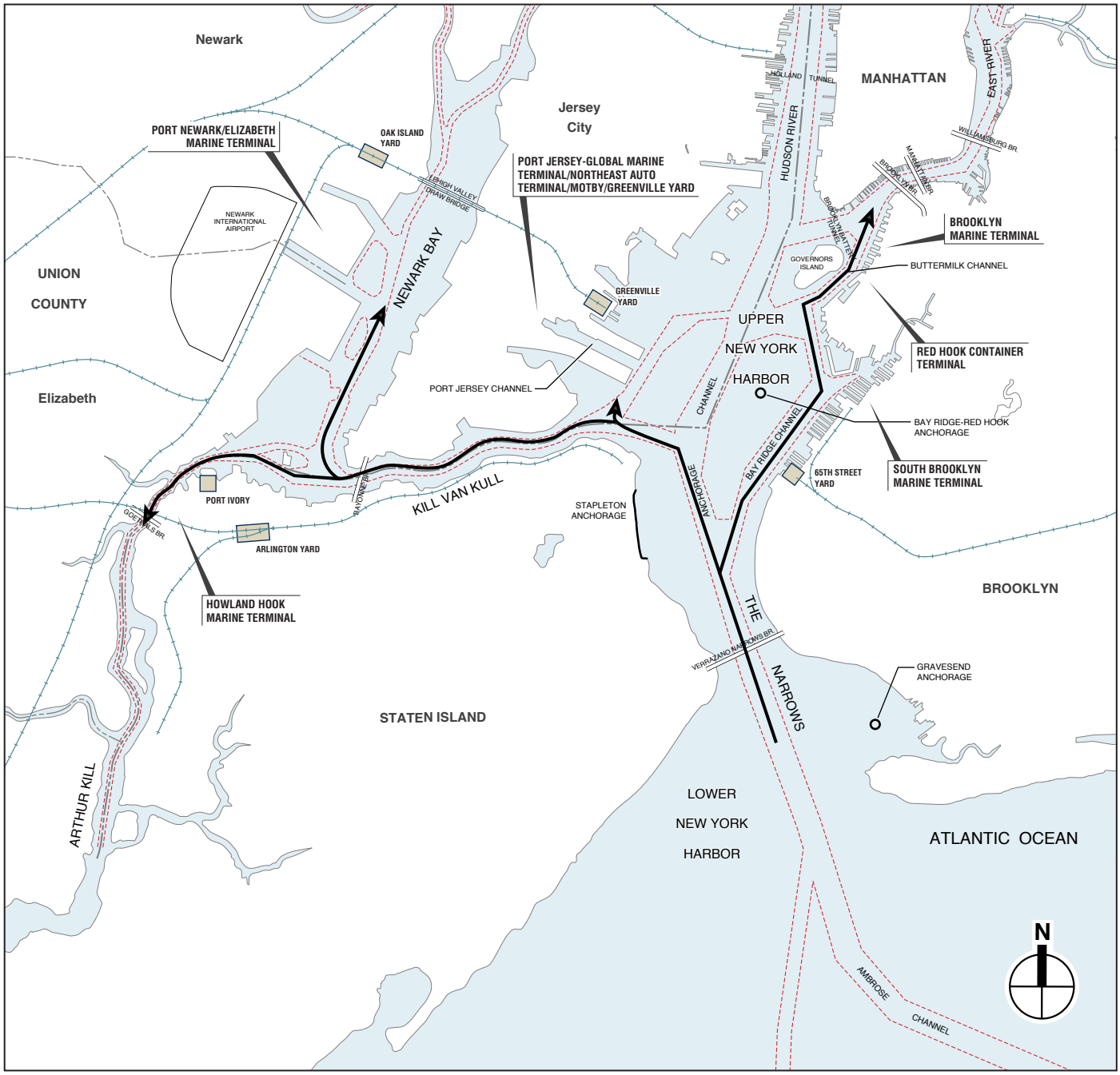
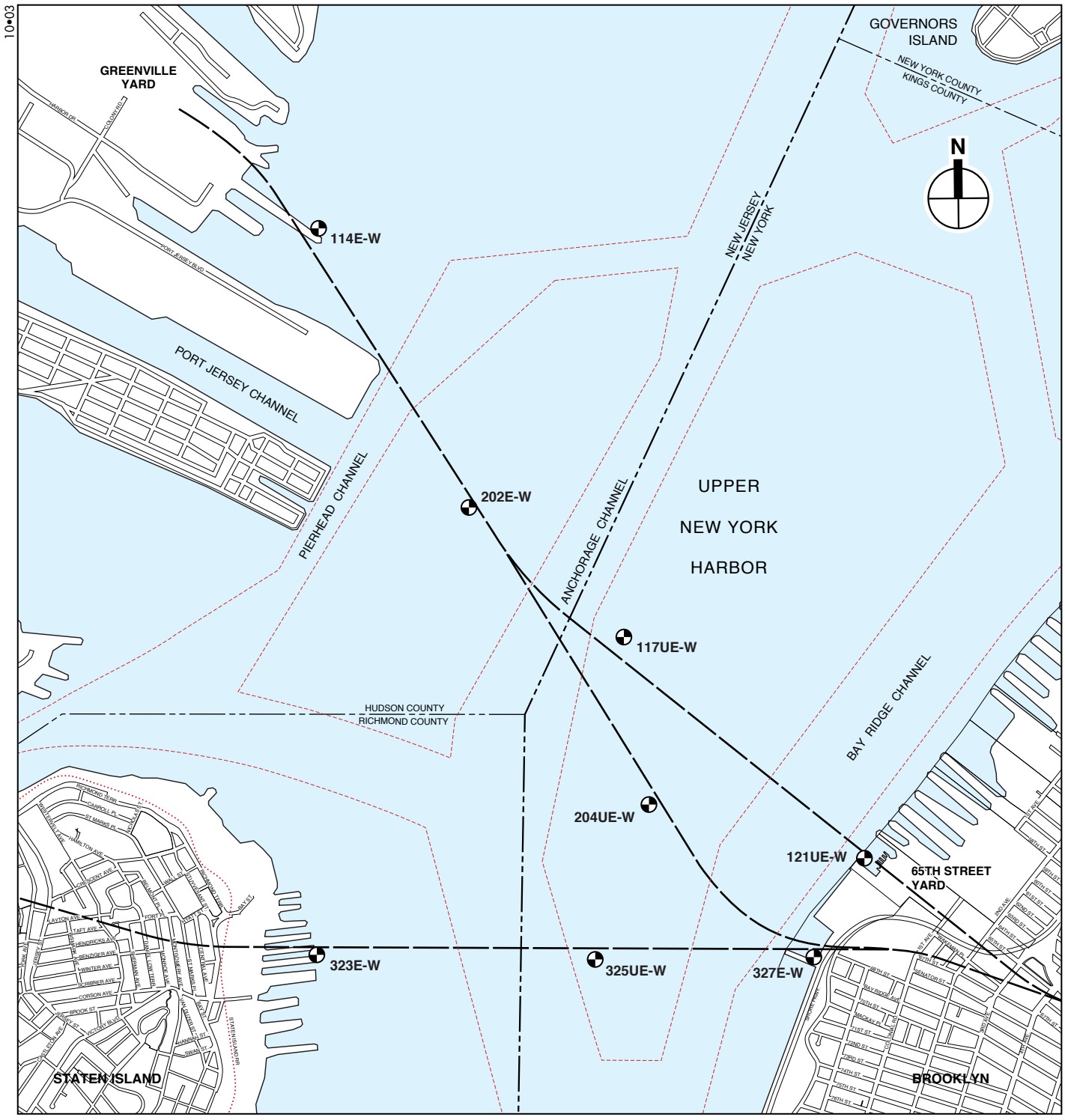


Figure 13-1

Federal Navigational Channels in New York Harbor

CROSS HARBOR FREIGHT MOVEMENT PROJECT



—— —— Possible Tunnel Alignment

Sampling Location

U Undisturbed Sample Boring

E Environmental Sample Boring

W Water Boring

Figure 13-2

Project Sampling Locations

CROSS HARBOR FREIGHT MOVEMENT PROJECT

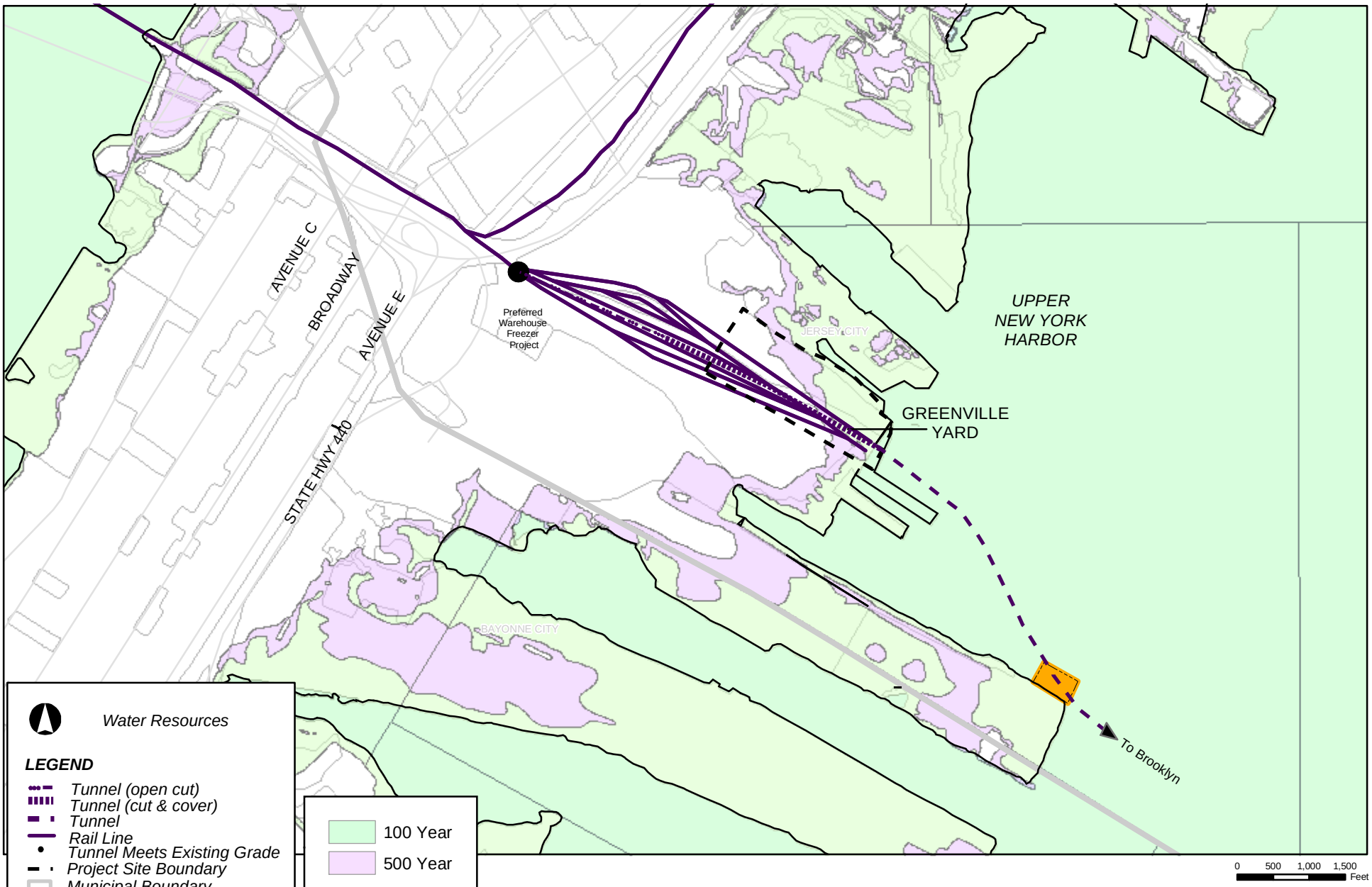


Figure 13-3
Greenville Yard/Potential Tunnel Alignment Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

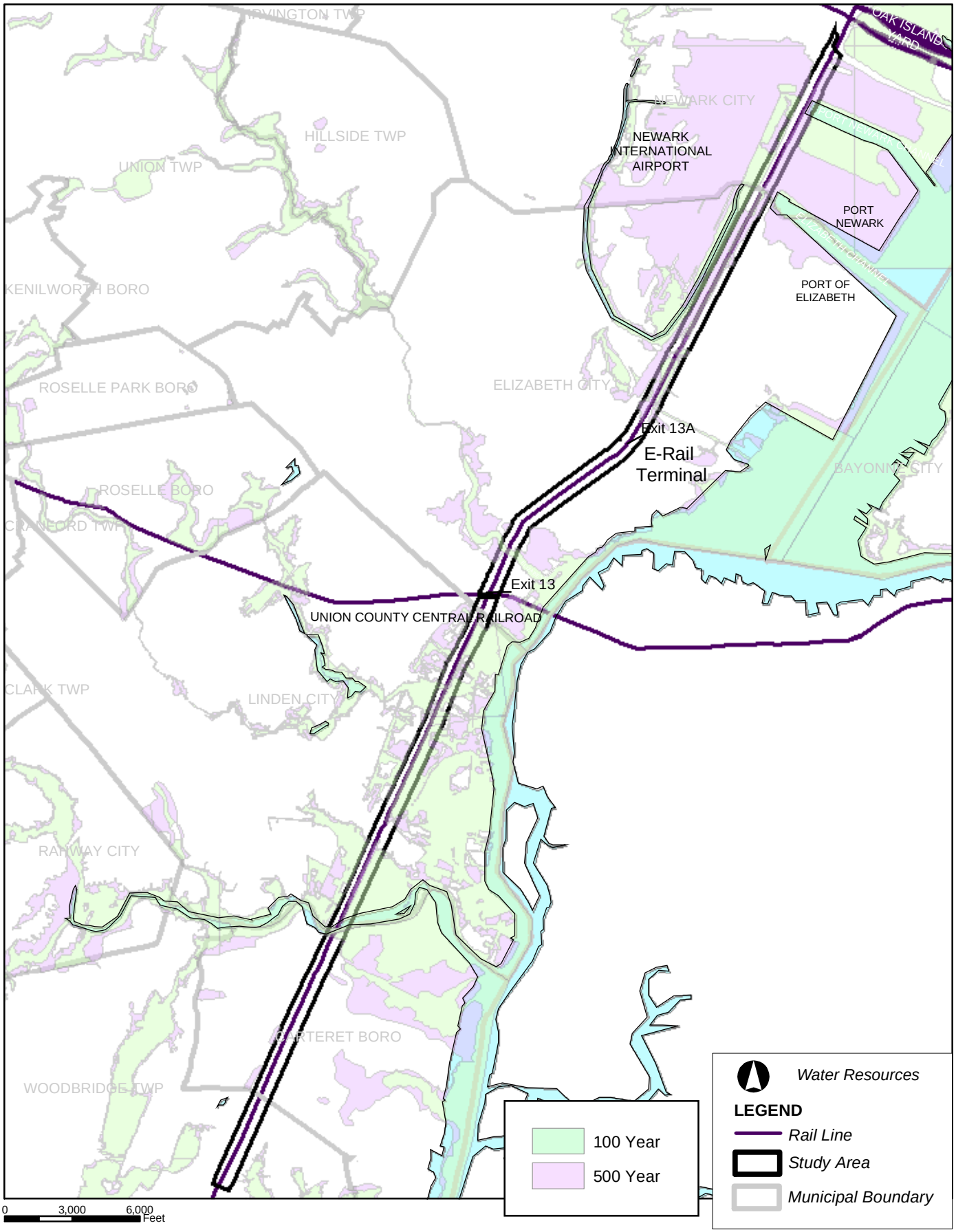


Figure 13-4
Chemical Coast Line Study Area-Segment 1

CROSS HARBOR FREIGHT MOVEMENT PROJECT

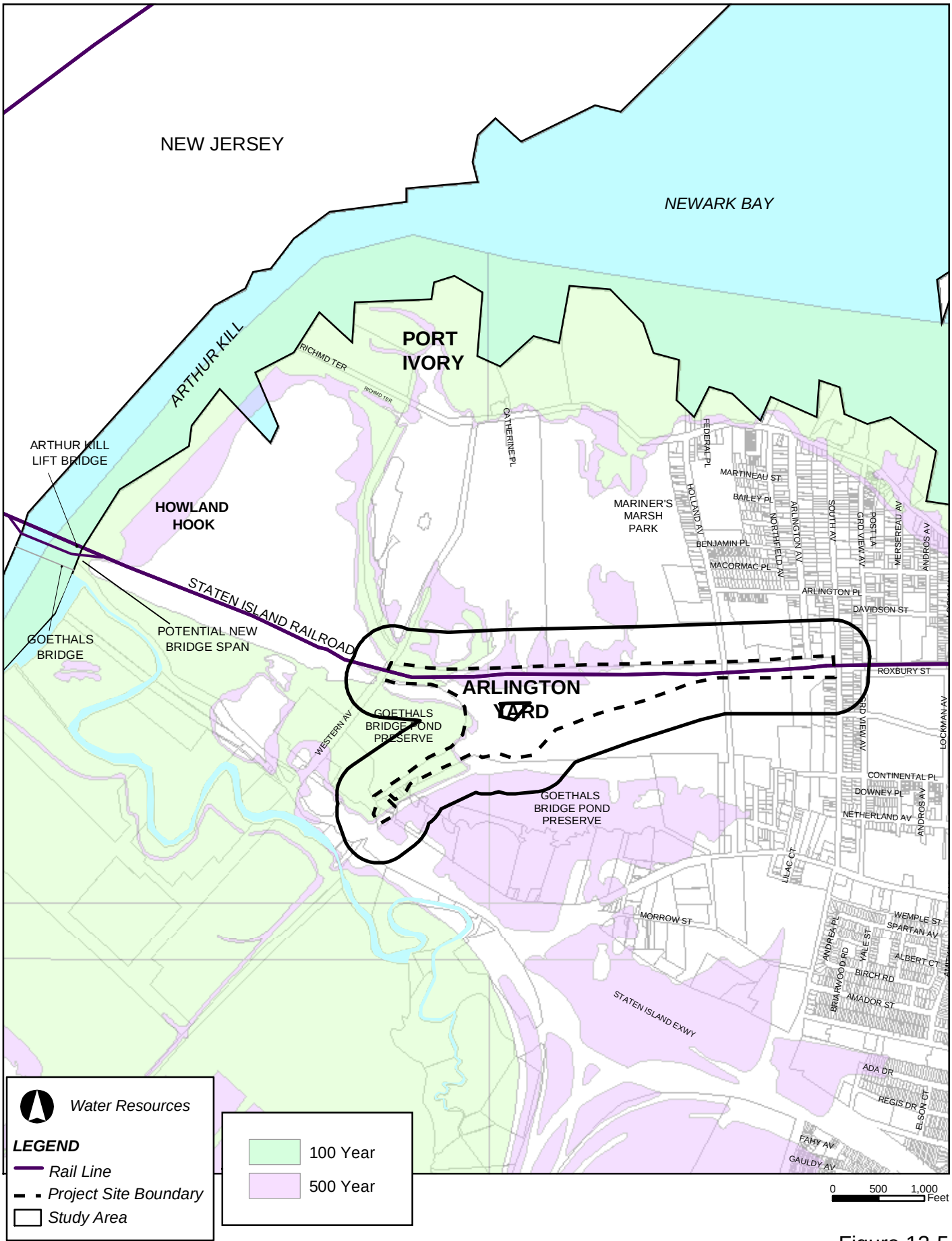


Figure 13-5
Northwestern Staten Island Study Area
CROSS HARBOR FREIGHT MOVEMENT PROJECT

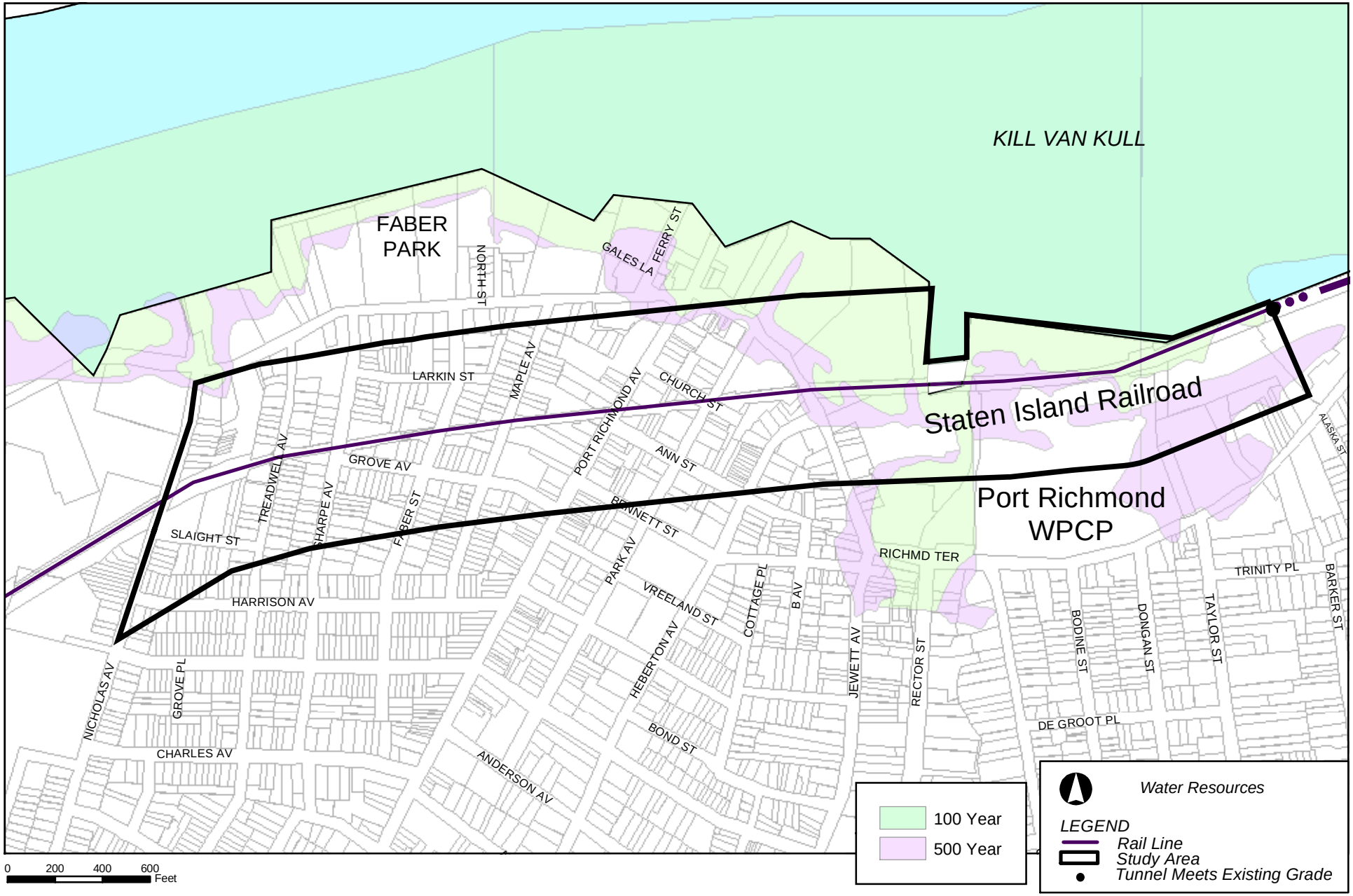


Figure 13-6
Northern Staten Island Study Area-Segment 2
CROSS HARBOR FREIGHT MOVEMENT PROJECT

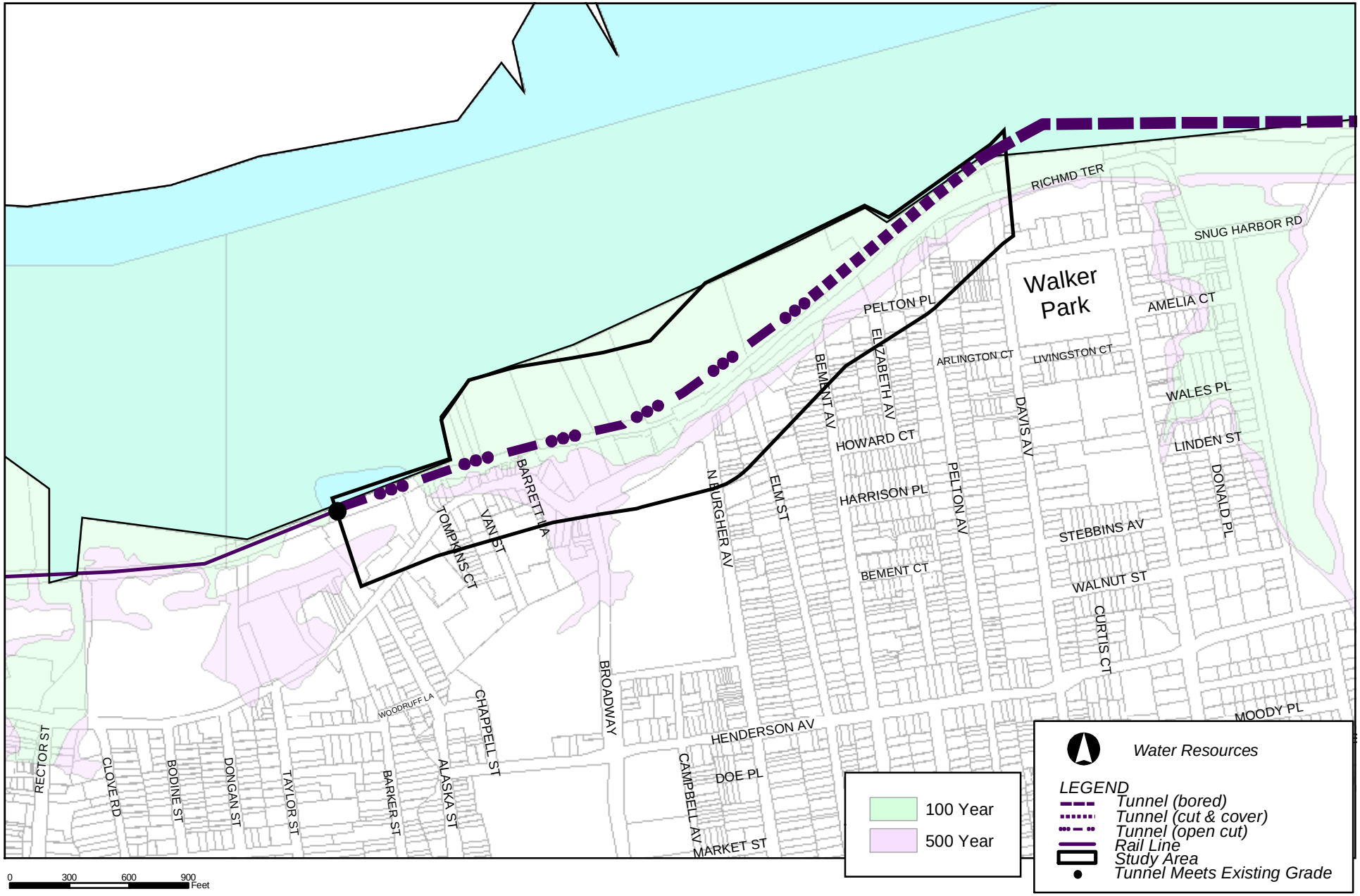


Figure 13-7

Northern Staten Island Study Area-Segment 3

CROSS HARBOR FREIGHT MOVEMENT PROJECT

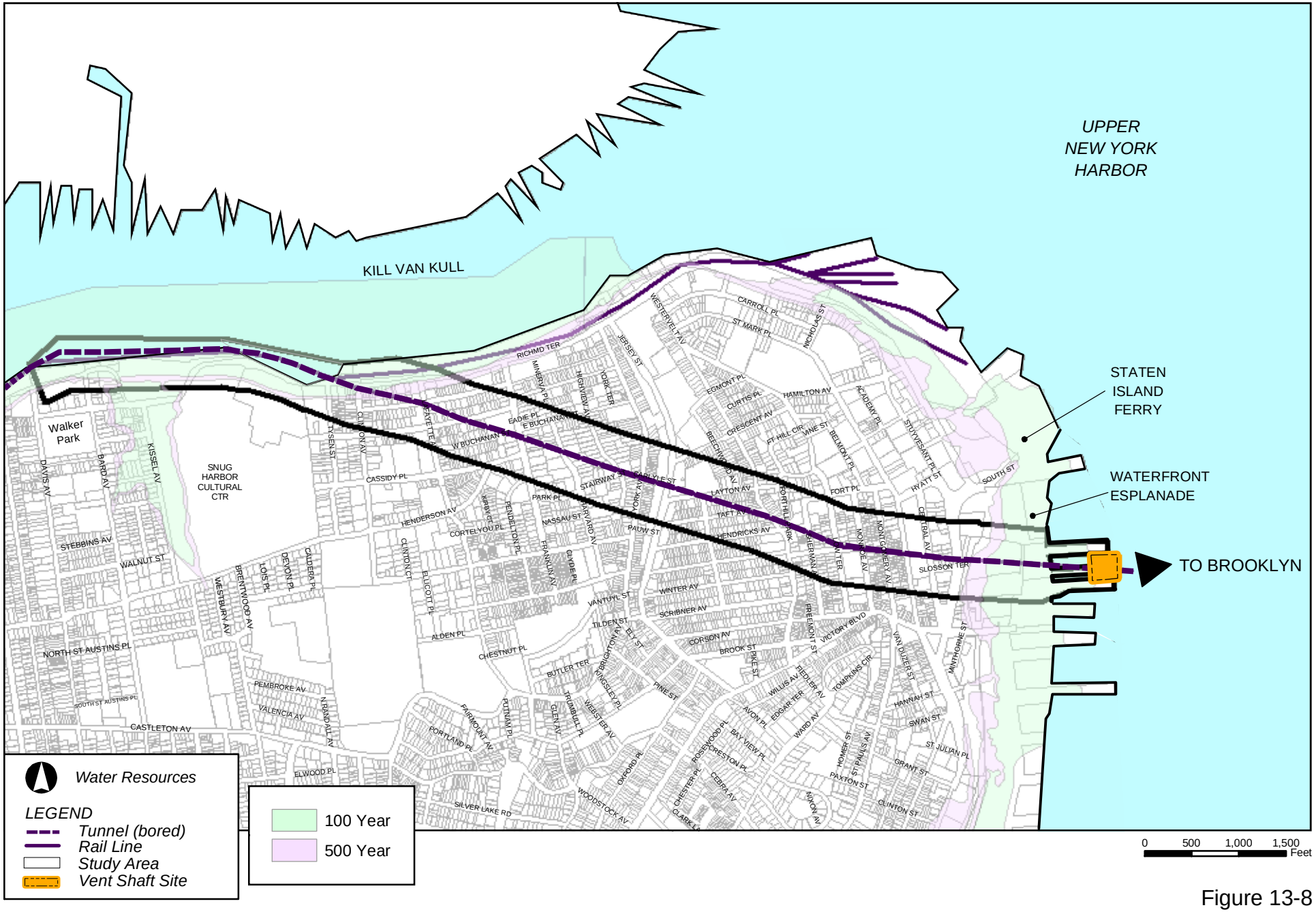


Figure 13-8
Northern Staten Island Study Area-Segment 4

CROSS HARBOR FREIGHT MOVEMENT PROJECT

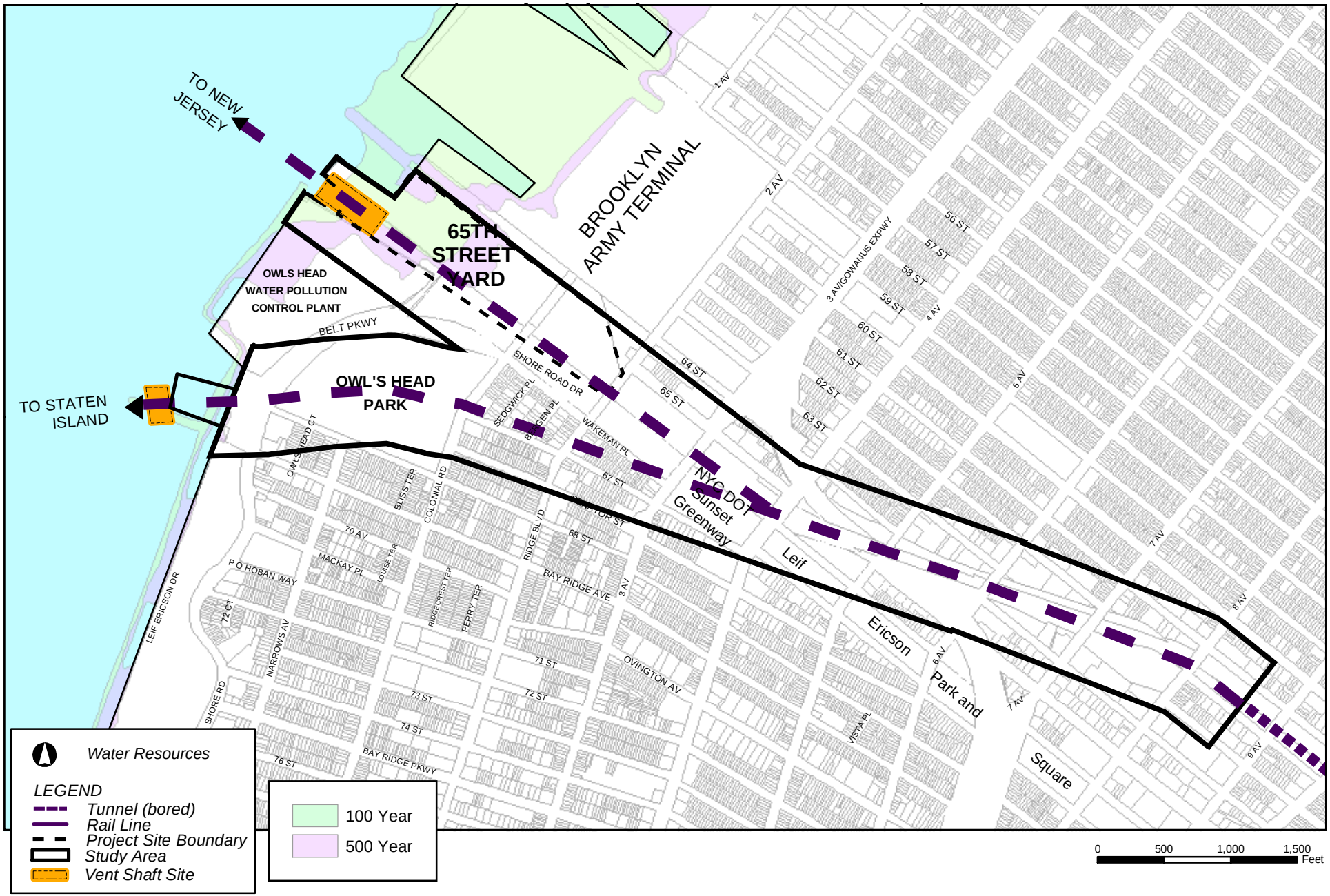


Figure 13-9
Bay Ridge Branch Study Area-Segment 1
CROSS HARBOR FREIGHT MOVEMENT PROJECT

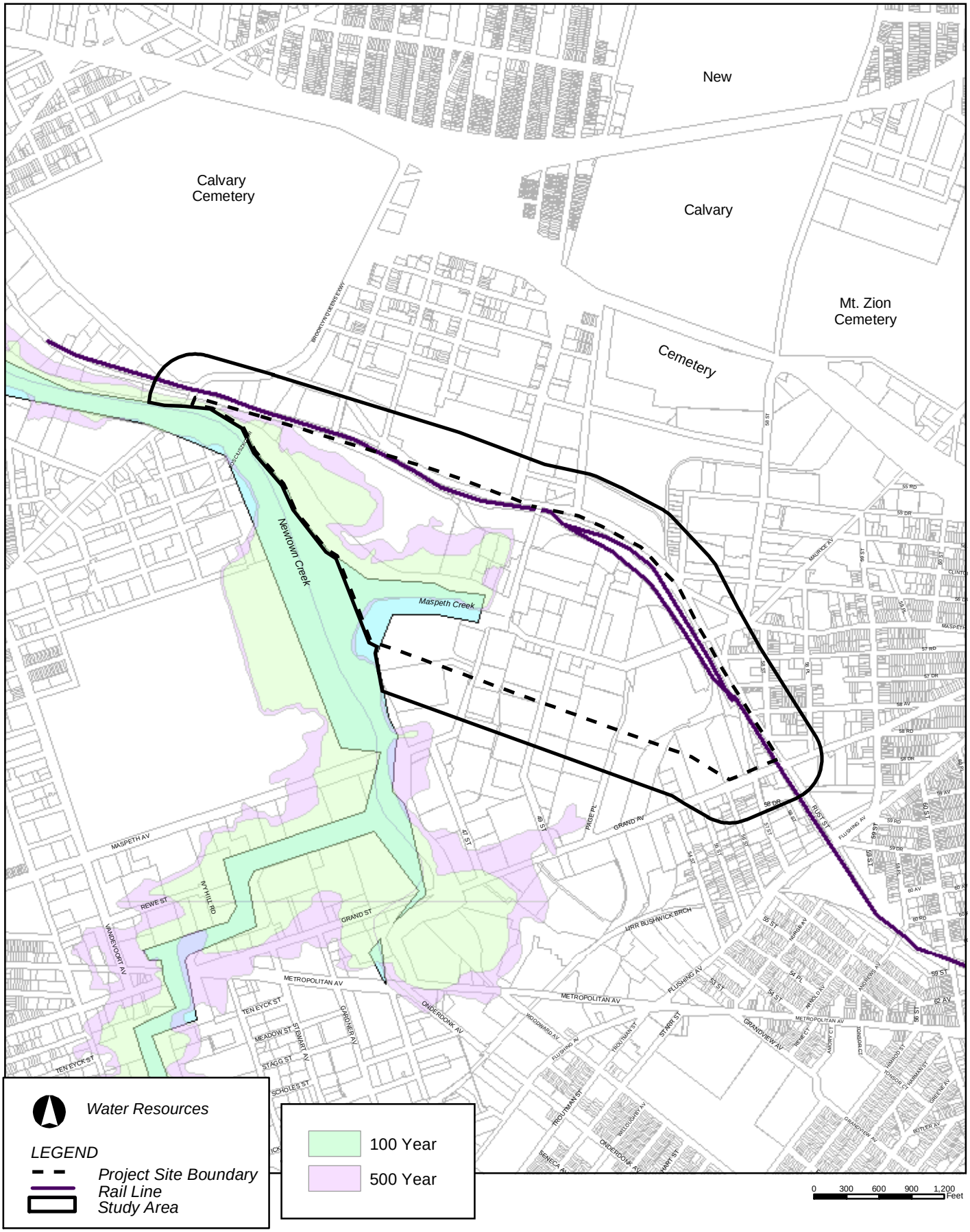


Figure 13-10

West Maspeth Yard Study Area

CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 14: Wetland and Terrestrial Resources

A. INTRODUCTION AND METHODOLOGY

This chapter describes existing wetland and terrestrial resources within the project study areas, and assesses the potential impacts to these resources from the project alternatives. Wetland and terrestrial resources include plant and animal species and the habitats that support these species, including tidal and nontidal wetlands, ponds, lakes, and freshwater and brackish (mix of fresh and saltwater) surface waterbodies, and terrestrial habitats such as woodlands, fields and grassy areas.

METHODOLOGY

Study areas were delineated for each site where potential operational or construction activities would occur under the project alternatives. Wetland and terrestrial resources were assessed within 400 feet of each of these project sites. (The project area, including each of the project sites, is shown on the project context map, Chapter 2, Figure 2-5.) Certain study areas are also assessed in a broader context beyond the 400-foot area surrounding the project sites to take into account sensitive habitats or wildlife identified as occurring near a particular project site. A description of regulations pertaining to wetland and terrestrial resources is provided in Appendix 6.

EXISTING CONDITIONS METHODOLOGY

Existing conditions for wetland and terrestrial resources within the study areas were summarized from existing information and site visits. Sources include:

- United States Fish and Wildlife Service (USFWS) Significant Habitats and Habitat Complexes of the New York Bight Watershed (USFWS 1997);
- New York Natural Heritage Program (NYNHP) Ecological Communities of New York State (Reschke 1990);
- New York State Department of Environmental Conservation (NYSDEC) tidal and freshwater wetland maps;
- New Jersey Department of Environmental Protection (NJDEP) tidal and freshwater wetland maps;
- USFWS National Wetlands Inventory (NWI) maps;
- National Oceanic Atmospheric Administration (NOAA) Office of Response and Restoration Coastal Resources Atlas;
- NYSDEC Open Space Conservation Plan;

- United States Army Corps of Engineers (USACOE) *New York and New Jersey Harbor Navigation Study Final Environmental Impact Statement* (FEIS);
- New York-New Jersey Harbor Estuary Program (NY/NJ HEP) Management Plan and Habitat Workgroup 2001 Status Report; and
- Trust for Public Land and New York Audubon Society, "An Islanded Nature" (Blanchard et al. 2001).

Site visits were conducted to verify and augment the information compiled through the literature review, check the approximate wetland boundaries identified using the existing sources with respect to general accuracy, identify approximate locations of unmapped wetlands, and identify other issues of concern. Site visits were conducted in fall 2001 for study areas in Brooklyn, Queens, and the Bronx. Site visits for study areas in New Jersey and Staten Island were conducted in spring 2002.

PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES METHODOLOGY

The potential impacts of the No Action and project alternatives on wetlands and terrestrial resources within the study areas were assessed using a weight of evidence approach that considered the following:

- Existing and No Action conditions and trends;
- Results of the ecological risk assessment presented in Chapter 13, "Water Resources" for food chain effects to terrestrial animals within the study areas;
- Results of hydrologic modeling for potential effects to wetlands from in-water construction activities as well as operational activities such as potential shoreline erosion effects;
- Potential impacts to wetlands from stormwater runoff due to construction and operational activities associated with the project alternatives based on an assessment of land use changes and Best Management Practices (BMPs) to control stormwater runoff;
- Potential loss of wetland and terrestrial habitat due to construction activities, including potential loss of bird breeding or nesting habitat;
- Potential impacts to wildlife associated with noise from construction activities, increased rail traffic, and increased night-time light levels during construction; and
- Results of empirical field studies from the New York-New Jersey Harbor Estuary and other areas.

B. EXISTING CONDITIONS

REGIONAL OVERVIEW

WETLANDS

Wetlands as defined by USACOE, are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil

conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. If the soils in the area are saturated or inundated for a two-week time period, and certain vegetation and soil conditions exist, the area is generally described as a wetland. While there are many types of wetlands distinguished by specific characteristics, wetlands may be described as being one of two fundamental types: tidal and freshwater. Most of the wetlands found within the project study areas are tidal wetlands.

The NY/NJ HEP estimates that approximately 75 percent of the New York-New Jersey Harbor shoreline consists of man-made structures such as bulkheads, riprap, and piers. Some of the remaining shoreline areas that have not been stabilized contain coastal wetlands (approximately 105,000 acres) that provide habitat for terrestrial and aquatic animals. Much of the shoreline within the study areas has been stabilized with bulkheads or riprap. Areas of tidal marsh and/or mudflats do occur within some of the New Jersey and Staten Island study areas where shoreline stabilization is absent or degraded.

Approximate areas of federally-identified wetlands are presented on NWI maps; New York State designated wetland areas are presented on NYSDEC tidal and freshwater wetland maps; and New Jersey designated wetland areas are presented on NJDEP tidal and freshwater wetland maps. NWI, NJDEP, and NYSDEC each have their own classification systems for defining and identifying tidal and freshwater wetlands. An explanation of these classification systems as well as figures depicting the location of various types of wetlands within the project study areas are provided in Appendix 6.

BIRDS

The New York Harbor lies within the Atlantic Flyway, a major migratory pathway for birds, and provides important resting and feeding habitats during the spring and fall migrations (USACOE 1999). Birds typically found in the Harbor Area include the following (see Appendix 6 for a complete list of birds with the potential to occur in the study areas):

- Waterfowl - Waterfowl use the New York City area during fall migration, which peaks in November, and as wintering areas. Common migratory species of waterfowl include brant, American black duck, and mallard (USFWS 1997). Waterfowl overwintering in the waters surrounding New York City include horned grebe, brant, red-breasted merganser, American widgeon, greater scaup, and bufflehead (NRG 1990). Common waterfowl breeding in the New York-New Jersey Harbor Estuary include mallard, wood duck, American black duck, and Canada goose. Within the study areas, waterfowl are concentrated along the Staten Island shoreline of Upper and Lower New York Harbor, the lower Hudson River, and the Kill Van Kull (USFWS 1997).
- Shorebirds - Nearly 30 species of shorebirds regularly use and migrate through the Harbor area during the spring (March to June) and fall (July to November), feeding in marshes, flats, and shallow water areas before continuing their migration. Abundant shorebirds include herring gull, semipalmated sandpiper, sanderling, ruddy turnstone, and least sandpiper. Spotted sandpiper, willet, killdeer, piping plover, American oystercatcher, least tern, and clapper rail breed in the New York Harbor area (NRG 1990a and 1995a, USFWS 1997).
- Wading Birds - Abundant wading birds found in the Harbor include great blue heron, little blue heron, tricolored (Louisiana) heron, American bittern, snowy egret, glossy ibis, and great egret (NYCDPR 1994, USFWS 1997). NY/NJ HEP (1996) estimates that the heron

populations in the Harbor represent up to 25 percent of all nesting wading birds along the East Coast from Cape May, New Jersey, to Rhode Island. Regionally significant colonies of these bird populations are found in the Arthur Kill Complex and Harbor Herons Complex along the Arthur Kill and Kill Van Kull.

- Raptors - Raptors, such as northern harrier, osprey, common barn owl, and peregrine falcon breed in the New York/New Jersey Metropolitan area. Overwintering species include northern harrier, rough-legged hawk, American kestrel, common barn owl, long-eared owl, and peregrine falcon. Commonly observed raptors migrating through the area include American kestrel and sharp-shinned hawk, as well as merlin, northern harrier, and osprey (NRG 1990, USFWS 1997).
- Songbirds - Many songbirds migrate through the New York/New Jersey Metropolitan area, and about 172 species are believed to breed in the area. They include song sparrow, American robin, gray catbird, yellow warbler, red-winged blackbird, marsh wren, tufted titmouse, yellow-shafted (northern) flicker, American redstart, and blue winged warbler (NRG 1991, USFWS 1997). Grassland species known to occur in the area include grasshopper sparrow, savannah sparrow, and bobolink (USFWS 1997).
- Other - Other birds known to occur in the Metropolitan area, such as American goldfinch, ring-necked pheasant, eastern meadowlark, and northern cardinal (NRG 1991b, 1995b, NYCDPR 1994), are listed in Appendix 6.

AMPHIBIANS AND REPTILES

Generally, amphibians and reptiles within the New York/New Jersey Metropolitan area are restricted to pockets of remaining terrestrial and freshwater habitats. Some snakes (such as the northern water snake) and turtles (such as the red-eared sliders) may also occur in brackish waters, while the diamondback terrapin is only found in brackish waters. Examples of amphibians and reptiles with the potential to occur within the study areas are listed in Appendix 6.

MAMMALS

Because many of the study areas are highly developed, mammals likely to occur are limited to pockets of undeveloped areas that provide suitable habitat, and developed areas that may provide habitat to a limited number of species. These areas include residential, parks and other land uses with some open space. Common small animals are those adapted to human disturbance. Mammals with the potential to occur in the study areas, such as gray squirrel, opossum, and red bat, are listed in Appendix 6.

ENDANGERED AND THREATENED SPECIES AND OTHER SPECIES OF CONCERN

A number of listed species (federally listed, state listed, and/or proposed to be listed) are found in the vicinity of the project sites (see Table 14-1). The transient bald eagle is the only federally listed or proposed endangered or threatened species under USFWS jurisdiction known to occur within the vicinity of the project sites. The USFWS will therefore not require further consultation pursuant to Section 7 of the Endangered Species Act (Staples 2001, Stilwell 2001). The New York State-listed endangered peregrine falcon has been identified as occurring within the vicinity of potential project activities. The least tern, found in the vicinity of the Greenville Yard, is listed as endangered in New Jersey and threatened in New York, and is federally listed

in some portions of its range. The section of this chapter entitled "Greenville Yard/Potential Tunnel Alignment" provides a discussion of the least tern nesting site near Greenville Yard.

The checkered white butterfly (*Pontia protodice*), a species of concern in New Jersey and New York, has been reported in the vicinity of Newark Airport (Lord 2001). Although not identified by the New York Natural Heritage Program (NYNHP) or the New Jersey Natural Heritage Program (NJNHP) in correspondence for this project as occurring within ½ mile of project sites, the colonial nesting wading birds associated with wetlands and shallow-water areas that form the Harbor Herons Complex, certain species of waterfowl, and certain raptors are considered sensitive species on Staten Island by the NYNHP (Conrad 2000).

Birds in this group known to occur on Staten Island, or the islands surrounding Staten Island, include great egret, cattle egret, snowy egret, tricolored (Louisiana) heron, little blue heron, glossy ibis, black-crowned night-heron, yellow-crowned night-heron, (threatened in New Jersey), least bittern (threatened in New York), pied-billed grebe (waterfowl threatened in New York, endangered in New Jersey), and northern harrier (raptor threatened in New York, endangered in New Jersey).

NEW JERSEY STUDY AREAS

The following information on existing terrestrial and wetland resources for the New Jersey Study Areas is based on literature sources and observations made during site visits conducted in April 2002. The below descriptions highlight the existing resources within certain project study areas. Detailed explanations of existing conditions within all of the study areas are provided in Appendix 6.

GREENVILLE YARD/POTENTIAL TUNNEL ALIGNMENT

The site is built on fill material and is bulkheaded, and contains limited areas that are suitable for wildlife habitat. At the time of the site visit, large piles of segregated material were located south of the tracks. Vegetation such as mugwort, goldenrod, mulberry, switchgrass (*Panicum virgatum*), and jimson weed (*Datura stramonium*) were observed next to the piles. Overall, this area is expected to provide little wildlife habitat. However, brant and herring gull were observed along the shoreline at the Global Marine Terminal/Auto Marine Terminal (NEAT) pier near the observation platform (south of Greenville Yard) during the site visits. These species, along with other waterfowl such as black duck and mergansers, and other shorebirds such as terns and other gulls, would be expected to occur along the shoreline off Greenville Yard.

Isolated herbaceous wetlands and saline marshes are mapped along the shoreline of Greenville Yard by the NJDEP (NJDEP GIS 2002a). The NWI map indicates that the shoreline contains subtidal wetlands (see Figure 14-1). North of the Greenville Branch next to the Tropicana facility, the NJDEP wetland maps indicate a NJDEP freshwater wetland classified as palustrine emergent, but this wetland was not present at the time of the site visit. Near the northeast corner of the Global Marine Terminal/NEAT pier (the potential location of the tunnel ventilation shaft), the Upper New York Harbor wetlands provide some habitat for migrating wading birds and shorebirds (NOAA 2001), including a least tern (NJ-listed endangered) nesting area[*]. Declines

[*] The least tern arrives in the metropolitan area to breed by late April to mid-May, and departs by late August to early September for wintering areas on the Gulf Coast, Central America, and Peru and Brazil

Table 14-1
List of Rare, Threatened, or Endangered Animals and Plants Recorded Within ½ Mile of the Project Sites*

Common Name	Scientific Name	State Status[1]	Federal Status[2]
NEW YORK			
STATEN ISLAND			
Animals			
Peregrine falcon	*Falco peregrinus*	Endangered	NS
Plants			
Angled spikerush	*Eleocharis quadrangulata*	Endangered	NS
Slender crabgrass	*Digitaria filiformis*	Threatened	NS
Pale duckweed	*Lemna valdiviana*	Endangered	NS
NEW JERSEY			
Animals			
Least tern	*Sterna antillarum*	Endangered	PS
Checkered white butterfly	*Pontia protodice*	NS	NS

Notes:
* Species identified in correspondence from NYNHP, NJNHP, USFWS, and/or USNMFS.
1 State Status:

New York
Endangered—any species meeting one of the following (1) any native species in imminent danger of extirpation or extinction in New York; (2) any species listed as endangered by the U.S. Department of the Interior, as enumerated in the Code of Federal Regulations (CFR) 50 CFR 17.11.
Threatened—any species meeting one of the following (1) any native species likely to become an endangered species within the foreseeable future in New York; (2) any species listed as threatened by the U.S. Department of the Interior, 50 CFR 17.11.

New Jersey
Endangered—any species whose prospects for survival within the state are in immediate danger due to one or many factors- a loss of habitat, over exploitation, predation, competition, disease. An endangerd species requires immediate assistance or extinction will probably follow.
NS- No Status

2 Federal Status:

NS—No status.
PS—Partial status: the species is listed in parts of its range and not in others, or one or more subspecies or varieties is listed, while others are not listed.

Source: Ketcham (2001), Lord (2001), Rusanowsky (2002), Staples (2001), Stilwell (2001).

in the number of least tern are attributed to development in coastal areas and disturbance from recreational activities (Jenkins 2001, NYSDEC 2000e). The NJNHP has designated the tip of the Global Marine Terminal/NEAT pier as a Natural Heritage Priority Site because it is a nesting site for the least tern. Natural Heritage Priority Sites are considered critically important areas for the conservation of New Jersey's biological diversity. NJNHP sites represent some of the best remaining habitat for rare species and exemplary natural communities in the state. The Global Marine Terminal/NEAT pier NJNHP Site is being maintained by the PANYNJ in compliance with a Waterfront Development Permit issued by the NJDEP for the development of the Global

in South America. The nesting season can extend from April through August. It breeds in colonies of up to 200 birds, and is frequently associated with piping plover nests. Nests are built in sand, shell, or gravel on broad level expanses of beach, dredge spoil, and other open shoreline areas.

Marine Terminal. Though nesting has been sporadic, this nesting location generally has between 5 and 12 nests per year (Malione 2001). While the least tern nesting area was inaccessible at the time of the site visit, wildlife observed along the riprap shoreline area west of the least tern nesting area and in the water included pigeons, starling, brant, and herring gull.

GREENVILLE BRANCH

Most of this rail line runs through a mixture of commercial, industrial, and residential land uses that provide limited wildlife habitat. The 20 to 30-foot portion of the rail bed on either side of the rails contains a mixture of invasive trees, shrubs and herbaceous plants. Wildlife observed within this area included red-winged blackbird, starling, and pigeon. The remainder of the study area outside the rail right-of-way and east of State Highway 440 is mapped as freshwater palustrine emergent marsh by NJDEP and estuarine intertidal emergent on the NWI maps (see Appendix 6 for detailed figures of this area). At the time of the site visit, it was an emergent marsh dominated by *Phragmites* with a fringe of shrub/scrub/wooded wetland on the periphery.

CHEMICAL COAST LINE

The New Jersey Turnpike (I-95) parallels the rail line over the entire length of this study area. Most of the Arthur Kill shoreline in New Jersey is densely developed for industrial, commercial, transportation, and residential uses (USFWS 1997). Within the study area, the Chemical Coast Line crosses Morses Creek, Piles Creek, the Elizabeth River, and the Rahway River.

In the southern portion of the study area is deciduous woodland, a small pond, and a portion of a larger pond between the Turnpike and the rail line right-of-way, which both the NWI and the NJDEP wetland maps identify as freshwater wetland. The portions of the study area within the Borough of Carteret and the City of Linden includes extensive salt marsh habitat associated with the Rahway River and Marshes Creek. The Rahway River portion of this study area consists of disturbed uplands, and mudflats and salt marsh. North of Tremley Point Road, the right-of-way and study area contains rudderal vegetation and salt marsh associated with Piles Creek. Tidal marsh associated with Morses Creek is located north to the City of Elizabeth border, which provides habitat for gulls, shorebirds, terns, wading birds, and waterfowl (NOAA 2001). Tidal wetlands in the Chemical Coast Line Study Area are classified by NJDEP as disturbed wetlands (modified), herbaceous wetlands and saline marshes and by NWI as estuarine intertidal emergent wetlands.

The Elizabeth River, classified as riverine upper perennial unconsolidated bottom wetland on the NWI maps and tidal wetlands on the NJDEP maps, is a channelized tidal river including marsh elder and small areas of *Spartina* that grade into *Phragmites* and locust. Laughing gull, great egret, black duck and red-winged blackbird were observed. Just south of North Avenue in Elizabeth, between the rail line and the New Jersey Turnpike, is a large pond identified as tidal wetland on the NWI maps and emergent wetland on the NJDEP maps. North of North Avenue, the study area passes through industrial, commercial and transportation-related land uses, many of which are associated with port operations. Near the IKEA complex there is a small stream area with *Phragmites* labeled as tidal wetlands on the NWI map.

ARTHUR KILL LIFT BRIDGE

The study area includes the area within 400 feet of the bridge and existing Staten Island Railroad between the bridge and the Chemical Coast Line. The New Jersey shoreline along the Arthur Kill at the site of the lift bridge is bulkheaded with steel sheeting. There is no natural shoreline

where the existing bridge crosses the Arthur Kill. The area from the Arthur Kill to the Chemical Coast Line runs through industrial, commercial, and urban areas that provide limited habitat for wildlife. Adjacent to the Arthur Kill, the rail line is elevated over abandoned lots containing cottonwood, willow, poison ivy, and *Phragmites*. Peregrine falcons nest within the vicinity of the existing lift bridge. Management of the nesting site is currently the responsibility of NYCDEP. The peregrine falcon is described in the next section, *"Staten Island Study Areas."* West to the crossing with the Chemical Coast Line, the rail line and study area consists of a cleared right-of-way in an industrial area. The NWI maps label the Arthur Kill as estuarine subtidal unconsolidated bottom habitat.

STATEN ISLAND STUDY AREAS

Existing conditions for the Staten Island study areas are based on literature sources and observations made during the April 2002 site visits. A summary of the study areas are presented below. A detailed description of each study area is provided in Appendix 6.

NORTHWESTERN STATEN ISLAND

Overview

Two project sites are located in the northwestern section of Staten Island: Arlington Yard and the Arthur Kill Lift Bridge. This section is along the Staten Island industrial waterfront of the Arthur Kill and is largely characterized by port and industrial facilities surrounded by open space. Much of the shoreline in Staten Island is bulkheaded or riprapped, with some natural shoreline that contains mudflats and tidal marsh around Shooters Island in Kill Van Kull, around Arlington Marsh to the east of Port Ivory, and along the Arthur Kill in the Howland Hook Marine Terminal area where Bridge Creek and Old Place Creek discharge to the Arthur Kill. Additional natural shoreline areas have developed where engineered shoreline areas such as wooden bulkhead or riprap have degraded.

The northwestern part of Staten Island is home to a number of significant wetland and upland habitat areas along the Arthur Kill and Kill Van Kull in New York and New Jersey (see Figure 14-2), designated as the Arthur Kill Complex by the USFWS (1997). The wetlands include intertidal marshes, coastal flats, littoral zone, high marsh, and formerly connected wetlands along Bridge Creek, in Arlington Marsh, Mariner's Marsh, and Old Place Creek, and Goethals Bridge Pond. These wetlands and associated upland areas provide nesting and foraging habitats for colonial nesting waterbirds such as herons, egrets and ibisis that form regionally significant colonies in the Arthur Kill and Kill Van Kull, referred to as the Harbor Herons Complex.

<u>*Significant Coastal Fish and Wildlife Habitats*</u>. In addition to the habitats identified by the USFWS, there are four Significant Coastal Fish and Wildlife Habitats as designated by the New York State Department of State (NYSDOS) in the vicinity of the study areas:

- Pralls Island—Located in the Arthur Kill approximately two miles north of Fresh Kills and three miles south of the Arthur Kill Lift Bridge, this 88-acre uninhabited island off the western shore of Staten Island contains a central wooded area developed on dredge spoil surrounded by tidal wetlands on the periphery.
- Goethals Bridge Pond—Goethals Bridge Pond is located within the Goethals Bridge Pond Preserve immediately southwest of the Arlington Yard. The 33-acre pond, a NYSDEC-designated and federally-designated wetland, is shallow (generally less than three feet deep)

freshwater to slightly brackish with a well-developed fringe of emergent wetland vegetation that is primarily *Phragmites*. The preserve also includes forested wetland next to the emergent wetland and pond. Though disturbed (it is believed to have once been a brackish tidal marsh), the pond provides valuable habitat for wildlife and is close to or adjacent to other valuable habitat areas such as Mariner's Marsh to the north, Bridge Creek to the west, Cable Avenue Woods and Graniteville Swamp to the east and southeast, and Old Place Creek to the south.

- Shooters Island—Shooters Island is located in the Kill Van Kull at its confluence with the Arthur Kill. Approximately 34 acres of the island are within New York State and owned by the City of New York as parkland; approximately nine acres are in New Jersey and are protected by conservation easements. It is one of the largest undisturbed upland habitats in the Manhattan Hills ecological region and prior to 1998 was used for nesting by large numbers of colonial waterbirds.
- Sawmill Creek Marshes—This 216-acre freshwater and tidal marsh complex includes Sawmill and Merrell's Creeks on the western shore of Staten Island. This marsh complex provides habitat for a large population of southern leopard frog (Chelsea Marsh), one of the few known locations for this frog in New York State, and foraging habitat for wading birds, nesting and foraging habitat for certain song birds, and nesting and foraging habitat for diamond back terrapin and swallow. The Sawmill Creek Marshes are at least two miles south of the Staten Island Railroad Line.

Threatened or Endangered Terrestrial Species. Several New York State-listed species have been identified in this section of Staten Island. A known nest site of the State-listed endangered peregrine falcon occurs on or in the vicinity of Goethals Bridge. This site has been active since 1990 (Loucks 2001). Peregrine falcons typically return to the same nesting sites every year and mate for life. There are 12 pairs of peregrine falcons nesting in the New York City area (NYCDEP 2000). In 1998, 38 pairs of peregrine falcons were reported for the State of New York (NYSDEC 2000d).

The state-listed threatened/endangered pied-bill grebe and state-listed threatened least bittern are both found most commonly in marshes and ponds. This pied-bill grebe is known to nest in Goethals Bridge Pond. The state-threatened/endangered northern harrier found in the study area is a marsh species that can cover up to 100 miles a day feeding on rodents and small birds. Declines in this species are attributed to habitat loss due to development of wetlands and changes in land use (NYSDEC 2000f).

Arthur Kill Lift Bridge (along Staten Island Railroad)

The portion of the study area south of the existing rail line consists of tidal marsh that is part of the Old Place Creek marsh system. The creek and its associated high and low marsh and mudflats occupy approximately 200 acres on Staten Island's western shore. The habitat complex has been identified as a significant foraging site for colonial nesting wading birds that form the Harbor Herons, and is known as a foraging area for the New York state-listed threatened northern harrier, and peregrine falcon (Blanchard et al. 2001, USFWS 1997). The active peregrine falcon nesting site, discussed above, is within this study area.

Arlington Yard

Arlington Yard comprises an inactive rail yard located in close proximity to several areas of natural resource significance, including Goethals Bridge Pond (described above). Surrounding

the railroad tracks and access roads within the yard is a mosaic of successional old field and successional southern hardwood forest habitats, as described by Reschke (1990). Herbaceous plants were present along the rail line and in other open areas. Saplings and young trees observed within the yard include cottonwood, tree-of-heaven, gray birch (*Betula populifolia*), and locust. Numerous birds were observed in Arlington Yard, such as killdeer, flicker, towhee, and possibly hermit thrush.

The Arlington Yard Study Area includes portions of Bridge Creek, Mariner's Marsh Park, and Goethals Bridge Pond Preserve. All of these wetland areas are located outside the Arlington Yard site. Classified as saltmarsh by both the NYSDEC and NWI (Figure 14-2) this wetland/upland complex south of the rail line contains black cherry, tree-of-heaven, cottonwood, and black locust in the upland area next to *Phragmites*/saltmarsh wetlands. Bridge Creek and its wetlands provide additional foraging habitat for the birds known to use Arlington Marsh (Blanchard et al. 2001). At the time of the April 2002 site visit, the portion of the marsh west of Western Avenue was mostly *Phragmites* with some *Spartina* and groundsel bush near the creek bank. In the larger portion of the Bridge Creek marsh east of Western Avenue, *Spartina* was more abundant along the creek bank with *Phragmites* present in the higher marsh areas. Wildlife observed in the creek included Canada goose, snowy egret, black duck, and sparrows.

Goethals Bridge Pond, described above under "Overview," is classified as a NYSDEC-designated formerly connected tidal wetland. The Goethals Bridge Pond Preserve also contains several NWI freshwater emergent wetlands. At the time of the site visit, Goethals Bridge Pond consisted of an open water area surrounded by *Phragmites*. Wildlife observed in and around the pond included towhee, great egret, ducks, and sand pipers.

The approximately 107-acre Mariner's Marsh Park is located adjacent to and north of Arlington Yard. Mariner's Marsh Park contains NYSDEC Class I freshwater wetlands. Class I wetlands provide the most critical of the state's wetland benefits, reduction of which is acceptable only in the most unusual circumstances. Mariner's Marsh Park provides habitat for a state-listed endangered plant (Ketcham 2001). Approximately 150 species of birds have been recorded in the park, 30 of which are known to nest there. A small portion of the southern section of Mariner's Marsh Park is contained within the Arlington Yard study area. The habitats contained within the study area include palustrine emergent wetland, and palustrine forested wetlands. At the time of the April 2002 site visit, the emergent wetlands were dominated by *Phragmites* and open water areas. The wooded wetland was located at the southeastern corner of Mariner's Marsh Park.

On the southeastern border of Arlington Yard lies the Cable Avenue Woods, a small piece of swamp forest. These woods contain small federally-identified wetlands and the major portion of a NYSDEC-designated freshwater wetland. South of the Arlington Yard fence line, within the Cable Avenue Woods area were several freshwater ponds mapped as palustrine emergent wetlands. The ponds were situated within a successional southern forest similar to that found within Arlington Yard. Examples of wildlife with the potential to occur in the vicinity of the ponds and woodlands would be similar to those listed for Arlington Yard.

NORTHERN STATEN ISLAND

The Northern Staten Island Study Area includes the portion of the Staten Island Railroad right-of-way from Arlington Yard to Davis Street. At Davis Street, the bored portion of the tunnel alignment would travel under the Staten Island Railroad right-of-way to Tysen Street and angle in a southeasterly direction to the waterfront at St. George.

Segment 1

The eastern portion between South Avenue and Grandview Avenue contains a dirt slope on either side of the right-of-way with a thin line of trees and herbaceous plants (mugwort). This portion of the right-of-way provides limited wildlife habitat but sparrows were observed and the area may be suitable for animals commonly associated with urban areas. Towards the east, the plant community is better developed and occupies most of the right-of-way on either side of the rails. Wildlife with the potential to occur in this vegetated corridor would include species commonly found in forest edge habitat. Between Morningstar Avenue and Nicholas Avenue the rail right-of-way is elevated on an embankment which contained primarily invasive plants such as mugwort, tree-of-heaven, and cottonwood and provides limited habitat for wildlife with the exception of those commonly associated with urban areas.

Segment 2

From Nicholas Avenue to Richmond Terrace, the rail line is elevated with no vegetation. Starting near Jewett Avenue, the northern portion of the study area includes NWI tidal wetlands classified as estuarine subtidal unconsolidated bottom and NYSDEC wetlands classified as littoral zone that are mapped along the length of the Kill Van Kull shoreline. North of the Port Richmond Water Pollution Control Plant (WPCP), there is a mapped NWI wetland classified as estuarine intertidal unconsolidated shore of sand and mud (mudflats) near the mouth of the tidal creek that runs through the WPCP. This tidal creek and the Kill Van Kull shoreline area would provide habitat for waterfowl known to occur on Staten Island such as mallard, black duck, American wigeon, and ruddy duck (NOAA 2001).

Segment 3

The Segment 3 study area, extending from Alaska Street to Davis Avenue, would be the site of the open cut and cut and cover portions of the tunnel. This entire length of rail line runs through waterfront-related commercial land uses. The southern half of the study area consists of urban commercial and residential areas and provides little wildlife habitat. The northern part the study area includes waterfront-related commercial operations and the Kill Van Kull shoreline. This portion of the right-of-way provides no wildlife habitat. The shoreline in this area consisted of decaying bulkhead. Similar to the Segment 2 study area, NWI tidal wetlands classified as estuarine subtidal unconsolidated bottom and NYSDEC wetlands classified as littoral zone are mapped along the length of the Kill Van Kull shoreline. Wildlife expected to use this area are the same as those discussed for the shoreline portion of Segment 2.

Segment 4

The Segment 4 study area is the bored portion of the tunnel, extending from Davis Avenue to the shoreline at St. Georges, just south of the Staten Island Ferry Terminal and the waterfront esplanade. The tunnel would be 65 feet deep or more in this segment and, therefore, the only potential impacts on natural resources would be the area near the shoreline where the ventilation shaft would be constructed. The tunnel ventilation structure would be constructed at the seaward side of Pier 2 just south of the Staten Island Ferry terminal. This would also be the site of a cofferdam during construction. The study area near the ventilation shaft contains a waterfront esplanade, a paved waterfront area with scattered small shade trees and benches. The shoreline along the potential tunnel alignment is an elevated platform on pilings with water underneath. Existing piers in the area including Pier 2 are collapsing in some areas and some of piers had

degraded to pile fields. During the site visit, laughing gulls, herring gulls, Canada geese, and cormorants were perched on the piers and pile fields.

BROOKLYN STUDY AREAS

65TH STREET YARD

Vegetative species observed during the site visit were predominantly invasive, non-native species that exist in disturbed areas and are tolerant of urban conditions. The ecological communities on-site are early successional stage communities and consist of herbicide-sprayed roadside/pathway and urban vacant lot communities, as defined by Reschke (1990). Along the northern portion of the site is a fenced parking lot with *Phragmites* along the perimeter. Down-slope of the parking lot is a gravel walkway and a riprapped shoreline. Some areas of dense vegetation are present between the parking lot and riprap. Flocks of several species of waterfowl were observed in the bay, within 50 yards of the site, and a flock of cormorants were observed on dilapidated piers in the harbor.

Although there were no vegetated tidal wetlands present during the site visit, portions of New York Harbor within the study area are classified as NYSDEC-regulated unvegetated wetlands (littoral zone). In addition, three areas along the shoreline of the 65th Street Yard are shown as tidal wetlands on the NWI maps. These wetlands are classified as estuarine subtidal unconsolidated bottom and total approximately 10 acres. However, the shoreline in this area appears to have been modified since the NWI map was prepared (1995), since some of the piers shown on the map are no longer present. No protected plant species were listed in the NOAA coastal resources atlas or NYNHP database for any species of special concern in the vicinity of the yard (NOAA 2001; Ketcham 2001).

BAY RIDGE BRANCH

There are no designated wetland areas in this study area except at the shoreline (see Segment 1 below). This study area, particularly in Segments 2, 3, and 4, does not provide sufficient habitat to allow for extensive nesting and cover area for wildlife, nor does it provide sufficient natural area to develop food resources for most terrestrial species. The limited habitat for wildlife such as gray squirrel and mockingbird occurs within the railroad right of way, tree-lined streets, landscaped areas, and municipal parks. No threatened or endangered flora or fauna were identified by USFWS or NYNHP in these study areas.

Segment 1

NWI and NYSDEC wetlands are mapped along the shoreline of the Staten Island tunnel alignment, where the proposed ventilation would be located. The shoreline consists of riprap or bulkhead. Although there are no vegetated tidal wetlands present, portions of New York Harbor within the study area are classified as NYSDEC-regulated unvegetated wetlands (littoral zone). In addition, portions of the shoreline immediately south of the alignment are shown as tidal wetlands on the NWI maps. These wetlands are classified as estuarine subtidal unconsolidated bottom and estuarine intertidal aquatic bed.

Owl's Head Park, located near the shoreline, is approximately 27 acres in size and consists of a landscaped mowed lawn with a tree community, as defined by Reschke (1990). Tree specimens on-site included native and exotic species. Willow oak (*Quercus phellos*), listed by NYNHP as an endangered species, is also present in the park. Herbaceous plants such as New York aster

(*Aster novi-belgii*) and New England asters (*Aster novae-angliae*) were located at the perimeter of the park. A number of gray squirrels and a flock of dark-eyed juncos were observed in this area.

Segment 2

Dominant plants observed along the right-of-way were mostly invasive, non-native species common to disturbed areas and tolerant of urban conditions. No NWI or NYSDEC tidal or freshwater wetlands are mapped for this study area.

Segment 3

Dominant plants observed along the right-of-way were similar to those described above for the Segment 2 study area and included predominantly invasive, non-native species that exist in disturbed areas and are tolerant of urban conditions, such as Norway maple. No NWI or NYSDEC tidal or freshwater wetlands are mapped for this study area.

Segment 4

Like the Segment 2 and 3 study areas, the dominant plants observed along the Segment 4 right-of-way included predominantly invasive, non-native species that occur in disturbed areas and are tolerant of urban conditions. Substantial portions of the railroad embankments and elevated areas in Segment 4 contain little invasive vegetation or no vegetation. The Cemetery of the Evergreens and Trinity Cemetery are located at the Brooklyn-Queens border, east of the rail line. The cemeteries contain a wide variety of planted trees, some of which are indigenous to this region and some that are not native. Willow oak, listed by NYNHP as an endangered species, is also present in the Cemetery of the Evergreens. No NWI or NYSDEC tidal or freshwater wetlands are mapped for Segment 4.

QUEENS STUDY AREAS

BAY RIDGE BRANCH (QUEENS PORTION)

Dominant plants observed along this portion of the rail line were predominantly invasive, non-native species that occur in disturbed areas and are tolerant of urban conditions. Eastern phoebes were observed perching in the black cherry trees, and pigeons, song sparrows, and mourning doves were observed flying over the site. No NWI or NYSDEC tidal or freshwater wetlands are mapped for this study area. The Cemetery of the Evergreens (described above under Brooklyn Study Areas) is also located in this study area.

FRESH POND YARD

Most of East Yard consists of a gravel parking lot bounded on the east and west by rail tracks. This portion of the site is best described as a combination of urban structure exterior and unpaved road/path communities. The perimeter of the site along Otto Road is densely vegetated and is best described as an urban vacant lot community. This area consists of plant species common to disturbed areas. A small pond is located in the northwest corner of the juncture of the Fremont Secondary and the Montauk Branch adjacent to the operators' houses. The pond is surrounded by cattails and *Phragmites*, classified as an artificial pond and reedgrass marsh communities according to Reschke (1990). Although no NYSDEC or NWI wetlands are mapped for this area, the small pond, and stand of cattails and *Phragmites* indicate the potential presence of a wetland.

In West Yard, the southern perimeter of the Montauk Branch is densely vegetated and various birds were observed. Mafera Park is adjacent to the southeast corner of West Yard and consists primarily of mowed lawn with trees. Lutheran Cemetery, located immediately north of East Yard, consists of a mowed lawn with trees community. The plant life in Lutheran Cemetery consists mainly of shallow rooted trees including cherry, plum, and pear. Various species of mature trees observed within the cemetery included oaks, maples, linden, and London plane. The cemetery is not densely vegetated. No NWI or NYSDEC freshwater or tidal wetlands are mapped for the Fresh Pond Yard Study Area.

MONTAUK BRANCH

Most of the line passes through commercial/industrial areas with several vacant lots present along the corridor. Dominant plants observed along the railroad right-of-way were predominantly invasive species that exist in disturbed areas and are tolerant of urban conditions. Several patches of *Phragmites* were observed in a vacant lot at the intersection of 49th Street and 57th Avenue in the study area, but outside of the right-of-way. No NWI or NYSDEC freshwater or tidal wetlands are mapped for the Montauk Branch Study Area.

WEST MASPETH YARD

In general, the ecology of the West Maspeth Yard Study Area consists of terrestrial resources that are ubiquitous and tolerant of disturbed, urban conditions. Minimal vegetation (e.g., ragweed and invasive grasses) exists on the streets in the study area where these commercial/industrial properties are located. The Phelps Dodge site, part of the potential yard site, is currently vacant with no structures and is situated along Newtown Creek and Maspeth Creek. Most of the site consists of a paved and gravel lot that has become colonized with invasive species. Planted oaks, pines, and ornamental locust trees are located in the medians of the site. Several small patches of *Phragmites*, approximately 1,400 square feet each, exist on-site indicating the potential presence of wetlands. The edge of the Phelps Dodge site along Maspeth and Newtown Creeks is riprapped with ragweed and tree-of-heaven colonizing the riprap. This portion of the site is best classified as an estuarine riprap/artificial shore according to Reschke (1990).

Maspeth Creek/Portion of Newtown Creek

Water quality conditions in Maspeth Creek and Newtown Creek are discussed in Chapter 13 "Water Resources." Maspeth Creek and Newtown Creek abut the site of the West Maspeth Yard. The eastern edge of Maspeth Creek is bulkheaded. The northern and southern edges contain sections that are bulkheaded and riprapped. Landward of the riprap (south of Maspeth Creek) is a grassy area where black locust trees and eastern red cedars were planted along the fence line of the NYCDOS property. Sparrows, double-crested cormorants, and snowy egret were also noted in this location. The uplands on the south side of the creek contain tall, mature trees and shrubs. The eastern half of the north side contains herbaceous vegetation and a stand of *Phragmites* situated at the high water mark. The stand of *Phragmites* may indicate the presence of a wetland.

The shorelines of Newtown Creek and Maspeth Creek are mapped as NYSDEC-regulated unvegetated wetlands (littoral zone) and NWI estuarine subtidal unconsolidated bottom subtidal wetlands.

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES

OVERVIEW

Construction and operational activities resulting from the project alternatives may adversely affect wetland and terrestrial resources in the study areas. Construction activities may result in the temporary or permanent loss of habitat and the temporary increase in noise levels. Potential operational impacts may result from increased train or barge noise and activity.

To determine if an adverse impact would be significant, temporary and permanent loss of habitat is reviewed with regard to the extent of loss, the value of the resource lost and the proximity of similar habitat nearby. Determination of the significance of impacts due to construction activities, other than habitat loss, and operational activities are based on applicable studies that evaluated the effects of noise on birds and other wildlife, the ability of the species of concern to adapt to the stimuli and where avoidance would occur, and the proximity of similar habitat nearby.

STUDIES OF THE EFFECTS OF NOISE ON WILDLIFE

Studies have been conducted on the effects of noise, human presence, and boating activity on birds and other wildlife. While many of the studies of the impacts of noise on birds and other wildlife were conducted to assess the effect of helicopter and fixed-wing aircraft noise and highway noise, they provide information on how wildlife reacts to both sudden and constant sources of noise that can be applied to potential construction and operational activities associated with the project alternatives.

Songbirds and mammals have been found to habituate to a wide variety of reoccurring human activities as long as they do not feel threatened or harassed (Renewable Resources Consulting Services (RRCS) Limited 1994, Geist 1971 in RRCS 1994). Tolerance to disturbance varies among songbirds. The behavioral response of waterfowl and shorebirds to noise stimuli appears to depend on the species, the intensity of the stimuli, and other sources of noise in the area (ambient or background noise conditions). Some species of waterfowl and shorebirds have been found to habituate to certain stimuli such as sound and traffic. Waterfowl can become accustomed to sensory stimuli that they do not perceive as threatening (RRCS 1994). Canada geese and mallards habituate to urban environments and the sound levels and other human disturbances associated with these areas (Godfrey 1966, Mackenzie 1976, Eberhardt et a. 1989 in RRCS 1994) and are unlikely to be affected by any increase in noise levels associated with additional train traffic. Muskrat and other mammals such as rabbits and fox are known to habituate to human activity (RRCS 1994).

Additional details regarding these studies are provided in Appendix 6.

STUDIES OF THE EFFECTS OF BOAT TRAFFIC ON WILDLIFE

Migrating and staging ducks have been found to avoid areas exposed to boating or to high levels of other human activities (Thompson 1973, Kahl 1991, Havera et al. 1992). Ward et al. (1986, in Gladwin et al. 1988) observed that brant flocks (a species observed within the New York Harbor area) flew off in response to approach by boats and humans on foot. In addition to avoidance behavior, young waterfowl disturbed by boats have been found to suffer increased predation rates (Götmark and Åhlund 1984, Keller 1991 in RRCS 1994). Eider ducklings (a species that is

found within the New York City metropolitan area) disturbed by boats had a four-fold increase in predatory encounters with gulls (Keller 1991 in RRCS 1994).

NO ACTION ALTERNATIVE

STATEN ISLAND

The NY/NJ HEP Habitat Workgroup identified four (of a total of 60) acquisition sites and three (of a total of 88) restoration projects within the vicinity of the Northwestern Staten Island Study Area that are also significant habitats identified by the USFWS (1997). Restoration activities at these sites may include salt marsh and forest restoration, non-point source pollution reduction, and habitat enhancement (HEP 2001). USACOE New York District began a feasibility study in 2001 to assess potential sites for habitat restoration in New York Harbor. One of the restoration areas, the Old Place Creek Watershed, is within the vicinity of the Arthur Kill Lift Bridge and Arlington Yard. The USACOE also identified other undeveloped land areas within the Harbor area, including the New York and New Jersey sides of the Arthur Kill, as potential sites for habitat restoration. The New York District proposes to remove *Phragmites* and undesirable fill from formerly high-value wetlands, and restore flow to enhance fish and wildlife value in these wetlands (USACOE 2002). These efforts would eventually increase the quality of habitat in these restoration areas. Old Place Creek watershed, Arlington Marsh and Cable Avenue Woods are listed by the NY/NJ HEP habitat workgroup as Highest Priority acquisition sites. The Regional Advisory Committee of the New York State Open Space Conservation Plan also proposed the Cable Avenue Woods as a New York City Land Protection Priority (NYSDEC Region 2 2000). The acquisition and restoration of these sites should enhance the wetland, aquatic and terrestrial habitats available to wildlife within the northwestern portion of Staten Island.

Under the No Action Alternative, Howland Hook Marine Terminal will undergo an expansion and the adjacent Port Ivory site will be redeveloped as an intermodal rail yard. Arlington Yard will also be redeveloped into an intermodal facility and the Staten Island Railroad will be reactivated between the Arthur Kill Lift Bridge and Arlington Yard as part of NYCEDC's Staten Island Railroad Reactivation project. Following construction, approximately five trains would use the yard and 10 trains would cross the bridge each day. The future site of the National Lighthouse Museum is planned at the currently abandoned U.S. Coast Guard Base (former Staten Island lighthouse depot complex), along the shoreline in St. George. The St. George Ferry Terminal will be reconstructed and developed as a mixed-used attraction for visitors and commuters.

Construction at Arlington Yard would result in a loss of a portion (between one third and one half) of the successional old field and successional southern hardwood forest habitat currently present within the rail yard. In addition to the direct loss of habitat, the fragmentation of habitat would have the potential to reduce the quality of the remaining habitat for some wildlife and may result in an increase in the number of species that inhabit edge habitat and that are tolerant of human disturbance. The type of habitat currently present within the yard, successional old field mixed with successional hardwood forest, is not common within this portion of Staten Island and there may not be suitable available habitat adjacent to the yard to accommodate individuals dislocated by the development of the yard.

OTHER SITES

In the New Jersey Study Areas, construction activity would be primarily track work associated with construction of the Waverly Loop to connect the P&H Line to the Greenville Branch; a second track along the P&H Line between North Bergen and Kearny Yards; connections from the Chemical Coast Line to the Staten Island Railroad; and a second track along the Chemical Coast Line between the Port Reading Secondary Line and Bayway Yard and between Elizabethport and Oak Island Yard. In addition, CP is proposing to improve its intermodal facility at Oak Island Yard by constructing a food facility, a paved transfer area, and laying new track. A second bypass track will be constructed south of the yard. Roadway improvements in the area will be implemented under Portway and several port projects are planned including the development of a portion of the former Military Ocean Terminal at Bayonne (MOTBY) for port development; expansion of the Global Marine Terminal; and relocation of the Auto Marine Terminal (NEAT). Some increases in rail, truck and barge activities are expected to result from these projects.

Construction and operational activities related to the No Action Alternative are not part of the Cross Harbor Freight Movement Project. These activities may result in clearing of vegetation and increased train activity and other noise that may affect wetland and terrestrial resources on certain project sites.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

NEW JERSEY

Greenville Yard

During rehabilitation of the two new float bridges, there may be a temporary change in habitat use in the vicinity of the float bridges until waterfowl and shorebirds habituate to the increased human activity and noise, including avoidance of the area. However, waterfowl can become accustomed to sensory stimuli that were initially alarming, provided that the stimuli are not associated with an unpleasant experience (RRCS 1994). In addition, portions of the shoreline would be disturbed and there may be permanent losses of some habitat areas. Given the large area of similar open water habitat and perching habitat surrounding the area of the float bridges, the temporary and permanent loss of some habitat and the temporary avoidance of the area due to construction activities would not cause significant adverse impacts to bird populations within the region.

NEW YORK

At 65th Street Yard, the site is sparsely vegetated with non-native and invasive species indicative of disturbed areas. Several small patches of *Phragmites* were observed on-site during field investigations, which may indicate the presence of non-tidal wetlands. These small patches of *Phragmites* could require Army Corps of Engineers wetland delineation to determine the potential for significant adverse impacts from the filling or clearing of these potential wetland sites. Along the Bay Ridge Branch and Montauk Branch rights-of-way, existing vegetative communities consist of species common to disturbed areas. Temporary impacts during construction and the period of regrowth are also not expected to be significant. No significant adverse impacts would occur to wetland and terrestrial resources at these sites. Bird species and other wildlife observed or with the potential to occur on these sites are well adapted to urban

areas and disturbances that could occur with construction for this alternative. Some wildlife will remain in the vicinity of these sites during and after construction, while others will either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the New York City region.

There would be a slight increase in the number of trains using the Fremont Secondary with the TSM Alternative. Because the wildlife common in urban areas are acclimated to the noise levels and other types of human disturbance associated with urban areas, an increase in rail activity along this rail line under this alternative is not expected to have significant adverse impact on wildlife resources in the study area.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

NEW JERSEY

Greenville Yard

During rehabilitation of the float bridges, portions of the shoreline would be disturbed and there would be some permanent losses of habitat areas. Areas may be filled and bulkheaded along the shoreline, including portions of the mapped littoral zone wetlands. Dilapidated piers in the water may be removed and the sunning/perching habitat for shorebirds such as migratory ducks and cormorants may be lost. During construction of the float bridges, there may be a temporary change in habitat use in the vicinity of the float bridges until waterfowl and shorebirds habituate to the increased human activity and noise, including avoidance of the area. However, waterfowl can become accustomed to sensory stimuli that were initially alarming, provided that the stimuli are not associated with an unpleasant experience (RRCS 1994).

Substantially increased maritime traffic may discourage the use of the site and adjacent waters by migratory shorebirds. While the operation of the float bridges would not be a constant source of sound or activity, or particularly intensive, the activity may result in avoidance of the area by some birds. Because the operation of the float bridge and movement of the barge is an ongoing operation and does not result in a sudden disturbance to birds, disturbance to bird activity patterns within the study area such as feeding and resting would be small. Some waterfowl and shorebirds may be startled by approaching boats, which may result in an increased loss to predation, or a change in activity pattern in the vicinity of the float bridges and the barge route. Disturbance of nesting activity would be small since suitable nesting habitat is limited in the vicinity of the float bridges.

Given the large area of similar open water habitat and perching habitat surrounding the area of the float bridges, the temporary and permanent loss of some habitat and avoidance of the area due to float operation activities would not cause significant adverse impacts to bird populations within the metropolitan region.

Other Sites

There would be a slight increase in the number of trains using the National Docks Secondary, P&H Line, Chemical Coast Line and Greenville Branch. The species using these areas have already adapted to train noise and activity. The minor increase in usage would not result in significant adverse impacts on wetland and terrestrial resources in the New Jersey study areas.

NEW YORK

65th Street Yard

Potential impacts from the construction and operation of the float bridges would be similar to those described above for Greenville Yard. Given the large area of similar open water habitat and perching habitat surrounding the area of the float bridges, the temporary and permanent loss of some habitat, and avoidance of the area due to float operation activities would not cause significant adverse impacts to bird populations within the metropolitan region. In the remainder of the site, new tracks would be laid. As discussed above under the TSM Alternative, the small patches of *Phragmites* could require Army Corps of Engineers wetland delineation to determine the potential for adverse impacts from the filling or clearing of these potential wetland sites. Wildlife that inhabit these and other upland areas that would be cleared would be expected to find suitable habitat areas (e.g., nearby Owl's Head Park), or remain on-site despite disturbance, as they are tolerant of disturbed urban environments.

Other Sites

Under the Expanded Float Operations Alternative, there would be minor new construction and operational activity at the affected New York project sites similar to that of the TSM Alternative. Expansion of the rail yard in West Maspeth would include the construction of new tracks, internal roadways, and paved areas. No construction activities (e.g., filling, bulkheading, rearmoring riprap) are proposed for the shorelines of Maspeth Creek and/or Newtown Creek. Minimal excavation and clearing of vegetation would be necessary for work at these project sites.

The site of the expanded rail yard in West Maspeth is mostly paved or graveled with some invasive species and grasses indicative of disturbed areas colonizing portions of the paved areas. At least two small patches of *Phragmites* (approximately 1,400 square feet each) were observed on-site during field investigations, which may indicate the presence of non-tidal wetlands. These small patches of *Phragmites* could require Army Corps of Engineers wetland delineation to determine the potential for adverse impacts from the filling or clearing of these potential wetland sites.

Along the Bay Ridge Branch and Montauk Branch rights-of-way, existing vegetative communities consist of species common to disturbed areas. Temporary impacts during construction and the period of regrowth are also not expected to be significant. No significant adverse impacts would occur to wetland and terrestrial resources at these sites. Bird species and other wildlife observed or with the potential to occur on these sites are well adapted to urban areas and disturbances that could occur with construction for this alternative. Wildlife observed foraging in the uplands of Maspeth Creek would be expected to continue to use this habitat as a foraging/resting location. Some wildlife will remain in the vicinity of these sites during and after construction, while others will either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the New York City region.

There would be a slight increase in the number of trains using the Bay Ridge Branch and Fremont Secondary with the Expanded Float Operations Alternative. Similar to the TSM Alternative, this increase in rail activity would not have a significant adverse impact on wildlife resources in the study area.

TUNNEL ALTERNATIVE

SINGLE TUNNEL SYSTEM

New Jersey

In New Jersey, construction associated with the New Jersey tunnel alignment would occur at Greenville Yard and along the Greenville Branch. The Staten Island tunnel alignment would require the construction of a second span of the Arthur Kill Lift Bridge and additional sidings along the Chemical Coast Line.

Greenville Yard/Potential Tunnel Alignment. The terrestrial resources identified in the study area along and adjacent to the open cut and cut and cover portions of the potential tunnel alignment consist of vegetative communities common to disturbed areas that are found throughout the region and would likely recolonize this environment post-construction. Temporary impacts during construction and the period of regrowth are also not expected to be significant. Following completion of tunnel construction, some portion of Greenville Yard may be available for replanting with vegetation indigenous to the area depending on future uses for the yard, which would enhance the available wildlife habitat. No significant adverse impacts would occur to wetland and terrestrial resources at these sites. Bird species and other wildlife observed or with the potential to occur on these sites are well adapted to urban areas and disturbances. Some wildlife will remain in the vicinity of these sites during and after construction, while others, particularly those located in the areas of tunnel construction, would either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the region. Additionally, based on their life history characteristics, additional individuals of these species tolerant of urban conditions are likely to move to the study area following construction.

The immersed tube portion of the tunnel would extend from the shoreline of Greenville Yard for approximately 4,200 feet (0.8 miles) to the vent structure location near the corner of the Global Marine Terminal/NEAT pier. The shoreline area is bulkheaded and currently offers limited wildlife habitat. As discussed in the previous sections for the TSM Alternative and Expanded Float Operations Alternative, there may be a temporary change in habitat use in the vicinity of this portion of Port Jersey until waterfowl and shorebirds habituate to the increased human activity and noise, including avoidance of the area.[*] Overwintering and spring migratory populations would not be affected if there was a break in underwater activities but fall migrating waterfowl and shorebirds have the potential to be affected. The tunnel ventilation shaft at the northeast corner of the Global Marine Terminal/NEAT pier would be constructed in the Harbor. The ventilation shaft's footprint would be approximately 230 by 150 feet (0.8 acre), and it would rise 50 to 60 feet above low to mean tide. During construction, the base of the vent shaft would serve as a cofferdam to contain the construction area and minimize disturbance to in-water habitat. Potential water quality and aquatic resource impacts associated with in-water construction and operation of the Staten Island tunnel ventilation shaft are discussed in Chapter 13, "Water Resources."

[*] Appendix 6 provides a discussion on the effects of noise on wildlife, including various case studies.

Because final design has not been completed, it has not been determined how much of the vent structure would be located at the end of the Global Marine Terminal/NEAT pier and how much would be in the water. As discussed under "Existing Conditions," the portion of the Global Marine Terminal/NEAT pier within the vicinity of the vent structure is a NJ Natural Heritage Priority Site because it provides nesting habitat for the NJ-listed endangered least tern. This nesting site is currently being maintained by the PANYNJ in compliance with a Waterfront Development permit issued to PANYNJ by the NJDEP and has generally had between 5 and 12 nests per year. The permanent loss of all or a portion of the least tern nesting habitat due to the construction of the vent shaft would significantly impact least tern nesting activity within this portion of the New York Harbor because similar nesting habitat is scarce within the vicinity of the site. Mitigation measures to reduce these impacts are presented under "Mitigation Measures" below.

However, if the vent structure were constructed in the water near the least tern nesting habitat, indirect impacts associated with noise and human disturbance during construction would have the potential to affect nesting during the nesting period (April to August). The loss of the nesting habitat during one season would not be a significant adverse impact to the least tern population within the New York City region since the site has historically supported a small number of nests. However, as discussed in Chapter 13, "Water Resources," dredging and in-water construction for the immersed tube portion of the tunnel is projected to extend for 76 weeks with two breaks in in-water activities from February 1 to May 31 to accommodate the striped bass overwintering period, or 72 weeks without any breaks in in-water activities. Because the starting date for dredging and in-water construction is not known at this point, it is not possible to determine with certainty how many nesting seasons might be affected by the construction of the immersed tube portion of the project. The schedule (without breaks) has the potential to affect at least one and possibly two nesting seasons depending on when the dredging and in-water activities are started. A spring or early summer start in mobilization and dredging would have a lower potential to affect nesting of that year since dredging would start near the Greenville Yard. In-water activities would be near the nesting site the following nesting season and would have the potential to affect nesting along with the construction of the vent structure if initiated before dredging is completed. A 76-week schedule with two breaks in the winter would have a greater chance of affecting two nesting seasons and possibly three. For other species, the permanent loss of the aquatic habitat due to the construction of the ventilation structure would not significantly impact waterfowl or shorebird populations feeding there given the large amount of similar habitat nearby. As discussed under "Mitigation" below, other engineering controls (best management practices) would be employed to minimize resuspension of sediments and potential impacts to water quality. After construction, water quality is expected to return to existing conditions.

Operation of the vent structure would not directly impact waterfowl or shorebirds using the area in the vicinity of the vent structure, but has the potential to cause indirect impacts due to noise from the fans. Should all or a portion of the least tern nesting beach remain after the construction of the vent structure, noise from the vent shaft and the presence of the vent itself would have the potential to make the nesting habitat at the end of the Global Marine Terminal/NEAT pier undesirable. As discussed previously, the loss of this least tern nesting area would significantly impact least tern nesting activity within this portion of the Upper New York Harbor. Least tern appear to be somewhat tolerant of human presence and are known to nest on building roof tops. This suggests that some individuals may not be impacted by the presence and noise associated with the operation of the tunnel and the vent structure. Mitigation measures to reduce potential

significant impacts associated with tunnel and vent operation are discussed in "Mitigation Measures" below. Other waterfowl and shorebirds have been found to acclimate to stimuli such as noise, and there is similar feeding and perching habitat nearby. Therefore, potential secondary operational impacts associated with the fan noise would not be significant for other species.

Chemical Coast Line. Under the Staten Island tunnel alignment, 30,000 feet of sidings would be required along this line near its planned connection to the Staten Island Railroad. These sidings would accommodate trains waiting to cross the Arthur Kill Lift Bridge while it is lifted to allow passage of maritime traffic. There also would be an increase in freight traffic, primarily in the northern portion of the study area; from 18 trains under the No Action Alternative, to 24 under the New Jersey tunnel alignment, and to 20 under the Staten Island tunnel alignment. The northern portion of the study area, where most of the increase in traffic is expected, is primarily industrial in nature.

This portion of the right-of-way is essentially clear of vegetation and provides little wildlife habitat. The exact alignment of the proposed sidings has not been identified. Based on a preliminary evaluation of the area, however, the construction of the sidings would not significantly adversely affect terrestrial or wildlife resources. If this alternative is selected, further assessment of the area will determine if wetlands would be impacted and if any permits would be required. Because the wildlife common in urban areas are acclimated to the noise levels and other types of human disturbance associated with urban areas, an increase in rail activity along this currently active rail line under this alternative is not expected to have significant adverse impact on wildlife resources in the study area. Additionally, the majority of the Chemical Coast Line right-of-way is next to the NJ Turnpike with its associated traffic noise.

Arthur Kill Lift Bridge. Under the Staten Island tunnel alignment of the Single Tunnel System, a second span would be constructed adjacent to the south side of the existing Arthur Kill Lift Bridge to accommodate additional rail traffic. The new span would be identical to the existing span. A viaduct would connect the new span to the Chemical Coast Line. The distance between the center lines of the two structures would be approximately 100 feet. The new pier caps would be adjacent to the existing pier cap in the Arthur Kill, approximately 165 feet east of the New Jersey shoreline. On the basis of conceptual design plans, an area of subtidal habitat approximately 150 feet long by 75 feet wide (approximately 11,250 square feet (0.26 acre)) would be disturbed by the placement of the bridge foundation, piercaps and fender. A small area of bulkheaded New Jersey shoreline would be disturbed south of the existing bridge. The temporary disturbance of the shoreline area and permanent displacement of a small area of subtidal habitat would not adversely affect waterfowl or shorebird populations that use this area for feeding or resting. Birds known to use this portion of the Kill would have sufficient feeding and resting habitat within the vicinity of the bridge that the loss of a small area will not significantly impact populations that use this area. The new bridge foundations would also provide additional resting or perching areas for waterfowl and shorebirds.

As discussed previously under "Existing Conditions," there is an existing peregrine falcon nesting site currently near the existing Arthur Kill Lift Bridge. Peregrine falcons have been observed to exhibit little reaction to aircraft when nesting (Windsor 1977 and Ritchie 1987 in RRCS 1984), but may be more easily flushed when the young have hatched (White and Cade 1975 in RRCS 1994). The degree of response to human disturbances may depend on the distance of the stimuli from the birds. Experimental overflights by a helicopter produced mild or no reactions at distances of 300 meter (984 feet) and 150 meters (492 feet) from the nesting ledge (Platt 1975 in RRCS 1994). Frequent and nearby jet aircraft passes were found to have minimal

affect on nesting peregrine falcons in Arizona, and were never associated with reproductive failure. When peregrines have been disturbed by a human activity, such as a sonic boom, normal activities resumed within minutes after the disturbance had stopped (Ellis 1981 in RRCS 1994). This tolerance to overflights by helicopter and fixed-wing aircraft suggest that the passage of trains, which would not likely be noisier than nearby aircraft, would not be likely to affect nesting or other behaviors of peregrine falcons.

The 2,500-foot viaduct connecting the new span to the Chemical Coast Line would cross through a highly urbanized area developed with commercial and transportation-related operations. The area lost due to footings for the viaduct and through construction clearing and then shading from overlying tracks would not significantly affect plant or animal communities within this portion of New Jersey. Little vegetation is found in this area and typically consists of invasive species common to disturbed areas. Temporary impacts during construction and the period of regrowth are also not expected to be significant. Bird species and other wildlife observed or with the potential to occur on these sites are well adapted to urban areas and disturbances that could occur with construction for this alternative. Some wildlife will remain in the vicinity of these sites during and after construction, while others will either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the region.

National Docks Secondary, P&H Line, Chemical Coast Line, Greenville Branch and Oak Island Yard. The project would generate moderate to substantial increases in the number of trains using the National Docks Secondary, P&H Line, Chemical Coast Line, Greenville Branch and Oak Island Yard. These are active rail lines and yard, many of which are located near highways and Newark Airport. Waterfowl and other wildlife with the potential to use the areas have been found to acclimate to noise and other stimuli and have already adapted to train and other noise and activity. The noise and other stimuli associated with the additional trains should not result in the same startle response as nearby aircraft experienced at sites close to Newark Airport. The increase in usage is not expected to result in significant adverse impacts on wetland and terrestrial resources in the New Jersey study areas.

New York

Staten Island

Arthur Kill Lift Bridge. As discussed above, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span under the Staten Island tunnel alignment. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track.

On the basis of conceptual plans, an area of salt marsh within the Old Place Creek tidal wetland system would be displaced south of the existing bridge for construction of the eastern bridge footing, pier cap and fender. As with the New Jersey side of the Arthur Kill Lift Bridge, it is expected that an area approximately 150 feet long by 75 feet wide would be disturbed. Part of the bridge footing, pier cap, and fender would be in the Kill within subtidal habitat. In addition to the salt marsh displaced for the bridge footing, the construction of the new track from Arlington Yard to the new lift bridge will require the existing railroad embankment to be extended to the south. The size of the potential embankment has not been determined, but is expected to occupy a 50-foot-wide band immediately south of the southern toe of the existing

embankment. The embankment would cross through the Old Place Creek salt marsh system for a distance of approximately 2,295 feet, then cross through the portion of Bridge Creek salt marsh west of Western Avenue and south of the rail tracks for a distance of approximately 500 feet, and finally through a portion of the Bridge Creek salt marsh system east of Western Avenue for a distance of approximately 1,100 feet. Up to five acres of tidal wetland would potentially be adversely impacted by the construction of the additional embankment area and bridge footing. Old Place Creek has been identified by New York City as part of the Special Natural Waterfront Area along western Staten Island (NYC 2001). In addition, this area has been the site of a wetland restoration project, and is proposed as a site for potential wetland restoration by the USACOE. The NY/NJ HEP has identified Old Place Creek and its marsh as an area where habitat loss may occur should a second span be constructed for the Goethals Bridge and the associated widening of the Staten Island Expressway (NY/NJ HEP 2001b). There is a potential for significant wetland and terrestrial impacts associated with construction of the second span of the Arthur Kill Lift Bridge.

The temporary disturbance of the shoreline area and permanent displacement of a small area of subtidal habitat would not adversely affect waterfowl or shorebird populations that use this area for feeding or resting. Birds known to use this portion of the Kill would have sufficient feeding and resting habitat within the vicinity of the bridge such that the loss of a small area will not significantly impact populations that use this area. The new bridge foundations would also provide additional resting or perching areas for waterfowl and shorebirds. Peregrine falcons nest in the area as discussed under New Jersey Arthur Kill Lift Bridge study area above. Although peregrine falcons are tolerant of human activity, the construction of the potential Arthur Kill Lift Bridge has the potential to significantly affect nesting activity or nesting success. Mitigation measures are discussed in Section D below.

There would be a substantial increase in train activity (34 trains per day as compared to 10 under the No Action Alternative) under the Single Tunnel System. Waterfowl and other wildlife with the potential to use the areas have been found to acclimate to noise and other stimuli and have already adapted to train and other noise and activity. The increase in usage is not expected to result in significant adverse impacts on wetland and terrestrial resources in the study area.

Arlington Yard. Two new main line tracks would be added at Arlington Yard for the additional trains passing through the yard. Additional lines would be added in this area under the No Action Alternative, and little or no additional clearing would be required for the construction of the two lines. Therefore, no potential significant impacts to terrestrial resources are expected.

As previously discussed, the increase in train activity is not expected to result in significant adverse impacts on wetland and terrestrial resources in the study area.

Northern Staten Island—Segments 1 and 2. The Staten Island Railroad would be rehabilitated between Arlington Yard and the tunnel entrance at Alaska Street. The existing right-of-way along Segments 1 and 2 would be cleared for a width of 40 feet through the clearance work area. The width of the right-of-way along the Staten Island Railroad, which is currently wooded, ranges from approximately 105 feet to 120 feet for the non-elevated portion. At the eastern end of Segment 1 at Nicholas Avenue, the rail line is elevated and the width of the right-of-way is approximately 62 feet. While the required clearing would remove much of the existing vegetation, some vegetation would remain on either side of the track, which would continue to provide habitat for wildlife similar to that already expected to use the right-of-way. Some individual wildlife using the right-of-way may be adversely impacted from the loss of edge habitat due to vegetation clearing and by disruptions associated with the rail construction, if

similar habitat is not available nearby. Because the species using the right-of-way are expected to be those common to successional forest edge areas and common to suburban or urban land uses, the loss of some individuals would not significantly impact the populations of these species within the New York City region.

At the eastern end of Segment 2, the rail right-of-way approaches the Kill Van Kull shoreline. Because clearing and construction would be restricted to the right-of-way and would not result in clearing along the shoreline, waterfowl and shorebirds using the area adjacent to the right-of-way would not be directly impacted by construction activities.

Northern Staten Island—Segment 3. No shoreline habitats or subtidal habitat would be directly impacted by the construction of the open cut or cut and cover portion of the tunnel. Upon completion of the cut and cover portion, the area would be revegetated with native vegetation, to the extent possible depending on future land use, which may provide additional habitat for wildlife tolerant of urban conditions along the shoreline. Construction activities and train traffic have the potential to cause secondary impacts to waterfowl and shorebirds from noise and human activity. However, as discussed in previous sections, waterfowl and shorebirds have been found to habituate to human disturbances. Individuals using the Kill Van Kull already experience some level of disturbance due to human activity associated with waterfront-related commercial operations and shipping. Individuals that are disturbed have similar subtidal habitats nearby that can be used during the construction period. The increase in activity is not expected to result in significant adverse impacts on wetland and terrestrial resources in the study area.

Northern Staten Island—Segment 4. The ventilation shaft for the Staten Island tunnel alignment would be constructed in the Harbor near the seaward end of Pier 2. Potential permanent loss of pile habitat and construction noise and activity would affect waterfowl and shorebirds using it as a perching and feeding area. Because similar pile field habitat is available within the vicinity, the loss of the pile field habitat within the vent structure footprint would not result in a significant adverse impact. The permanent loss of the aquatic habitat due to the ventilation structure would not significantly impact waterfowl or shorebird populations feeding there given the large amount of similar habitat nearby. As discussed under "Mitigation Measures" below, engineering controls (best management practices) would be employed to minimize resuspension of sediments and potential impacts to water quality. After construction, water quality is expected to return to existing conditions.

Operation of the vent structure has the potential to impact waterfowl and shorebirds using the area in the vicinity of the vent structure due to noise from the fans. Because waterfowl and shorebirds have been found to acclimate to stimuli such as noise, and there is similar feeding and perching habitat nearby, potential operational impacts associated with the fan noise would not be significant. Individuals that are affected by fan noise would have similar habitat available nearby.

<u>*Brooklyn*</u>

65th Street Yard. Clearing of vegetation would be required for the installation of the tunnel vent shaft, staging areas, and new tracks. As discussed previously, the site is sparsely vegetated with non-native and invasive species indicative of disturbed areas. Several small patches of Phragmites could require Army Corps of Engineers wetland delineation for issuance of a permit. However, no significant adverse impacts to terrestrial resources are anticipated as a result of upland construction and operation activities.

Bay Ridge Branch of the LIRR. The ventilation shaft for the Staten Island tunnel alignment would be constructed in the Harbor near the seaward end of the public 69th Street pier. The permanent loss of the aquatic habitat due to the ventilation structure would not significantly impact waterfowl or shorebird populations feeding there given the large amount of similar habitat nearby. As discussed under "Mitigation" below, other engineering controls (best management practices) would be employed to minimize resuspension of sediments and potential impacts to water quality. After construction, water quality is expected to return to existing conditions. Similar to the vent structure on the Staten Island/New Jersey side, operation of the vent structure would not directly impact waterfowl or shorebirds using the area.

The construction work for the open cut and cover portions of the tunnel alignment and the clearance work would occur within the right-of-way of the existing rail line. The terrestrial resources identified in the study area are generally located in right-of-way embankments. Along the Bay Ridge Branch right-of-way, existing vegetative communities consist of species common to disturbed areas that are found throughout the New York City region and would likely recolonize this environment post-construction. Temporary impacts during construction and the period of regrowth are also not expected to be significant. No significant adverse impacts would occur to wetland and terrestrial resources at these sites.

Bird species and other wildlife observed or with the potential to occur on these sites are well adapted to urban areas and disturbances. Some wildlife will remain in the vicinity of these sites during and after construction, while others, particularly those located in the areas of tunnel construction, would either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. Based on their life history characteristics, these populations are expected to rebound after temporary loss of habitat. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the New York City region.

Queens

Bay Bridge Branch (Queens Portion). The minor track work required for rehabilitation of the Bay Ridge Branch (Queens Portion) would occur within the right-of-way of the existing rail line. Terrestrial resources are similar to those described for the Bay Ridge Branch Study Area in Brooklyn. For the reasons stated above, no significant adverse impacts would occur to wildlife in the Bay Ridge Branch Study Area from the Tunnel Alternative.

Fresh Pond Yard. Substantial increases in train traffic would be expected at Fresh Pond Yard, requiring more interchanges than are currently handled. The existing terrestrial resources in the yard consist of vegetative and wildlife species typical of disturbed ecological communities. Some wildlife will remain in the vicinity of these sites during and after construction, while others will either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the New York City region.

No NYSDEC or NWI wetlands are mapped for the Fresh Pond Yard study area; however, the small pond adjacent to the operator's house at Fresh Pond Yard (in the northwest comer of the yard) and wetland vegetation indicate the potential presence of a wetland. No construction activities are proposed for this location. Additional rail activity would also have no significant adverse impacts on terrestrial resources in the study area, as the existing terrestrial resources are already adapted to the current rail activities and noise levels associated with the yard.

Therefore, no significant adverse impacts would occur to these resources during the construction of the Tunnel Alternative.

Montauk Branch. The existing terrestrial resources consist of vegetative and wildlife species typical of disturbed ecological communities. Some wildlife will remain in the vicinity of these sites during and after construction, while others will either move to neighboring habitat areas that are suitable and available for additional individuals, or be lost from the vicinity of these sites. These species are common to urban environments, and the loss of some individuals would not result in a significant adverse impact on the bird and wildlife community of the New York City region.

West Maspeth Yard. An expanded intermodal rail yard, comprising approximately 108 acres, would be constructed at Maspeth. The construction would include demolishing a number of warehouses and other commercial and industrial buildings, laying new rail tracks, constructing a new vehicular bridge leading to the site, and replacing/widening an existing bridge.

The upland portion of the site is mostly paved or graveled with some invasive species and grasses indicative of disturbed areas colonizing portions of the paved areas. At least two small patches of *Phragmites* (approximately 1,400 square feet each) were observed on-site during field investigations which may indicate the presence of non-tidal wetlands. These small patches of *Phragmites* could require Army Corps of Engineers wetland delineation to determine the potential for significant adverse impacts from the filling or clearing of these potential wetland sites. Wildlife that inhabit these upland areas that would be cleared would be expected to find suitable habitat areas or remain on-site despite disturbance, as they are tolerant of disturbed urban environments.

DOUBLE TUNNEL SYSTEM

The probable impacts of the potential Double Tunnel System would include all of those impacts discussed in the previous section. In addition to those impacts, the following elements exclusive to the Double Tunnel System would be anticipated to affect wetland and/or terrestrial resources.

Additional Trains

The Double Tunnel System would result in increased numbers of train trips along the rail lines within the study areas. Based on the studies discussed above under "Overview" and in Appendix 6, these additional trains are not expected to have a significant adverse impact on wildlife resources within the study areas.

New York

Queens

West Maspeth Yard. Under the Double Tunnel System, an existing rail yard in West Maspeth would be expanded to a 160-acre intermodal facility. A storage facility would be built in the center of the site. Construction of the yard would require filling in Maspeth Creek and a portion of Newtown Creek for a total of approximately eight to nine acres. The work would include demolishing a large number of warehouses and other commercial and industrial buildings, laying new track, and constructing buildings for storage and maintenance.

The potential filling of Maspeth Creek and portions of Newtown Creek (eight to nine acres of aquatic habitat) to provide additional upland area for the potential Maspeth Yard would result in the permanent loss of habitat including foraging grounds or resting sites for shorebirds and

wading birds and other wildlife that rely on the creek, shoreline, and upland areas for habitat and/or food resources. This construction would result in adverse impacts to those individuals that use the area for habitat, but the loss of this subtidal area would not significantly impact bird populations within the New York City metropolitan area because it constitutes a small portion of this type of the habitat available within the region. However, the loss would constitute an adverse impact to wetland resources within New York City. The water quality and aquatic resources impacts associated with filling Maspeth Creek and a portion of Newtown Creek are discussed in Chapter 13, "Water Resources."

Wildlife that inhabit the upland areas that would be cleared would be expected to find suitable habitat areas or remain on-site despite disturbance, as they are tolerant of disturbed urban environments.

D. MITIGATION MEASURES

GREENVILLE YARD

Potential significant adverse impacts to the NJ-listed endangered least tern nesting site at the tip of the Global Marine Terminal/NEAT pier could occur from the construction and/or operation of the vent structure under the New Jersey alignment of the Single Tunnel System. Construction and operation of the vent structure may result in the loss of all or a portion of the habitat used by least terns as a nesting site. Mitigation measures to minimize these potential impacts would be developed in coordination with NJDEP and could include the following:

- If the vent structure is constructed adjacent to the nesting area, the construction period would be scheduled if possible to avoid the nesting period (April to August), or so that it impacts only one nesting season.
- If the nesting habitat is not directly affected by the construction of the vent structure, or only a portion is affected, monitor use of the nesting site for a period of time agreed to by NJDEP to determine whether the nesting habitat is still suitable for least tern after the tunnel and the vent shafts are in operation. If the monitoring results suggest the nesting area is no longer suitable, mitigation plans would be developed in coordination with NJDEP to create suitable nesting habitat along the New Jersey shoreline.
- If the nesting habitat is directly affected due to the construction of the vent structure at the end of the pier, mitigation plans would be developed in coordination with NJDEP to create suitable nesting habitat along the New Jersey shoreline.

ARTHUR KILL LIFT BRIDGE

Under the Staten Island alignment of the Single Tunnel System, construction of the Arthur Kill Lift Bridge and the embankment for the new rail line leading to Arlington Yard have the potential to significantly impact tidal wetlands within the Old Place Creek marsh system and the Bridge Creek marsh system through the placement of fill. Mitigation measures to minimize these potential impacts would be developed in coordination with USACOE, NJDEP, NYCDEP's Wildlife Biologist, NYC Parks Department, and NYSDEC as part of the permitting process for construction and could include the following:

- Avoiding wetlands to the greatest extent possible.
- Minimizing the amount of fill to the greatest extent possible.

- Implementing erosion and sediment control measures during construction.
- Restoration or creation of wetlands in or within the vicinity of the wetland systems impacted by construction.

While peregrine falcons would tolerate activities associated with the construction of the proposed waiting track, mitigation measures will be developed in coordination with NYSDEC and NJDEP to minimize potential impacts to the falcons, nesting success, and juvenile falcons. Potential measures could include the following:

- Bird control device on the top of cranes or other tall construction equipment to keep young falcons from landing on them and slipping off.
- Moving the nest(s) back to the existing nesting tower constructed by PANYNJ and ensuring a buffer of between 100 and 300 feet between barges associated with construction and the nesting tower.
- Safety precautions for the workers such as head protection and face protection etc. Falcons can be extremely aggressive during nesting season which starts in February and March.

65TH STREET YARD

Under all project alternatives, potential wetland loss could occur from construction activities at 65th Street Yard where *Phragmites* patches were observed during field investigations. These sites may require closer examination prior to site development to determine whether they are under the jurisdiction of the USACOE or NYSDEC. Should these areas fall under regulatory jurisdiction as wetlands, their loss would be incorporated into the wetland mitigation plan that would be prepared as part of the environmental permitting for the entire Cross Harbor Freight Movement Project.

WEST MASPETH YARD

Under the Expanded Float Operations Alternative and the Tunnel Alternative, potential wetland loss could occur from the expansion of the rail yard on the Phelps Dodge site where *Phragmites* patches were observed during field investigations. These sites may require closer examination prior to site development to determine whether they are under the jurisdiction of the USACOE or NYSDEC. Should these areas fall under regulatory jurisdiction as wetlands, their loss would be incorporated into the wetland mitigation plan that would be prepared as part of the environmental permitting for the entire Cross Harbor Freight Movement Project.

If the Tunnel Alternative were expanded to the Double Tunnel System, approximately eight to nine acres of subtidal habitat would be lost. Mitigation measures for Maspeth Creek and the portion of Newtown Creek to be filled are discussed in Chapter 13, "Water Resources." Expansion of the West Maspeth Yard rail yard, including the filling of Maspeth Creek to provide additional upland areas for the yard has the potential to result in the loss of foraging grounds or resting sites for shorebirds and wading birds. Mitigation measures for this habitat would be incorporated into the wetland mitigation plan that would be prepared as part of the environmental permitting for the entire Cross Harbor Freight Movement Project. Mitigation measures will be developed in coordination with NYSDEC, USACOE, NYC Parks Department's Natural Resources Group, and other entities with regard to acreage, type, and location. Measures could include the following:

- Minimizing the area of Maspeth Creek and Newtown Creek to be filled to the greatest extent possible.
- Restoration or creation of subtidal or wetland habitat within New York City. ✷

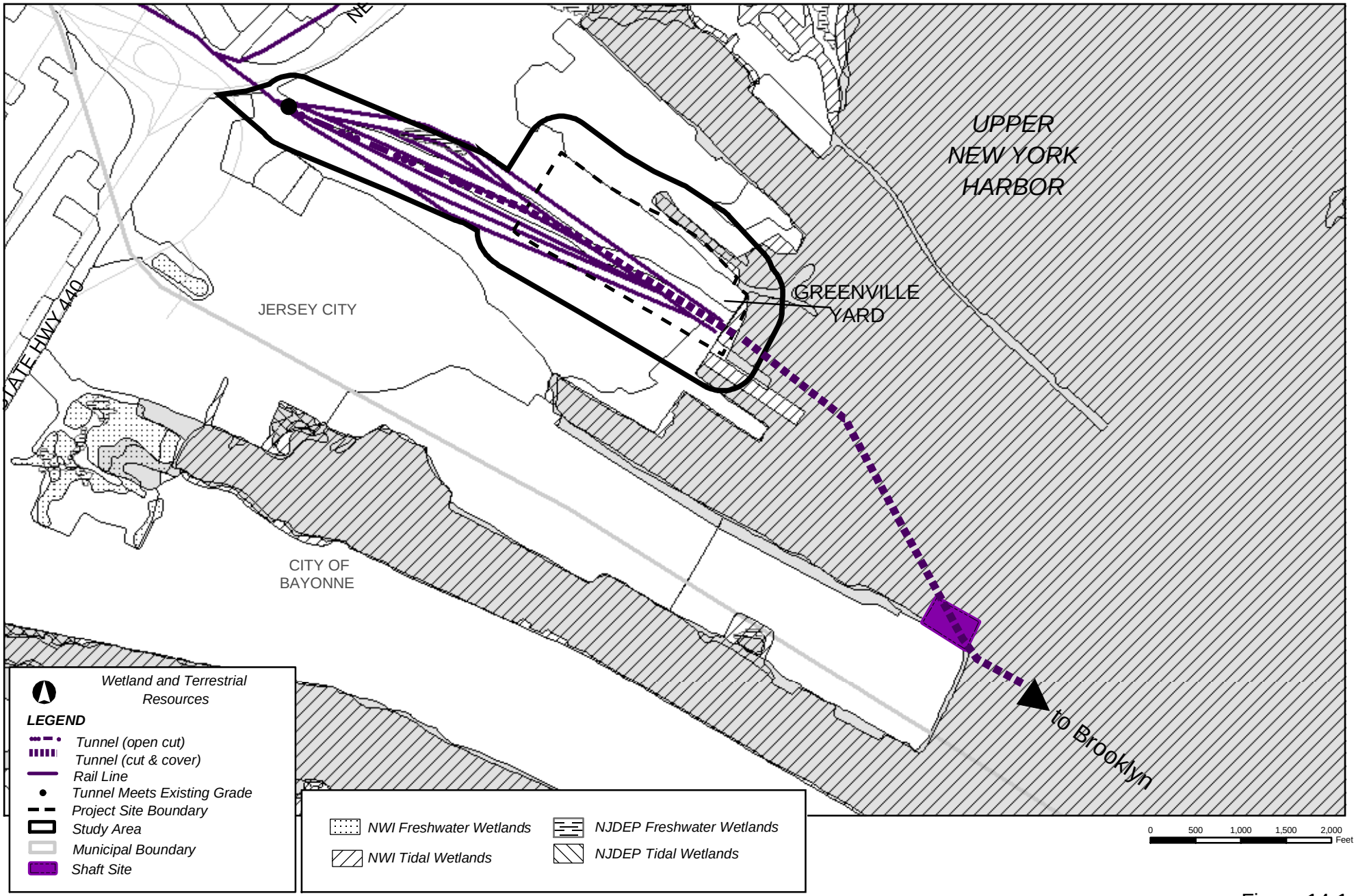


Figure 14-1
Greenville Yard/Potential Tunnel Alignment Study Area Wetlands
CROSS HARBOR FREIGHT MOVEMENT PROJECT

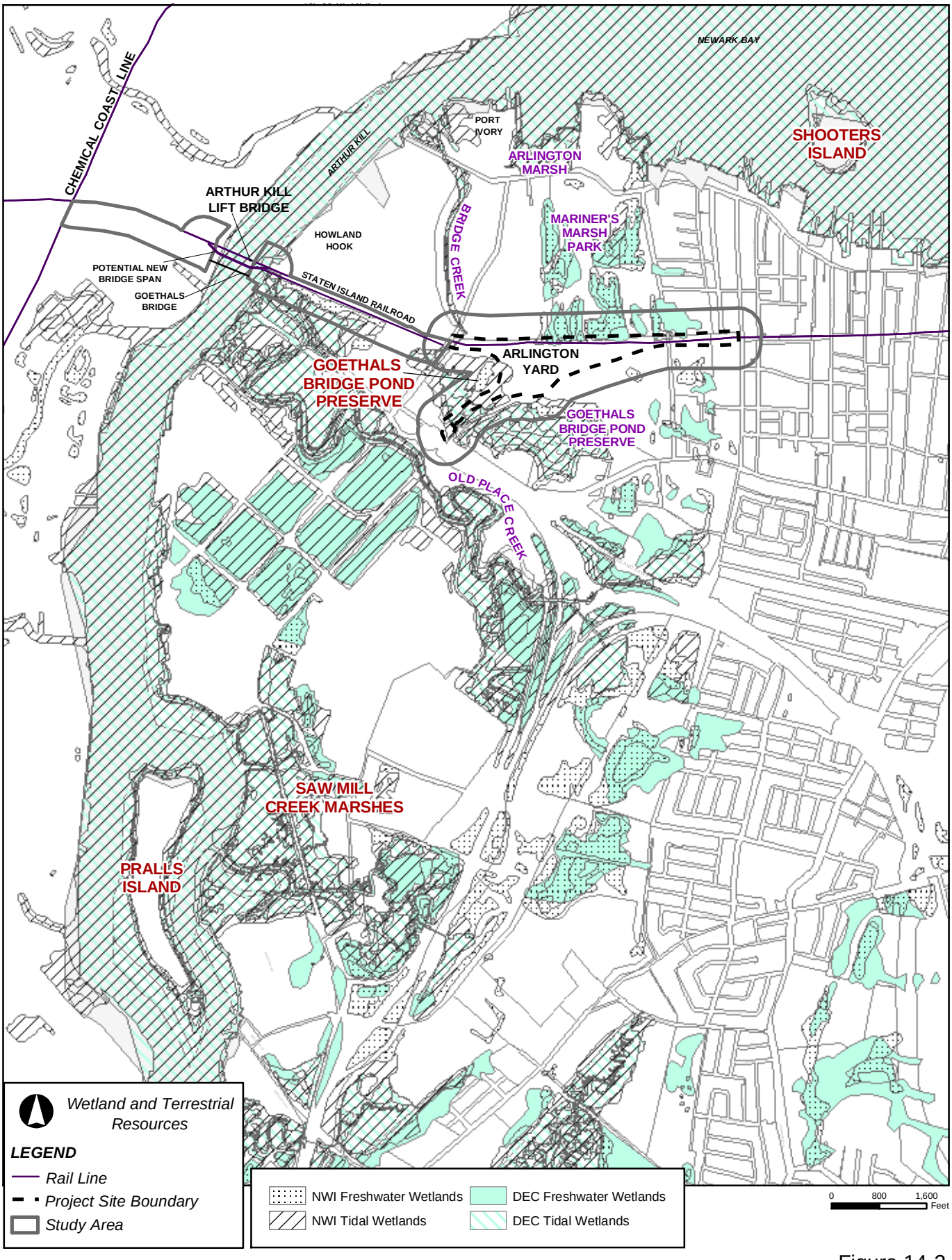


Figure 14-2
Northwestern Staten Island Wetlands
CROSS HARBOR FREIGHT MOVEMENT PROJECT

A. INTRODUCTION

WATERFRONT REVITALIZATION PROGRAM POLICIES IN NEW YORK AND NEW JERSEY

The federal Coastal Zone Management Act (CZMA) of 1972 was established to encourage coastal states to manage development within the states' designated coastal areas to reduce conflicts between coastal development and protection of resources within the coastal zone. Requirements for federal approval of coastal zone management programs and grant application procedures for development of the state programs is included in 15 CFR Part 923, Coastal Zone Management Program Development and Approval Regulations, National Oceanic and Atmospheric Administration (NOAA). The Coastal Zone Management Act requires that federal activities within a state's coastal zone be consistent with that state's coastal zone management plan. Both New York and New Jersey have federally approved coastal zone management programs. The New Jersey Department of Environmental Protection (NJDEP) administers New Jersey's coastal zone management program. The New York State Department of State (NYSDOS) administers New York's coastal zone management program; and the New York City Department of City Planning (DCP) administers the program in the City.

NEW YORK

The New York State Coastal Management Program (CMP) establishes New York's vision for its coast by articulating specific policies on the following: Development, Recreation, Fish and Wildlife, Historic and Scenic Resources Policies, Flooding and Erosion Hazards Policies, Agricultural Lands Policy, General, Energy and Ice Management, Public Access, and Water and Air Resources. The New York State coastal zone management program authorizes the State to encourage local governments to adopt local waterfront revitalization programs that incorporate the state's policies. New York City has a program that is administered by the New York City Department of City Planning (NYCDCP). Because the proposed project is located within the City's coastal zone, it is subject to the City's Coastal Zone Management Program. The New York City Waterfront Revitalization Program (WRP) is the City's principal coastal zone management tool. The WRP was originally adopted in 1982 and approved by the City Council in October 1999. In August 2002, the New York State Department of State and Federal authorities adopted the City's 10 WRP policies for projects located within the City boundaries. This chapter reviews the 10 New York City coastal zone policies that constitute the new WRP and, where applicable, assesses the general consistency of the project with the policies.

NEW JERSEY

NJDEP regulates coastal zone activities under N.J.A.C. Section 7:7E, Coastal Zone Management (CZM) Policies. Section 7:7E sets forth substantive rules of the NJDEP regarding the use and

development of coastal resources, to be used primarily by the Department's Land Use Regulation Program in reviewing permit applications under the Coastal Area Facility Review Act (CAFRA), N.J.S.A. 13:9A-1 et seq (as amended to July 19, 1993), Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq, Waterfront Development Law, N.J.S.A. 12:5-3, Water Quality Certification (401 of the Federal Clean Water Act), and Federal Consistency Determinations (307 of the Federal Coastal Zone Management Act). Because the Cross Harbor Freight Movement Project is outside the CAFRA Zone, consistency with CAFRA is not addressed in the DEIS.

PROJECT STUDY AREAS WITHIN THE COASTAL ZONE

As discussed in Chapter 14, "Wetlands and Terrestrial Resources," several of the project sites are within the coastal zone of New York and New Jersey (see Figure 15-1). The process for determining consistency with coastal zone management policies varies with location and regulation. Under the National Environmental Policy Act (NEPA), NYSDOS, in consultation with NYCDCP, will make a consistency determination as required under CMP regulations. NJDEP will make a consistency determination under the CZM regulations.

Table 15-1 lists the project alternatives and the areas of the project sites that lie within the coastal zone, and Figure 15-1 identifies the coastal zone management area within the Cross Harbor Freight Movement Project study area. The following sections discuss consistency with New York City coastal zone management policies and New Jersey coastal zone management policies, respectively.

Table 15-1
Areas Within the Coastal Zone

Location (State, County)	TSM	Expanded Float Operations	Staten Island Tunnel Alignment	New Jersey Tunnel Alignment
NEW JERSEY				
Hudson	Greenville Yard	Greenville Yard		Greenville Yard Tunnel construction
Union			Arthur Kill Lift Bridge *	
NEW YORK				
Richmond (Staten Island)			Arthur Kill Lift Bridge; Staten Island Railroad (Seg 2 to 4); Ventilation shaft off Eastern Shoreline (Pier 2)	
Kings (Brooklyn)				
		65th Street Yard	69th St Pier (vent shaft site) & 65th St (construction staging)	65th Street Yard
Queens				
		West Maspeth Yard	West Maspeth Yard	West Maspeth Yard
	Portion of Fremont Secondary* that crosses the East River	Portion of Fremont Secondary* that crosses the East River	Portion of Fremont Secondary* that crosses the East River	Portion of Fremont Secondary* that crosses the East River
Bronx				
			Harlem River Yard*	Harlem River Yard*
			Oak Point Yard*	Oak Point Yard*

Note: * Operational impacts only (i.e., additional trains).

B. CONSISTENCY WITH NYCDCP LOCAL WATERFRONT REVITALIZATION PROGRAM (LWRP) POLICIES

New York City's new LWRP includes 10 policies designed to maximize the benefits derived from economic development, environmental preservation, and public use of the waterfront, while minimizing the conflicts among those objectives. Those policies relevant to the proposed project are presented below, followed by a discussion of the project's applicability to and consistency with the policy. Only the relevant subsections of each policy are discussed in detail.

Policy 2: Support water-dependent and industrial uses in New York City coastal areas that are well suited to their continued operation.

Policy 2.1: Promote water-dependent and industrial uses in Significant Maritime and Industrial Areas (SMIA).

Policy 2.3: Provide infrastructure improvements necessary to support working waterfront uses.

TSM and Expanded Float Operations Alternatives

By rehabilitating the float bridges at 65th Street Yard (within the Sunset Park SMIA) and expanding a rail yard in West Maspeth, Queens (within the Newtown Creek SMIA), these alternatives would be in compliance with this policy, as they would promote industrial use in the coastal zones SMIAs.

Tunnel Alternative

The Tunnel Alternative would continue the industrial and water-dependent uses within the Sunset Park SMIA. Newtown Creek, including Maspeth Creek, has been classified by New York City as a SMIA. While the placement of fill within Maspeth Creek and a portion of Newtown Creek under the Double Tunnel System would not promote water-dependent uses in these waterbodies, it would promote industrial use and would not affect the fulfillment of this policy in the remaining portion of the Newtown Creek SMIA. Because the loss of a small portion of waterfront within these waterbodies is an integral component of the Double Tunnel System, which supports the development and expansion of rail freight facilities and intermodal freight movement and would partially occur within the Sunset Park SMIA, this alternative would be consistent with this policy.

Policy 3: Promote use of New York City's waterways for commercial and recreational boating and water-dependent transportation centers.

Policy 3.1: Support and encourage recreational and commercial boating in New York City's maritime centers.

Policy 3.2: Minimize conflicts between recreational, commercial, and ocean-going freight vessels.

Policy 3.3: Minimize impact of commercial and recreational boating activities on the aquatic environment and surrounding land and water uses.

TSM and Expanded Float Operations Alternatives

Water-dependent transportation centers would be supported by the rehabilitation and revitalization of the float bridges and yards that are within the coastal zones under the TSM and Expanded Float Operations Alternatives. These alternatives would also

support commercial boating. Recreational boating is not a component of these alternatives. Movement of barges associated under these alternatives would be scheduled to be compatible with current ship traffic patterns and would not affect the movement of ocean-going freight vessels nor recreational vessel traffic. As described in Chapter 2, "Project Alternatives," the TSM Alternative would not result in additional barge traffic and the Expanded Float Operations Alternative would include only 8 to 16 additional barge trips over a 24-hour period. Therefore, these alternatives would be consistent with these policies.

Tunnel Alternative

The Tunnel Alternative does not include a water-dependent transportation center as a component, nor would these alternatives include recreational or commercial boating as components. Therefore, these policies do not apply to these alternatives.

Policy 4: Protect and restore the quality and function of ecological systems within the New York City coastal area.

Policy 4.1: Protect and restore the ecological quality and component habitats and resources within the Special Natural Waterfront Areas, Recognized Ecological Complexes, and Significant Coastal Fish and Wildlife Habitats.

TSM and Expanded Float Operations Alternatives

This policy does not apply to these alternatives since no Special Natural Waterfront Areas, Recognized Ecological Complexes, or Significant Coastal Fish and Wildlife Habitats, occur within the study area boundaries. Therefore, these alternatives are consistent with this policy.

Tunnel Alternative

Chapter 14, "Wetland and Terrestrial Resources," discusses the Significant Coastal Fish and Wildlife Habitats and Special Natural Waterfront Areas that exist in the vicinity of the project study areas. Goethals Bridge Pond, a Significant Coastal Fish and Wildlife Habitat, is located near Arlington Yard, where two rail lines would be rehabilitated or added as part of the Staten Island tunnel alignment. This 33-acre pond, a NYSDEC-designated and federally designated wetland, is shallow (generally less than 3 feet deep) freshwater to slightly brackish with a well-developed fringe of emergent wetland vegetation that is primarily Phragmites. The development of the additional rail lines in Arlington Yard would be at the northern portion of the yard and would not result in adverse impacts to the resources of Goethals Bridge Pond.

As discussed in Chapter 14, Old Place Creek has been identified by New York City as part of the Special Natural Waterfront Area along western Staten Island (NYC 2001). A portion of the salt marsh within the Old Place Creek tidal wetland system would be impacted by the construction of the second span of the Arthur Kill Lift Bridge and the existing embankment would be impacted by the construction of a new rail track. Up to 5 acres of tidal wetlands would potentially be adversely impacted by the construction of the additional embankment area and bridge footing. While the temporary disturbance of the shoreline area and permanent displacement of a small area of subtidal habitat would not adversely affect waterfowl or shorebird populations that use this area for feeding or resting, the construction of the second span could significantly affect the nesting activities of the peregrine falcon. Chapter 14 also presented mitigation measures for

these potential impacts, such as minimizing the quantity of fill and use of an existing nesting tower. Absent acceptable mitigation measures, the Staten Island alignment of the Tunnel Alternative would be inconsistent with this policy.

Policy 4.2: Protect and restore tidal and freshwater wetlands.

TSM and Expanded Float Operations Alternatives

Construction activities expected to occur in the NYSDEC mapped littoral zone at 65th Street Yard under the TSM and Expanded Float Operations Alternatives would be permitted activities and would minimize the area of disturbance to the greatest extent possible. As presented in Chapter 14, "Wetland and Terrestrial Resources," and Chapter 13, "Water Resources," no adverse impacts are expected to aquatic organisms or birds as a result of these alternatives. The small aerial extent of the littoral zone that would be affected would not result in adverse impacts to these resources. Therefore, these two alternatives would be in compliance with this policy.

Tunnel Alternative

Under the Staten Island Alignment, the Tunnel Alternative would result in minimal disturbance of littoral zone as a result of the vent structures. As presented in Chapter 14, "Wetland and Terrestrial Resources," the construction of the Arthur Kill Lift Bridge for the Staten Island tunnel alignment would result in the placement of fill in coastal wetlands associated with Old Place Creek and Bridge Creek. The Double Tunnel System would result in the placement of fill in Maspeth Creek and a small portion of Newtown Creek. Mitigation measures to minimize these potential wetland impacts would be developed in coordination with USACOE and NYSDEC as part of the permitting process. These measures could include minimizing the area of wetlands affected to the greatest extent possible, and restoration or creation of similar habitats within New York City. As discussed above, no Significant Coastal Fish and Wildlife Habitats would be impacted by these alternatives. Therefore, with mitigation, the Tunnel Alternative would be consistent with this policy.

Policy 4.3: Protect vulnerable plant, fish, and wildlife species, and rare ecological communities. Design and develop land and water uses to maximize their integration or compatibility with the identified ecological community.

Policy 4.4: Maintain and protect living aquatic resources.

All Alternatives

Where the tunnel alternatives would require disturbance to potentially contaminated sediments during construction, all alternatives would be constructed in a manner consistent with minimizing releases of contaminated material into the coastal zone, as discussed in Chapter 16, "Construction Impacts." As presented in Chapter 13, "Water Resources," the results of the modeling conducted to examine potential adverse water quality impacts associated with dredging for various in-water components of the project alternatives, such as increases in suspended sediment and resuspension of contaminated sediment, would be temporary and would not be significant. The results of the ecological risk assessment also presented in Chapter 13 suggest that there would be little risk to aquatic or terrestrial organisms from the resuspension or redeposition of contaminated sediment through direct exposure or through the food chain. Additionally, measures would be implemented to minimize the increase in suspended sediment during

dredging, such as the selection of dredging equipment and operation measures that reduce the amount of sediment resuspended during dredging.

The implementation of erosion and sediment control measures and stormwater management measures during construction of various on-land facilities, in compliance with the SPDES General Stormwater Permit for Construction Activity, would greatly reduce the possibility of water quality impacts.

Policy 5: Protect and improve water quality in the New York City coastal area.

Policy 5.1: Manage direct or indirect discharges to waterbodies.

Policy 5.2: Protect the quality of New York City's waters by managing activities that generate non-point source pollution.

Policy 5.3: Protect water quality when excavating or placing fill in navigable waters and in or near marshes, estuaries, tidal marshes or wetlands.

Policy 5.4: Protect the quality and quantity of groundwater, streams, and the sources of water for wetlands.

All Alternatives

All project alternatives would be consistent with these policies as discussed in the response to Policy 4.4 above.

TSM and Expanded Float Operations Alternatives

By limiting the discharge of waste material from the float bridges into coastal waters to protect water resources, the TSM and Expanded Float Operations Alternatives would be consistent with these policies. Best management practices will be used to minimize the potential for accidents and spills.

Tunnel Alternative

During construction of the Tunnel Alternative, the discharge of waste material from vessels within the Upper Harbor would be limited to protect significant fish and wildlife habitats, recreational areas and water supply areas. Operation of the Tunnel Alternative would not include the operation of vessels within New York coastal waters. This alternative would therefore be consistent with these policies.

Policy 6: Minimize the loss of life, structures, and natural resources caused by flooding and erosion.

Policy 6.1: Minimize losses from flooding and erosion by employing non-structural and structural management measures appropriate to the condition and use of the property to be protected and the surrounding area.

All Alternatives

All of the shoreline within the project alternatives is currently protected from erosion with structural measures such as bulkhead or riprap. The urban and transportation land uses behind the bulkheads and riprap provide little opportunity to use non-structural measures to minimize damage to natural resources and property from flooding and erosion. Nevertheless, non-structural measures of erosion and flood control will be integrated into the alternatives where feasible. In accordance with good engineering

practices, all non-structural and structural measures will be designed to have at least a 30-year life with proper maintenance.

Chapter 13, "Water Resources," includes a discussion of regulations regarding flooding impacts, as well as an analysis of the project's potential to affect flooding patterns, and maps depicting the 100- and 500-year floodplains within the project study areas. The TSM and Expanded Float Operations Alternatives would not create a measurable increase in the risk of erosion or flooding at the construction sites or at other locations. Shoreline erosion protection structures disturbed during construction of the additional float bridges for the Expanded Float Operations would be restored or replaced according to good engineering practices. The Tunnel Alternative would also restore or replace erosion control structures disturbed during the construction of the proposed vent structure. There would be no increase in the risk of flooding associated with the Tunnel Alternative.

Therefore, all of the alternatives would be consistent with this policy.

Policy 7: Minimize environmental degradation from solid waste and hazardous substances.

Policy 7.1: Manage solid waste material, hazardous wastes, toxic pollutants, and substances hazardous to the environment to protect public health, control pollution and prevent degradation of coastal ecosystems.

All Alternatives

All project alternatives would be consistent with these policies as discussed in the response to Policy 4.4, above. In addition, the transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as to protect groundwater and surface water supplies, significant fish and wildlife habitats, recreation areas, important agricultural lands and scenic resources. Strict transport requirements would be adhered to so as to protect significant resources. During construction, an environmental health and safety plan would be followed to minimize the potential for degradation of coastal ecosystems from disturbance of contaminated materials. During operation of the project, strict FRA guidelines would be adhered to when handling these substances. All project alternatives would be consistent with this policy

Policy 7.2: Prevent and remediate discharge of petroleum products.

Policy 7.3: Transport solid waste and hazardous substances and site solid and hazardous waste facilities in a manner that minimizes potential degradation of coastal resources.

All Alternatives

Activities related to the shipment and storage of petroleum and other hazardous materials will be conducted in a manner that will prevent or at least minimize spills into coastal waters. All practicable efforts will be undertaken to expedite the cleanup of such discharges and restitution for damages will be required when these spills occur. As discussed in Chapter 12, "Contaminated Materials," any shipment or storage of hazardous materials under the project alternatives would adhere to strict FRA guidelines for the movement of such substances. During construction, the removal and disposal of any hazardous materials would be performed in conformance with all applicable local,

state, and federal requirements. Petroleum storage (e.g., for diesel locomotive fuel) would comply with the requirements found in 6NYCRR Parts 612-614 where applicable (storage capacity of 1100 gallons, and the requirements for Emergency Spill Response [ESR] presented in 6NYCRR Part 611). Therefore, the project alternatives would be consistent with these policies.

Policy 8: Provide public access to and along New York City's coastal waters.

Policy 8.1: Preserve, protect, and maintain existing physical, visual and recreational access to the waterfront.

Policy 8.2: Incorporate public access into new public and private development where compatible with proposed land use and coastal location.

Policy 8.3: Provide visual access to coastal lands, waters and open space where physically practical.

Policy 8.4: Preserve and develop waterfront open space and recreation on publicly owned land at suitable locations.

Policy 8.5: Preserve the public interest in and use of lands and waters held in public trust by the state and city.

TSM and Expanded Float Operations Alternatives

The refurbishment and construction of the float bridges associated with the TSM and Expanded Float Operations Alternatives would be a water dependent use of the City's coastal zone. The activities for 65th Street Yard and the expansion of West Maspeth Yard would occur on land already in use as a rail yard for 65th Street Yard, or as a former industrial site for the proposed expansion of West Maspeth Yard. These areas do not currently provide access for water-dependent recreation nor would public access to the waterfront be compatible with these existing land uses. Therefore, this policy is not applicable. However, none of the proposed activities associated with these two alternatives would affect current or future water-dependent or water-enhanced recreation on adjacent properties.

Tunnel Alternative

The projects sites within the City coastal zone for the New Jersey tunnel alignment (65th Street Yard, rail lines, and the West Maspeth Yard) are currently developed for similar uses or industrial/commercial uses. None of these areas currently provide access for water-dependent recreation or water-enhanced recreation, nor would the existing or potential uses be compatible with public access to the waterfront. This policy is therefore not applicable for the New Jersey tunnel alignment. The potential to develop water-dependent or water-enhanced recreation opportunities at Owls Head Park, to the south of 65th Street Yard, or on Newtown Creek would not be affected by this alternative.

The project sites within the City coastal zone for the Staten Island tunnel alignment (potential Arthur Kill Lift Bridge, open cut and cut and cover portions of the tunnel along the Kill Van Kull waterfront, and the proposed vent structures at Pier 2 in St. George Staten Island, and 69th Street Pier in Brooklyn) are within the vicinity of public areas that already provide access for water-dependent or water enhanced recreation. The existing access to the waterfront along the Kill Van Kull would not be affected by this

alternative. The access provided by the waterfront esplanade in St. George would not be affected by the construction of the vent structure off Pier 2. Additionally, the current use of 69th Street Pier as a public fishing pier would not be affected by the construction of the vent structure. Because the vent structures and tunnel along the Kill Van Kull shoreline would not result in a barrier to the recreational use of the shoreline in these areas of the project, the Staten Island tunnel alignment would be consistent with this policy.

Policy 9: Protect scenic resources that contribute to the visual quality of the New York City coastal area.

Policy 9.1: Protect and improve visual quality associated with New York City's urban context and the historic and working waterfront.

All Alternatives

Chapter 5, "Visual and Aesthetic Considerations" evaluated existing scenic resources and the potential impacts to these resources from the project alternatives. No scenic resources of statewide significance would be adversely affected by any of the alternatives. Potential impacts to scenic resources would be minimized with the implementation of mitigation measures such as noise barriers, and designing the vent structures to be aesthetically appealing to the extent possible. Additionally, the refurbishment of the float bridges and removal of dilapidated structures in front of the new float bridges at 65th Street Yard would enhance scenic resources within the vicinity of 65th Street Yard. Therefore, all of the project alternatives would be consistent with this policy.

Policy 9.2: Protect scenic values associated with natural resources.

All Alternatives

As discussed under the response to Policy 9.1, Chapter 5, "Visual and Aesthetic Considerations" evaluated existing scenic resources and the potential impacts to these resources from the project alternatives. Potential impacts to scenic resources would be minimized with the implementation of mitigation measures such as noise barriers, and designing the vent structures to be aesthetically appealing to the extent possible. Additionally, scenic values within the project sites for the alternatives are degraded. Revitalization of these underutilized sites would enhance the natural resources value by providing upkeep and maintenance of the sites (e.g., removing garbage, invasive vegetation). Therefore, all of the project alternatives would be consistent with this policy.

Policy 10: Protect, preserve, and enhance resources significant to the historical, archaeological, and cultural legacy of the New York City coastal area.

Policy 10.1: Retain and preserve designated historic resources and enhance resources significant to the coastal culture of New York City.

All Alternatives

Chapter 6, "Historic Resources," identified existing historic and/or cultural resources in and within the vicinity of the project study areas and the potential impacts to these resources assessed. Potential adverse impacts to these resources would be mitigated

under a Programmatic Agreement with NYSHPO. Therefore, these alternatives are consistent with this policy.

Policy 10.2: Protect and preserve archaeological resources and artifacts.

All Alternatives

As discussed above, Chapter 6, "Historic Resources," and Chapter 7, "Archaeological Resources," describe existing historic and archaeological resources in and within the vicinity of the project study areas and assessed the potential impacts to these resources. Potential adverse impacts would be mitigated under a Programmatic Agreement with NYSHPO. Therefore, these alternatives are consistent with this policy.

C. NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION COASTAL ZONE MANAGEMENT POLICIES

This section presents the NJDEP CZM Policies with respect to Special Areas identified in the coastal zone, as described in New Jersey Administration Code (N.J.A.C.) Subchapter 3: Special Areas, Section 7:7E, and states whether the project alternatives are consistent with these policies. The 48 Special Areas are coastal areas identified by the State that merit focused attention and special management rules. They are categorized as Special Water Areas (N.J.A.C. 7:7E-3.2 through 3.15), Special Water's Edge Areas (N.J.A.C. 7:7E-3.16 through 3.32), Special Land Areas (N.J.A.C. 7:7E-3.33 through 3.35), and Coastwide Special Areas (See N.J.A.C. 7:7E-3.36 through 3.48). Only the policies that are relevant to the project alternatives are discussed below. The applicable policies are paraphrased below, as they are too lengthy to include in their entirety. The complete set of policies presented in N.J.A.C. 7:7E can be viewed at: http://www.state.nj.us/dep/landuse/njac/7-7e.pdf.

Policy 7:7E-3.5: Finfish Migratory Pathways

Development that obstructs fish passageways or lowers water quality to an extent that interferes with fish movement or violates standards is prohibited in waterways that serve as migratory pathways unless mitigation is provided.

TSM and Expanded Float Operations Alternatives

The area of disturbance associated with the rehabilitation and/or construction of new float bridges off Greenville Yard would be small and the duration of the disturbance short. As discussed in Chapter 13, the potential impacts to water quality would not be expected to be significant and would not increase the concentration of suspended sediment above the range that normally occurs in the Upper Harbor. These results suggest that finfish migratory pathways in New Jersey waters of the Hudson River would not be affected by these two alternatives. Therefore, these alternatives would be consistent with this policy.

Tunnel Alternative

As presented in Chapter 13, "Water Resources," the results of the modeling conducted to examine potential adverse water quality impacts associated with dredging for the Tunnel Alternative, such as increases in suspended sediment and resuspension of contaminated sediment would be temporary and would not be significant. Because the modeling suggested that the increase in suspended sediment would drop significantly within 200 meters of the dredge for dredging activities associated with the immersed

tube portion of the tunnel off Greenville Yard, and would not increase the suspended sediment concentration above the range that normally occurs in the Upper Harbor, the migratory fish passage would not be expected to be affected. No dredging for this project would occur in the main channel of the Hudson River. Additionally, the results of the ecological risk assessment also presented in Chapter 13 suggest that there would be little risk to aquatic or terrestrial organisms from the resuspension or redeposition of contaminated sediment through direct exposure or through the food chain. Measures would be implemented to minimize the increase in suspended sediment during dredging, such as the selection of dredging equipment and operation measures that reduce the amount of sediment resuspended during dredging. Therefore, the Tunnel Alternative would be consistent with this policy.

Policy 7:7E-3.7: Navigation channels

The navigability of existing navigation channels must not be impacted by dredging or development, or by siltation as a result of said dredging or development.

TSM and Expanded Float Operations Alternatives

Mitigation measures (e.g., silt curtains, booms) to protect the shoreline from erosion and siltation would be employed so as to minimize impact to water quality, terrestrial and aquatic resources. No construction would extend into navigation channels, and thus, no adverse impacts would occur from the reconstruction/construction activities in Greenville Yard.

Tunnel Alternative

The results of the DREDGE modeling suggest that deposition of sediment resuspended as a result of dredging off Greenville Yard for the immersed tube portion of the New Jersey tunnel alignment would be small and would not result in siltation of navigation channels within the vicinity of the project. No dredging would occur in the main navigation channels and there would be no loss of navigability of channels in New Jersey waters. All work along the shoreline would be conducted to minimize erosion and siltation, through measures such as silt curtains and booms. Dredging activities would employ mitigation measures to reduce suspended sediments, such as silt curtains (where appropriate), use of a closed clamshell dredge, and operational modifications such as the speed of raising and lowering the dredge. Construction activities associated with the proposed Arthur Kill Lift Bridge for the Staten Island tunnel alignment would not occur in the navigation channel. Therefore, this alternative would be consistent with this policy.

Policy 7:7E-3.11: Ports

Any use that will preempt or interfere with port uses (i.e., marine terminal) is prohibited; docks and piers for cargo movement are encouraged.

TSM and Expanded Float Operations Alternatives

These alternatives, which involve the rehabilitation of float bridges and revitalization of facilities at Greenville Yard, encourage the use of the port and the intermodal movement of cargo. Because the operation of the float bridges and movement of barges associated with the Expanded Float Operations Alternative would be scheduled to be compatible with current ship traffic patterns, these alternatives would not adversely affect the

movement of waterborne cargo that occurs at Port Jersey or other ports within the vicinity of Greenville Yard and would therefore be consistent with this policy.

Tunnel Alternative

Chapter 8, "Transportation," of this EIS evaluated potential effects to the movement of waterborne cargo and the operation of ports within the vicinity of the project areas. No adverse impacts would occur to the movement of cargo through Port Jersey or other ports within the vicinity of Greenville Yard as a result of dredging activities associated with the immersed tube portion of the New Jersey tunnel alignment or the construction of the proposed Arthur Kill Lift Bridge associated with the Staten Island tunnel alignment. Therefore, the Tunnel Alternative would be consistent with this policy.

Policy 7:7E-3.12: Submerged Infrastructure Routes

A "submerged infrastructure route" is the corridor in which a pipe or cable runs on or below a submerged land surface. Any activity that will increase the likelihood of damage to a submerged pipe or cable, or interfere with maintenance operations, is prohibited.

All Alternatives

Chapter 16 of the EIS examined potential effects to existing pipelines and cables that occur within the vicinity of all dredging and underwater construction activities associated with the project alternatives. As part of the conceptual design for the alternatives, all submerged infrastructure routes were identified. All alternatives would be designed and constructed to prevent interference with submerged infrastructure routes and would be consistent with this policy. Once the final route is selected, all submerged infrastructure routes would be located and mapped within and adjacent to the alignment.

Policy 7:7E-3.13: Shipwrecks and artificial reefs

Acceptable uses of these submerged habitats include recreational and commercial/finfishing and shellfishing, and scuba diving. In addition, construction of new or expanded artificial reefs by the deposition of weighted nontoxic material is conditionally acceptable provided that:

- It can be demonstrated that the material will not wash ashore and interfere with either navigation as regulated by U.S. Coast Guard or commercial fishing operations; and
- Placement of the material and ultimate management of the habitat is coordinated with the NJDEP Division of Fish, Game, and Wildlife.

Any use, except archaeological research, that will significantly adversely affect the usefulness of this special area as a fisheries resource is prohibited. Persons conducting archaeological research that significantly affects the usefulness of a shipwreck for fisheries purpose must compensate for this loss by the creation of an artificial reef of equal habitat value.

TSM and Expanded Float Operations Alternatives

In the Upper New York Harbor adjacent to Greenville Yard are areas of potential shipwrecks. Construction of float bridges would not be expected to interfere with these resources, so as not to adversely impact these artificial resources.

Tunnel Alternative

Chapter 6, "Historic Resources," described existing shipwrecks in the vicinity of the immersed tube portion of the New Jersey tunnel alignment. No shipwrecks that have the potential to provide fish habitat would be affected by the Tunnel Alternative. Three areas potentially sensitive for shipwrecks have been identified as occurring off Greenville Yard within the vicinity of the proposed location of the immersed tube portion of the New Jersey tunnel alignment. Once the final alignment has been determined, it will be surveyed to determine whether any shipwrecks are present. The loss of any shipwrecks that provide fish habitat that would occur as a result of the construction of the immersed tube portion of the tunnel would be mitigated through fish habitat enhancement measures developed in coordination with the NJDEP, USACOE and NMFS. Therefore, the Tunnel Alternative would be consistent with this policy.

Policy 7:7E-3.15: Intertidal and subtidal shallows

Development, filling, and new dredging are generally discouraged in intertidal and subtidal shallows, but may be permitted in accordance with the Use Policy for the applicable water body type (in this case, large rivers). Submerged infrastructure is conditionally acceptable, provided that there is no feasible alternative route that will not disturb intertidal and subtidal shallows, the infrastructure is buried deeply enough to avoid exposure or hazard, and all trenches are backfilled with naturally occurring sediment.

TSM and Expanded Float Operations Alternatives

NWI mapped wetlands may be adversely impacted by the reconstruction and development of float bridges at Greenville Yard. Dredging, filling, and/or clearing activities would be permitted and mitigation would be developed to compensate for the loss of any intertidal and subtidal shallows (i.e., potential wetland or wildlife habitat) that would be limited in aerial extent.

Tunnel Alternative

Chapter 13, "Water Resources" assessed potential effects to aquatic resources as a result of this alternative. The New Jersey tunnel alignment would result in temporary loss of some intertidal and subtidal habitat during construction of the immersed tube portion of the tunnel. Once this portion of the tunnel is completed, these areas would be restored to original grade and the habitat would be restored. A small area of subtidal habitat would be permanently lost due to the construction of the vent structure off the Global Marine Terminal/NEAT pier but this loss would not be significant. Adverse impacts to fish habitat associated with the construction of the New Jersey tunnel alignment would be mitigated through the development of fish habitat enhancement measures developed in coordination with the NJDEP, USACOE and NMFS. Loss of intertidal and subtidal habitat associated with the construction of the Arthur Kill Lift Bridge for the Staten Island tunnel alignment would be small and would not be significant. Therefore, the Tunnel Alternative would be consistent with this policy.

Policy 7:7E-3.23: Filled water's edge

On filled water's edge sites with direct water access, this policy generally encourages that the waterfront portion of the site be developed with a water dependent use or left undeveloped for future water dependent uses. In addition, on the remaining non-waterfront portion of the site, provision of additional area devoted to water dependent or water-oriented uses may be required.

Moreover, for sites with an existing or pre-existing water dependent use other than a marina, development that would reduce or adversely affect the area currently or recently devoted to the water dependent use is discouraged.

TSM and Expanded Float Operations Alternatives

Under these alternatives, water dependent uses would be revitalized at Greenville Yard. The use of the waterfront for the float bridge operation for both alternatives would be consistent with this policy.

Tunnel Alternative

Under the New Jersey tunnel alignment, a portion of the waterfront area would be occupied by the junction between the cut and cover portion of the tunnel and the immersed tube portion of the tunnel. This area would be small and would not interfere with current maritime port and industrial land uses within the vicinity of this area. Additionally, once the tunnel is constructed, Greenville Yard could continue to be used for water-oriented activities. Construction of the tunnel would not affect use of adjacent filled land. The construction of the vent structure within the vicinity of the Global Marine Terminal/NEAT pier has the potential to result in the permanent loss of some waterfront land. However, the area lost would be small and would not interfere with the current port operations that occur on the pier. Therefore, this alternative would be consistent with this policy.

Policy 7:7E-3.25: Flood hazard areas

In an undeveloped portion of a flood hazard area that is within 100 feet of a navigable water body, development is prohibited unless the development is for water dependent use. Development is conditionally acceptable at greater distances provided the development would not prevent potential water-dependent uses adjacent to the water body.

TSM and Expanded Float Operations Alternatives

The rehabilitation of the existing float bridges or possible construction of new float bridges at Greenville Yard would primarily occur in the water (Upper New York Harbor) and would not be within the flood hazard area. The limited shoreline construction associated with these two alternatives would be designed to meet the flood proofing requirements and the requirements for impervious cover and vegetative cover. Therefore, these alternatives would be consistent with these policies.

Tunnel Alternative

Chapter 13, "Water Resources," includes a discussion of regulations regarding flooding impacts, as well as an analysis of the project's potential to affect flooding patterns, and maps depicting the 100- and 500-year floodplains within the project study areas. For the New Jersey tunnel alignment, the cut and cover portion of the tunnel would be within the flood hazard area at the Greenville Yard site. This structure would be below ground and would therefore be consistent with this policy. The proposed tunnel construction would not impact future use of the Greenville Yard project site for water-related activities. For the Staten Island tunnel alignment, activities within the flood hazard area would include the proposed Arthur Kill Lift Bridge and a viaduct to connecting to the Chemical Coast Line. These project elements would be consistent with this policy.

Policy 7:7E-3.27: Wetlands

Development in wetlands defined under the Freshwater Wetlands Protection Act of 1987 is prohibited unless the development is found to be acceptable under the Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A). Development of all kinds in all other wetlands not defined is prohibited unless the Department can find that the proposed development meets the following conditions:

- Requires water access or is water oriented as a central purpose of the basic function of the activity;
- Has no prudent or feasible alternative on a non-wetland site;
- Will result in minimum feasible alteration or impairment of natural tidal circulation (or natural circulation in the case of non-tidal wetlands); and
- Will result in minimum feasible alteration or impairment of natural contour or the natural vegetation of the wetlands.

If an application to disturb or destroy wetlands meets the standards for permit approval, the Department will require the applicant to mitigate for the loss or degradation of the wetlands. All mitigation proposals submitted to the Department shall be prepared in accordance with N.J.A.C. 7:7E-3B.

TSM and Expanded Float Alternatives

The Upper New York Harbor within the area of the float bridges is mapped as subtidal wetlands on the NWI maps. The shoreline area across from the float bridges also contains areas of littoral zone wetlands. Wetlands that meet the definition presented in 7:7E-3.27 (hydrology, soil and hydrophytic vegetation) do not appear to occur within the project areas for these two alternatives. Chapter 14, "Wetland and Terrestrial Resources" of the EIS presents an assessment of potential impacts to wetland resources within the project areas for these alternatives. However, potential impacts to wetlands as a result of these alternatives would be minimized through the implementation of mitigation measures developed in coordination with the NJDEP and USACOE. Therefore, these alternatives would be consistent with this policy.

Tunnel Alternative

As discussed above, wetlands that meet the definition presented in 7:7E-3.27 (hydrology, soil and hydrophytic vegetation) do not appear to occur within the project areas for the Tunnel Alternative. Under the New Jersey tunnel alignment, areas of littoral zone wetland may be impacted by the construction of the structure that connects the cut and cover portion of the tunnel to the immersed tube portion of the tunnel. Along the immersed tube portion of the tunnel, subtidal habitat would be temporarily disturbed during dredging and construction of the tunnel. A smaller area of subtidal habitat may also be permanently disturbed by the construction of the vent structure near the Global Marine Terminal/NEAT pier. Under the Staten Island tunnel alignment, a small area of subtidal habitat would be permanently disturbed for the construction of the footings for the proposed Arthur Kill Lift Bridge. While wetlands, as defined in 7:7E-3.27, do not appear to occur in any of the project areas associated with these two alternatives where construction would occur (Greenville Yard and Arthur Kill Lift Bridge), potential impacts to wetlands as a result of this alternative would be minimized through the implementation of mitigation measures developed in coordination with the NJDEP and USACOE. Therefore, the Tunnel Alternative would be consistent with this policy.

Policy 7:7E-3.28: Wetlands buffers

Wetland buffers, or "transition areas," associated with wetlands subject to the Freshwater Wetlands Protection Act are regulated by the Freshwater Wetlands Protection Act Rules, N.J.A.C. 7:7A. Development is prohibited in a wetlands buffer around all other wetlands, unless it can be demonstrated that the proposed development will not have a significant adverse impact and will cause minimum feasible adverse impact, through the use of mitigation where appropriate on the wetlands, and on the natural ecotone (transition area) between the wetlands and surrounding upland.

All Alternatives

As discussed in the response to Policy 7:7E-3.27, no coastal or freshwater wetlands appear to occur within the project areas for the project alternatives where construction would occur. As discussed above, however, subtidal wetlands are mapped within the area of the proposed float bridges. Should wetlands and their associated buffers be affected by an alternative, mitigation measures developed in coordination with NJDEP and USACOE would be implemented to minimize these impacts. Therefore, all alternatives would be in compliance with this policy.

Policy 7:7E-3.34: Historic and Archaeological Resources

Development that detracts from, encroaches upon, damages, or destroys the value of historic and archaeological resources is discouraged, while adaptive reuse is encouraged. Mitigation measures must take place if the proposed development will irreversibly and/or adversely affect historic and archaeological resources.

TSM and Expanded Float Alternatives

In Chapter 6, "Historic Resources," existing historic and/or cultural resources were identified in and within the vicinity of the project study areas and the potential impacts to these resources assessed. Greenville Yard is an historic resource determined eligible for listing on the National Register as the Greenville Yard Historic District. The float bridges are part of the historic Greenville Yard Transfer Bridge System. Three areas potentially sensitive for shipwrecks are located off Greenville Yard. Little disturbance to the on-land portion of the Greenville Yard Historic District would occur under the TSM or Expanded Float Operations Alternative. Removal of the existing bridges to construct new float bridges would impact the Greenville Yard Transfer Bridge System. To minimize potential impacts to this resource, a plan for rehabilitation and construction work would be developed in consultation with NJ SHPO. Further site inspection would be conducted prior to construction/rehabilitation of the float bridges to determine what, if any, disturbance would occur to shipwrecks under these alternatives. If necessary, measures to mitigate potential impacts to these archaeological resources would be developed in coordination with NJ SHPO. Therefore, these alternatives are consistent with this policy.

Tunnel Alternative

The proposed tunnel entrance for the New Jersey tunnel alignment may be located near the National Register-listed Morris Canal. Once the final location of the portal has been determined, mitigation measures would be developed, as necessary, in coordination with the NJ SHPO. As discussed above, three areas potentially sensitive for shipwrecks are located off Greenville Yard in the vicinity of the proposed alignment for the immersed

tube portion of the tunnel. Once the exact alignment is determined, potential mitigation measures would be developed in consultation with the New Jersey and New York SHPOs to identify whether shipwrecks are present within the area to be disturbed and measures to minimize impacts.

For the Staten Island tunnel alignment, the area in the vicinity of the proposed Arthur Kill Lift Bridge is in an area considered sensitive for prehistoric and historic-period archaeological resources. To minimize potential impacts to these resources, mitigation measures would be developed in consultation with the NJ SHPO as project plans are being more fully developed.

Policy 7:7E-3.38: Endangered or threatened wildlife or vegetation species habitats

Development in these areas or their buffers is prohibited unless it can be demonstrated that endangered or threatened wildlife or vegetation species habitat would not directly or through secondary impacts on the relevant site or in the surrounding area be adversely affected.

TSM and Expanded Float Alternatives

Chapter 15, "Wetlands and Terrestrial Resources" of the EIS describes endangered or threatened species that occur within the project alternatives and assesses potential impacts to these resources. NJDEP has designated the tip of the Global Marine Terminal/NEAT Pier as New Jersey Natural Heritage Priority Site because it provides nesting habitat for the New Jersey-listed endangered least tern. Activities from construction and rehabilitation of float bridges at Greenville Yard are not expected to have a significant adverse effect on this nesting site. Therefore these alternatives would be consistent with this policy.

Tunnel Alternative

As discussed above, the New Jersey Natural Heritage Priority Site at the tip of the Global Marine Terminal/NEAT Pier provides nesting habitat for the New Jersey-listed endangered least tern. This nesting site is currently being maintained by the PANYNJ in compliance with a Waterfront Development permit issued to PANYNJ by the NJDEP and has generally had between 5 and 12 nests per year. The potential loss of all or a portion of the least tern nesting habitat due to the construction of the vent shaft for the New Jersey tunnel alignment would significantly impact least tern nesting activity within this portion of the New York Harbor because similar nesting habitat is scarce within the vicinity of the site. Mitigation measures to reduce these impacts would be developed in coordination with NJDEP. Therefore, this alternative would be in compliance with this policy.

A peregrine falcon nesting location is within the vicinity of the proposed Arthur Kill Lift Bridge. Mitigation measures to minimize potential impacts to the nesting pair would be developed in coordination with NYSDEC and NYCDEP. This alternative, therefore, would be consistent with this policy.

Policy 7:7E-3.39: Critical wildlife habitats

Development that would directly or through secondary impacts on the relevant site or in the surrounding region adversely affect critical wildlife habitats is discouraged, unless:

- Minimal feasible interference with the habitat can be demonstrated;
- There is no prudent or feasible alternative location for the development; and
- The proposal includes appropriate mitigation measures.

All Alternatives

No critical wildlife habitats would be adversely impacted by the project alternatives. Therefore, the project alternatives would be consistent with this policy.

Policy 7:7E-3.41: Special hazard areas

Coastal development, especially residential and labor-intensive economic development, within special hazard areas is discouraged. All development within special hazard areas must include appropriate mitigating measures to protect the public health and safety. NJDEP's Division of Hazardous Waste Management handles approvals for hazardous substance investigations or clean-up activities at contaminated sites.

All Alternatives

Chapter 12, "Contaminated Materials" describes known locations of past or present hazardous materials within the project alternatives. Demolition or renovation of the float bridges at Greenville Yard would require assessment and abatement for asbestos and lead-based paint. Construction of the New Jersey tunnel alignment within Greenville Yard may require mitigation measures to address potentially contaminated soil and groundwater. Construction of the proposed Arthur Kill Lift Bridge for the Staten Island tunnel alignment may require excavation of potentially contaminated soil and possibly groundwater. Once a preferred alternative is selected further investigations would be conducted to confirm the presence of contaminated materials and mitigation measures would be implemented prior to and during construction. During construction, an environmental health and safety plan would be followed to minimize the potential for degradation of coastal ecosystems from disturbance of contaminated materials. Any potential hazardous substances would be moved, stored, or disposed of under strict permitted regulations regarding the handling of these materials. Therefore, with mitigation measures, all project alternatives would be consistent with this policy.

Policy 7:7E-3.43: Special urban areas

Development that will help to restore the economic and social viability of special urban areas is encouraged. Development that would adversely affect the economic well being of these areas is discouraged when an alternative which is more beneficial to the special urban areas is feasible.

TSM and Expanded Float Alternatives

Revitalization of the Greenville Yard float bridges would encourage and restore the economic viability of the special urban areas (Jersey City and Bayonne) that surround the Greenville Yard. Therefore, these alternatives would be consistent with this policy.

Tunnel Alternative

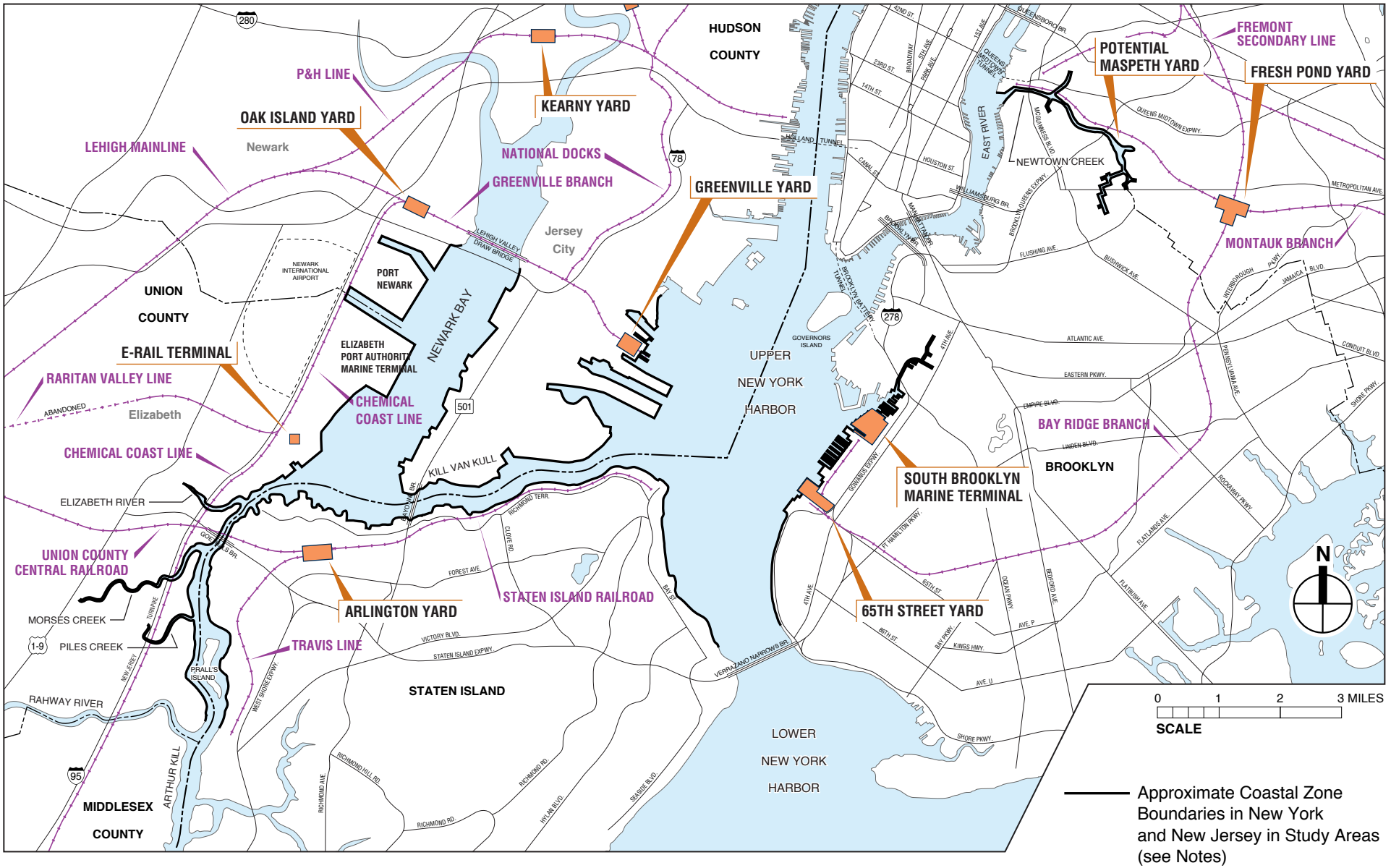
The Tunnel Alternative would encourage the economic viability of the special urban areas surrounding the Tunnel Alternative (Jersey City, Bayonne and Elizabeth) due to the increased movement of freight through the New York Metropolitan Area. Therefore, this alternative would be consistent with this policy.

Policy 7:7E-3.48: Hudson River Waterfront Area

The Hudson River Waterfront Area extends from the George Washington Bridge in Fort Lee to the Bayonne Bridge in Bayonne, and includes all land within Jersey City that is subject to the Waterfront Development Law. Non-industrial development within the Hudson River Waterfront Area must conform to allowable building height, massing, and public access.

All Alternatives

None of the alternatives would result in non-industrial development on piers. As described in the previous sections, the project alternatives in New Jersey would comply with all other applicable Coastal Resource and Development policies and would be consistent with this policy. ✷



Notes: This map is for reference only and shall not be used to make jurisdictional determinations for any permit programs. State and/or Federal jurisdiction may apply. For example, the upland extent of Waterfront Development jurisdiction is not represented on this map.
In portions of the New Jersey coastal zone that are outside the Hackensack Meadowlands Development District and CAFRA, the regulated waterfront area includes tidal waterways and all lands lying under the waterway, up to and including the mean high water line, and adjacent upland areas extending landward of the mean high water line to the first paved public road, railroad or surveyable property line existing on September 26, 1980 generally parallel to the waterway, provided that the landward boundary of the upland area is no less than 100 feet and no more than 500 feet landward of the mean high water line.

Figure 15-1
Coastal Zone Boundaries in Study Areas
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 16: Construction and Construction Impacts

A. INTRODUCTION

Described in this chapter are the activities required for construction of the project alternatives, described in Chapter 2, "Project Alternatives." The environmental impacts that may result from that construction and any required mitigation measures are also considered.

B. DESCRIPTION OF CONSTRUCTION ACTIVITIES

NO ACTION ALTERNATIVE

Since the No Action Alternative would not create new facilities or services other than those planned to occur without the Cross Harbor Freight Movement Project, it also would not require construction activities.

TSM ALTERNATIVE

Construction activities associated with implementation of the TSM Alternative would be minimal. In addition, most of the work would occur in existing rail yards and rights-of-way. The elements of this alternative that require construction include:

- The rehabilitation of the two existing float bridges at Greenville Yard in New Jersey. The float bridges would be rehabilitated either through partial reconstruction of specific elements or a complete replacement of the structures.
- Rehabilitation of the single-track Bay Ridge Branch to allow for higher service speeds. The rehabilitation would include the placement of new rail, ties and ballast.
- Minor construction work to provide 17 feet 6 inch clearance at one location along the Bay Ridge Branch and four along the Montauk Branch. This would involve lowering the track, during the rail rehabilitation, several inches at each location.
- Improvements to the signal system on the Montauk Branch to allow bi-directional train movement.
- Modifications to the 65th Street Yard in Brooklyn including the rehabilitation of existing storage and unloading tracks.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

The Expanded Float Operations Alternative would include all of the work described above for the TSM Alternative as well as the following addition:

- Rehabilitation/construction of two additional float bridges at Greenville Yard.
- Construction of two additional float bridges at 65th Street Yard in Bay Ridge, Brooklyn.
- Possible construction of a new yard to include the Phelps Dodge site and existing West Maspeth rail yard in West Maspeth, Queens.

TUNNEL ALTERNATIVE

The Tunnel Alternative would require a lengthy construction process involving many different types of activities throughout the study area, regardless of alignment (New Jersey or Staten Island) or implementation scenario (Single Tunnel System or Double Tunnel System). It is expected that the Bay Ridge Branch would remain operational during the construction period to allow existing freight volumes to move through the region. The discussion below provides a description of the main elements of the construction methods and processes under the Tunnel Alternative. The majority of these construction elements remain the same under either tunnel alignment or implementation scenario. Construction elements specific to a particular alignment or implementation scenario are noted as such.

TUNNEL CONSTRUCTION

Tunnel Methods

Tunnel Boring. Either tunnel alignment would be constructed using a variety of methods along its length. For the majority of either route, the tunnel would be constructed using one or two types of Tunnel Boring Machines (TBMs). A TBM is basically a large diameter drill that excavates a circular tunnel section without disturbance to the surface. TBMs are custom designed and built for specific geologic conditions and other project requirements. In solid rock, a TBM is used. In general, tunnel boring in rock is the least disruptive of all tunneling methods. In soil, a different type of TBM is used that is specifically designed for materials that are not self-supporting, including soil and degraded rock. For this project, it is expected that an Earth Pressure Balance Machine (EPBM) would be used. The EPBM exerts pressure on the tunnel face as it carves out the soft rock and soil, which prevents extra rock and soil from coming loose as the tunnel is bored, minimizing ground settlement and groundwater seepage and preventing cave-ins.

Both types of TBMs consist of a drill head followed by several hundred feet of machinery; this machinery powers the drilling head, conveys the spoils, and propels the TBM forward. The circular drill head is outfitted with numerous rotating, hardened steel roller bits, which cut as they rotate, producing circular tunnels. At the rear of the drilling head, hydraulic jacks exert high pressure to push the machine's drilling head against the tunnel's rock or soil face.

Both types of boring machines operate by installing tunnel support systems concurrently with the excavation. Such supports protect the tunnel workers and also create the tunnel's interior walls. Often with a rock TBM, the exposed rock tunnel wall is secured directly behind the drilling head via the use of steel ribs or rock bolts. Soil TBMs operate by providing support at the tunnel face and above the machines as they advance, to prevent the loose tunnel face and walls collapsing before the installation of the tunnel liner.

Using either type of TBM, concrete tunnel liners, either pre-cast or cast in place, are then placed to complete the tunnel. This can be done later in a rock tunnel, but is done immediately in a soil tunnel. As the concrete liner is placed, voids betweens the lining and the soil are sealed by injecting cement grout, under pressure, into the voids. This creates an effective barrier against

the seepage of water into the tunnel and reduces the long-term settlement of the ground above the tunnel. For the Cross Harbor Freight Movement Project, it is proposed to install a permanent liner directly behind the TBM for both the soil and rock tunnels.

Behind the cutter face, the TBMs have long compartments containing computerized control rooms from which the boring operations are conducted. Behind those compartments, trailing gear on wheels supports the drilling operations. This equipment includes pumps, transformers, grouting equipment, as well as mechanisms for removing the excavated rock or soil and conveying it back behind the machine by either rail or conveyor.

TBMs are powered by electricity brought to the machine from substations near or along the tunnel route. This power is supplied to the machines at the tunnel face through feeder cables constructed in the tunnel as drilling progresses.

With all these components, TBMs are very large pieces of equipment that are brought to the start of the tunnel operation and assembled at the shaft site. The machines cannot execute tight curves, so tunnels constructed by a TBM must have wide shallow curves. They also cannot reverse direction without being disassembled and reassembled facing the opposite direction.

Shaft Sites. The use of a TBM requires a deep excavation, typically referred to as a "shaft site," to begin its operation. This is due to the fact that the machines require approximately one tunnel diameter of cover above the tunnel to insure safe operation. Therefore, for a 33-foot diameter tunnel such as proposed for the Cross Harbor Freight Movement Project, the excavation would need to be approximately 66 feet deep. The excavation to commence the TBM drive may be located at the end of a cut and cover tunnel, described below, or may be in the form of a shaft. For either arrangement, the shaft sites would also be used to transport materials, workers and tunnel spoils (i.e., the excavated rock and soil) to and from the surface as well as to provide energy and ventilation for the tunneling operations. The shaft sites would be adjacent to a staging area where material and equipment is stored with provisions for maintenance shops, construction trailers, parking, and other ancillary facilities. The shaft sites can either by a deep vertical excavation reaching to the tunnel depth or a more gradual excavation that follows the future alignment of the rail line. It is expected that a combination of shaft sites would be used for the construction of the project tunnels.

Cut and Cover Construction. The portion of the tunnel alignment between the at-grade segment and where the TBM can begin operating is known as the transition zone. Construction methods in the transition zone would include traditional "open cut" and "cut and cover" techniques until the excavation is deep enough to launch either the TBM or EPBM. The length of the tunnel between the portal and the commencement of the TBM driven tunnel will need to be formed using cut and cover techniques. As the name implies, cut and cover construction entails cutting the ground surface open, excavating to the required depth, and then covering permanently when construction is complete. In the section of the right-of-way between the at-grade portion of the line and the tunnel portal, the "cut" would remain open but depressed from the surrounding topography.

In cut and cover construction, the specific method to be used is based on numerous factors including the depth of the desired cut, the location and foundation type of adjacent structures, the geological characteristics of the subsurface, and the design of the finished tunnel.

STATEN ISLAND TUNNEL ALIGNMENT

Under this alignment, tunnel(s) approximately 31,500 feet long from portal to portal would be constructed. Approximately 18,000 feet would be constructed with the EPBM type of tunneling machine which would be launched from the Brooklyn cut and cover. In Brooklyn and across the harbor, the tunnel alignment passes through soil, while rock prevails on Staten Island. Both a rock TBM and a soil EPBM would therefore be required for the Staten Island tunnel alignment.

The Brooklyn cut and cover section of the Staten Island tunnel alignment would undergo substantial construction activity since it will also serve as the EPBM shaft site for this alignment. Excavation would begin between 12th and 13th Avenues and would deepen to approximately 66 feet between 8th and 9th Avenues. At the start of the cut section, the excavation would be approximately 40 feet wide and would increase to 100 feet wide where the EPBM would be launched. The process would begin with the relocation of the existing track to provide continued service to 65th Street Yard while construction proceeds in this area. Excavation work would then begin using traditional construction equipment such as slurry wall or pile plant to form the retaining walls for the cut and cover tunnels and the approach. Temporary supports would be used until the structural work is ready to begin after completion of the tunneling activities. As the excavation deepens, retaining walls are constructed which would become part of the finished structure. To complete the tunnel construction in this area, concrete, steel and other material would be delivered to the site. The roof of the tunnel structure would be formed of cast-in-place concrete. Backfilling of the excavation would occur to cover the completed concrete structure from the location where the EPBM was launched through to the tunnel portal (10th Avenue). From the tunnel portal until the tracks reach grade (between 12th and 13th Avenues), the completed structure would have a U shape with decreasing side depth until the track bed meets the existing grade.

The EPBM would be extracted at the site of the planned ventilation structure at the end of Pier 2 on the Staten Island shoreline. A cofferdam would be constructed to serve as the transition between the soil and rock boring and to facilitate the extraction of the EPBM. The cofferdam would be approximately 230 feet by 150 feet. It would be constructed by temporary steel sheet piles, driven deep through the soils, and keying into the underlying rock stratum. Once constructed, it would be dewatered and sediment from the harbor bottom would be excavated until a depth of approximately 120 feet is obtained. Approximately 30,000 cubic yards of sediment would be removed from the cofferdam and transported from the site by barge. A chamber would be constructed at the bottom of the cofferdam to serve as the transition between the tunnel under the harbor and the rock boring on Staten Island.

The rock TBM would be launched from the Staten Island cut and cover section and extracted at the cofferdam adjacent to Pier 2. The TBM would travel approximately 10,800 feet and generate approximately 500,000 to 1,000,000 cubic yards of rock under the Single Tunnel and Double Tunnel System, respectively. It is expected that this material would be transported from the shaft site by barge.

Staten Island Cut and Cover. The western end of the tunnel in Staten Island would be constructed by traditional cut and cover methods. The cut would begin at Alaska Street and would reach the required depth of 66 feet at Davis Avenue. The construction in this area would be similar to the cut and cover construction in Brooklyn. The excavation for the cut and cover section in this area would take approximately 15 months. Similar to the Brooklyn site, it would widen from 40 to 100 feet from the shallow to the deep end of the excavation, respectively. The

concrete retaining walls would be constructed as the excavation occurred, requiring material delivery of steel and concrete in addition to the soil removal.

Staten Island Shaft Site. The TBM(s) for the main tunnels under Staten Island would be installed at the eastern end of the cut and cover section. Arlington Yard would be used as a construction staging area, where materials would be delivered to and stored and transported via rail or truck to the cut and cover section. Workers will park at Arlington Yard and be transported either by rail or shuttle. Materials (primarily concrete and steel) will be transported to the portal via rail and truck. Liners would be delivered by rail to the cut and cover section. A conveyor may also be constructed to move materials between the portal area and the yard. Excavated material would be removed from the portal and likely be transferred onto a barge near the site of the portal or by rail back to Arlington Yard. The yard would be used as a staging area for approximately 2.5 years for the Single Tunnel System and 3 years for the Double Tunnel System.

Staten Island Ventilation Structure. After completion of the tunneling work, the Staten Island ventilation structure would be constructed within the cofferdam along the shore off Pier 2. A barge would be used as the main staging area for vent shaft construction. Most workers will arrive by boat and be dropped off on the barge. A major concrete structure would be constructed within the cofferdam to house ventilation fans and controls. Although the majority of the ventilation building would be located below the water line, approximately 10 feet of the main structure would remain above the water. This structure would be on the order of 230 feet long by 150-feet wide. Under the Double Tunnel System, two air shafts, approximately 40 feet high, would extend above the main building. One air shaft would be constructed under the Single Tunnel System. After completion of the structure, the cofferdam would be removed and installation of equipment could occur. Construction of the ventilation structure would be expected to take approximately one year to complete.

Brooklyn Shaft Site. As discussed above, the main shaft site and staging area for the westbound EPBM operation would be located at the western end of the Brooklyn cut and cover section between 8th and 10th Avenues. The site would be equipped with a conveyor, front loaders, trucks, and generators. Once the TBM(s) are launched through an opening or "lid" in the roof of the western end of the cut and cover tunnel, the materials excavated from the tunnel would be transported back through the cut and cover tunnel by either a conveyer or temporary rail system to the portal area and then to the staging area at 65th Street Yard. From 65th Street Yard, the excavated materials would be removed by either barge or rail.

The excavation would remain open until the EPBM emerges on the other side of the harbor at the Pier 2 cofferdam in Staten Island. After the tunneling is completed, the "lid" in the roof of the cut and cover tunnel can be closed, followed by backfilling and installation of the new mainline track on the surface. The installation of the track work and other signaling and safety control systems inside the tunnel would only begin once the complete tunnel, through to Staten Island, is finished.

Brooklyn Ventilation Structure. Similar to the Staten Island ventilation building described above, a major structure would be required on the Brooklyn shoreline to house ventilation fans and shafts connecting to the tunnels. The alignment of the tunnels passes between the Owl's Head Pollution Control Plant and 69th Street. The building would be located off-shore of the Belt Parkway, off the seaward side of the 69th Street pier. This ventilation building would be similar in size to the Staten Island building, and would also be located predominately below the waterline, but with approximately 10 feet of the building above the water, and with the air

shaft(s) extending a further 40 feet in height. A barge would be used to construct the vent shaft and 65th Street Yard would also be used for storage/deliveries. Some activities may also occur at the portal location. This would take approximately six months to complete.

NEW JERSEY TUNNEL ALIGNMENT

Under this alignment, tunnel(s) with an approximate length of 29,000 feet, portal to portal, would be constructed. Due to the existing geological features in the Greenville Yard vicinity, it is not possible to use the EPBM completely across the harbor to the landside in New Jersey. The presence of mixed ground (i.e. rock overlain by sediment) along the northern shoreline of the Global Marine Terminal/NEAT pier would make the bored tunneling method (EPBM or TBM) impractical. The base of the tunnel would be in fairly hard rock, with the upper part of the tunnel in soft sediments. Therefore, an Immersed Tube Tunnel (ITT) would be constructed in this area. ITT is essentially a specialized method of cut and cover construction, in water, using pre-cast tunnel elements. This method would be used to connect the EPBM bored tunnel under the harbor with the cut and cover tunnel beginning in Greenville.

Since it is not feasible to expand an ITT once it has been constructed, the pre-cast elements would be sized for two tunnels under the Single Tunnel System. If an ITT for a single tunnel were constructed, it would preclude the possibility of expanding the Single Tunnel System to the Double Tunnel System.

Greenville Cut and Cover. The excavation for the cut and cover tunnel in Greenville would start at the western end of Greenville Yard and extend a distance of almost 3,000 feet to the shoreline, where a transition structure would be built to accept the elements of the immersed tube. The immersed tube portion of the tunnel would continue for approximately 4,300 feet to a cofferdam constructed at the end of the Global Marine Terminal/NEAT pier where it would join the EPBM-bored tunnel from Brooklyn. After completion of the tunneling work, the New Jersey ventilation structure would be constructed on the site of the cofferdam.

The cut and cover construction in this area would take approximately 9 to 12 months to complete and would be similar to those already discussed in Staten Island and Brooklyn. An open trench, approximately 1,700 feet long would be excavated from westwards from the tunnel portal, to bring the railroad to surface. At the portal itself, the depth of the open cut is approximately 35 feet. At the eastern end of the cut and cover construction where it meets the ITT portion of the alignment, a temporary cofferdam arrangement would be constructed to facilitate the connection between the cut and cover tunnel with the pre-cast elements of the ITT. Material delivery and disposal of excavated soil for the cut and cover construction would consist of a combination of rail and truck transport.

The Double Tunnel System would include the construction of a direct connection between the Greenville tunnel and the National Docks Secondary. The construction would include approximately 700 feet of new rail track connecting the cut and cover section of the Greenville Branch to the existing National Docks Secondary. In the location where this proposed connection would cross the existing Tropicana rail line, the connection track would be constructed below grade, and a small bridge would be built for the Tropicana rail line.

Immersed Tube Tunnel. Generally, ITT construction consists of lowering pre-cast reinforced concrete or composite steel/concrete tunnel segments into a trench that has been excavated on the bottom of the harbor. After placement and connection of the elements, the trench is backfilled with structural fill to protect the tunnel. For this project, it is anticipated that ten 430-

foot long, pre-cast concrete tunnel elements would be used. The tunnel elements would be approximately 35 feet high and 43 feet wide and would contain both tubes of the tunnel. A trench approximately 50 feet wide at the bottom, increasing to 300 feet at the top would be excavated with a clamshell dredge. Silt curtains would be placed around the dredging area to contain sediment transport within the area of construction.

The actual process of ITT construction begins with the casting of the individual elements at a casting basin. The casting basin would most likely be constructed in an existing drydock somewhere along the east coast. The completed tunnel elements would be transported to the project site by barge for immersion into the dredged trench. When they first arrive at the construction site, the elements are brought to a fit-out pier where rigging can be attached to the elements before they are floated to where they are to be placed. The fit-out pier would be a structure attached to temporary piles near the tunnel alignment.

Dredging would begin two to three months before the first elements are brought to the site. A trench slightly longer than the length of five elements (2,500 to 3,000 feet) would be excavated using a clamshell dredge. Dredge material would be temporarily stored on a barge. If harder rock is encountered, a cutter dredge would be used. The findings of the recent borings conducted in the area show that it is unlikely that blasting would be required, but it is possible if the rock stratum is less fractured than indicated in the marine borings. The trench will be approximately 300 feet wide at the top with a 1:4 side slope.

The elements are lowered into the trench in a controlled manner using pontoons which support the weight of each element. The elements are accurately positioned using guide cables and winches attached to temporary piles installed in the harbor. The foundation layer for the immersed tunnel elements could either be a sand layer which is pumped into the void between the underside of the tunnel elements and the trench bottom, or onto a ballast-like subgrade material, which is placed in the trench before the immersion operations take place. With either option there would be negligible disturbance of the soils adjacent to the trench. Each tunnel element has a rubber seal at the leading end that allows a temporary watertight connection to be effected with the preceding element. Divers pump out the water between the elements pulling them tightly together after which the joints are completed, by installing the permanent seal which is protected by concrete.

Backfilling of the first element would occur after the second element is in place. A granular fill (coarse sand to fine gravel) would be placed in the trench approximately halfway up the tunnel element followed by other clean fill to nearly the top of the trench. This material would be fairly substantial since it must support the protective rock layer above. Approximately five feet of rock fill will be placed with a clamshell on top of the tunnels, within the trench, and extending 30 to 40 feet on each side of the elements. This would prevent anchors and other items from damaging the tunnel.

Brooklyn Cut and Cover. For the New Jersey tunnel alignment, the Brooklyn cut and cover section would require the same construction as discussed previously under the Staten Island alignment. However, since it would not serve as the shaft site for the EPBM operation, the structural work and tunnel completion would start earlier at this location (i.e., once the EPBM emerged after boring the Brooklyn tunnel segment from 65th Street Yard.

Brooklyn Shaft Site. For the New Jersey tunnel alignment, a shaft site at 65th Street Yard would be constructed and tunneling would proceed in two directions sequentially (i.e., tunnel eastbound

and extract the machine at the Brooklyn cut and cover site and then re-insert the machine to tunnel westbound to New Jersey).

The 65th Street Yard would be used as the main shaft site for the EPBM operation. To prepare the shaft, a 75-foot deep excavation approximately 230 feet by 150 feet would be constructed in the western side of the yard. At this point in the alignment, the bottom of the tunnel is approximately 110 feet below grade.

The site would include the necessary ancillary facilities including parking for construction workers. Site access would be from a truck ramp which is being constructed by NYCEDC (as part of the No Action Alternative), or from 2nd Avenue, east of the yard. Excavation for the shaft would take approximately 6 to 9 months. Once the shaft is prepared, the EPBM would be launched west toward New Jersey and east to the cut and cover extraction point between 8th and 9th Avenues. Under the Double Tunnel System, it would take approximately 2.5 years to complete the tunnel, during which approximately 1,800,000 yds^3 of material would be removed. Under the Single Tunnel System, it would take approximately two years to complete the tunnel during which an estimated 900,000 yds^3 of material would be removed. This material could be transported by either barge or rail, with truck transportation only used in the event these modes were not available. As a shaft site, material deliveries of pre-cast concrete tunnel liners would also be required.

Brooklyn Ventilation Structure. Once the tunnel construction was complete, a ventilation structure would be constructed in the excavated shaft site. This would take approximately 12 months to complete and require the construction of a major building, approximately 230 feet long by 150 feet wide and 40 feet high. As with the Staten Island tunnel alignment, one air shaft would be constructed under the Single Tunnel System and two air shafts would be constructed under the Double Tunnel System. The air shaft(s) would extend 40 feet in height above the main building. The structure would accommodate the ventilation fans and controls which provide for the safe operations of the rail freight tunnel.

New Jersey Ventilation Structure. On the New Jersey side, the ventilation structure would be constructed at the end of the Global Marine Terminal/NEAT pier after tunneling work is completed within the cofferdam. A barge would be used at the site of construction of the vent shaft. Offices and storage would be staged at Greenville Yard. The construction process would be the same as that described for the Staten Island ventilation structures.

YARD CONSTRUCTION

West Maspeth Yard

Under either tunnel alignment, a major intermodal yard would be developed in West Maspeth, Queens. The construction would be staged from the open area of the former Phelps-Dodge site minimizing disruption to the surrounding street network. The construction process would begin with the demolition of the existing structures on the sites to be acquired. After preliminary environmental work, such as asbestos abatement and the removal of any hazardous materials stored on-site, the existing structures would be demolished. The construction debris would most likely be removed by barge but could also be transported off-site by rail.

After the sites have been cleared, remediation of any contaminated soil would be performed before other earth moving activities would begin. Due to the large size of the cleared site, it would be expected that multiple operations may be occurring at the same time. While one part of

the site may be undergoing an environmental remediation, another part may be undergoing foundation or other types of construction activities.

As discussed in previous chapters, the Single Tunnel System would require a yard of approximately 108 acres, with no structures. West Maspeth Yard under the Double Tunnel System would be further expanded to approximately 160 acres, requiring the filling of Maspeth Creek and a portion of Newtown Creek, and would contain a storage structure. As described in Chapter 2, "Project Alternatives" and Chapter 5, "Visual and Aesthetic Conditions," the structure would be an open-air multi-story parking garage for container storage. It would be built on piles and have asphalt paving on grade level. The building would be built using standard construction techniques and materials predominately made of concrete with some additional steel support structures. It would contain minor office amenities for employees (e.g., a locker room, bathroom, offices).

As part of the 108-acre site, a new bridge would be constructed over Newtown Creek at 59th road as part of the access plan to the site. The proposed bridge would be a two-lane movable bridge. Although the bridge has not yet been fully designed, it is expected to span the width of the creek and should not require in-water piers. A second bridge along Grand Avenue would be replaced and widened.

Fresh Pond Yard

Construction activities would be required at Fresh Pond Yard to provide the necessary doublestack clearance at two existing bridges and to install a new through track from the Bay Ridge Branch to the Montauk Branch. This work would be required under either tunnel option.

The bridge carrying the NYC Transit M Line would be reconstructed within the existing yard and transit rights-of-way. In addition, the railroad track structure under this bridge would be lowered approximately 6.5 feet. During construction at this bridge, subway service would be disrupted and buses would be provided to transport passengers. Adjustments to track and switch locations would be required for the existing Fresh Pond East Yard and West Yard to accommodate new profile transitions to the existing yards. Construction of a locomotive service facility and crew quarters in the West Yard is planned.

RAIL LINE CONSTRUCTION

Bay Ridge Branch

The Tunnel Alternative would require rehabilitation of the Bay Ridge Branch. The majority of the construction work along the branch would be to provide clearance for the doublestack trains and the installation of the new mainline tracks and sidings. Minor work would include utility relocations, signals, right-of-way fencing, sound walls, and retaining walls.

As previously discussed in Chapter 2, "Project Alternatives" the clearance work would be required at over 47 locations where road and subway bridges pass over the depressed Bay Ridge Branch. Much of the clearance work would be accomplished by lowering the existing track several feet and replacing or shoring the adjacent foundations of the existing bridges. Depending upon the location of the clearance work and the change in elevation required, several different construction options are anticipated.

Between 8th Avenue and Albany Avenues, a 20,000 foot long trench, 40 feet wide would be excavated to a finish depth of five feet. Earth retaining structures up to nine feet tall would be constructed on both sides of the right-of-way. Approximately 12 bridges would require

underpinning or shoring along the trench. Shoring would consist of sheeting or soldier piles and lagging to protect existing foundations adjacent to the trench excavation. It would take approximately four weeks to underpin each location. In addition, excavation of the trench would require the relocation of several utilities including the Buckeye Pipeline. Generally, utility adjustments would be performed prior to structural excavations, but would potentially be staged concurrently with structural work. The trench would be excavated once the foundations of the existing bridges were supported and the utilities were either relocated or protected. It would take approximately 54 months for the entire 20,000 feet.

The work for the clearances would be staged from the existing Bay Ridge Branch right-of-way and excavated soil would be removed by rail. Material deliveries would most likely include steel, concrete, ballast, track, and pipe and would arrive by truck and rail. The process would proceed such that construction in one 1,000-foot stretch would take approximately three months limiting the disturbance to any one area or community.

In addition to the shoring of the 12 bridges, 16 bridges would require a complete replacement including a new superstructure, abutments and piers. The bridge work would be progressed using typical NYCDOT procedures where they are reconstructed in halves thereby maintaining access throughout the replacement process. Some locations will require detours to optimize the traffic flow and work progress. Reconstruction of each bridge would take approximately 12 to 24 months depending upon the size of the structure. Construction of the replacement bridges will take longer than the rehabilitation work. It is anticipated that the replacement bridge work will be phased in order to reduce potential impacts to maintenance of roadway traffic. The work on the bridge structures would take longer than the work on the balance of the right-of-way. Both items need to be completed to increase the operating clearance, but the bridges would require the most time and effort to maintain street-level traffic.

Between New Lots and Liberty Avenues, clearance work would be required at seven locations. Most of the work involves increasing clearances from between 1.5 and 5 feet. All seven locations would require protection to the existing structures similar to that described above. In addition, two bridges at Sutter Avenue and at Blake Avenue would require complete reconstruction to provide the required clearance. A trench 40 feet wide and 5 feet deep would be excavated from New Lots Avenue to Liberty Avenue. These bridges would be reconstructed in a manner similar to those described above, although due to a wider right-of-way and shallower excavation, retaining structures would not always be required.

Major reconstruction work would be required to provide doublestack clearance at the East New York Tunnel. This tunnel extends from Liberty Avenue to Evergreen Avenue. The existing tunnel is a four-cell concrete frame structure. One cell carries the Buckeye pipelines and would not be disturbed. The remaining three cells would be converted into a two-cell frame to provide the required clearances. The invert of the tunnel would be demolished and then excavated approximately 6 feet requiring the removal of approximately 38,000 cubic yards of soil and concrete. Disposal is planned by truck and rail similar to the rest of work on the branch. The design of the reconstruction is based on maintaining the integrity of the existing tunnel roof, thereby minimizing the impacts to adjacent property.

Clearance work would also be required for the single track between 65th Street Yard and the two mainline tracks. A 3500-foot trench, 40 feet wide and 4 feet deep would be excavated from 12th Avenue to 2nd Avenue with similar protections provided to the existing structure.

Once the earth and structural work is complete, new track bed, ties and rails would be installed over the entire 53,000 feet of the branch from the tunnel portal to Fresh Pond Yard. Two additional tracks, on each side of the mainline tracks, would be constructed from East 43rd to East 98th Street. Finally, new signals and retaining and sound walls would be installed as part of the rehabilitation. Track and signal work would proceed relatively quickly, at approximately 350 feet per day. New rail and other material would be transported to the work site by train.

Montauk Branch

The improvements to the Montauk Branch would occur under either alignment of the Tunnel Alternative. The rehabilitation would include track and clearance work and would occur entirely within the right-of-way of the existing Montauk Branch.

The clearance work would involve the excavation of a 4,800-foot-long trench, 35 feet wide and 4 feet deep from Fresh Pond Yard to Wellbilt Stove, west of Andrews Avenue. In total, approximately 53,000 cubic yards of material would be excavated and removed from the construction site by rail. Five bridges would require underpinning and two additional bridges, at Fresh Pond Road and the BMT Overpass, would require complete reconstruction. Within the cut area, an earth retaining structure up to 9 feet tall would be constructed. Approximately 10 utility lines of various types would require relocation due to the excavation of the trench. The entire process, including the reconstruction of the two bridges, would take approximately 20 months to complete. Staging for this work would allow both local vehicular and rail traffic to be maintained along the Montauk Branch.

In addition to the clearance work, new track would be installed from Fresh Pond Yard to West Maspeth Yard. Signal work would also be required which would be performed after the clearance work was completed, and would be linked to the signal work on the Bay Ridge Branch.

Staten Island Railroad

Rehabilitation of the Staten Island Railroad would be required only under the Staten Island tunnel alignment. This would require construction activity related to increasing clearances for doublestack trains and the installation of new mainline tracks.

Under the Single Tunnel System, two new mainline tracks would be installed from Arlington Yard to the beginning of the cut and cover section described above. The clearance work would involve the excavation of two trenches between Arlington Yard and Morningstar Avenue. The first trench would be approximately 1,000 feet long reaching a maximum depth of 4 feet under the South Avenue Bridge. The second trench would be 5,000 feet long and would be maintained at a depth of 4 feet from Harbor Road to Morningstar Avenue. Both trenches would be 35 feet wide with earth retaining structures. Along the second trench, 10 bridges would require shoring or replacement of foundation. In addition, the John Street Pedestrian Bridge would be raised to obtain the required clearance. This work would take approximately 14 months. The work would proceed from west to east enabling material and spoil removal to be accomplished via Arlington Yard and the operating section of the Staten Island Railroad. The existing concrete and steel viaduct between Nicholas Avenue and Richmond Terrace would receive general rehabilitation repairs and the replacement of track. This work is anticipated to require 8 to 12 months.

The Staten Island tunnel alignment would also require a second mainline track over the Arthur Kill. This would be accomplished by constructing a second span of the Arthur Kill Lift Bridge to the south of the existing structure. From the bridge, the embankment for the existing Staten

Island Railroad track would be expanded southward to accommodate a second track to Arlington Yard.

Waverly Loop

As discussed in Chapter 2, "Project Alternatives," either alignment of the Single Tunnel System would require the construction of a second Waverly Loop to connect the P&H Line and the Greenville Branch. This connection would involve the installation of rail track and shallow excavation.

SCHEDULE

For either tunnel alignment, construction would proceed simultaneously at several project sites. While some aspects of either alignment are dependent upon one another, others can be constructed at any time in the process. Since the Single Tunnel System contains most of the same construction elements as the Double Tunnel System, the schedules are largely the same. Discrete tasks that may have a shorter duration under the Single Tunnel System are noted in the subsections below.

Staten Island Tunnel Alignment

The schedule for the construction of the Staten Island alignment is shown in Figure 16-1. It should be noted that this schedule has been developed to assess potential adverse environmental impacts and may change as the engineering is refined during final design. The schedule presents the construction timeframe for the Double Tunnel System. Those items that may be shorter and/or not applicable under the Single Tunnel System are indicated.

As shown in the figure, construction would begin at several locations and take approximately 5½ years to complete for the Double Tunnel System and 4½ years for the Single Tunnel System.

Tunneling. As shown in Figure 16-1, construction would begin at the Brooklyn and Staten Island cut and cover sections while the TBMs are designed and procured. The TBMs would be available to begin tunneling in the second year of construction. The schedule assumes that four TBMs (2 EPBMs and 2 rock TBMs) would be used concurrently for the Double Tunnel System. Under the Single Tunnel System, one EPBM and one rock TBM would be used. Therefore, the tunneling for the Double Tunnel System would not take much longer than the Single Tunnel System.

The first tunnel would begin on the Staten Island side in the beginning of the second year. The second TBM would be ready to begin by the middle of the same year. The tunneling at the Staten Island cut and cover section would be completed by the middle of the second year. The tunneling works would be completed on this side by the end of the third year.

Work for the Staten Island ventilation building would begin in the fourth year with the construction of the cofferdam at Pier 2. This work would be expected to take approximately four to six months. The completion of the ventilation structure would occur later on in the schedule and take approximately one year to finish.

Tunneling on the Brooklyn side would begin at the same time as the Staten Island tunneling work, but would take slightly longer, finishing near the end of the fourth year. The tunnel from Brooklyn would be completed towards the end of the fourth year. Similar to the Staten Island ventilation building, the structure at 69th Street pier would require a cofferdam that would take

1½ years to construct. Construction and equipment installation would be completed after the majority of the tunneling work is finished.

Installation of track and systems would take approximately one year for the Single Tunnel System and two years for the Double Tunnel System and would start in the middle of the fourth year in either case.

West Maspeth and Fresh Pond Yards. Construction of the 108-acre West Maspeth Yard under the Single Tunnel System would take approximately 2½ years. Under the Double Tunnel System, this would increase to approximately 3½ years required for the storage structure.

Work at Fresh Pond would take approximately 2 years. Utility and track work would constitute the majority of the required time.

Track Work and Clearances. As shown in Figure 16-1, the required work on the Staten Island Railroad, Bay Ridge Branch, and Montauk Branch would take approximately 4 years to complete. This would include time required for utility relocations, track bed lowering, bridge reconstruction, reconstruction of the East New York Tunnel, and installation of track and signals. The element with the longest duration would be the reconstruction of the East New York Tunnel and it would take approximately 4 years to complete. Construction at all other locations would be of much shorter duration and would not be in any one location for nearly that long.

Summary. Therefore, the areas which are expected to experience the longest disruption due to construction activities are the Brooklyn cut and cover section, the East New York Tunnel, the Staten Island cut and cover section, and, under the Double Tunnel System, West Maspeth Yard.

New Jersey Tunnel Alignment

The schedule for the construction of the Greenville alignment is shown in Figure 16-2. Similar to the Staten Island tunnel alignment, the construction process would begin with design and procurement of the TBMs and work at the cut and cover sections. The schedule presents the construction timeframe for the Double Tunnel System. Those items that may be shorter and/or not applicable under the Single Tunnel System are indicated. This alignment would be completed in approximately 5 years.

Tunneling. Work for the Greenville alignment would begin with the shaft construction at 65th Street Yard while the casting basin for the ITT elements is constructed and the TBMs are designed and procured.

Actual construction work for the ITT would begin in the first year and last approximately three years. The cut and cover work in Greenville Yard would last approximately 1½ years. The New Jersey ventilation facility would be completed by the middle of the fifth year after the tunnel work is completed. The scheduling of this work is somewhat flexible and may be modified based on fish spawning periods and least tern nesting periods (see Chapter 13, "Water Resources," and Chapter 14, "Wetland and Terrestrial Resources).

On the Brooklyn side, the TBMs would be available to begin tunneling in the early part of the second year. The underland portion of the work (from 65th Street Yard to the Brooklyn portal) would be completed by the end of the third year. The undersea portion to the cofferdam at the Global Marine Terminal/NEAT pier would be completed several months later near the end of the third year.

This alignment allows the use of 65th Street Yard as the main shaft site for the tunnel work from the Brooklyn side and decreases the duration of construction activities at the cut and cover

section to approximately 2.5 years, in comparison to the Staten Island alignment, which requires construction for 4.5 years at the cut and cover location.

Track Work and Clearances. The schedule for this work along the Bay Ridge and Montauk Branches would be the same as discussed for the Staten Island tunnel alignment, with the East New York Tunnel work lasting four years.

West Maspeth and Fresh Pond Yards. The schedule for work in these areas would be the same as discussed above under the Staten Island alignment.

Summary. For this alternative, the longest construction periods would occur at 65th Street Yard, East New York Tunnel, and Greenville/NEAT pier.

PEAK CONSTRUCTION ACTIVITY

As discussed in the previous section, each tunnel alignment would require substantial construction activity at different times and places over a 5- to 6-year period. While construction at a given location may span several years, the intensity of that activity would vary over time. To assess potential adverse environmental effects in the communities surrounding the construction sites, an estimate of the more disruptive activities is required. With respect to environmental impacts to the surrounding communities, construction activities that relate to increases in local traffic, air quality and noise are of the most concern. These are usually a function of the number of workers on-site, delivery of material, spoil removal and the specific construction equipment used. For other areas of the environment, potential adverse impacts are more a function of the direct effects of the actual activity (e.g., sediment transport on water quality, loss of habitat or wetlands, exposure to contaminated materials, disturbance to archaeological resources, etc) and are described under each technical area in the impact section of this chapter.

While the Tunnel Alternative would require substantial construction over an extended period throughout the study area, the availability of rail and water transport for material delivery/spoil removal and the reliance of TBMs to bore the majority of the tunnel would mitigate many impacts that would otherwise have occurred for a similar size project without these advantages.

Peak construction activities, for the each tunnel alignments by geographic study area, are discussed below. While the overall length of duration in each area is discussed above under "Schedule," the duration of the more intensive aspect of the construction process is described in this section. This includes the number of workers during peak periods, the amount of spoil to be removed from the sites, the amount and type of materials to be delivered on-site and how those figures relate to the number of trucks, barges or railcars on a daily basis.

Staten Island Tunnel Alignment

Material Removal and Transport. The Staten Island tunnel alignment would require the removal and transport of excavated soil, sediment and rock for the construction of the cut and cover sections, EPBM and TBM tunnel boring and the two ventilation structures. Table 16-1 shows the total volume of material generated at each location as well as the anticipated mode of transportation from the construction site.

In almost all cases, the preferred method of transport would be either barge or rail. However, in certain instances, the contractor may use trucks to transport some of this material from the construction sites. For example, if trucks were used for the Brooklyn cut and cover section an average of 30 trucks per day over a 38-month period would be required to transport this material.

Table 16-1
Staten Island Tunnel Alignment
Excavated Material Generation and Transport

Activity	Material	Bulk Volume*	Location	Mode
Brooklyn Cut and Cover	Soil	250,000 yds^3	8th to 13th Avenues	Rail
Brooklyn Ventilation/ Cofferdam Construction	Marine Sediment	154,000 yds^3	End of 69th Street pier	Barge
EPBM Tunneling	Soil	1,610,000 yds^3 *Double Tunnel*	Brooklyn cut and cover between 8th and 10th Avenues	Rail
		850,000 yds^3 *Single Tunnel*		
Rock Tunneling Staten Island	Rock and Soil	960,000 yds^3 *Double Tunnel*	Staten Island cut and cover between Alaska Street and Davis Avenue	Barge/Rail
		480,000 yds^3 *Single Tunnel*		
Pier 2, Ventilation/ Cofferdam construction	Marine sediment	160,000 yds^3	End of Pier 2	Barge
Staten Island Cut and Cover	Soil	525,000 yds^3	Alaska Street to Davis Avenue	Truck/Rail
Bay Ridge clearances	Soil	305,000 yds^3	2nd Ave. to Fresh Pond Yard	Rail/Truck
Montauk clearances	Soil	35,000 yds^3	Fresh Pond Yard to Flushing Ave	Rail/Truck
Staten Island Railroad clearances	Soil	38,000 yds^3	John St to South Ave	Rail/Truck
Note: *Bulk Volume includes a swell ratio of 1.4				

Using rail, two cars per day would be loaded and the train would probably leave the site once a week. Similarly, the Staten Island cut and cover section would require the completion of the rail route between Arlington Yard and the construction site, if rail transport were to be used. Using trucks, approximately 30 trucks per day over a 10-month period would be required to move the excavated material off-site.

Construction Material Delivery. At each construction site, large amounts of various building materials and supplies would need to be delivered on a daily basis. Some of this material may be delivered weekly and stored on-site while others may be delivered on a daily basis. While it is not possible at this time to determine exactly the number of deliveries and, therefore, the number of trucks, barges or railcars that would arrive on a daily basis, a rough estimate to base environmental impacts can be made. For each construction area, Table 16-2 lists the types of material to be delivered to the site, the average number of truck trips and the activity leading to peak deliveries. As shown in Table 16-2, the availability of rail and barge access for material delivery and spoil removal results in very low daily truck trips for a project of this size.

Table 16-2
Staten Island Tunnel Alignment
Material Delivery

Location	Types of Materials	Average Daily Truck Traffic	Peak Activity	Peak Daily Truck Trips	Duration of Peak Activity
Brooklyn Cut and Cover	Concrete, Steel Rod	4/day	Concrete delivery for tunnel box structure	40/day	1 day every 3 weeks
Brooklyn Ventilation	Concrete, Wood, Steel, Mechanical Equipment	Truck/Barge	Supplies for shaft construction	10/day	8 months
Staten Island Ventilation	Concrete, Steel, Wood, Mechanical Equipment	NA (Barge Only)	NA	NA	NA
TBM Tunnel (Brooklyn)	Concrete TBM Supplies	5-10/day	Supplies for 1 or 2 TBMs	15/day	26 months
TBM for Staten Island Portal	Concrete TBM supplies	5-10/day	TBM supplies for 1 or 2 TBMs	15/day	16 months
Staten Island Cut and Cover	Concrete, Steel	4/day	Concrete for structure	40/day	1 day every 3 weeks
West Maspeth Yard	Concrete Steel Finish Material Rail, Asphalt	20/day*	Yard Construction, then Garage Construction	50/day*	18 months
65th Street Yard	Tunnel Liners	Barge	NA	NA	NA
Bay Ridge Branch	Concrete, Steel	7/day	Concrete Delivery	15/day	24 months
Staten Island Railroad	Concrete, Steel	1/day	Steel Delivery	6/day	1 month
Montauk Branch	Concrete, Steel	2/day	Concrete Delivery	6/day	4 months

Note: * Double Tunnel System only.

As shown in the table, some of the material used in construction would be delivered by truck. For example, the greatest number of trucks in almost all locations would be related to the delivery of concrete. However, the concrete delivery would not occur everyday, but rather as the formwork is finished and ready for concrete delivery. While a project of this size may justify the construction of an on-site concrete batching plant on one or two sides of the harbor, it is not known at this time if such a possibility would indeed occur.

Construction Workers. Table 16-3 shows the average and peak number of construction workers on-site in each area of construction for the Staten Island alignment as well as the duration of the peak activity at each location.

As shown in Table 16-3, the greatest number of construction workers would be related to the TBM tunneling operations both on an average and peak basis.

Table 16-3
Staten Island Tunnel Alignment
Construction Employment

Site/Location		Construction Workers		Duration	
		Average	Peak	Total	Peak
Brooklyn Cut and Cover		25	30	18 months	8 months
Brooklyn Ventilation		12	15	8 months	4 months
TBM Tunnels from Brooklyn Portal	*Double Tunnel*	220	260	34 months	26 months
	Single Tunnel	110	130	30 months	26 months
Staten Island Ventilation		12	15	8 months	4 months
TBM Tunnels from Staten Island Portal	*Double Tunnel*	195	260	24 months	16 months
	Single Tunnel	100	130	20 months	16 months
Staten Island Cut and Cover		25	30	18 months	8 months
West Maspeth Yard		50	150	24 months	8 months
65th Street Yard		5	10	12 months	6 months
Bay Ridge Branch		35	108	39 months	19.5 months
Staten Island Railroad		12	36	13 months	6.5 months
Montauk Branch		12	36	13 months	6.5 months

New Jersey Tunnel Alignment

Material Removal and Transport. The New Jersey tunnel alignment would require the removal and transport of excavated soil, sediment, and tunnel spoils for the construction of the cut and cover sections, EPBM tunnel boring, ITT dredging, and the two ventilation structures. Table 16-4 shows the total volume of material generated at each location as well as the anticipated mode of transportation from the construction site.

Table 16-4
New Jersey Tunnel Alignment
Excavated Material Generation and Transport

Activity	Material	Bulk Volume*	Location	Mode
Brooklyn Cut and Cover	Soil	250,000 yds^3	8th to 13th Avenues	Rail
Brooklyn Ventilation	Soil	273,000 yds^3	65th St Yard	Barge/Rail
EPBM Tunneling	Soil and organic foam	1,176,000 yds^3 *Double Tunnel*	65th St Yard	Barge/Rail
		588,000 yds^3 *Single Tunnel*		
Dredging for ITT	Marine sediments	2,900,000 yds^3	Off Greenville	Barge
Greenville Cofferdam/ Ventilation	Marine sediments	177,000 yds^3	End of Global Marine Terminal/NEAT pier	Barge
Greenville Cut and Cover	Soil	450,000 yds^3	Greenville Yard	Barge/Rail
Bay Ridge Clearances	Same as Staten Island Alignment (see Table 16-1)			
Montauk Clearances				
Note: *Bulk Volume includes a swell ratio of 1.4				

Similar to the Staten Island tunnel alignment, in almost all cases, the preferred method of transport would be by barge or rail.

Construction Material Delivery. Similar to that shown for the Staten Island tunnel alignment, Table 16-5 lists the types of material to be delivered to the site for the construction of the New Jersey tunnel alignment. Like the Staten Island alignment, it is likely that some materials would arrive at each construction site by truck. However, the number of trucks on a 24-hour basis would not be significant due to the availability of rail and barge access. Peak truck activity would again be related to concrete delivery when structural work was beginning.

Table 16-5
New Jersey Tunnel Alignment
Material Delivery

Location	Types of Materials	Average Daily Truck Traffic	Peak Activity	Peak Daily Truck Trips	Duration of Peak Activity
Brooklyn Cut and Cover	Same as Staten Island Alignment				
Brooklyn Ventilation	Wood, Concrete, Steel, Mechanical Equipment	8	Concrete for Structure	12	12 months
TBM Tunnel	Concrete, TBM Supplies	10-20	Supplies for 2 or 4 TBMs	30	10 months
Greenville Ventilation	Wood, Concrete, Steel, Mechanical Equipment	NA (Barge Only)	NA	NA	NA
ITT Tunnel	-	NA (Barge Only)	NA	NA	NA
Greenville Cut and Cover	Concrete, Steel Rod	8	Concrete for Structure	12	12 months
West Maspeth Yard	Same as Staten Island Alignment (see Table 16-2)				
65th Street Yard					
Bay Ridge Branch					
Montauk Branch					

Construction Workers. Table 16-6 shows the average and peak number of construction workers on-site in each area of construction for the New Jersey tunnel alignment as well as the duration of the peak activity at each location.

Table 16-6
New Jersey Tunnel Alignment Construction Employment

Site/Location		Construction Workers		Duration	
		Average	Peak	Total	Peak
Brooklyn Cut and Cover		Same as Staten Island Alignment			
Brooklyn Ventilation		12	15	15 months	12 months
TBM Tunnel	*Double Tunnel*	400	500	26 months	13 months
	Single Tunnel	200	250	22 months	12 months
Greenville Ventilation		12	15	8 months	4 months
ITT Tunnel		10	20	27 months	4 months
Greenville Cut and Cover		25	30	18 months	8 months
West Maspeth Yard		Same as Staten Island Alignment			
65th Yard		Same as Staten Island Alignment			
Bay Ridge Branch		Same as Staten Island Alignment			
Montauk Branch		Same as Staten Island Alignment			

C. PROBABLE IMPACTS OF THE NO ACTION AND PROJECT ALTERNATIVES DURING CONSTRUCTION AND ASSOCIATED MITIGATION MEASURES

This section discusses the anticipated impacts during the construction period of the various build alternatives. These construction impacts comprise a combination of impact categories discussed in other chapters of this EIS, such as noise, land use, neighborhood character, and air quality. Impacts deemed to be "significant" are based upon the criteria presented in the respective chapters.

NO ACTION ALTERNATIVE

Since the No Action Alternative would not require new construction as part of this project, no construction-related impacts would occur.

TSM ALTERNATIVE

The TSM Alternative would result in some disruption, but this would be relatively minor and of short duration. Work at each rail yard would take 6 months and would not involve substantial disruption to the sites since earthwork would be minimal. The yards are existing railroad facilities located in industrial areas. These areas are well-buffered from any sensitive uses; therefore, the disturbance to the surrounding land uses would not result in adverse impacts. As discussed in Chapter 13, "Water Resources," the installation of the two new bridges would result in some minor disturbances to water quality in the immediate area of the structures and the loss of bottom habitat. As described in that chapter, these impacts would not be adverse since the area disturbed would be small and measures to prevent temporary increases in pollutant loadings to the water body would be used.

Similarly, the construction activity required to rehabilitate the Bay Ridge Branch and Montauk Branch would not result in any adverse environmental effects. The work involved would be limited to the existing right-of-way, which for the most part, is well buffered by adjacent industrial uses or in a depressed cut-section. Where the line is adjacent to sensitive uses, such as residences and schools, construction activity would only last several days in any one location as new track, ties and ballast is installed.

EXPANDED FLOAT OPERATIONS ALTERNATIVE

Like the TSM Alternative, the Expanded Float Operations Alternative, would not result is any adverse environmental impacts. The additional effort required for this alternative would involve the construction of two additional float bridges at Greenville Yard, the construction of two additional effort required for this alternative would involve the construction of two new float bridges at 65th Street Yard. The construction of these bridges would take approximately 8 months and like the other work in the yard would not be disruptive to the surrounding community or environment. Construction at West Maspeth Yard would take place within a primarily industrial area. Therefore, disturbance from construction for this alternative would not cause adverse impacts.

TUNNEL ALTERNATIVE

As discussed above, many different neighborhoods throughout the study area would experience construction activity for some duration. However, in situations where the activity is limited in scope or duration, the potential environmental impacts and disruption to the surrounding area would be short-term, and not considered adverse. It is only in those areas where construction activities would continue over a longer term that adverse impacts due to traffic, noise, and air quality on the surrounding communities would potentially rise to a level that would constitute an adverse impact. Direct impacts, such as the disturbance to wetlands, archaeological resources, etc., have been considered previously and are summarized below. Therefore, the discussions of land use, neighborhood character, visual resources and the effects of construction from direct or indirect (e.g., trucks, employee traffic, etc.) activities, is assessed on specific study areas that would experience multi-year construction disruption.

As discussed above, the areas of concern include all of the cut and cover sections, the shaft sites, and West Maspeth Yard.

LAND USE

New Jersey Cut and Cover Section (Greenville Yard and Greenville Branch)

Under the New Jersey tunnel alignment (either the Single or Double Tunnel Systems), construction in the Greenville Yard area, including operations related to the ITT construction, would last approximately 3.5 years. The cut and cover portion of the potential tunnel alignment would be located within Greenville Yard, while the open cut section would be located along Greenville Branch.

The land use in the Greenville Yard Study Area is industrial (see Figure 3-3), with a mix of port and marine related facilities, built industrial facilities, and large areas of open yard and storage facilities. Immediately surrounding the yard to the northwest is a juice processing facility; to the north is a scrap yard and a paper recycling facility; to the southeast is a car port, a parking area for the Auto Marine Terminal (NEAT), and a garage facility; and to the west is the Greenville Branch and vacant land owned by Conrail Shared Assets (CSAO). There are no residents or community facilities within the study area. The portion of the study area adjacent to the site of the ventilation shaft is located on the northeast corner of the Global Marine Terminal/NEAT pier with a public observation point along the pier to the west. Impacts on the public observation pier would be temporary. Since construction would occur in an industrial area, no adverse neighborhood character or land use impacts are expected.

Staten Island Cut and Cover Section (Staten Island Railroad - Segment 3)

The Staten Island cut and cover section is located in land use Segment 3. Since this site would also serve as the shaft site for the bored portion of the tunnel between the portal and Pier 2, construction would last 3 years in this area for the Double Tunnel System and 2.5 years for the Single Tunnel System.

In general, the land uses immediately adjacent to the potential tunnel alignment, which is along the waterfront of the Kill Van Kull, consist of mostly industrial uses along Richmond Terrace. North of Richmond Terrace are larger-scale facilities, including some maritime uses. The south side of Richmond Terrace contains a mix of smaller industrial and commercial uses. There are a few residential uses on the north and south sides of Richmond Terrace. The remainder of the

Segment 3 study area is almost entirely residential south of Richmond Terrace with some open space. There are no community facilities in the study area.

Construction at this site would result in elevated air emissions. There would be a substantial increase in noise levels above existing levels at the nearest sensitive residences.

However, construction is not expected to adversely impact the neighborhood character or land uses of the study area. Construction activities would not be highly visible since the area is located within the Staten Island Railroad right-of-way, which is below existing grade and views would be limited to the surrounding streets. The residential uses, with one exception (a residence at Barretta Lane), and open spaces in the study area are buffered from the construction area by Richmond Terrace and intervening industrial uses. There would be limited increased traffic at the site because materials and excavated materials would be transported by barge or by rail from a satellite staging area at Arlington Yard.

65th Street Yard- Construction Staging Area

65th Street Yard would be the construction staging area in Brooklyn for the New Jersey tunnel alignment. Construction activities at the site would last five and years for the Double and Single Tunnel Systems, respectively.

Existing land uses near the yard along the waterfront are primarily limited to industrial complexes and the adjacent elevated expressways. The expressways separate the rail yard from the residential uses and open spaces in the study area such as Owl's Head Park and Leif Ericson Park and Square. While construction activities at this site would result in elevated air emissions and noise levels, they would not result in adverse impacts at the nearest sensitive receptors. Trucks and construction worker vehicles would travel to and from the major arterials primarily through the industrial area. Therefore, no adverse impacts on neighborhood character and land use are expected.

Brooklyn Cut and Cover Section (Bay Ridge Branch of the LIRR—Segment 2)

The Brooklyn cut and cover section is located in land use Segment 2. Under the Staten Island alignment, construction activities in this area would last 4 years for the Double Tunnel System and 3.5 years for the Single Tunnel System. Under the New Jersey tunnel alignment, the duration would be reduced to 1.5 years for both Tunnel Systems since this location would not serve as a shaft site and the construction for the cut and cover section would be the same.

In general, the land uses immediately surrounding the Brooklyn cut and cover section of the potential tunnel alignment between 8th Avenue and 13th Avenue include the Bay Ridge Branch itself, and a mix of residential, industrial, institutional, commercial and vacant uses. The northern half of the study area also contains institutional uses as well as residential uses with ground-floor retail, generally located along the avenues. Mixed uses also front the rail line to the south. The southeastern portion of the study area, to the east of Fort Hamilton Parkway, is predominantly residential with some commercial, institutional and industrial uses mainly located along the avenues. Although predominantly industrial in nature, the southwestern section, west of Fort Hamilton Parkway, contains a variety of uses including open space, residential, institutional and commercial uses. The Leif Ericson Park and Square and a few other open spaces are located on several blocks near the southwestern boundary of the study area. Residential uses and ground-floor retail are found in the southwestern corner of the study area. The Leif Ericson Park buffers the industrial and transportation uses to the north of the park from the residential area located to the south.

Construction at this site would not be highly visible since it would occur within the existing open cut of the Bay Ridge Branch right-of-way and land uses are somewhat buffered from the right-of-way by 61st and 62nd Streets. However, construction activity would result in elevated air emissions and there would be a substantial increase in noise levels above existing levels at the nearby residences and some noise levels would exceed NYSDOT noise criteria for construction. For the Staten Island tunnel alignment, there would be considerable increases in traffic and construction activity, since this area would serve as the primary staging area in Brooklyn. For the New Jersey tunnel alignment, this activity would be more limited because the primary construction staging area would be located at 65th Street Yard. For the Staten Island tunnel alignment, due to the length and highly disruptive nature of the construction period, the high noise levels that would be generated, and the close proximity of numerous residences, there would be adverse neighborhood character impacts at this location. These impacts could be partially mitigated by the noise, traffic and air mitigation measures discussed below.

West Maspeth Yard. Under the Double Tunnel System, an existing rail yard would be expanded to a 160-acre intermodal rail yard in West Maspeth, Queens. Construction work at the site would last approximately 3½ years. Under the Single Tunnel System, the yard would be approximately 108 acres and would take approximately 2½ years to construct.

The project site is located in a predominantly industrial area and is zoned M3. Immediately bordering the yard site are a few vacant properties to the northwest, the Montauk Branch and a large United Parcel Service distribution facility to the north along 56th Road, a mixed-use residential neighborhood to the east, and Newtown Creek to the west. The dominant uses in the vicinity of the site are industrial and transportation-related, with buildings primarily used for warehousing and distribution purposes. The Brooklyn-Queens Expressway (BQE) traverses the northwest corner of the study area crossing Newtown Creek via the Kosciuszko Bridge. There are a few notable exceptions in this predominantly industrial study area. In the northernmost section of the study area, there are a few two- and three-story residential buildings along 55th Avenue at 46th Street and at 54th Drive and 43rd Street. East of 56th Road (also called Rust Street south of Maurice Avenue) there is a residential neighborhood, including a church along Rust Street. The portion of the study area south of Grand Avenue near Rust Street contains a mix of smaller industrial uses, two small offices, residential uses, and a school.

Construction at this site would result in elevated air emissions. At the nearest sensitive receptors under the Double Tunnel System, there would be a substantial increase in noise levels above existing levels and some noise levels would exceed NYSDOT noise criteria for construction. Noise levels would be highest during pile driving activities; although pile-driving activities would extend over a considerable portion of the construction period, the location of the activity would shift over much of the yard site. Construction trucks would primarily travel along designated truck routes on their way to and from the LIE and BQE. In general, while there would be significant noise impacts during construction, construction activities would not cause an adverse change to overall neighborhood character since West Maspeth is one of the City's most intensive industrial districts.

As previously discussed, under the Single Tunnel System, West Maspeth Yard would not include the storage building. Construction of the yard would therefore not require pile-driving and therefore no significant noise levels would be generated.

SOCIOECONOMIC CONDITIONS

Under the Tunnel Alternative, major construction activity would occur at various locations throughout the study area. However, much of the construction activity would occur in existing rail yards, rail rights-of-way or other isolated areas with few exceptions. Therefore, most of the construction activity would not result in any adverse economic impacts by limiting or restricting access to local businesses. During clearance work, roadway access on bridges would be maintained. In some cases, such as along the Staten Island Railroad right-of-way, where the construction area is narrower, measures to assure continued access to waterfront businesses would be maintained.

CONSTRUCTION EXPENDITURES

Detailed year by year construction expenditures (i.e., costs) were used as input variables to the Regional Economic Models, Inc. (REMI) economic simulation model to analyze the total regional economic impact of building the Cross Harbor transportation improvements.

Single Tunnel System

Construction of the Single Tunnel System is anticipated to take place over a five-year period (2005-2009).[*] The following steps were taken to conduct this analysis:

- The capital cost of building the tunnel is spread evenly over a five-year period beginning in 2005;
- The capital cost estimate for the tunnel is based on the New Jersey alignment; impacts of the Staten Island alignment would vary insignificantly;
- The split between labor and cost of equipment was determined for each element of the capital cost summary based on industry standards;
- Equipment that is expected to be purchased outside of the Metropolitan New York City area is not included in this analysis;
- Labor and cost of equipment were allocated to the appropriate REMI economic simulation model variables. For example, most labor-intensive activities are input as construction activity (business sales) for Metropolitan New York, while equipment purchases are input as additional demand for electrical, communications, and other manufactured products and reflect typical purchase and trade patterns in the region; and
- Though the total cost for the New Jersey alignment in 2002 dollars is estimated to be $3.8 billion, the economic impact analysis included $3.0 billion of direct expenditures for the region. The difference is because the economic impact analysis does not include costs that will not have an appreciable effect on the economy, such as insurance payments, real estate acquisition, and purchases of specialized equipment produced outside of the region.[**]

[*] Although the capital cost of building the Staten Island Tunnel is slightly higher than the New Jersey Tunnel, the economic impact of building either tunnel alignment is considered roughly the same for the purpose of this analysis. Staten Island 'hard costs' are only estimated to be less than two percent higher than the New Jersey Tunnel, so the impacts will likely vary by a similar amount.

[**] In year of expenditure dollars, the Staten Island and New Jersey alignments of the Single Tunnel System are estimated to cost $4.1 and $4.3 billion, respectively.

- Costs separated out for re-construction activities were included as construction input variables.

It is important to keep in mind that while this impact will contribute economic activity to the region, similarly sized alternative investments would also likely contribute an equal impact (regardless of its benefit to the transportation system). In other words, this is a prime example of the concept of opportunity cost. If the funds are not spent on the Cross Harbor project, they may be spent on something else that would have roughly the same economic contribution from construction expenditures. To the extent that the Cross Harbor project attracts Federal dollars, it could be seen as a windfall for the region, but likely not a national economic gain as another use of the funds would produce similar impacts. It should be noted, however, that Federal transportation dollars earmarked for this project cannot be used for other purposes. Therefore, the value of the impact of construction expenditures is reported, but it is not included in the economic impact-based benefit-cost analysis. This is consistent with the economic impact and benefit-cost analysis literature.*

Results and Analysis. Table 16-7 displays the results of the REMI economic analysis of constructing the Single Tunnel System for Metropolitan New York City, New York State, and New Jersey in 2009 (although benefits are shown for a single year-2009, similar sized benefits accrue in 2005 through 2008). Important notes regarding the analysis include the following:

Table 16-7
Economic Impacts of Constructing the Single Tunnel System in 2009

Benefit	Metropolitan New York City	New York State	New Jersey
Personal Income	$398 M	$276 M	$157 M
Gross Regional Product	$619 M	$449 M	$231 M
Employment	8,820	6,270	3,230
Employment by Industry			
Manufacturing	288	325	120
Mining	6	6	5
Construction	4,568	3,112	1,498
Transportation and Public Utilities	176	127	66
FIRE	161	139	56
Retail Trade	767	551	346
Wholesale Trade	197	144	80
Services	2,254	1,586	861
Agriculture, Forestry, and Fisheries	44	31	25

Source: Regional Economic Models, Inc. (REMI)

* Most recently, TCRP Report H-19 provides a good description of this issue and why it is not included in benefit-cost analyses ("Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners").

- These results represent the impact of building the Tunnel Alternative, but do not include the impact of more efficient goods movement and accessibility to markets (see the economics chapter).
- While this impact will contribute economic activity to the region, similarly sized alternative investments would also likely contribute an equal impact (regardless of its benefit to the transportation system).
- The REMI model measures jobs by their location, but personal income (earnings of workers) is adjusted to reflect commuting patterns, and therefore place of residence. This is important in terms of properly accounting for the ripple effects of consumer spending (for example, commuters from New Jersey working in New York City likely spend much of their earnings in New Jersey and their earned income is attributed to New Jersey).
- Benefits by region are not additive (i.e., left to right).

Economic impacts from construction spending for this alternative are largest in the Metropolitan New York region, as expected, since most of the direct expenditures occur within that area. Annual impacts in 2009 include $398 million of additional personal income, $619 million additional gross regional product (GRP) and over 8,800 jobs, with almost half of those coming in the construction industry. The manufacturing industry benefits from this activity, as intermediate construction supplies are needed from various industrial firms in New York and New Jersey. The retail trade and services industries also benefit greatly from the increased demand for their goods and services due to additional personal income (and project engineering expenditures are included in services).

Impacts on New York State and New Jersey are also considerable, and include non-metropolitan area impacts as well, that can benefit from increased demand for goods and services from the construction and equipment purchases.

Double Tunnel System

Economic impacts from construction spending for the Double Tunnel System are largest in the Metropolitan New York region, as expected, since most of the direct expenditures occur within that area. Annual impacts in 2009 include over $560 million of additional personal income, almost $900 million additional gross regional product (GRP) and over 12,500 jobs, with almost half of those coming in the construction industry (see Table 16-8 below). The manufacturing industry benefits from this activity, as intermediate construction supplies are needed from various industrial firms in New York and New Jersey. The retail trade and services industries also benefit greatly from the increased demand for their goods and services due to additional personal income (and project engineering expenditures are included in services).

Impacts on New York State and New Jersey are also considerable, and include non-metropolitan area impacts as well, that can benefit from increased demand for goods and services from the construction and equipment purchases.

VISUAL AND AESTHETIC CONSIDERATIONS

Short-term visual impacts in cut and cover sections and shaft sites where visual obstructions would be created by construction equipment, leading to a temporary loss of context would occur. However, any such impacts would only last as long as the project construction in any given location. In addition, once the project was built, the tunnel would not be visible above the

surface, and the overall context of the resources would remain unchanged. Therefore, any potential construction related contextual impacts would only be considered short-term, and as such, would not be expected to constitute adverse impacts on visual resources.

To avoid adverse impacts on the Ocean Parkway visual resource, the design of the reconstructed overpass would be developed in consultation with the New York State Historic Preservation Office (NYSHPO).

HISTORIC RESOURCES

It is possible that temporary contextual impacts could occur on historic resources during construction.

Table 16-8
Economic Impacts of Constructing the Double Tunnel System in 2009

Benefit	Metropolitan New York City	New York State	New Jersey
Personal Income	$568 M	$395 M	$224 M
Gross Regional Product	$884 M	$641 M	$330 M
Employment	12,600	8,960	4,620
Employment by Industry			
Manufacturing	412	465	171
Mining	9	9	7
Construction	6,526	4,446	2,140
Transportation and Public Utilities	251	182	94
FIRE	231	199	80
Retail Trade	1,095	787	494
Wholesale Trade	282	206	115
Services	3,220	2,266	1,230
Agriculture, Forestry, and Fisheries	63	45	35

Source: Regional Economic Models (REMI), Inc.

Greenville Yard

Historic resources located in the APE at Greenville Yard for cut and cover work, which would be visible above ground, may experience short-term visual impacts due to visual obstructions created by machinery and other construction equipment required to build the project, and temporary loss of context as the APE is visually changed by the construction of the project. However, any such impacts would only last as long as the project construction in any given location. In addition, once the project was built, the tunnel would not be visible above the surface, and the overall context of the historic resources would remain unchanged. Therefore, any potential construction related contextual impacts would only be considered short-term, and as such, would not be expected to constitute adverse impacts on historic resources.

Arthur Kill Lift Bridge (NY and NJ)

Construction activities associated with the construction of the new span may under the Staten Island tunnel alignment have physical impacts on these historic resources due to their close

proximity. To avoid adverse physical and visual impacts on these resources, a plan for the construction work and design would be developed in consultation with NJ and NYSHPO.

Bay Ridge Branch - Segment 3

Although most construction work would be minor, there is the potential for adverse physical impacts on one historic resource. The Ocean Parkway overpass would be reconstructed as part of the work to increase clearance heights. Depending on the form and height of the new overpass and the replacement walls and fencing, reconstruction of the overpass could adversely affect Ocean Parkway by altering sight lines along the parkway, causing it to become a different visual entity. Ground-borne construction period vibrations could also potentially damage the structures lining Ocean Parkway in this location. To avoid adverse physical impacts on Ocean Parkway, a construction protection plan covering the parkway would be developed in consultation with NYSHPO, and the design of the Ocean Parkway overpass would be developed in consultation with NYSHPO.

ARCHAEOLOGICAL RESOURCES

As described in Chapter 7, "Archaeological Resources," there is a possibility that some of the sites to be affected by the Tunnel Alternative may contain buried archaeological resources. If any resources are present on project sites, they could be disturbed by construction activities for the tunnel alternative. To avoid adverse impacts on archaeological resources, work will be performed in consultation with NYSHPO and NJSHPO where the potential for archaeological resources has been identified. The steps to be taken will be outlined in the project's Programmatic Agreement. These would include the following measures. Once preliminary engineering is under way, soil borings would be performed in all locations identified as potentially of concern (where soil borings have not already been completed and analyzed for the EIS analysis). The results of the borings would be used to determine depths of fill, to better understand the sensitivity of the areas to be affected by the project. The potential for impacts would then be re-evaluated. If the potential for any adverse impacts is identified, appropriate mitigation measures would be developed through ongoing consultation with NYSHPO and NJSHPO, so that no adverse impact would occur. Mitigation measures may include subsurface archaeological testing to identify the presence or absence of archaeological features, followed by an assessment of their eligibility for the National Register of Historic Places. For any sites to be affected by the project that are identified as having archaeological features present that are eligible for the National Register, mitigation will be developed. As appropriate, this may include data recovery in the form of a full-scale excavation.

TRANSPORTATION

This section of the construction chapter analyzes potential impacts on traffic conditions that could result during the construction phase of the tunnel alignments. Construction activities would vary depending on which tunnel element is being constructed, but in general, activity is expected to peak during the tunnel construction periods after the shaft building and cut and cover excavation construction is completed.

Construction is expected to start in 2006, and could continue until 2010 or 2012. It is estimated that the peak construction activity would occur at about halfway through the process; thus, a construction year near the approximate midpoint of construction duration, in this case 2008, was selected for analysis.

During the construction phase of the Tunnel Alternative, an increase in construction employee and truck vehicle traffic could result in significant traffic impacts. Potential impacts would likely occur near each tunnel's construction staging areas where materials would be stored and employees would gather. Areas near each tunnel's cut and cover sections and at shaft/access sites along the tunnel alignment are not expected to be impacted since construction materials, tunnel spoils, and employees would be transported by completed rail sections leading directly to ongoing construction activities.

Traffic analyses of potential construction-related impacts are similar to those previously discussed for the main project alternatives sections; these include selections of the most appropriate study area within which traffic impacts could potentially occur and of critical analysis periods, and analysis of key intersections within those areas. The 2000 *Highway Capacity Manual* (*HCM*) procedures were again used in determining the capacities and levels of service for each of the intersections analyzed.

Both tunnel alignments were evaluated in terms of potential vehicle traffic impacts since different geographic areas would be affected and unique impacts could occur under each alternative. Critical intersections near construction staging areas were identified and analyzed. For the Staten Island tunnel alignment, intersections were identified near Arlington Yard in the northeast corner of Staten Island and again in the Sunset Park area of Brooklyn. For the New Jersey tunnel alignment, key locations were identified in the Greenville area in New Jersey and in the 65th Street/Sunset Park area of Brooklyn.

The analysis hours would involve those periods when employee shift changes are expected. Typically, these peak construction shift-change hours occur during an early morning, mid-afternoon, and late-evening periods that do not coincide with the normal weekday commuter peaks. For this project, analyses were conducted for the 6:30-7:30 AM and 2:30-3:30 PM hours, corresponding to the day and afternoon shift change hours when the highest number of employees would be working. Employee trips would vary depending on the tunnel alternative, but are expected to be intense when construction activities peak—as high as a total of 330 vehicles arriving and departing for the afternoon shift change hour for the New Jersey Double Tunnel alignment. For both alternatives, it is estimated that a maximum of 5 to 10 trucks per shift would arrive to and depart from each staging area site during peak operation for materials delivery.

A description of existing traffic conditions for Greenville and Arlington is included because these two areas were not selected as rail yard options for the tunnel alternatives analyses and there was no prior Existing Conditions analysis done. For the 65th Street area, which is common to both tunnel alternatives, only a brief overview will be presented of existing and future baseline conditions since a full detailed discussion is presented earlier in the EIS.

Staten Island Tunnel Alignment

Existing Conditions.

Arlington Construction Staging Yard. The traffic study area for the Arlington staging yard consists of the major intersections along streets that serve as access routes into and out of the area, including the key locations through which construction employee and truck traffic would be concentrated. Since vehicles have close access to the Staten Island Expressway (SIE), there are only a few potentially affected intersections for analysis, including the Forest Avenue intersections at Goethals Road North, at Gulf Avenue, and at South Avenue. This is advantageous to the proposed staging yard in that only limited travel along local streets would be

needed. Furthermore, regional access is direct, and extends immediately into New Jersey via the Goethals Bridge, south along the West Shore Expressway (and the Outerbridge Crossing), and, further east, into Brooklyn via the Verrazano-Narrows Bridge.

The three streets that would be accessed vary in their operations capabilities. South Avenue is a narrow street north of Forest Avenue with only 1 travel lane in each direction, while it widens to 2 travel lanes in each direction when passing through the Staten Island Corporate Park to the south. Forest Avenue has 2 travel lanes in each direction, and spans nearly the entire width of Staten Island's north shore starting at Gulf Avenue; in this area, the avenue primarily processes vehicle traffic to and from the SIE. It has signal controls at the intersection with Goethals Road North and South Avenue, and is unsignalized at Gulf Avenue. Gulf Avenue and Goethals Road North are the SIE's east and westbound service roads, and each carries moving traffic on 3 travel lanes.

In general, traffic volumes throughout this study area are low to moderate. There are two prevailing, overlapping travel patterns in the area during the AM peak period. There is an influx of trucks to the area from New Jersey destined to the Howland Hook container terminal, as indicated by a volume of about 450 vehicles per hour (vph) exiting the eastbound SIE onto Gulf Avenue, and then turning inland toward the terminal. At the same time, there is a sizeable flow (350 vph) traveling onto the westbound SIE entrance ramp just west of the Goethals Road North/Forest Avenue intersection. In the PM peak, the prevailing movement is eastbound along Gulf Avenue and off of the SIE onto northbound Forest Avenue (about 420 vph), while there is not a heavy westbound flow onto the westbound SIE seen in the AM peak hour. Traffic volumes on the approaches to the Forest Avenue/South Avenue intersection vary depending on time, with the lower volumes of 350 vph or less recorded during the AM hour, and volumes as high as 400-600 vph on Forest Avenue in the PM analysis hour. These peak hours reflect the periods when construction-related traffic volumes would be traveling through the area.

Overall, the three intersections analyzed were found to be operating at overall acceptable levels of service B to C during both analysis periods due primarily to the low to moderate volume of traffic flowing through the area (see Table 16-9). However, the north and southbound approaches on Forest Avenue at Gulf Avenue experience some congestion during the PM analysis hour (LOS D-E) primarily due to the heavy conflicting volume turning left from eastbound Gulf Avenue (and from the eastbound SIE) onto northbound Forest Avenue.

65th Street (Sunset Park) Construction Staging Yard. The traffic study area for the 65th Street staging yard site consists of the major intersections along arterials that serve as access routes into and out of the area that would be used by construction employees. These include intersections on 2nd Avenue at 39th and 65th Streets; on 3rd Avenue at 39th, 60th, and 65th Streets; on 4th Avenue at 38th Street; and 7th Avenue at 65th Street.

Both 3rd and 4th Avenues continue to have strong directional traffic flows (e.g., northbound in the AM) during the hours that are slightly earlier than the later normal commute hours, although the volumes are slightly lower. During the morning peak hours, traffic volumes are heaviest for northbound 3rd and 4th Avenues, with about 1,700 to 2,400 vph northbound and 400 to 600 vph southbound. In the PM peak, northbound volumes range from 600 to 800 vph versus 1,100 to 1,450 vph southbound on 3rd and 4th Avenues. Volumes along cross streets are typically low (150-300 vehicles per hour or less), with the exceptions being the two intersections where the Gowanus Expressway ramps touch down at 39th Street. Study hour traffic volumes at the eastbound 65th Street approach to 7th Avenue are about 450 vph in the AM peak hour and 650

vph in the PM peak, while southbound volumes exiting the 39th Street off-ramp range between 550 vph (PM) and 630 vph (AM).

Table 16-9
Existing Traffic Levels of Service: Arlington Yard

		AM Peak (6:30 – 7:30 AM)				PM Peak (2:30 – 3:30 PM)			
Intersection & Approach		Mvt.	V/C	Control Delay	LOS	Mvt.	V/C	Control Delay	LOS
Goethals Road North & Forest Avenue									
Forest Avenue	NB	LT	0.35	11.8	B	DefL	0.35	12.7	B
						T	0.27	11.2	B
	SB	TR	0.10	9.5	A	TR	0.12	9.7	A
Goethals Road North	WB	LT	0.21	20.5	C	LT	0.10	19.5	B
Overall Intersection			0.29	14.5	B		0.25	12.9	B
Forest Avenue & Gulf Avenue									
Keyspan Driveway NB		T	0.14	30.1	D	T	0.12	25.6	D
		TR	0.16	20.4	C	TR	0.13	21.2	C
Forest Avenue	SB	L	0.46	42.2	E	L	0.49	43.2	E
		T	0.06	27.4	D	T	0.06	23.0	C
Gulf Avenue	EB	L	0.29	8.3	A	L	0.27	8.2	A
Overall Intersection				14.9	B			15.4	B
South Avenue & Forest Avenue									
South Avenue	NB	L	0.09	9.1	A	L	0.38	23.3	C
		TR	0.40	12.0	B	TR	0.63	27.4	C
	SB	LTR	0.32	11.3	B	LTR	0.64	29.4	C
Forest Avenue	EB	LTR	0.47	23.1	C	LTR	0.44	12.0	B
	WB	LTR	0.39	22.2	C	DefL	0.52	16.3	B
						TR	0.39	11.8	B
Overall Intersection			0.43	17.4	B		0.57	18.3	B

Overall, all 7 intersections analyzed operate at acceptable overall LOS A, B, or C to, in one case (2nd Avenue/39th Street in the AM), at a slightly congested overall LOS D. Several individual movements operate with modest to significant congestion, particularly the traffic exiting from the northbound Gowanus Expressway onto 7th Avenue approaching 65th Street (LOS D during the PM peak hour), the left turn movement from the mainline of 3rd Avenue at 60th Street (LOS E), and eastbound 65th Street left turns at 3rd Avenue (LOS D in the PM).

2008 Future Baseline.

Arlington Construction Staging Yard. Area-wide traffic volumes are projected to increase by about 4 percent by the year 2008, which is about 0.7 percent per year. This growth rate is

consistent with traffic trends for Staten Island indicated in the New York Metropolitan Transportation Council model.

During the AM and PM peak hours, vehicle flows along Forest and South Avenues and the expressway service roads would increase in the future baseline condition by about 10 to 20 vph, which represent the largest traffic increases in the study area. There would be no level of service deteriorations in the No Action condition, although vehicle delays would increase slightly corresponding to vehicle increases noted above.

65th Street Construction Staging Yard. Areawide traffic volumes are projected to increase by about 3 percent by the year 2008, or about one-half percent per year. This growth rate is within the range of NYC CEQR guidelines for Brooklyn, and consistent with traffic trends for Brooklyn indicated in the New York Metropolitan Transportation Council model.

During the AM and PM peak hours, vehicle flows for northbound 3rd and 4th Avenues would increase in the future baseline condition by about 20 to 50 vph, which represent the largest traffic increases in the study area. Volumes along Second Avenue and along cross streets analyzed would increase by 10 to 20 vph during both study peak hours.

Those intersections currently operating at congested levels would deteriorate to a worse level of service in the No Build condition. Overall, 2 of the 7 intersections analyzed would experience worsened levels of service on one or more approaches from an existing LOS D or better into a congested LOS E or F. These would include approaches at the intersections of 3rd Avenue at 60th Street and 7th Avenue at 65th Street.

2008 Future Construction Build.

Arlington Construction Staging Yard. At the Arlington staging yard, about 110 and 150 employee vehicle trips would be generated in the AM and PM peak hours, respectively, during the peak construction hours (see Table 16-10) for the Double Tunnel System. Only 5 inbound and 5 outbound truck trips would be generated by staging area activities because nearly all material deliveries and spoil removals would be transported by rail out of the region.

These volumes of auto and truck trips generated at each staging yard were assigned to the local street network. For Arlington Yard, regardless of vehicle type, ramp connections to regional highways would tend to funnel traffic flows to only a limited number of local arterials that connect to the yard itself along South Avenue. Vehicles were routed directly to and from the Staten Island Expressway and then along either Forest or South Avenue.

Table 16-10
Year 2008 Trip Generation for Arlington
Construction Staging Yard
Double Tunnel System – Staten Island Alignment

Vehicle Movement	AM Peak Hour (Day Shift Change)	PM Peak Hour (Afternoon Shift Change)
Autos In	74	74
Autos Out	37	74
Trucks In	5	5
Trucks Out	5	5

In the Arlington area, overall traffic volumes in the study area would increase by an additional 10 to 20 vehicles during the peak construction period of the Double Tunnel System—an increase of less than 5 percent compared to the future baseline traffic levels. The one exception would be along South Avenue, which would experience traffic increases of 40-45 vehicles in the AM on its approaches to Forest Avenue and up to 70 additional vehicles on the southbound approach in the PM. These traffic volumes assigned to South Avenue represent increases of 20 to 30 percent over future baseline levels, although overall traffic volumes would remain low to fairly moderate at between 220 and 500 vph. Figures 16-3 and 16-4 illustrate the expected traffic into and out of the study area for the Double Tunnel System. Of the 3 intersections studied, 2 locations would experience a significant traffic impact; namely, the Forest Avenue/Gulf Avenue intersection, where during the AM and PM peak hours, the installation of a stop sign on the Gulf Avenue approach would create sufficient gaps for Forest Avenue vehicles to proceed and mitigate the impact; and the South Avenue/Forest Avenue intersection, where the shift of 3 seconds of green time from the east/west to north/south approaches could mitigate the impact (see Table 16-11).

Table 16-11
Year 2008 Traffic Impacts for Arlington Staging Yard
Double Tunnel System - Staten Island Alignment

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact (Time Period)	Mitigation Required
	No Build	Build	No Build	Build		
Forest Avenue at Goethals Road North	B	B	B	B	—	—
Forest Avenue at Gulf Avenue	C	C	C	C	YES (AM / PM)	Installation of stop sign on Gulf Avenue EB approach
Forest Avenue at South Avenue	B	B	B	C	YES (PM)	Standard mitigation

The Single Tunnel System would generate approximately half the number of vehicle trips with about 57 and 76 employee vehicle trips in the AM and PM peak hours, respectively. About 3 inbound and 3 outbound truck trips would be generated in the AM peak hour and 2 inbound and 2 outbound truck trips would be generated in the PM peak hour. Overall traffic volumes under the Single Tunnel System would increase by approximately half the number of vehicles as under the Double Tunnel System. For example, the southbound approach on South Avenue at Forest Avenue would experience traffic increases of 20 vehicles in the AM peak hour and about 35 vehicles in the PM peak hour. Of the 3 intersections analyzed, only the intersection of Forest Avenue and Gulf Avenue would experience significant traffic impacts during the AM and PM peak hours. Mitigation measures needed for the Double Tunnel System would also be needed to mitigate impacts.

65th Street Construction Staging Yard. 65th Street Yard would have more vehicle trips arriving and departing since construction would be more intense in Brooklyn. As shown in Table 16-12, about 125 employee vehicle trips would be generated to and from the site in the AM peak hour, and almost 170 employee vehicle trips would be generated in the PM peak hour for the Double Tunnel System. The Single Tunnel System would generate about half the number of vehicle trips. Only 5 inbound and 5 outbound truck trips would be generated by staging area activities

because nearly all material deliveries and spoil removals would be transported by rail out of the region.

Table 16-12
Year 2008 Trip Generation for 65th Street Construction Staging Yard
Double Tunnel System – Staten Island Alignment

Vehicle Movement	AM Peak Hour (Day Shift Change)	PM Peak Hour (Afternoon Shift Change)
Autos In	84	84
Autos Out	42	84
Trucks In	5	5
Trucks Out	5	5

For the 65th Street Yard, employees can come from many areas and along many streets that lead to the Brooklyn waterfront. Additionally, vehicles could be expected to use the Gowanus Expressway for travel to and from more distant points. Overall, employee vehicle trips were assigned based on existing known traffic flows at the periphery of the study area since, again, many streets could be used. For arrivals, about 20 percent of employee vehicles was assigned to the 39th Street exit ramp that leads from the southbound Gowanus Expressway directly to 1st Avenue, another 20 percent was assigned to the Shore Parkway exit onto 2nd Avenue, 10-15 percent was assigned to 3rd Avenue from the south, and 10 percent via northbound Gowanus Expressway off-ramp to 7th Avenue. The remaining employee assignments were allocated to local westbound side streets. For departures, similar assignment percentages to highways and local streets were used, although for use of the northbound Gowanus Expressway, vehicles were assigned to 2nd and 3rd Avenues since no northbound on-ramps exist in the area. Trucks arriving and departing the staging yard were assigned to the Gowanus Expressway to either the 39th or 60th Street ramps to limit their use to designated truck routes.

In the 65th Street area, most streets in this study area would carry up to an additional 10 to 20 vehicles in each peak hour—an increase of less than 3 percent compared to the future baseline traffic levels in the area. The assignment paths are shown in figures for the discussion of 65th Street Yard in Chapter 8, "Transportation." Of the 7 intersections studied for the Double Tunnel System, 2 locations would experience a significant traffic impact. At the 3rd Avenue/60th Street intersection, during the AM and PM peak hours, a shift of 1 second of green time from the east/west approaches to the north/south left-turn movement could mitigate the impact. At the 7th Avenue/65th Street intersection, during the PM peak hour, a shift of 1 second of green time from the east/west to the north/south approaches could mitigate the impact (see Table 16-13). For the remaining 5 intersections, no significant impacts are expected during either the AM or PM peak hours.

The Single Tunnel System would generate approximately half the number of vehicle trips with about 63 and 84 employee vehicle trips in the AM and PM peak hours, respectively. About 3 inbound and 3 outbound truck trips would be generated in the AM peak hour and 2 inbound and 2 outbound truck trips would be generated in the PM peak hour.

Table 16-13
Year 2008 Traffic Impacts for 65th Street Staging Yard
Double Tunnel System - Staten Island Alignment

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact (Time Period)	Mitigation Required
	No Build	Build	No Build	Build		
2nd Ave. at 39th St.	D	D	D	D	—	—
2nd Ave. at 65th St.	B	B	B	B	—	—
3rd Ave. at 39th St.	C	C	A	A	—	—
3rd Ave. at 60th St.	D	D	C	C	YES (AM / PM)	Standard mitigation
3rd Ave. at 65th St.	B	B	B	C	—	—
4th Ave. at 38th St.	B	B	B	B	—	—
7th Ave. at 65th St.	B	B	D	D	YES (PM)	Standard mitigation

Under the Single Tunnel System, significant traffic impacts would be generated at the same 2 locations as expected for the Double Tunnel System. At one location impacted during both the AM and PM peak hours under the Double Tunnel System (Third Avenue and 60th Street), impacts under the Single Tunnel System would occur only during the PM peak hour. Mitigation measures implemented under the Double Tunnel System would be the same for the Single Tunnel System.

New Jersey Tunnel Alignment

Existing Conditions.

Greenville Construction Staging Yard. The traffic study area for the Greenville construction staging yard consists of five intersections along roadways serving Bayonne's eastern waterfront, including locations along Route 440 (formerly Route 169), and at the New Jersey Turnpike's 14A Interchange. The yard itself is to be located adjacent to the Port Jersey pier and the existing Global Container Terminal. Analysis locations included Route 440 and Pulaski Street, Avenue E / Port Jersey Boulevard Bridge / New Jersey Turnpike Interchange 14A and 53rd Street, Garfield Avenue at Linden and Chapel Avenues, and Princeton Avenue and Linden Avenue. These are locations at which impacts from the construction vehicles could potentially be significant.

The staging yard lies east of the NJ Turnpike Extension and Route 440, a divided facility that extends from the Bayonne Bridge in the south and past Constable Point before merging into other arterials north of the Turnpike. North of the Turnpike, Route 440 is renamed as Route 185. For most of its length near the staging yard, Route 440 carries 2 travel lanes in each of the north and southbound directions, with exclusive left- or right-turn lanes at selected intersections. Major intersections along it are signal-controlled, while curbside parking is not allowed. Descriptions of other major streets serving the area follow.

Avenue E operates as a major north/south street extending nearly the entire length of Bayonne from the Turnpike interchange south toward the city's Bergen Point area. Avenue E typically provides 1 moving travel lane along its length, with a second curb lane for parking. At many intersections, curb parking is prohibited at the corner areas to allow passing when a left turn vehicle stops and waits for a gap in the opposing traffic flow. 53rd Street is an east-west street that functions as another entry point into the New Jersey Turnpike Interchange 14A, Avenue E,

and Port Jersey Boulevard into Global Terminal. It carries 1 moving lane in each direction, although at the Interchange, the approach widens to allow right and left turns to be made from separate lanes. Pulaski Street, on the Port Jersey pier, is a short, east-west street that connects Route 440 and interior pier destinations. The street processes traffic on 1 wide travel lane. Garfield and Princeton Avenues are local collector streets that run north/south and process traffic along 1 travel lane in each direction.

During the 6:30-7:30 AM peak hour, traffic volumes along Route 440 are higher in the northbound direction (about 970 vph northbound, 500 vph southbound) out of Bayonne toward Jersey City and the NJ Turnpike. At NJ Turnpike 14A Interchange, the directional peak is also heavily weighted toward the northbound direction, with approximately 2,000 vph traveling north on Avenue E and the Port Jersey Boulevard overpass and 1,250 vph exiting the Turnpike at 14A. Traffic along 53rd Street is also heavily oriented toward the Turnpike interchange, with about 650 vph turning left from eastbound 53rd Street to enter the Turnpike in the AM peak hour. Pulaski Street serves as the connection between the NJ Turnpike and southbound Route 440, so the dominant movement on Pulaski Street at the Route 440 intersection in both the AM and PM peak hours is the westbound left turn (270 vph and 360 vph, respectively).

In the mid afternoon 2:30-3:30 PM hour, vehicle flows on several major streets appear to be balanced in both the north and southbound directions. Traffic volumes along Route 440 average about 650 vph northbound and 500 vph southbound. Volumes along Avenue E are also high, with about 1,030 vph exiting the Turnpike and 880 vph traveling north from the interior residential area south of 53rd Street. The Turnpike's toll plaza processes about 1,200 vph southbound and another 1,260 vph northbound onto the facility. The AM and PM peak hour volumes are illustrated in Figures 16-5 and 16-6, respectively.

Truck volumes are consistently heavy throughout the study area, though truck volumes as a percentage of the overall vehicular traffic vary from one location to another. During the AM peak hour, trucks comprise approximately 10 to 20 percent of the traffic along Route 440. About 10 to 15 percent of the vehicles entering and exiting the NJ Turnpike during the morning peak are trucks. Truck activity along the Route 440 corridor is slightly higher in the mid-afternoon peak hour; trucks comprise about 15 to 25 percent of the vehicles on Route 440. At the 14A Interchange, trucks make up 20 to 25 percent of the vehicle mix during the mid-afternoon peak hour for traffic exiting and entering the Turnpike.

Overall, 4 of the 5 intersections analyzed currently operate at overall acceptable levels of service B to C during both analysis periods due primarily to the low to moderate volume of traffic at some intersections and adequate capacity at other locations analyzed. The one location experiencing some congestion is the Route 440/Pulaski Street intersection, which has several approaches operating at LOS D or E during both peak hours (see Table 16-14).

65th Street Construction Staging Yard. For the New Jersey tunnel alignment, the study area analyzed is identical to that examined for the Staten Island tunnel alignment; refer to the discussion of existing traffic conditions for the 65th Street area under the Construction Impacts section for the Staten Island tunnel alignment.

2008 Future Baseline

Greenville Construction Staging Yard. In New Jersey, a future background growth rate of 0.7 percent was used, which is an average of traffic trends indicated in the New York Metropolitan Transportation Council model and projected annual traffic increases for Hudson County.

Table 16-14
Existing Traffic Levels of Service: Greenville Yard

Intersection & Approach		AM Peak (6:30 – 7:30 AM) Mvt.	V/C	Control Delay	LOS	PM Peak (2:30 – 3:30 PM) Mvt.	V/C	Control Delay	LOS
Garfield Avenue & Chapel Avenue									
Garfield Avenue	NB	TR	0.31	5.6	A	LTR	0.30	5.6	A
	SB	LT	0.19	5.0	A	LTR	0.45	6.7	A
Chapel Avenue	WB	LR	0.11	26.0	C	LTR	0.34	28.0	C
Overall Intersection			0.26	6.7	A		0.42	8.9	A
Garfield Avenue & Linden Avenue									
Garfield Avenue	SB	LT	0.01	7.9	A	LT	0.02	7.9	A
Linden Avenue	EB	LTR	0.15	13.2	B	LTR	0.14	13.3	B
Overall Intersection				12.3	B			11.9	B
Princeton Avenue & Linden Avenue									
Princeton Avenue	SB	LT	0.02	7.6	A	L	0.02	7.7	A
Linden Avenue	EB	LTR	0.12	9.9	A	T	0.19	10.4	B
	WB	LR	0.14	10.7	B	T	0.09	10.2	B
Overall Intersection				10.0	A			10.1	B
Route 440 & Pulaski Street									
Route 440	NB	TR	0.51	27.2	C	TR	0.48	30.9	C
	SB	T	0.52	35.5	D	T	0.71	44.3	D
Pulaski Str	EB	L	0.25	45.7	D	L	0.57	55.6	E
		T	0.86	69.0	E	T	0.76	66.8	E
	WB	L	0.47	40.5	D	L	0.40	30.7	C
		LR	0.44	40.1	D	LR	0.46	31.7	C
Overall Intersection		-	0.57	36.4	D	-	0.51	38.7	D
NJ Tpk. Ex. 14A / Ave. E & E. 53rd St.									
Avenue E	NB	L	0.16	34.8	C	L	0.20	35.1	D
		T	0.53	10.7	B	T	0.22	8.3	A
NJ Turnpike Exit 14A to Avenue E	SB	T	0.24	16.8	B	T	0.57	20.2	C
NJ Turnpike Exit 14A to Route 440		T	0.54	19.7	B	T	0.37	17.9	B
E. 53rd Street	EB	L	0.67	28.9	C	L	0.49	26.2	C
		R	0.18	13.5	B	R	0.11	13.0	B
Overall Intersection		-	0.57	18.3	B	-	0.48	19.2	B

During the AM and PM peak hours, increases in vehicle flows would be heaviest along Route 440 and at Turnpike Interchange 14A, with increases of 40 to 50 vph in the peak travel directions. Volume increases along less trafficked streets such as Garfield and Princeton Avenues would be in the range of 10 to 20 vph during both peak construction hours. There would be no level of service deteriorations in the No Action condition, although vehicle delays would increase slightly corresponding to vehicle increases noted above.

65th Street Construction Staging Yard. Refer to the discussion of future baseline traffic conditions for the 65th Street area under the Construction Impacts section for the Staten Island tunnel alignment.

2008 Future Construction Build

Greenville Construction Staging Yard. At the Greenville staging yard, about 20 employee vehicle trips would be generated in the AM peak during the peak construction hours, and about 15 employee vehicle trips would be generated in the PM peak hour (see Table 16-15) under either the Single Tunnel System or the Double Tunnel System. At each staging area, truck trip generation would be low (4 inbound and 4 outbound truck trips) since nearly all material deliveries and spoil removals would be transported by rail out of the region.

Table 16-15
Year 2008 Trip Generation for Greenville Construction Staging Yard
Single & Double Tunnel Systems – NJ Alignment

Vehicle Movement	AM Peak Hour (Day Shift Change)	PM Peak Hour (Afternoon Shift Change)
Autos In	10	10
Autos Out	5	10
Trucks In	4	4
Trucks Out	4	4

These volumes of auto and truck trips generated at each staging yard were assigned to the local street network. For Greenville yard, regardless of vehicle type, there are few connections to highways and only a limited number of local arterials that connect to the yard's main entrance along Route 185. From points west and south, vehicles would likely use Route 440 and the Turnpike and then directly to Route 185. From the north, Garfield Avenue would be the most likely route selected to approach the staging area.

In the Greenville area, overall traffic volumes in the study area would increase by 5 to 10 additional vehicles during the peak construction period—an increase of less than 1 percent compared to the future baseline traffic levels (see Table 16-16). Figures 16-5 and 16-6 illustrate the expected traffic into and out of the study area. No significant impacts are expected at the other intersections analyzed during the AM or PM peak hours.

Table 16-16
Year 2008 Traffic Impacts for Greenville Staging Yard
Single & Double Tunnel Systems - New Jersey Alignment

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact (Time Period)	Mitigation Required
	No Build	Build	No Build	Build		
Garfield Avenue at Chapel Avenue	A	A	A	A	—	—
Garfield Avenue at Linden Avenue	B	B	B	B	—	—
Princeton Avenue at Linden Avenue	B	B	B	B	—	—
Route 440 at Pulaski Street	D	D	D	D	—	—
NJ Turnpike Exit 14A / Avenue E / 53rd Street	B	B	B	B	—	—

65th Street Construction Staging Yard. 65th Street Yard would have more vehicle trips arriving and departing since construction would be more intense in Brooklyn. Four TBMs would be operating under the Double Tunnel System and two under the Single Tunnel System. As shown in Table 16-17, about 230 employee vehicle trips would be generated either to or from the site in the AM peak hour, and almost 310 employee vehicle trips would be generated in the PM peak hour for the Double Tunnel System. Truck trip generation would be modest (10 inbound and 10 outbound truck trips) since nearly all material deliveries and spoil removals would be transported by rail out of the region.

Table 16-17
Year 2008 New Jersey Double Tunnel System: Trip Generation for 65th Street Construction Staging Yard

Vehicle Movement	AM Peak Hour (Day Shift Change)	PM Peak Hour (Afternoon Shift Change)
Autos In	154	154
Autos Out	77	154
Trucks In	10	10
Trucks Out	10	10

For the 65th Street Yard, employees can come from many areas and along many streets that lead to the Brooklyn waterfront and along the Gowanus Expressway. As discussed above, employee

vehicle trips were assigned based on existing known traffic flows at the periphery of the study area since, again, many streets could be used. For arrivals, about 20 percent of employee vehicles was assigned to the 39th Street exit ramp; 20 percent was assigned to the Shore Parkway exit onto 2nd Avenue, 10-15 percent assigned to 3rd Avenue from the south; 10 percent via northbound Gowanus Expressway off-ramp to 7th Avenue; 35 percent allocated local westbound side streets. For departures, similar assignment percentages to highways and local streets were used. Trucks arriving to and departing from the staging yard were assigned to the Gowanus Expressway to either the 39th or 60th Street ramps to limit their use to designated truck routes.

In the 65th Street area, under the Double Tunnel System, most streets in this study area would carry up to an additional 20 to 30 vehicles in each peak hour—an increase of 5 to 6 percent compared to the future baseline traffic levels in the area. The increases under the Single Tunnel System would be about half. The assignment paths are shown in figures for the discussion of 65th Street Yard in Chapter 8, "Transportation." Of the seven intersections studied under the Double Tunnel System, four locations would be significantly impacted, although all impacts could be mitigated using signal timing modifications. At the southbound off-ramp from the Gowanus Expressway to 39th Street, the impacts on the westbound left-turn movement in the AM and PM peak hours could be mitigated with a shift of 1 second of green time from the east/west approaches to the exclusive off-ramp phase. At the 3rd Avenue/60th Street intersection, during the AM and PM peak hours, a shift of 2 to 3 seconds of green time from the east/west approaches to the north/south left-turn movement could mitigate the impact. At the 65th Street intersections at 3rd and 7th Avenues during the PM peak hours, a shift of 1 second of green time from the north/south to the east/west approaches could mitigate the impact (see Table 16-18). For the other 3 intersections analyzed, no significant impacts are expected during the AM or PM peak study hours, and no further traffic analyses are required.

Table 16-18
Year 2008 Traffic Impacts for 65th Street Staging Yard
New Jersey Tunnel Alignment

Signalized Intersection	AM Peak Hour		PM Peak Hour		Significant Impact (Time Period)	Mitigation Required
	No Build	Build	No Build	Build		
2nd Ave. at 39th St.	D	D	D	D	YES (AM / PM)	Standard mitigation
2nd Ave. at 65th St.	B	B	B	B	—	—
3rd Ave. at 39th St.	C	C	A	A	—	—
3rd Ave. at 60th St.	D	D	C	C	YES (AM / PM)	Standard mitigation
3rd Ave. at 65th St.	B	B	B	C	YES (PM)	Standard mitigation
4th Ave. at 38th St.	B	B	B	B	—	—
7th Ave. at 65th St.	B	B	D	D	YES (PM)	Standard mitigation

The Single Tunnel System would generate approximately 60 percent of the vehicle trips out of this location with about 115 employee vehicle trips generated in the AM peak hour and about 150 employee vehicle trips generated in the PM peak hour. Only 5 inbound and 5 outbound

truck trips would be generated in the AM and PM peak hours. Three of the seven intersections studied would be significantly impacted. The impacts can be expected to occur at the intersections of 2nd Avenue and 65th Street (PM). Similar to the Double Tunnel System, all impacts could be mitigated using signal timing modifications.

AIR QUALITY

Possible effects on local air quality during construction of the Tunnel Alternative may result from fugitive dust (particulate matter) emissions from construction of the surface track work, cut and cover sections, and, to a lesser extent, tunnel excavation. Air quality may also be affected by mobile source emissions—including PM_{10}, $PM_{2.5}$, VOCs, NO_x, and CO emissions—from construction workers' private vehicles, disruptions in traffic due to construction, additional truck traffic, and construction equipment at the locations undergoing construction.

Fugitive Emissions

Fugitive dust emissions from construction operations can occur from excavation, hauling, dumping, spreading, grading, compaction, wind erosion, and traffic over unpaved areas. Actual quantities of emissions depend on the extent and nature of the clearing operations, type of equipment employed, the weight of construction vehicles, physical characteristics of the underlying soil, ambient wind speed and on the type of fugitive dust control methods employed. Much of the fugitive dust generated by construction activities consists of relatively large particles, which are expected to settle within a short distance from the construction site. For this project, excavation and construction would be conducted with care and all appropriate fugitive dust control measures—including watering of exposed areas and dust covers for trucks—would be employed to minimize effects to nearby people or buildings.

Since much of the tunnel excavation work would not involve surface disturbance, many of the fugitive dust sources typically associated with construction work would be avoided. Excavated material would be transported through the tunnels to the staging areas previously discussed. The most likely transport method would be a conveyor system. While it is expected that large quantities of dust would be generated by the tunnel excavation, it would be controlled at the source through the use of foams or other wetting agents. The work area within the tunnel would also be equipped with a mechanical ventilation system. This ventilation system, consisting of flexible ductwork and fans, would be equipped with air pollution control and noise attenuation equipment at its exhaust point. To assess potential impacts on ambient air quality from activities at the shaft sites, a $PM_{2.5}$ and PM_{10} analysis was conducted. The impacts discussed below are local in nature. The emission of PM from construction sites is not expected to have any significant impact on a regional scale.

The first part of the analysis consisted of emissions modeling for the various potential construction sites, and assessing the potential emissions from each during various construction stages. The study sites were all sites that would experience long term construction phases. Emissions modeling was performed for the following sites:

> *1. 65th St. Yard*. For the Staten Island tunnel alignment this site is expected to be used as a staging area only. For the New Jersey alignment, two construction phases were investigated: The excavation of the ventilation shafts at this site, and the tunneling phase, during which 65th St. Yard will be used as the portal to the tunneling work, including materials input and muck extraction.

2. Brooklyn Portal Site. This location will be an active construction site for an extended period of time under both tunnel alignments. For the New Jersey tunnel, alignment this site is expected to undergo extensive open-cut and cut and cover operations. For the Staten Island tunnel alignment, in addition to the open-cut and cut and cover operations the site would also be an active portal accessing the tunneling work, similar to activity at 65th Street Yard for the New Jersey tunnel alignment. All three phases were assessed.

3. Staten Island Portal Site. This site would have both extensive open-cut and cut and cover operations, as well as acting as an active portal accessing the tunneling work for the rock portion of the Staten Island tunnel alignment between the portal and the ventilation shaft off Pier 2. Both phases were assessed.

Emissions were modeled based on detailed construction activity, using the USEPA's NONROAD model and AP-42* procedures. The NONROAD model is a computerized model that calculates the projected emissions from engines, such as construction equipment, for a given target year and location based on the expected technological changes and emission regulations. AP-42 is a compilation of methods for computing emissions from many different types of sources, such as fugitive dust from various construction activities. A full description of the emissions modeling and assumptions is included in Appendix 3.

For each of the three sites one scenario was chosen as a worst-case and used for dispersion modeling. In all three cases the phase chosen for modeling was the tunneling period, during which relatively high levels of activity, longer working hours and more extensive construction durations would be expected. Dispersion modeling was performed using the USEPA's ISCST3 model and monitored background values as described in Chapter 9, "Air Quality." The emission factors used were based on worst-case assumptions, with no additional emissions reduction controls.

Assuming that no dust control and no engine emissions controls are implemented, the concentrations in residences near the Brooklyn and Staten Island portal sites would be high, as presented in Table 16-19. The contributions in the vicinity of the 65th St. Yard are significantly lower, due to the large distance from the nearby residences. Although background concentrations of $PM_{2.5}$ are yet to be determined (see discussion in Chapter 9, "Air Quality"), preliminary data from NYSDEC indicate that the area may not be in compliance with the $PM_{2.5}$ standard. A significant increase in $PM_{2.5}$ concentration at nearby residential uses would exacerbate that condition on a local scale. As to PM_{10}, including background concentrations, exceedances are not expected. Nonetheless, the increase in concentrations at nearby residences would be significant as compared to the concentrations without the project. Therefore, mitigation measures to lower the maximum predicted concentration is necessary.

* Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Fifth Edition—January 1995, updates 2000.

Table 16-19
Worst Case Contribution to PM Concentrations from Construction Sites (micrograms per cubic meter)

Location	$PM_{2.5}$		PM_{10}	
	24 hour	Annual	24 hour	Annual
65th St. Yard (NJ alignment)	5.1	0.87	5.6	0.75
Staten Island Shaft (SI alignment)	50.5	13.2	62.5	16.1
Brooklyn Shaft (SI alignment)	51.2	11.9	79.5	20.8

Note: Annual PM_{10} is calculated using the standard method for PM_{10} in ISC, which uses an average over the modeled years, and may be lower than the annual $PM_{2.5}$, which was based on the highest year due to the lack of guidance for $PM_{2.5}$.

As indicated by the above analysis, and by a closer examination of the relative emissions from fugitive dust sources and engine sources, both dust control and engine emission reduction means would be needed for the construction sites.

A second analysis was performed for the same sites using a mitigated activities scenario. This included the following measures:

- Dust suppression of road dust by 80 percent. This can be achieved by implementing a watering program at every site for the dirt roads or by paving and cleaning the access within the sites.
- PM exhaust emission reduction for all construction equipment (excluding on-road trucks and barges) by 85 percent. This can be achieved by using ultra-low sulfur fuel (0.003 sulfur content by weight) and using only equipment that includes Post Diesel Particulate Filters (DPF)[*], either new or retrofit.

The predicted contributions from project construction sites under the mitigated scenario, as presented in Table 16-20, would be significantly lower. $PM_{2.5}$ contributions would be reduced to 28 percent of the predicted non-mitigated contributions. PM_{10} contributions are similarly reduced, resulting in maximum absolute concentrations ranging from 33 to 59 percent of the NAAQS.

All of the concentrations mentioned are maximal values, at receptors immediately adjacent to the construction sites. The concentrations diminish rapidly in correlation with the distance from the site, such that within a few hundred feet predicted project contributions are negligible.

The following measures, aimed at minimizing construction related particulate emissions, are recommended:

[*] Diesel emissions resulting from Ground Zero activity, memorandum, NESCAUM, April 8 2002.

Table 16-20
Worst Case Mitigated Contribution to PM Concentrations From Construction Sites (Micrograms Per Cubic Meter)

Location	$PM_{2.5}$		PM_{10}	
	24 hour	Annual	24 hour	Annual
65th St. Yard (NJ alignment)	2.1	0.26	2.3	0.23
Staten Island Shaft (SI alignment)	17.2	4.84	17.7	4.60
Brooklyn Shaft (SI alignment)	14.9	3.40	23.7	5.62
Note: Annual PM_{10} is calculated using the standard method for PM_{10} in ISC, which uses an average over the modeled years, and may be lower than the annual $PM_{2.5}$, which was based on the highest year due to the lack of guidance for $PM_{2.5}$.				

- Dust suppression programs will be established for dirt roads and access ways serving construction traffic. These roads will be either watered on a regular basis throughout the duration of construction, or paved. Paving can be performed using temporary materials if such a design can last throughout the duration of the construction.
- Ultra-low sulfur fuel will be used for all construction equipment, enabling the use of emission controls.
- All construction equipment will include Post Diesel Particulate Filters, either new or retrofit.

The predicted $PM_{2.5}$ concentrations at both shaft sites were still significant, and would need further mitigation. The sources of these concentrations are mainly diesel exhaust, such as generators, cranes and ventilation of muck train exhaust from the tunnel. The high concentrations were predicted assuming worst-case operation and placement of these sources in respect to the nearest residential locations. These sources are mostly point sources, and can be controlled using a combination of measures, such as:

  - Using grid power to replace, or partially replace the use of generators.
  - Using alternative, cleaner fuel or grid power for muck trains and cranes.
  - Placement of all point sources as far as possible from sensitive locations.
  - Using higher stacks for tunnel ventilation and generators.

Additionally, further analysis including more detailed information on these sources, could result in the use of less conservative assumptions and lower results.

Mobile Source Emissions

As discussed previously, the creation of tunnels would result in a large volume of excavated material that would be transported to an off-site location. The project would use rail and/or barge transport to the maximum extent possible to move construction supplies, materials, and excavate, thereby limiting the number of trucks required and the air quality effects typically

associated with trucking activity compared to other projects of this size. As discussed above under "Traffic," the greatest number of vehicle trips on a daily basis would be related to construction workers' private vehicles. In addition, trucks would be used to transport material that would not be feasible to bring to the site by rail.

According to federal regulations on transportation conformity, CO and PM_{10} microscale (or hot-spot) analyses are not required to consider construction-related activities that cause temporary increases in emissions. Temporary increases are defined as those that occur only during the construction phase and last 5 years or less at any individual site. However, for this project, a detailed mobile source CO intersection analysis was conducted at locations where significant truck and construction worker traffic is expected as part of the construction of the Tunnel Alternative. The sites selected for study are shown in Table 16-21 and were selected because they are the locations that would experience the greatest increase in vehicular traffic during construction of the project. In addition, similar to the operational air quality analysis presented previously in Chapter 9, this magnitude of a pollutant increase would not result in measurable changes to ambient particulate levels.

Table 16-21
Future 2008 Maximum Projected 8-Hour Average CO Concentrations During Construction of Double Tunnel System(PPM)

Area	Site	No Action	With Construction	With Construction and Mitigation
Arlington Yard	Forest Avenue/South Avenue	4.1	4.1	4.1
65th Street Yard	2nd Avenue at 39th Street	5.2	5.3	5.4
Greenville Yard	Toll Plaza at 53rd Street	5.1	5.1	5.1

As shown in the table, all of the maximum predicted 8-hour average CO concentrations would be below the standard of 9 ppm with construction of the Double Tunnel System. Concentrations under the Single Tunnel System would be similar and would also not result in any significant impacts.

NOISE

Noise from construction activities was estimated following the detailed noise assessment methodology set forth in the April 1995 FTA guidance manual. This analysis procedure uses an equation that accounts for the noise emissions of the equipment, the amount of time the equipment is in use, and the distance between the equipment and the receptor to calculate noise levels due to operation of a single piece of construction equipment. The combination of noise from several pieces of equipment operating during the same time period is obtained from addition of the L_{eq} values for each piece of equipment.

In New York City according to NYSDOT criteria for construction, a noise impact would typically occur when the $L_{eq(1)}$ noise level exceeds 85 dBA. For purposes of this project, an $L_{eq(1)}$ noise level exceed 85 dBA will denote a significant noise impact due to construction activities.

Typical noise levels of construction equipment expected to be employed during the construction process are presented in Table 16-22. Noise from construction equipment is regulated by EPA noise emission standards. These federal requirements mandate that: 1) certain classifications of

Table 16-22
Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 feet from source
Air compressor	81
Backhoe	80
Bulldozer	85
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

Source: *Transit Noise and Vibration Impact Assessment*, FTA, April 1995.

construction equipment and motor vehicles meet specified noise emissions standards; and 2) construction material be handled and transported in such a manner as not to create unnecessary noise. These regulations would be carefully followed. In addition, appropriate low-noise emission level equipment would be used and operational procedures implemented.

In general, except for locations nearby and immediately adjacent to construction sites, increases in noise levels caused by delivery trucks and workers traveling to and from the construction sites would not be expected to be significant. Small increases in noise levels are expected to be found near a few defined delivery truck routes. Except for the areas immediately adjacent to the sites, all truck trips would be restricted to truck routes.

In general, with the exception of the activities discussed below, construction activities related to laying new track or improving track along existing railroad right-of-way would produce short-

term noise increases. At some locations, these increases may be intrusive and annoying. Measures to mitigate these short-term impacts will be examined between the DEIS and FEIS, and are discussed below in the mitigation section.

A general discussion of the noise associated with the major construction elements for the new tunnels, cut and cover construction, and work at the various yards is presented below.

Tunneling Activities. Airborne noise from mining activity is not anticipated to be discernible, as most noise would be contained underground. Ground-borne noise from tunneling operations is discussed below under "Vibration."

Cut and Cover Construction. The noise from excavation associated with the cut and cover construction would include noise from construction equipment such as backhoes, bulldozers, cranes, concrete mixers, concrete delivery trucks, delivery trucks, dump trucks, front-end loaders, pile drivers, and jackhammers.

ITT Construction. Construction equipment that would be used for ITT construction includes two cranes, construction safety gear, pumps, a generator, diving equipment, and a compressor.

Cofferdams. At the site of construction of the cofferdams, pile drivers, two cranes, pumps, a vibratory hammer, a compressor, and an excavator would be used.

Shaft Sites. At each shaft site (i.e., 65th Street Yard, Greenville Yard, Staten Island or Brooklyn cut and cover), equipment would include a conveyor, front loaders, drilling, trucks, generators, a compressor, pump, crane, barges, backhoes, and a tug boat.

Specifically, construction activities would have their greatest potential for significant impacts at the following sites which may be representative of other similar locations in the respective study areas.

For the Staten Island tunnel alignment, in Staten Island, construction activities would produce noise levels at the nearest residential receptor sites to the shaft site at the cut and cover section on Bement Avenue, that would have $L_{eq(1)}$ noise levels of approximately 78-80 dBA. These levels would occur under the either the Single or Double Tunnel Systems. Therefore, at these locations construction activities would produce noise levels that are substantially above existing noise levels, that may be intrusive and annoying, but are below the 85 dBA $L_{eq(1)}$ impact criteria.

For the New Jersey tunnel alignment, in Brooklyn, construction activities would produce noise levels at the nearest residential receptor site to the shaft site on Colonial Road, that would have $L_{eq(1)}$ noise levels of approximately 68 dBA. Therefore, at this location, construction activities would produce noise levels that are comparable to existing noise levels, and are well below the 85 dBA $L_{eq(1)}$ impact criteria. In addition, construction activities would produce $L_{eq(1)}$ noise levels of approximately 66-74 dBA in Owl's Head Park. Therefore, at this location, construction activities would produce noise levels that are comparable to existing noise levels, and, are well below the 85 dBA $L_{eq(1)}$ impact criteria.

For either tunnel alignment along the Bay Ridge Branch, in Brooklyn, construction activities would produce noise levels at the nearest residential receptor sites to the shaft site at the cut and cover section between 9th and 10th Avenues on 61st Street, that would have $L_{eq(1)}$ noise levels of approximately 83 dBA. Therefore, at this location, construction activities would produce noise levels that are substantially above existing noise levels, may be intrusive and annoying, but are below the 85 dBA $L_{eq(1)}$ impact criteria. However, construction activities would produce noise levels at the nearest residential receptor sites to the shaft site at the cut and cover section

between 9th and 10th Avenues on 62nd Street, that would have $L_{eq(1)}$ noise levels of approximately 89 dBA. Therefore, at this location, construction activities would produce noise levels that are substantially above existing noise levels, may be intrusive and annoying, and, more importantly, are above the 85 dBA $L_{eq(1)}$ impact criteria. These noise levels would occur under either the Single or Double Tunnel Systems.

For the West Maspeth Yard under the Double Tunnel System, construction activities would produce noise levels at the nearest residential receptor sites on 56th Street, except for the period when pile driving is occurring, that would cause $L_{eq(1)}$ noise levels of approximately 81 dBA. These noise levels would be above existing noise levels, may be intrusive and annoying, but are below the 85 dBA $L_{eq(1)}$ impact criteria. Noise levels at the nearest residential receptor sites on Rust Road, construction activities would produce, except for the period when pile driving is occurring, $L_{eq(1)}$ noise levels of approximately 89 dBA. These noise levels would be above existing noise levels, would be intrusive and annoying, and would be above the 85 dBA $L_{eq(1)}$ impact criteria. Measures to mitigate these significant impacts are discussed below in the mitigation section. During the period when pile driving is occurring, depending upon the type of pile drivers operating, placement of the drivers, and the number of drivers operating simultaneously, pile driving would produce $L_{eq(1)}$ noise levels of approximately 91-99 dBA. Pile driving operations would produce noise levels that are substantially above existing noise levels, that would be intrusive and annoying, and, more importantly, are above the 85 dBA $L_{eq(1)}$ impact criteria. Measures to mitigate these significant impacts are discussed below in the mitigation section.

Noise Mitigation. As described above, construction activities would result in significant impacts at some locations, and may result in perceptible increases in noise levels at other locations along the potential alignment. In general, these impacts would occur at locations where spoils removal would occur during tunnel boring, at locations where TBMs or EPBMs are operating and not shielded, where cut and cover operations would occur, and at locations adjacent to where pile driving would occur. In general, these impacts would occur even though the distance between receptors and construction equipment and construction operations has been maximized. As a result, no significant amount of sound attenuation is achieved by distance.

Although the project alignments have been carefully chosen to utilize existing railroad right-of-ways and avoid residences wherever possible, its location within a dense metropolitan area means that residents or sensitive land uses are almost always present in the nearby area. This proximity to sensitive uses limits opportunities for developing feasible, cost-effective mitigation. Nevertheless, despite these constraints, the project sponsors are committed to developing mitigation measures that would reduce and, where possible, eliminate significant impacts due to construction. Consequently, three categories of noise control have and are being examined: design consideration and project layout, sequence of operations, and alternative construction methods. Each of these categories of noise control have been and are being considered for this project.

Design considerations and project layout approaches include such measures as constructing noise barriers, rerouting traffic, placing construction equipment farther from noise-sensitive receptors, constructing walled enclosures around especially noisy activities, etc. In this category of noise control approaches, there are two measures that have the potential to substantially reduce project impacts: the use of noise barriers and/or walled enclosures around certain construction activities, and the placement of construction equipment in shielded locations. Both of these measures are being considered for use by the project as Preliminary Engineering

continues. Perhaps the greatest opportunity for substantially reducing noise impacts due to construction is the construction of noise barriers or walled enclosures around noisy operations. Noise barriers or walled enclosures would be examined at sites where spoils from tunnel boring operations would occur, and at locations where pile driving would occur. Noise barriers can achieve up to 15 dBA of attenuation and walled enclosures with roofs can achieve up to 25 dBA of attenuation. However, these types of measures would be expensive to construct, may restrict construction operations, and may also result in some visual impacts. However, they are generally a very effective means of reducing noise impacts.

A second category of mitigation, related to sequence of operations, includes such measures as changing construction sequencing to reduce noise impacts by either combining noisy operations to occur in the same time period or spreading them out, avoiding nighttime activities, etc. Project sponsors will explore which construction operations can be limited to daytime operations only, without adversely affecting schedule and costs.

Finally, a third mitigation category, alternative construction methods, includes such measures as avoiding impact pile driving in noise-sensitive areas, using specially quieted equipment, selecting and specifying quieter demolition methods, etc. One example of this type of measure to be explored and evaluated is alternatives to pile driving. Project sponsors will explore whether impact or sonic pile driving can be eliminated and whether bored or drilled piles can be used instead. This would eliminate a particularly annoying and disturbing operation. Similarly, project sponsors will examine the use of infrared lighting and/or flagmen, instead of backup horns for trucks. Backup horns, which are designed to attract attention, tend to produce noise that is generally annoying and disturbing, particularly late at night, to nearby residents.

Overall, the project sponsors are committed to implementing measures to reduce significant noise impacts due to construction. The project's goal is to achieve noise levels during construction that would either be below 85 dBA $L_{eq(1)}$ construction impact criteria or within 6 dBA of existing ambient $L_{eq(1)}$ noise levels, except for some limited essential operations or for activities that would only occur for limited periods of time (i.e., less than 6 months). Therefore, while construction operations, even with the proposed mitigation measures, may at some locations, during some periods of time result in perceptibly increased noise levels, they would not produce intrusive and annoying noise levels if the mitigation being evaluated by the project sponsors can be implemented.

Vibration

Controlled blasting, pile driving, pavement-breaking, TBM, and muck train operations to remove spoil would create the most noticeable change in vibration levels. The FHWA and FTA have set vibration-induced architectural damage thresholds at a Peak Particle Velocity (PPV) of 0.20 inches per second (100 VdB) for fragile buildings and 0.12 inches per second (95 VdB) for extremely fragile buildings. "Architectural" damage refers to minor cosmetic cracking. Structural damage can occur at much higher vibration levels. Construction projects typically employ a nominal structural damage criterion of 2 inches per second (126 VdB). Human annoyance vibration criteria are much lower (perception is at approximately 65 VdB; the FTA annoyance-based impact criterion is 72 VdB for frequent events) than structural or architectural damage criteria.

The potential for vibration impacts as a result of construction of the Tunnel Alternative is described below, and generalized vibration mitigation measures to avoid potential construction-related vibration impacts are identified. A more detailed vibration analysis will be included as

part of the final design work, once design details are known. The detailed vibration analysis will account for specific geological conditions, foundation assessment of all structures near vibration-causing construction activities, and the appropriateness of the criteria stated above to each affected building. Finally, the detailed analysis will include specific vibration mitigation measures.

Tunnel Boring Machine(s). Soil conditions have a strong influence on the levels of ground-borne vibration. Although shallow bedrock tends to transmit vibrations more efficiently, vibration sources in rock tend to result in low amplitudes of vibration levels. The dense bedrock or deep bedrock through which the TBMs would tunnel should attenuate vibration levels at the cutting head of the TBMs. Vibration levels at the foundations of buildings may be perceptible, but should be below the conservative damage threshold of 0.12 inches per second. Ground-borne noise levels resulting from constant operation of the TBMs produce a perceptible rumbling sound in some nearby buildings for several weeks, as the TBM approaches, passes under, and moves beyond the building.

Trains to Remove Spoil. As described earlier, trains or conveyors would most likely be used to remove spoil or debris from tunneling activities. Data from the Los Angeles County Transportation Commission indicates that these trains can cause perceptible ground-borne vibration in residences within 200 feet, which may be considered intrusive. This vibration is caused by the train wheel/rail interaction and direct contact between the rail and tunnel floor. Vibration from spoil trains would be below the 0.12 inch/second criteria for extremely fragile buildings by instituting a program that would include wheel truing and rail grinding to eliminate and/or minimize discontinuities of the track and train wheels.

Drill and Controlled Blasting. While not anticipated at this time, some project components may require blasting. To avoid vibration-induced damage from any potential blasting operations, monitoring programs and a variety of control measures would be instituted (see vibration mitigation below). Vibration control measures would ensure that vibration levels at the foundations of nearby buildings remain below the architectural (0.20 in./sec for fragile buildings and 0.12 inches/second for extremely fragile historic buildings) and structural damage (nominally 2 inches/second) during blasting operations. Due to their short duration (a few seconds), using cautious blasting techniques, vibrations will be distinctly perceptible at a distance of 200 feet and barely perceptible at 300 feet.

Cut and Cover Construction. At locations where cut and cover construction is required, pavement breaking, earthmoving (digging) operations and pile driving would produce high vibration levels. In areas where buildings are within 80 feet of construction areas such as in some locations for overhead bridge reconstruction, deep saw cuts would be made between areas of pavement breaking and the sidewalk areas in front of buildings. These saw cuts would minimize the transmission of vibrations from pavement-breaking operations to the foundations of nearby structures. With this mitigation, ground-borne vibration levels should be below the criteria at the foundations of nearby buildings. Vibrations from pavement-breaking operations may be annoying at distances of 300 feet from pavement-breaking operations.

Shaft Site Equipment. As discussed previously, equipment at the shaft site would include a conveyor, front loaders, trucks, air compressors, backhoes, cranes, a slurry plant, drill rig, barge and tug boat.

Vibration Mitigation Measures. A number of controls would be implemented with respect to mitigation of vibration during construction. A preconstruction survey of any structure likely to

be affected by the construction activities would be performed and threshold or limiting values would be established, which take into account each structure's ability to withstand the loads and displacements due to construction vibrations. Detailed construction specifications that impose reasonable acceptance criteria would be included in construction contracts.

A project-wide vibration monitoring program would be developed and implemented to minimize vibration levels from any potential blasting, tunnel boring machine (TBM) operations, and general construction activities at nearby sensitive receptors. A complaint response procedure would be utilized to promptly address community concerns and implement additional control methods where necessary.

Additionally, site-specific vibration control plans would be developed by the contractor and best management practices to limit vibration would be employed. These plans and practices would include the following.

Pavement Breaking. To avoid architectural damage (e.g., cracked plaster) to extremely fragile buildings within 80 feet of the construction work, deep saw cuts would be made between areas of pavement breaking and the sidewalk areas in front of buildings. With this technique, ground-borne vibration levels should be below the criteria at the foundations of most buildings and no damage is anticipated. Additionally, where practical, concrete cutters would be used on pavement surfaces instead of pavement breakers.

Pile Driving. Pile driving would occur in only a few locations. There are no mitigation techniques that fully reduce vibration from pile driving operations. However, in areas where geological conditions permit their use, vibratory pile drivers would be used to reduce the vibrations associated with the installation of retaining walls and other structural elements. Unlike noise, the total vibration level produced can be considerably reduced when each vibration source operates separately. In addition, at locations within 150 feet of fragile historic resources, additional measures would be employed to keep vibration levels below appropriate damage criteria (see the discussion below).

Drill and Controlled Blasting. The vibration effects from controlled blasting would be intermittent, with blast vibrations occurring for a few seconds at a time. Efforts would be made to minimize potential vibration impacts from blasting operations in all anticipated areas of blasting activity, as described above. A specification would be inserted into construction contracts with regard to blasting operations requiring the contractor to implement a monitoring program and to protect nearby structures from damage, particularly if situated within 150 feet of drilling activity.

Vibration levels would be monitored in the foundations of nearby buildings during all blasting activities. Blasting activities resulting in peak particle vibration levels in excess of appropriate damage criteria as measured in the foundations of nearby structures would be immediately stopped until further precautionary measures are taken to reduce blasting-related vibration impacts. Work would not begin again until the steps proposed to stabilize and/or prevent further damage to the designated buildings were approved. In addition, the project would carry insurance to cover the expense of restoration caused by any damage that might occur despite this precaution.

Special Provisions For Historic Structures. In addition to the mitigation measures described above, special measures set forth by NYSHPO, the New York City Landmarks Preservation Commission (LPC), and NJSHPO would be followed to protect historic resources from increased vibration levels associated with construction activities. At any construction locations

where historic resources, and particularly older fragile building, are within an area of potential effect (see Chapter 6, "Historic Resources," for more details), construction contractors would be required to implement special vibration protection measures. These measures, to be included as part of the construction protection program for historic resources (discussed above under "Historic Resources") would likely include the following:

- Inspect and report on the current foundation and structural condition of any historic resources.
- Set up a vibration monitoring program to measure vertical and lateral movement and vibration to the historic structures within 150 feet of construction activities. Details as to the frequency and duration of the vibration monitoring program would be determined as part of the project's ongoing consultation process with the State Historic Preservation Office.
- Establish and monitor construction methods to limit vibrations to levels that would not cause structural damage to the historic structures, as determined by the condition survey;
- Issue "stop work" orders to the construction contractor, as required, to prevent damage to the structures, based on any vibration levels that exceed the design criteria in lateral or vertical direction. Work would not begin again until the steps proposed to stabilize and/or prevent further damage to the designated buildings were approved.

General Vibration Control Measures. Additional vibration control plans and practices would include routing truck traffic and heavy equipment to avoid impacts to sensitive receptors, properly securing street decking over cut and cover excavations, scheduling work to limit nighttime impacts in residential areas, and minimizing the duration of vibration impacts.

ENERGY

During construction, energy would be consumed by construction equipment related to building the tunnels, cut and cover sections, clearance work, and associated facilities. This includes the fuel energy consumed by vehicles transporting workers, equipment, and excavated materials during the construction process.

The project alternative requiring the largest energy consumption would be the Double Tunnel System. The power required for tunneling and supporting uses for the Double Tunnel System has been estimated assuming that a maximum combination of two TBMs or EPBMs would be in operation and powered at each shaft site: thus, the total power required to construct the tunnel and excavate spoils would be approximately 9.6 megawatts. This includes 3.7 megawatts for each TBM and approximately 2 megawatts for machinery needed for station construction. This estimate also includes all power that would be used during tunnel construction, including boring, spoils conveyance (both horizontal and vertical), supplying ventilation to the underground areas, pumping groundwater, and running elevator, lighting systems, and offices. This value is negligible compared to the estimated in-City load of approximately 11,000 megawatts. The relatively small amount of electricity needed for project construction is unlikely to affect the ability of Con Edison to meet its peak load demands, and it is being reviewed with Con Edison.

Other energy requirements would be supplied by fossil fuels used to power vehicles and equipment, and are thus considered separately from electrical power. Fuel would be consumed by construction equipment and by trucks, trains, and barges transporting materials and excavated spoils. In addition, fuel would be consumed indirectly by the project through the use of vehicles driven by workers to and from the construction sites.

UTILITIES AND SUBSURFACE STRUCTURES

Some utilities would have to be relocated as part of the construction of the Tunnel Alternative mainly as a result of track lowering to obtain the necessary clearance for doublestack trains. All necessary agreements would be executed with each utility company or governmental agency regarding the temporary or permanent relocation of any utilities, as well as the responsibility for and coordination of the actual work, and method of reimbursement. Overall, utility service would be maintained throughout construction, and no adverse impacts would occur.

Table 16-23
Major Utility Conflicts
Staten Island and New Jersey Tunnel Alignments in Brooklyn

Type of Utility	Size (INS)	Location (Approx.)	Probable Mitigation	Excavation Limits	Construction inside/outside limits of ROW
Sewer	168	Between 7th & 8th Ave	Abandon pipe. Bulkhead and fill void under tracks with grout. Construct new 168" diameter reinforced concrete pipe by 730' long adjacent to tracks.	~730' long by 20' to 30' deep	Inside
Sewer	162	Between 9th & Fort Hamilton Pkwy.	Abandon pipe. Bulkhead and fill void under tracks with grout. Replace with two inverted siphons next to existing pipe.	~250' long by 20' to 30' deep	Outside
Water	72	Fort Hamilton Pkwy.	Abandon pipe. Bulkhead and fill void with grout. A pressure pipe would be lowered under tracks and adjacent to existing pipe.	280' long by 10' to 20' deep	Outside
Sewer	162	Fort Hamilton Pkwy.	Abandon pipe. Bulkhead and fill void under tracks with grout.	30' long by 10' deep	Outside
Petroleum	2#12	8th Ave to 13th Ave	Abandon pipe. Plug ends with concrete and remove sections at undercutting. A pressure pipe would be relocated away from track.	10' to 15' deep	Inside

The major utility conflicts are listed below in Tables 16-23 through 16-26. These tables give a brief description of the probable resolution for each major conflict. The majority of utility construction work would be located inside the existing limits of the right-of-way.

Table 16-24
Major Utility Conflicts—Montauk Branch

Type of Utility	Size (INS)	Location (Approx.)	Probable Mitigation	Excavation Limits	Construction inside/outside limits of ROW
Petroleum		Along Montauk Branch	A pressure pipe would be relocated.	Not greater than 10'	Inside

Table 16-25
Major Utility Conflicts—Staten Island Tunnel Alignment

Type of Utility	Size (INS)	Location (Approx.)	Probable Mitigation	Excavation Limits	Construction inside/outside limits of ROW
Sewer	26 by 39	Morningstar Avenue	Abandon conduit. Bulkhead and fill void under tracks with grout. Replace with one reinforced concrete pipe with inverted siphons next to existing pipe.	200' long by ~10' deep	Inside
Sewer	36 by 60	Alaska Street	Encase existing pipe with concrete.	~100' long by 10' deep	Inside
Water	20	Pelton Ave/Richmond Terrace	A pressure pipe would be relocated away from tracks.	320' long by ~10' deep	Outside
Sewer	84	Pelton Ave/Snug Harbor Road	Relocate 84" pipe parallel to alignment.	3800' long by 15' to 20' deep	Outside
Sewer	84	Davids Ave/ Richmond Terrace	Relocate 84" pipe parallel to alignment.	NA	NA

HAZARDOUS MATERIALS

As discussed in Chapter 12, "Hazardous Materials," construction of the Tunnel Alternative has the potential to expose contaminated soil and/or groundwater, as well as asbestos. At areas where surface work (such as cut and cover construction, laying new track, and adding or relocating utilities and signals) would occur, contaminated soils or groundwater could be exposed. In addition, at some project locations, localized pockets of contamination or underground fuel storage tanks or other buried objects such as drums could be encountered during excavating and grading activities at any of the rail yards. Chapter 12 includes a detailed explanation of the areas of concern and specific mitigation measures to be employed during construction of the project. Those measures are summarized below.

During final design, as outlined in Chapter 12, investigations would be conducted at locations where the soil and/or groundwater may have been contaminated by past activities. Findings Reports will be prepared that document the on-site sampling and analytical efforts at each construction area, and quantify and delineate the contamination found.

Site-specific Construction Containment Management Plans (CCMPs) will be prepared for all project areas based on the conclusions in the Findings Reports. Each CCMP will contain a Sampling and Analytical Plan (SAP) to be implemented for contaminated materials. The SAPs will identify sampling and analytical requirements for materials (soil, groundwater, drums, underground storage tanks [USTs], and asbestos) encountered during construction (specific to both the cut-and-cover TBM methods). In addition, the CCMPs will describe the requirements for handling, management, treatment, and disposal of contaminated materials encountered during construction. In the case of groundwater contamination, containment, treatment, and discharge options will be included in the CCMP. All materials leaving the site will require

sampling and characterization prior to disposal or reuse off-site. The CCMPs will be coordinated with relevant local, state, and federal agencies.

The CCMPs will identify preliminary requirements for Health and Safety Plans (HASPs) to be submitted by each construction contractor prior to commencement of work at the site. The HASPs will comply with all applicable regulations and will include health and safety requirements related to site-specific environmental conditions at the site. The HASPs will establish methods to limit site access, include an air monitoring program for particulates (dust) and VOCs, and set standard safe operating procedures for the construction crew. The plans will also outline criteria to be used to identify non-routine and potentially dangerous conditions, such as petroleum odors, oil sheens, and discolored soil and groundwater. Any contaminated materials encountered during construction would be handled, stored, and disposed of in accordance with all applicable federal, state, and local regulations and in compliance with the site-specific HASPs.

Table 16-26
Major Utility Conflicts—Bay Ridge Branch

Type of Utility	Size (INS)	Location (Approx.)	Probable Mitigation	Excavation Limits	Construction inside/outside limits of ROW
Sewer	36	14th Avenue	Abandon pipe. Bulkhead ends with concrete. Remove portion under track.	~70' by 10' deep	Outside
Sewer	30	15th Ave. and 61st Street	Abandon pipe. Bulkhead ends with concrete. Remove portion under track.	~70' by 10'	Outside
			Proposed relocation along 62nd St/15th Ave/61st St/16th Ave.	~2087' long by 10' to 20' deep	Outside
Sewer	156	60th Street	Convert to 110" by 244" horizontal elliptical reinforced concrete pipe section and encase with concrete.	80' long by ~20' deep	Outside
Sewer	144	17th Ave and 56th Street	Abandon pipe. Bulkhead ends with concrete. Remove portion under track. Convert to two reinforced concrete pipes and encase with concrete by 180' long.	~780' long by ~20' to 30' deep	Outside
Sewer	30	54th Street	Bulkhead ends with concrete. Remove portion under track. Construct 12" diameter sewer.	~370' long by 10' deep	Outside
Sewer	40	53rd Street	Bulkhead ends with concrete. Remove portion under track. Construct 12" diameter sewer.	~600' long by 10' deep	Outside

Table 16-26 (cont'd)
Major Utility Conflicts—Bay Ridge Branch

Type of Utility	Size (INS)	Location (Approx.)	Probable Mitigation	Excavation Limits	Construction inside/outside limits of ROW
Sewer	24	51st Street	Abandon pipe. Bulkhead ends with concrete. Remove portion under track. Convert to 12" diameter reinforced concrete pipe as inverted siphon and encase with concrete by 180' long.	~180' long by ~10' deep	Outside
Sewer	138	19th Ave and 49th St	Encase pipe with concrete.	~100' long by 20' deep	Outside
Water	48	Ocean Parkway	A pressure pipe would be lowered under tracks and adjacent to existing. Remove portion under tracks	~220' long by ~16' deep	Outside
Sewer	42	13th Street	Abandon pipe. Bulkhead ends with concrete. Remove portion under track. Convert to one reinforced concrete pipe with inverted siphons under tracks by 180' long.	~180' long by ~12' deep	Outside
Water	30	Ocean Avenue	A pressure pipe would be lowered under the tracks and located adjacent to existing.	NA	Outside
Sewer	48	Flatbush Ave	Pipe assumed abandoned.	NA	Test pit required
Gas	30	Flatbush Avenue	A pressure pipe would be lowered under tracks and adjacent to existing.	160' long by ~12' deep	Outside
Sewer	2#10 8 by 192	Ave. H and E. 40th Street	Reconstruct top slab of existing sewer for reduced height.	~260' long by ~12' deep	Outside
Sewer	126	Dumont Ave	Abandon pipe. Bulkhead ends with concrete. Remove portion under track. Replace one reinforced concrete pipe and encase with concrete by 140' long.	~140' long by ~16' deep	Outside
Gas	30	Sutter Ave	A pressure pipe would be lowered under tracks and adjacent to existing. Remove portion under tracks.	~180' long by ~12' deep	Outside
Sewer	42	Belmont Ave	Abandon pipe. Bulkhead ends with concrete. Remove portion under track. Convert to one reinforced concrete pipe inverted with siphons under tracks by 180' long.	~180' long by ~12' deep	Outside
Petroleum	2#12	Along Bay Ridge Branch	A pressure pipe would be relocated.	Not greater than 10'	Inside

As described in Chapter 12, the Phelps Dodge site has been designated by the New York State Department of Environmental Conservation (NYSDEC) as a Class II Inactive Hazardous Waste Site. Special care would be taken at the site, including ongoing coordination with NYSDEC, to ensure that the project would not interfere with any remediation efforts at the site.

State and city regulations restrict the pumping of contaminated groundwater to rivers or sewers. The project specifications for dewatering during construction would include testing to ensure that regulatory levels are not exceeded and, therefore, no adverse impacts would occur.

WATER RESOURCES

Potential Impacts to Water Quality

In-Water Construction Activities. As described in Chapter 13, "Water Resources," dredging and other in-water and upland construction activities have the potential to affect water resources. BMPs and stormwater pollution prevention plans would be employed to minimize potential impacts.

Site-specific Construction Contaminant Management Plans (CCMPs) will be prepared for all project areas based on the conclusions in the Findings Reports. Each CCMP will contain a Sampling and Analytical Plan (SAP) to be implemented for contaminated materials that identifies sampling and analytical requirements for materials (soil, groundwater, drums, underground storage tanks [USTs], and asbestos) encountered during construction (specific to both the cut and cover and TBM methods). In addition, the CCMPs will describe the requirements for handling, management, treatment, and disposal of contaminated materials encountered during construction. In the case of groundwater contamination, containment, treatment, and discharge options will be included in the CCMP. All materials leaving the site will require sampling and characterization prior to disposal or reuse off-site. The CCMPs will be coordinated with relevant local, state, and federal agencies.

The CCMPs will identify preliminary requirements for Health and Safety Plans (HASPs) to be submitted by each construction contractor prior to commencement of work at the site. The HASPs will comply with all applicable regulations and will include health and safety requirements related to site-specific environmental conditions at the site.

Dredging has the potential to increase suspended sediments within the water column for some distance up- and downstream, result in the resuspension and then movement of pollutants attached to sediments and deposition of these contaminated sediments elsewhere, release nutrients, and decrease dissolved oxygen and light penetration within the area of increased suspended sediment.

Dredging and associated activities would be required for the construction of the immersed tube portion and ventilation shaft for the New Jersey tunnel alignment and ventilation and construction shafts for the Staten Island tunnel alignment (at Pier 2 in Staten Island and 69th Street pier in Brooklyn). During construction of the vent shafts, the bases would serve as a cofferdam to contain the construction area and minimize disturbance to in-water habitat.

As evaluated in Chapter 13, "Water Resources," no potential adverse impacts would occur due to dredging at these sites. The results of the DREDGE modeling suggest that even within the 100 meter area around the dredge that would be the zone of highest concentration, the projected increase in suspended sediment and metal concentrations is small compared to the range of concentrations recorded for the Upper Harbor. Other potential effects associated with dredging

such as decreased dissolved oxygen, increased nutrients, and other sediment contaminants are not expected to be significant, especially because dredging would be conducted where tidal exchange is not restricted. Since the increase in suspended sediment resulting from dredging for the immersed tube would be small, the deposition of sediments would also be minimal. Plumes from dredging generally dissipate in any where from several hours to days. Additionally, the results of the modeling also suggest that the increase in turbidity drops off significantly at 200 meters from the dredge. Use of an enclosed bucket dredge—likely to be required by NJDEP for the immersed tube tunnel section- would reduce the impacts due to dredging still further. The fill material placed around and over the immersed tube tunnel elements once installed in the trench will consist of clean material and would not affect water quality. Operational measures would be implemented to minimize the amount of these materials suspended in the water column during placement on or around the immersed tube tunnel.

The West Maspeth Yard under the Double Tunnel System would include the filling of Maspeth Creek and a portion of Newtown Creek for a total of eight to nine acres. The placement of clean fill material in these waterbodies has the potential to result in temporary adverse impacts to the water quality of Newtown Creek due to increased suspended sediment concentrations while the material is being put in place. Mitigation measures would be implemented to minimize water quality impacts.

Under the Staten Island tunnel alignment of either Tunnel System, a second span of the Arthur Kill Lift Bridge would be built immediately south of the existing span. A viaduct would connect the new span to the Chemical Coast Line. From the bridge to Arlington Yard, the existing embankment would be enlarged to accommodate a second track. The in-water construction activities for the bridge have the potential to affect water quality through the increase of suspended sediment caused by bottom disturbance from filling, bulkheading, pile driving, and other activities. Because the area to be disturbed is small and the disturbance would be of a short duration, suspended sediment conditions would be expected to return to ambient concentrations shortly after bottom disturbing activities have been completed. The potential impacts to water quality and aquatic resources would be far less extensive than those described above for the immersed tube portion of the New Jersey tunnel alignment and are not expected to be significant for the same reasons as described for that construction. The embankment would cross through the Old Place Creek and Bridge Creek salt marsh systems. For upland construction associated with the construction of the viaduct and embankment, see below.

On-Land Construction Activities. Upland activities include tunnel construction (open cut and cut and cover portions); yard construction and operation; and increasing clearances and other track work along rail lines. Construction activities on land associated with this alternative would have the potential to result in temporary water quality impacts along the Brooklyn shoreline, Newtown Creek shoreline, and Arthur Kill and Kill Van Kull shorelines. These potential changes in water quality have to the potential to temporarily impact aquatic invertebrates and fish near the point where surface runoff enters the water. However, the implementation of erosion and sediment control measures, and stormwater management measures during construction in compliance with the SPDES General Stormwater Permit for Construction Activity would reduce these impacts. As required for construction activities that disturb five acres or more, a stormwater pollution prevention plan (SWPPP) will be prepared in accordance with good engineering practices. Implementation of best management practices for erosion and sediment control and other measures of the SWPPP would minimize potential water quality and aquatic resources effects associated with the discharge of stormwater during these construction activities.

Mitigation

Dredging. There would be no significant adverse water quality impacts for dredging activities associated with the project. However, measures will be developed in consultation with USACOE, NJDEP, and NYSDEC to minimize potential effects. These involved agencies will specify the BMPs to be used when issuing permits for dredging projects. Increases in suspended sediment resulting from cutterhead hydraulic dredges and mechanical dredges can be reduced by improving operational techniques such as proper selection of cutter rotation speed, ladder swing speed, and depth of cut for cutterhead dredges, and reducing the speed at which the crane lowers the empty clamshell bucket through the water column and raises the full bucket, using watertight clamshell buckets (Barnard 1978, Hayes 1986, Havis 1988a). NJDEP (1997) has identified BMPs that should be used to minimize the potential for and magnitude of adverse environmental impacts from dredging operations. BMPs identified by NJDEP include:

- Using hydraulic dredging when feasible;
- Using a closed clamshell—this is required for dredging in Upper New York Harbor;
- Implementing certain dredging practices to reduce suspended sediments when using a clamshell dredge such as maximizing the size of the bite taken by the clamshell, slowly withdrawing the clamshell through the water column, not hosing down or rinsing sediments of the sides and gunwales of the barge;
- No barge overflow—this is required for dredging in Upper New York Bay;
- Shunting—this is the active pumping of free water in a barge to the bottom of the water column at the dredging site used as an alternative to barge-overflow in reducing the volume of water in the barge;
- Seasonal restrictions to minimize potential adverse impacts to anadromous or other migratory finfish, nesting shorebirds, etc.;
- In certain semi-enclosed waterbodies, dredging only during incoming tide to allow additional time for suspended sediment to settle and reduce the dispersal of contaminated sediments;
- On-board independent dredging inspectors certified by USACOE to observe dredging operation and ensure compliance with permit conditions; and
- Silt curtains in waters where currents are less than 1 knot.

In addition to the measures associated with dredging, mitigation measures associated with installation of the tunnel sections will be implemented to minimize suspended sediment in the water column during placement of any fill material or the rock layer. These measures may include moderating the speed at which the material is brought to the bottom to reduce suspension.

West Maspeth Yard. For the Double Tunnel System, best management practices (BMPs) such as the use of silt curtains would be implemented during the placement of fill in Maspeth Creek and Newtown Creek to minimize the suspension of material into the water column. These measures will be developed in consultation with the NYSDEC and USACOE.

On-Land Construction Activities. As required for construction activities that disturb five acres or more, a stormwater pollution prevention plan (SWPPP) will be prepared in accordance with

established engineering practices. Implementation of best management practices for erosion and sediment control and other measures of the SWPPP would minimize potential water quality effects associated with the discharge of stormwater during upland construction activities.

Potential Impacts to Aquatic Organisms.

Suspended Sediment. The assessment of potential impacts to water quality concluded that increases in suspended sediment within the water column as a result of dredging with an open bucket dredge, closed bucket dredge, and cutterhead dredge (hydraulic) would be minimal in terms of change in concentration and aerial extent and would not result in significant changes of water quality. Because the increase in suspended sediment would not cause suspended sediment concentrations that were outside the range reported within this portion of the Upper Harbor, significant impacts to fish, benthic macroinvertebrates or plankton would not be expected.

Environmental windows, the time period when dredging is permitted, have been imposed on dredging projects over the last 30 years (over 80 percent of USACOE dredging projects are subject to windows) to protect sensitive biological resources and habitats. However, limiting dredging to certain times of the year to protect certain resources can extend the overall length of time that dredging occurs for specific projects and the recovery period. It may also increase impacts to species of lesser economic or regulatory interest (but not necessarily of lesser ecological importance), whose critical period may coincide with the period allowed for dredging.

Potential impacts to aquatic organisms associated with water quality changes that may occur as a result of the construction of the vent structures would be much less than those associated with dredging for the immersed tube or the float bridges, which are not projected to be significant.

USACOE concluded that the main aquatic impact from the proposed harbor navigation dredging projects would be the loss of shallow water habitat. The Tunnel Alternative would not result in the loss of shallow water habitat. In addition, since no potential significant adverse water quality impacts would occur as a result of constructing these two projects concurrently, no potential significant aquatic impacts would occur.

Under the Double Tunnel System, best management practices (BMPs) such as the use of silt curtains would be implemented during the placement of fill in Maspeth Creek and Newtown Creek to minimize the suspension of material into the water column. These measures will be developed in consultation with the NYSDEC and USACOE.

WETLAND AND TERRESTRIAL RESOURCES

Greenville Yard

Potential significant adverse impacts to the NJ-listed endangered least tern nesting site at the tip of the Global Marine Terminal/NEAT pier could occur from the construction and/or operation of the vent structure under the Tunnel Alternative. Construction and operation of the vent structure may result in the loss of all or a portion of the habitat used by least terns as a nesting site. Mitigation measures to minimize these potential impacts would be developed in coordination with NJDEP and could include the following:

- If the vent structure is constructed adjacent to the nesting area, the construction period would be scheduled if possible to avoid the nesting period (April to August), or so that it impacts only one nesting season.

- If the nesting habitat is not directly affected by the construction of the vent structure, or only a portion is affected, monitor use of the nesting site for a period of time agreed to by NJDEP to determine whether the nesting habitat is still suitable for least tern after the tunnel and the vent shafts are in operation. If the monitoring results suggest the nesting area is no longer suitable, mitigation plans would be developed in coordination with NJDEP to create suitable nesting habitat along the New Jersey shoreline.
- If the nesting habitat is directly affected due to the construction of the vent structure at the end of the pier, mitigation plans would be developed in coordination with NJDEP to create suitable nesting habitat along the New Jersey shoreline.

Arthur Kill Lift Bridge

Under the Staten Island alignment of the Single Tunnel System, construction of the Arthur Kill Lift Bridge and the embankment for the new rail line leading to Arlington Yard have the potential to significantly impact tidal wetlands within the Old Place Creek marsh and the Bridge Creek marsh systems through the placement of fill. Mitigation measures to minimize these potential impacts would be developed in coordination with USACOE and NYSDEC as part of the permitting process for construction and could include the following:

- Avoiding wetlands to the greatest extent possible.
- Minimizing the amount of fill to the greatest extent possible.
- Implementing erosion and sediment control measures during construction.
- Restoration or creation of wetlands in or within the vicinity of the wetland systems impacted by construction.

While peregrine falcons would tolerate activities associated with the construction of the proposed Arthur Kill Lift Bridge, mitigation measures will be developed in coordination with NYSDEC and NJDEP to minimize potential impacts to the falcons, nesting success, and juvenile falcons. Potential measures could include the following:

- Bird control device on the top of cranes or other tall construction equipment to keep young falcons from landing on them and slipping off.
- Moving the nest(s) back to the existing nesting tower constructed by PANYNJ and ensuring a buffer of between 100 and 300 feet between barges associated with construction and the nesting tower.
- Safety precautions for the workers such as head protection and face protection etc. Falcons can be extremely aggressive during nesting season which starts in February and March.

65th Street Yard

Under all project alternatives, potential wetland loss could occur from construction activities at 65th Street Yard where Phragmites patches were observed during field investigations. These sites may require closer examination prior to site development to determine whether they are under the jurisdiction of the USACOE or NYSDEC. Should these areas fall under regulatory jurisdiction as wetlands, their loss would be incorporated into the wetland mitigation plan that would be prepared as part of the environmental permitting for the entire Cross Harbor Freight Movement Project.

West Maspeth Yard

Under the Expanded Float Operations Alternative and the Tunnel Alternative, potential wetland loss could occur from construction of a new rail yard on the Phelps Dodge site where Phragmites patches were observed during field investigations. These sites may require closer examination prior to site development to determine whether they are under the jurisdiction of the USACOE or NYSDEC. Should these areas fall under regulatory jurisdiction as wetlands, their loss would be incorporated into the wetland mitigation plan that would be prepared as part of the environmental permitting for the entire Cross Harbor Freight Movement Project.

Mitigation measures for Maspeth Creek and the portion of Newtown Creek to be filled under the Double Tunnel System are discussed in Chapter 13, "Water Resources." Development of the West Maspeth Yard intermodal facility, including the filling of Maspeth Creek to provide additional upland areas for the yard has the potential to result in the loss of foraging grounds or resting sites for shorebirds and wading birds. Approximately 8 to 9 acres of subtidal habitat would be lost. Mitigation measures for this habitat would be incorporated into the wetland mitigation plan that would be prepared as part of the environmental permitting for the entire Cross Harbor Freight Movement Project. Mitigation measures will be developed in coordination with NYSDEC and USACOE with regard to acreage, type, and location. Measures could include the following:

- Minimizing the area of Maspeth Creek and Newtown Creek to be filled to the greatest extent possible.
- Restoration or creation of subtidal or wetland habitat within New York City.

SAFETY AND SECURITY

The project would not involve construction methods, procedures or locations that would pose safety or security problems. Most of the construction activities would occur in areas where the general public has no access (e.g., within rail yards and in enclosed underground tunnels). Public access to all construction sites would be restricted. Standard safety and security measures would be followed and the most stringent provisions of the applicable statutes and regulations of New Jersey, New York City and New York State, and the Department of Labor, Occupational Safety and Health Administration, pertaining to the safe performance of the work, would be observed.

In the few instances where contractors would obstruct sidewalk pedestrian areas in the performance of the work bridge reconstruction on city streets, protective sidewalk sheds, barricades, warning signs, and other items to protect the public would be provided.

All sites would be secured during construction to prevent trespass, theft, and vandalism.

A project-wide Environmental HASP would be developed for the project to delineate project-wide policies and requirements for railroad safety, construction safety, environmental safety and industrial hygiene. Contractors would address these policies when preparing their site-specific and activity-specific HASPs. Contractors would use preventive and not reactive measures in controlling hazards. Inspections, self-assessments, and trending to identify problem areas and actions to remediate problem areas would be required.

The safety plans developed by each contractor would contain the following elements:

- Job hazard analysis—requirement for a review of the detailed work scope in order to plan for safety in each task;

- Task descriptions—requirement for including equipment, materials, controls, crew size, job responsibilities, operating procedures, and maintenance practices;
- Hazard assessment—requirement to identify potential safety concerns;
- Protection methods—requirement to describe methods to protect workers, the public, and the environment;
- Protective equipment—requirements for selection and use of the appropriate devices for the hazards to be confronted; and
- Emergency response procedures—requirements for spill response and project participants, local agencies, including fire and police departments, and the community. ✷

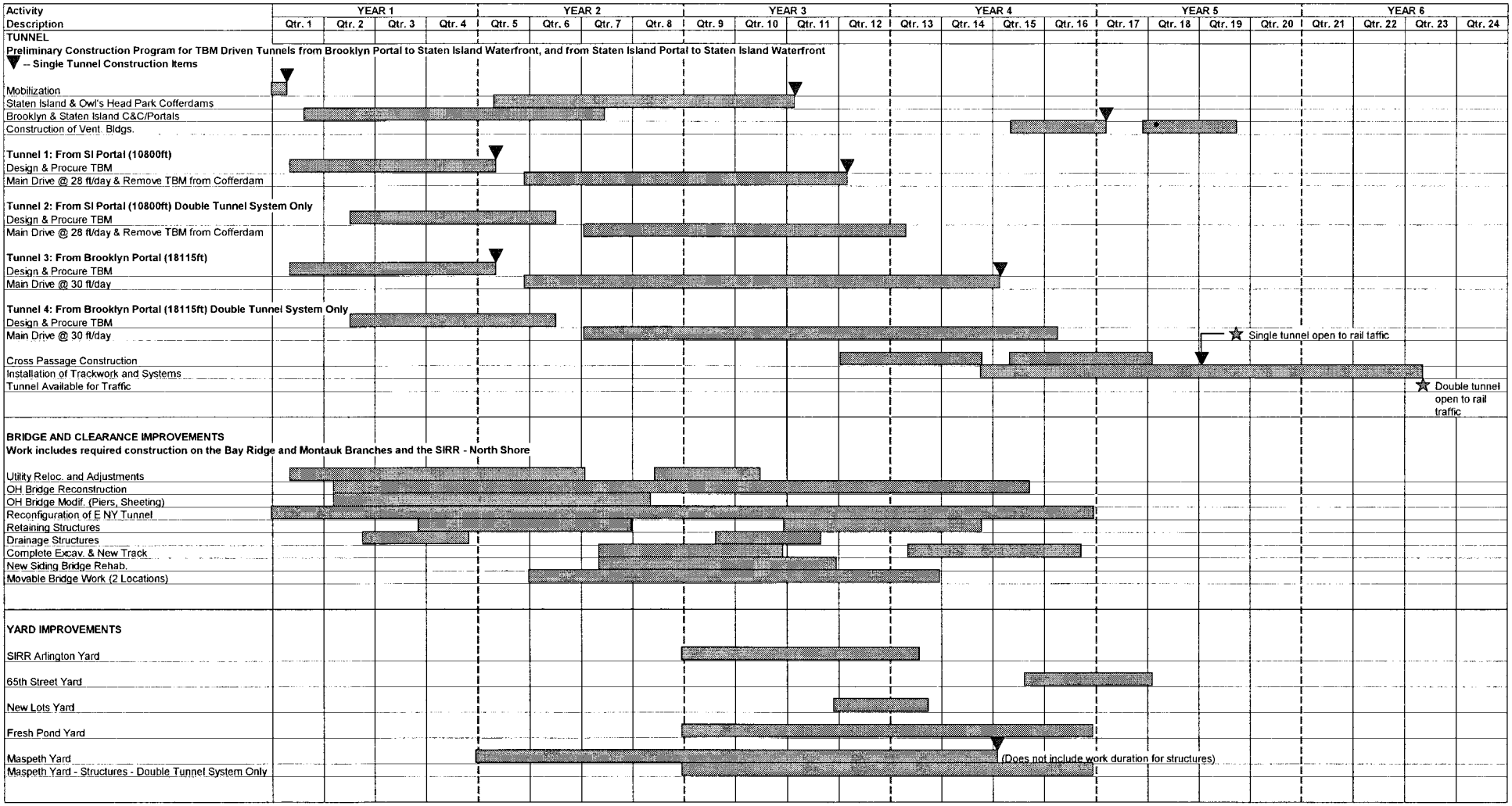


Figure 16-1
Project Schedule
Staten Island Tunnel Alignment

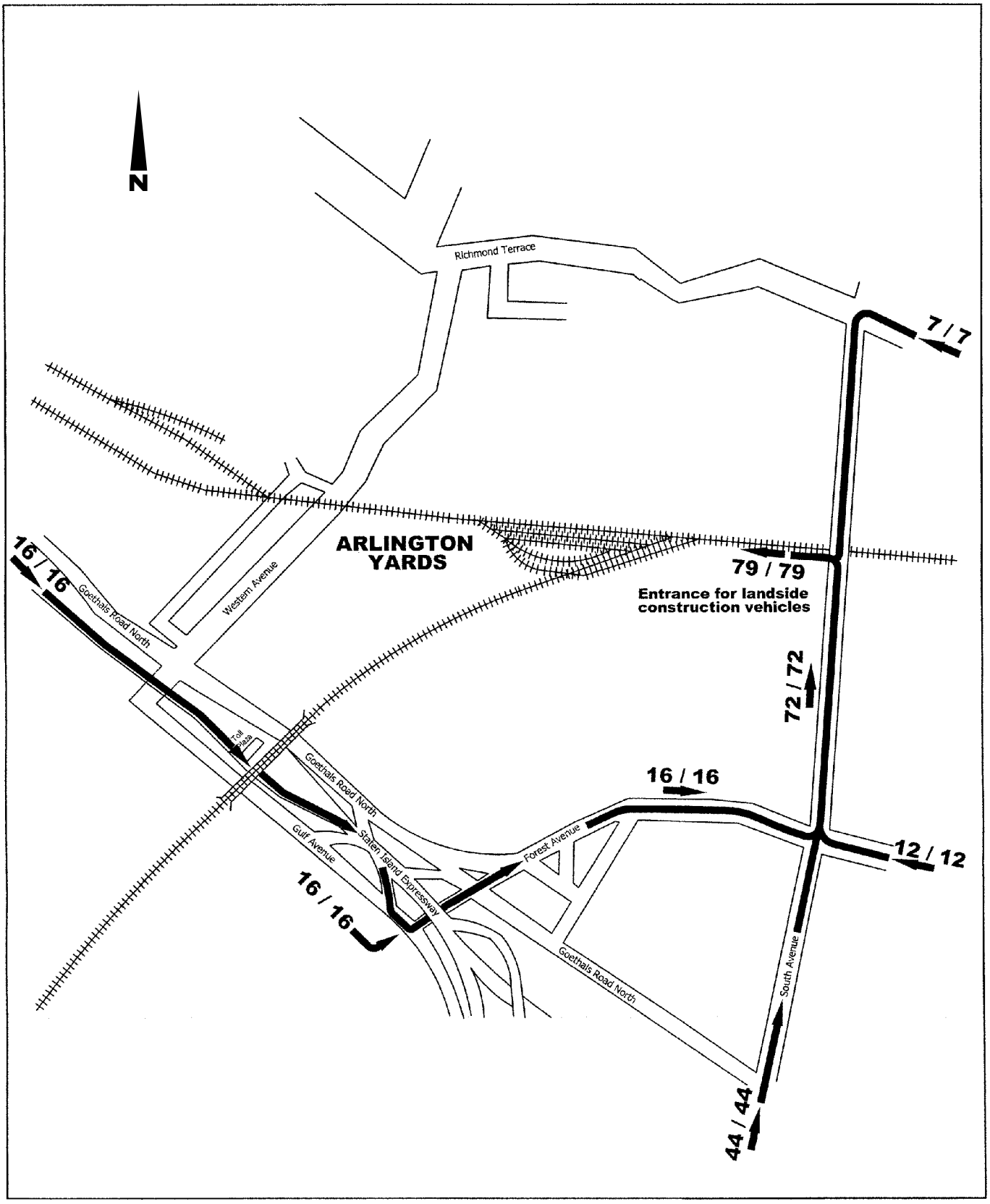
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Activity	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
Description	Qtr. 1	Qtr. 2	Qtr. 3	Qtr. 4	Qtr. 5	Qtr. 6	Qtr. 7	Qtr. 8	Qtr. 9	Qtr. 10	Qtr. 11	Qtr. 12	Qtr. 13	Qtr. 14	Qtr. 15	Qtr. 16	Qtr. 17	Qtr. 18	Qtr. 19	Qtr. 20	Qtr. 21	Qtr. 22	Qtr. 23	Qtr. 24
TUNNEL																								
Preliminary Construction Program for TBM Driven Tunnels from 65th Street Rail Yard to Global Marine Terminal and to Brooklyn Portal																								
Preliminary Construction Program for Immersed Tube Tunnels from Greenville Rail Yard to Global Marine Terminal																								
-- Single Tunnel Construction Items																								
Mobilization																								
Shaft Construction at 65th St																								
Global Marine Cofferdam																								
Portals and U-Boxes																								
Construction of Vent. Bldgs.																								
Tunnel 1 to Greenville (13500ft)																								
Design & Procure TBM																								
Main Drive @ 29 ft/day & Remove TBM from Cofferdam																								
Tunnel 2 to Greenville (13500ft) Double Tunnel System Only																								
Design & Procure TBM																								
Main Drive @ 29 ft/day & Remove TBM from Cofferdam																								
Tunnel 3 to Brooklyn Portal (7115ft)																								
Design & Procure TBM																								
Main Drive @ 25 ft/day & Remove TBM at B'lyn Portal																								
Tunnel 4 to Brooklyn Portal (7115ft) Double Tunnel System Only																								
Design & Procure TBM																								
Main Drive @ 25 ft/day & Remove TBM at B'lyn Portal																								
Immersed Tube Tunnel																								
Construct Casting Basin & Units 1-10																								
Dredging Works						(1)				(2)														
Immerse Element No. 1-5																								
Backfill trench, Units 1-4 (Note: Unit 5 not backfilled)																								
Immerse Element No. 6-10																								
Construct Closure Joint & Complete Backfill																								
Cross Passage Construction																								
Installation of Trackwork and Systems																								
Tunnel Available for Traffic																								
BRIDGE AND CLEARANCE IMPROVEMENTS																								
Work includes required construction on the Bay Ridge and Montauk Branches																								
Utility Reloc. and Adjustments																								
OH Bridge Reconstruction																								
OH Bridge Modif. (Piers, Sheeting)																								
Reconfiguration of E NY Tunnel																								
Retaining Structures																								
Drainage Structures																								
Complete Excav. & New Track																								
New Siding Bridge Rehab.																								
Movable Bridge Work (2 Locations)																								
YARD IMPROVEMENTS																								
Greenville Yard																								
65th Street Yard																								
New Lots Yard																								
Fresh Pond Yard																								
Maspeth Yard																								
Maspeth Yard - Structures - Double Tunnel System Only																								



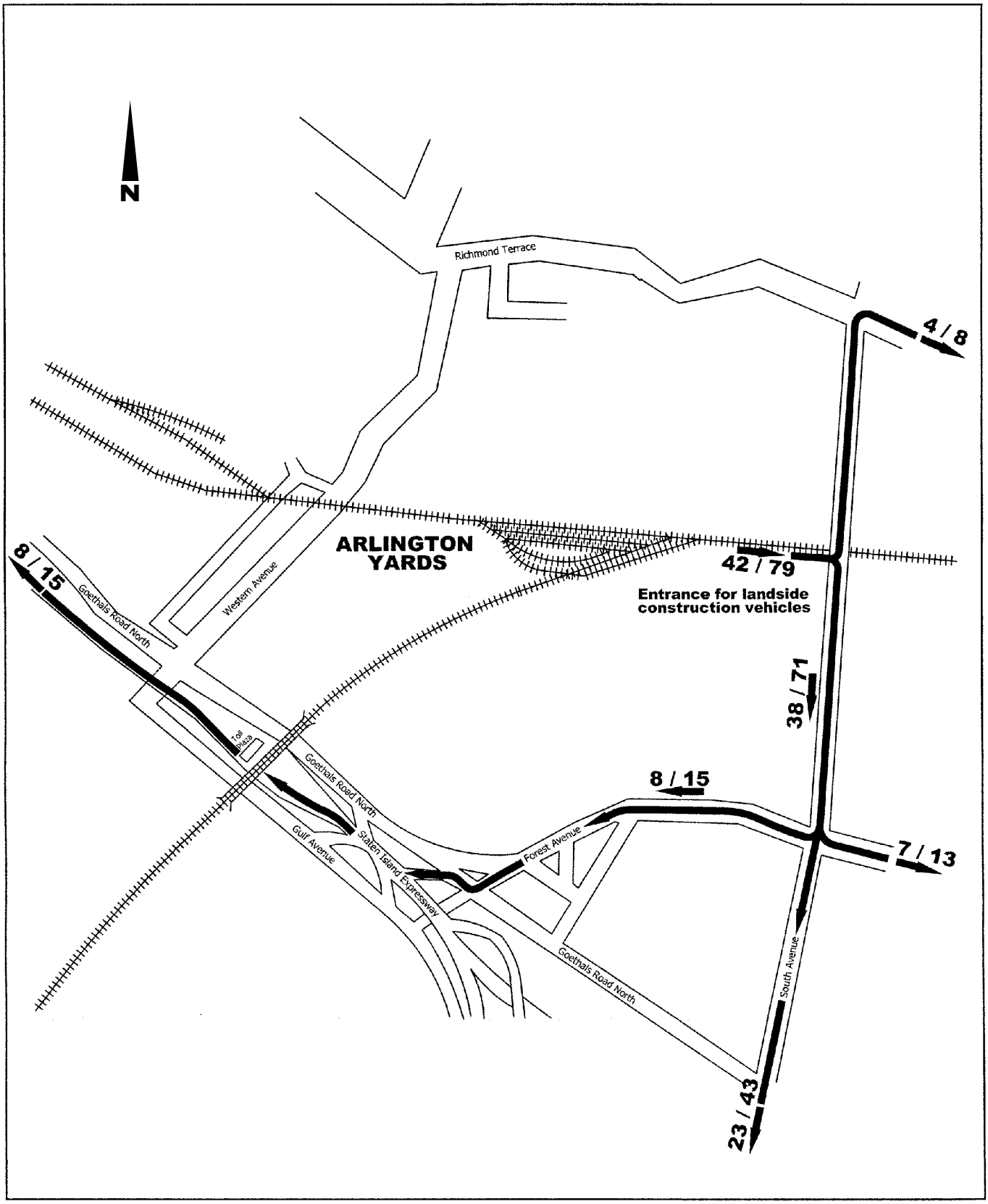
(1), (2): No marine works allowed (wintering of striped bass) - dependent on construction start date.

Figure 16-2
New Jersey Tunnel Alignment
Project Schedule
Cross Harbor Freight Movement Project



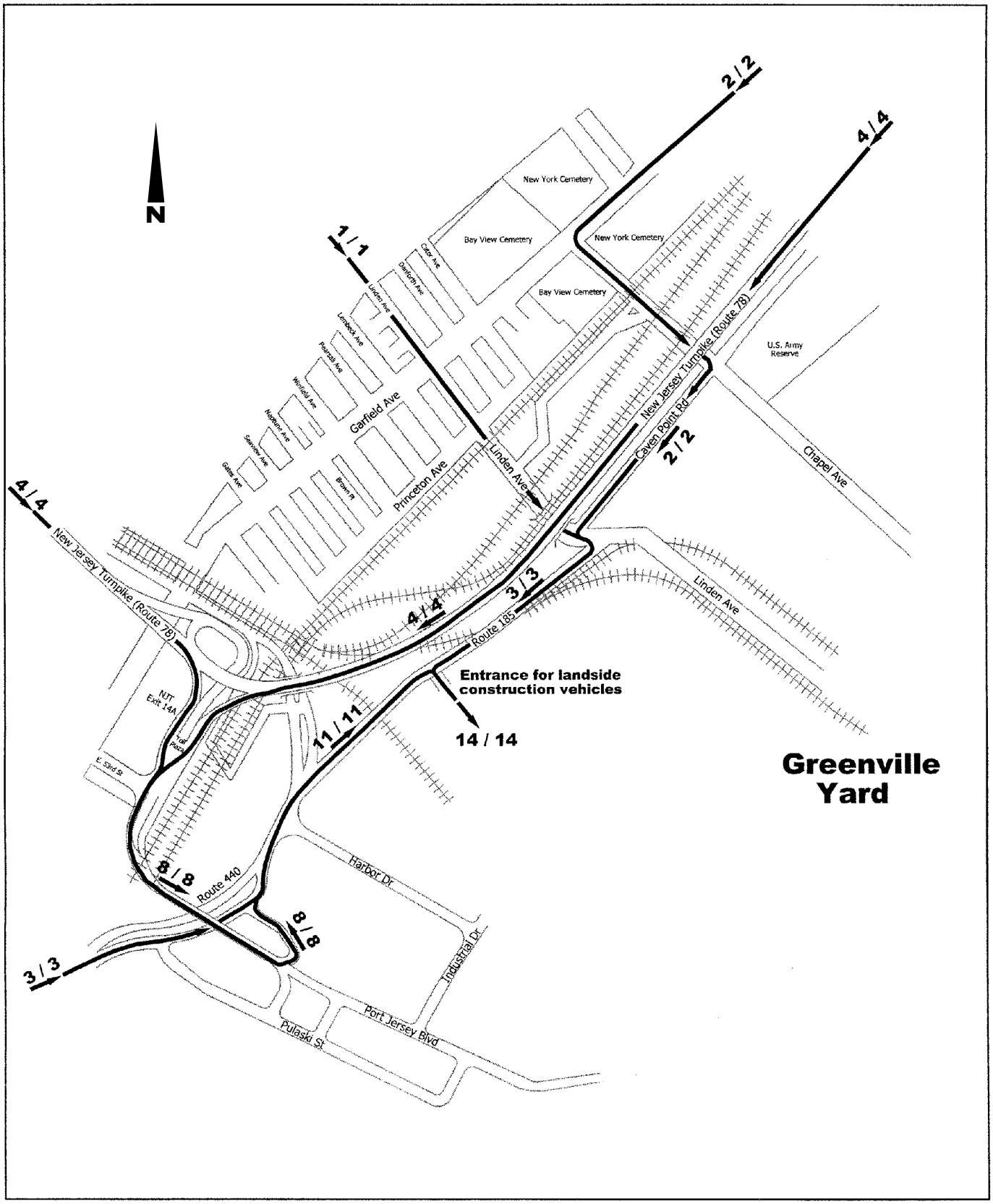
X/X - AM/PM Generated Vehicle Trips

Figure 16-3
2008 Staten Island Tunnel Alignment:
Inbound Trips to Arlington Yard,
Double Tunnel System



X/X - AM/PM Generated Vehicle Trips

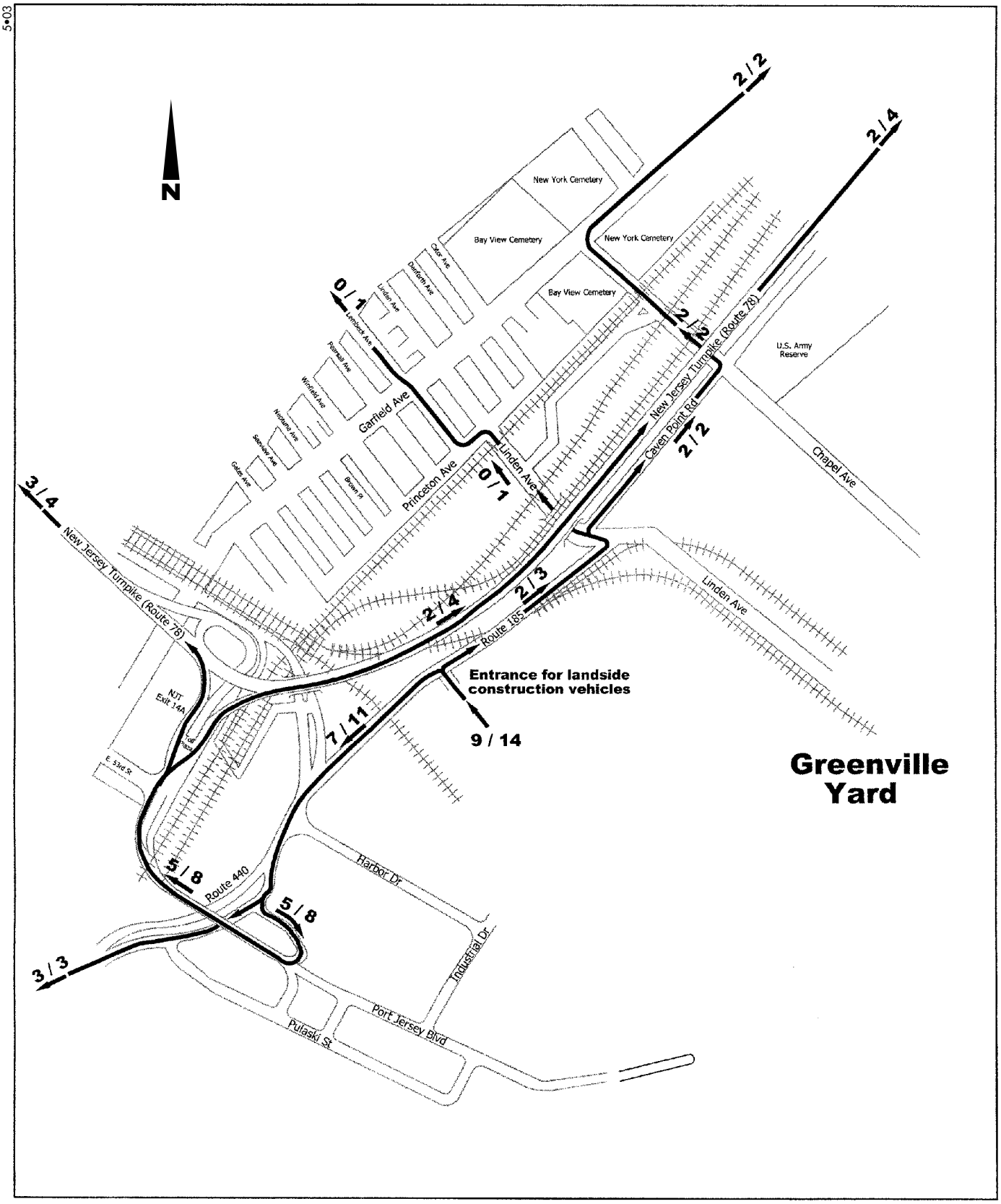
Figure 16-4
2008 Staten Island Tunnel Alignment:
Outbound Trips to Arlington Yard, Double Tunnel System



X/X - AM/PM Generated Vehicle Trips

Figure 16-5

2008 Greenville Yard Tunnel Alignment:
Inbound Trips to Greenville Yard
Single and Double Tunnel Systems



X/X - AM/PM Generated Vehicle Trips

Figure 16-6
2008 Greenville Yard Tunnel Alignment:
Outbound Trips to Greenville Yard
Single and Double Tunnel Systems

A. INTRODUCTION

Discussed in this chapter are the potential effects of the project alternatives on populations of minority and low-income residents, and determines whether these populations would be disproportionately affected by adverse environmental impacts resulting from the project alternatives.

On February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This Executive Order is designed to ensure that each federal agency "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Executive Order 12898 also requires federal agencies to work to ensure greater public participation in the decision-making process. To this end, the Cross Harbor Freight Movement Project has an extensive public participation and community outreach program, described in Chapter 21, "Public Process and Participation."

Analyzed in this chapter are the project's potential impacts in terms of their effects on minority and low-income populations, to determine whether the alternatives could have any disproportionately high and adverse impacts on those populations.

B. REGULATIONS AND METHODOLOGY

REGULATIONS

The analysis follows the U.S. Department of Transportation's (USDOT) *Final Order on Environmental Justice*, April 1997; the U.S. Environmental Protection Agency's (USEPA) *Guidance for Incorporating Environmental Justice Concerns in USEPA's NEPA Compliance Analyses*, April 1998; the Council of Environmental Quality's *Environmental Justice: Guidance under the National Environmental Policy Act*, December 10, 1997; and the FHWA's *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* December 2, 1998.

CEQ GUIDANCE

The federal Council on Environmental Quality (CEQ), which has oversight of the federal government's compliance with Executive Order 12898 and the National Environmental Policy Act (NEPA), developed its guidance to assist federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed. Federal agencies are permitted to supplement this guidance with more specific procedures tailored to their particular programs or activities, as the U.S. Department of Transportation (USDOT) has done.

The CEQ's document provides guidance on consideration of environmental justice in each phase of NEPA (i.e., scoping, analysis of impacts, issuance of a Record of Decision). In brief, the CEQ methodology involves collecting demographic information on the area where the project may cause high and adverse effects; identifying low-income and minority populations in that area using census data; and identifying whether the project's high and adverse effects are disproportionately high and adverse on the low-income and minority populations, in comparison to those on other populations. Any disproportionately high and adverse effects on minority and/or low-income populations should then be one of the factors the federal agency considers in making its finding on the project and issuing a Record of Decision.

USDOT'S FINAL ORDER ON ENVIRONMENTAL JUSTICE

The environmental justice assessments also followed USDOT's Final Order on Environmental Justice, which establishes the procedures for the USDOT to use in complying with Executive Order 12898. The order applies to all of USDOT's operating administrations, including FHWA and FRA. As set forth in the order, the sponsoring agencies must take steps to determine whether the project would have disproportionately high and adverse effects on minority and low-income populations. "Disproportionately high and adverse effects" are defined as adverse effects that are predominantly borne by a minority population and/or low-income population or will be suffered by the minority and/or low-income population and are appreciably more severe or greater in magnitude than the adverse effects that will be suffered by the non-minority or non-low-income population.

In making determinations regarding disproportionately high and adverse effects on minority and low-income populations, mitigation and enhancement measures that will be taken and all offsetting benefits to the affected minority and low-income populations may be taken into account, as well as the design, comparative impacts, and relevant number of similar existing system elements in non-minority and non-low-income areas. As set forth in the USDOT's Final Order on Environmental Justice (at Section 8.b.), "In making determinations regarding disproportionately high and adverse effects on minority and low-income populations, mitigation and enhancement measures that will be taken and all offsetting benefits to the affected minority and low-income populations may be taken into account, as well as the design, comparative impacts, and relevant number of similar existing system elements in non-minority and non-low-income areas." The analysis below therefore focuses on significant adverse impacts, and considers the population affected by those impacts. The mitigation of significant impacts is also considered. If a program or activity would have a disproportionately high and adverse effect on minority populations or low-income populations, it will only be carried out if: 1) further mitigation measures or alternatives that would avoid or reduce the disproportionately high and adverse effect are not practicable; 2) a substantial need for the program, policy, or activity exists, based on the overall public interest; and 3) alternatives that would have less adverse effects on protected populations that would still satisfy that need would either have other adverse social, economic, environmental, or human health impacts that are more severe, or would involve increased costs of extraordinary magnitude.

USEPA GUIDANCE

USEPA's guidance on conducting an environmental justice analysis follows the same methodology as the CEQ, which was discussed above.

METHODOLOGY

To identify minority and low-income populations within the project study area, demographic information was obtained from the U.S. Census Bureau for the year 2000. The U.S. Census Bureau allows the collection of information using various geographic units such as census tracts, block groups, and blocks. For the purposes of this analysis, two different geographic units were used. Population and race information were collected using the block level–the smallest geographic unit for which these data are available. Data for median household income and poverty status were collected using block group level data, the smallest geographic unit for which the income and poverty data are available. As described below, the noise impact boundaries along each of the rail segments for the Double Tunnel System (as defined in Chapter 10, "Noise and Vibration") determined which blocks and block groups were included in the demographic analysis.

IDENTIFICATION OF MINORITY COMMUNITIES

The guidance documents define minorities to include American Indian or Alaskan natives, Asian, Pacific Islanders, Black, or Hispanic persons. In identifying study areas with minority residents, the total percentage of minority residents was estimated by adding together all residents who are any of those racial groups. Data from the U.S. Census Bureau were used to determine the population characteristics for each of the study areas. The following information was collected for each block group in the study areas:

- *Data on racial and ethnic characteristics:* The population in each block group in the study area was characterized using the following racial categories provided in the 2000 Census: White, Black, Asian, and "Other." In addition to racial characteristics, the 2000 Census also includes information on Hispanic origin, which is considered to be an ethnic rather than racial characteristic. People of this ethnic category can be any race.
- *Total percentage of minority population:* Because Hispanic residents may be of any race, people who characterized themselves as White, Black, Asian, and Other in the 2000 Census may be non-Hispanic or Hispanic. To determine the total number of minority residents in each block group, the number of Black, Asian, Other, and Hispanic Whites were tallied.

A study area may be concluded to be a "minority community" when the percentage of minorities in a study area is "meaningfully greater" than the minority percentage of the general population or when the percentage of minorities in the community exceeds 50 percent.[*] It should also be considered in the analysis that the minority populations of New York City and Hudson County, New Jersey are greater than 50 percent of the general population—65 percent, according to year 2000 Census information.

IDENTIFICATION OF LOW-INCOME COMMUNITIES

Data from the U.S. Census Bureau were also used to determine the population characteristics for each of the study areas. The percent of households living below poverty level was used to determine the low-income population in a given block group. For households, the U.S. Census

[*] Section 1-101, Appendix A, *Guidance for Federal Agencies on Key Terms in Executive in Executive Order 12898*, *Environmental Justice: Guidance Under the National Environmental Policy Act*, Council on Environmental Quality, December 10, 1997.

Bureau defines a household as all people who occupy one housing unit. Accordingly, a household may include related family members and any unrelated people who share a housing unit. As another measure of low-income status, the median household income was also gathered for block groups and estimates were made of the median income for each study area/segment. Because the CEQ guidance does not suggest a threshold to be used in identifying low-income populations, areas with a proportion of low-income households that is meaningfully greater than in New York City and Hudson County overall were considered to be low-income. In New York City, approximately 21 percent of the population lives below the federal poverty threshold, therefore, for this environmental justice analysis, any New York study area with more than 21 percent of its population in poverty is considered to be a low-income area. The percentages of population below poverty level in the study areas were also compared to the respective borough. For the New Jersey study areas, poverty levels were compared to Hudson County, where an estimated 16 percent live below the federal poverty threshold. The project-wide threshold for all the study areas is 21 percent, which was determined using a weighted average of the poverty levels for New York City and Hudson County.

After identifying the communities of concern, the next steps in this environmental justice assessment include:

- Identifying the significant adverse impacts in each community;
- Determining whether significant impacts would disproportionately occur mostly within communities of concern;
- Comparing the severity of the adverse impacts in various communities to determine if the impacts are disproportionately severe in communities of concern;
- As appropriate, considering mitigation measures and alternatives to the proposed action.

C. EXISTING CONDITIONS

IDENTIFICATION OF STUDY AREAS

As explained in Chapter 3, "Land Use, Neighborhood Character, and Social Conditions," the project consists of numerous study areas located in New Jersey and New York City. For the purposes of this environmental justice analysis, the most pervasive environmental impact—noise impacts for the Double Tunnel System—was used to determine whether the project would be disproportionately causing adverse impacts in minority and/or low-income communities. Therefore, the study area boundaries for the environmental justice analysis were delineated based on the noise impacted areas for the Double Tunnel System as presented in Chapter 10, "Noise and Vibration." Information for the blocks and block groups located within these study area boundaries were obtained for this analysis.

NEW JERSEY

New Jersey has two study areas that were included in the analysis. The first study area is the Greenville Branch, which is located within the cities of Jersey City and Bayonne. The second study area is Segment 2 of the National Docks, which runs north-south and intersects the Greenville Branch. Noise impacts for the Greenville Branch would be considered significant at approximately 181 feet from the rail line, thus the study area boundaries were drawn at this

distance. Using the same method, the study area for Segment 2 of the National Docks was determined at 108 feet from the rail line.

NEW YORK

Staten Island

Segments 1 and 2 of the Northern Staten Island Railroad (as described in Chapter 3) were included in the analysis. Both segments run east-west across the northern section of Staten Island. The noise-impacted area boundary for the Segment 1 study area was defined as the area within 450 feet of the rail line. The noise-impacted area boundary for Segment 2 was established at 871 feet from the rail line.

Brooklyn

Three study areas in Brooklyn were included in the analysis. Segments 2, 3, and 4 of the Bay Ridge Branch run through central Brooklyn and intersect several communities. For this environmental justice analysis, Segment 2 has a study area boundary at 232 feet from the rail line, Segment 3 has a study area boundary at 1,249 feet from the rail line, and Segment 4, has a study area boundary that includes the area within 307 feet from the rail line.

Queens

Queens consists of the following study areas—the Queens portion of the Bay Ridge Branch, Montauk Branch East, Montauk Branch West, and Segments 1, 2, and 3 of the Fremont Secondary Line. The Queens portion of the Bay Ridge Branch is a continuation of Segment 4 in Brooklyn and ends at the Fresh Pond Yard. The study area boundary is defined as the area within 496 feet from the rail line. The Montauk Branch East is divided into two smaller segments--11e and 12e. The study area boundary for Segment 12e was determined to be 361 feet from the rail line. The study area for Segment 11e was defined as the area within 288 feet from the rail line. The Montauk Branch West runs west from the Fresh Pond Yard to West Maspeth Yard. The study area boundary for this segment includes the area within 763 feet of the rail line.

The Fremont Secondary Line begins at Fresh Pond Yard and extends north to the Hell Gate Bridge. Beginning at Fresh Pond Yard, Segment 1 has a study area boundary within 595 feet of the rail line. Segment 2 has a study area that covers an area within 447 feet of the rail line. The last segment in Queens is Segment 3, which runs until the Hell Gate Bridge and has a boundary that includes the area within 233 feet of the rail line.

IDENTIFICATION OF POPULATIONS OF CONCERN WITHIN STUDY AREAS

As discussed above, the environmental justice analysis must assess impacts on two populations of concern—minority populations and low-income populations. The assessment to identify populations of concern was performed for those study areas with adverse noise impacts, as discussed above.

The characteristics of the neighborhood areas making up the individual rail segments in the project study area are described below. Table 17-1 summarizes the overall demographic characteristics of the study areas with adverse impacts. The table includes a demographic profile of each study area, as well as the overall demographic profile of the larger geographic area of comparison. The study areas in which minority populations and/or low-income populations meet

the above thresholds are shaded in Table 17-1. Figures 17-1 through 17-4 show the block groups where minority populations and/or low-income populations are located.

Table 17-1
Population Demographic Summary

Study Area	Total Population	Population Characteristics (%)						Median Household Income	Pop. Below Poverty Level (%)	Impacts
		White	Black	Asian	Other	Hispanic	Total Minority			
New Jersey										
Hudson County										
Hudson County	*608,975*	*55.6%*	*13.5%*	*9.4%*	*21.6%*	*39.8%*	**64.7%**	*$40,293*	*15.5%*	
Greenville Branch	1,330	17.1%	66.6%	3.0%	13.2%	22.4%	**92.5%**	$44,535	19.2%	Noise, Air
National Docks Seg. 2	7,988	25.6%	38.3%	22.2%	13.9%	16.5%	**81.6%**	$34,258	22.2%	Noise
New York										
Staten Island										
Richmond County	*443,728*	*77.6%*	*9.7%*	*5.7%*	*7.1%*	*12.1%*	**28.7%**	*$55,039*	*10.0%*	
Northern Staten Is. RR Seg. 1	6,938	38.4%	38.8%	1.8%	21.0%	30.4%	**72.3%**	$38,253	23.1%	Noise, Air
Northern Staten Is. RR Seg. 2	4,612	30.7%	37.4%	2.6%	29.3%	40.0%	**80.4%**	$36,766	24.6%	Noise, Neigh. Char., Air
Brooklyn										
Kings County	*2,465,326*	*41.2%*	*36.4%*	*7.5%*	*14.8%*	*19.8%*	**65.3%**	*$32,135*	*25.1%*	
Bay Ridge Branch Seg. 2	3,543	29.9%	1.0%	54.8%	14.3%	14.8%	**74.9%**	$28,029	25.8%	Constr., Air
Bay Ridge Branch Seg. 3	59,633	59.0%	24.0%	9.3%	7.7%	7.6%	**43.9%**	$37,705	19.6%	Noise, Neigh. Char., Air
Bay Ridge Branch Seg. 4	10,744	6.9%	74.4%	0.9%	17.8%	24.0%	**97.5%**	$34,416	28.0%	Noise, Air
Queens										
Queens County	*2,229,379*	*44.1%*	*20.0%*	*17.6%*	*18.3%*	*25.0%*	**67.1%**	$42,439	*14.6%*	
Bay Ridge Branch	10,628	65.1%	4.6%	5.0%	25.3%	39.2%	**49.0%**	$38,727	15.0%	Noise, Air Neigh. Char.
Montauk Branch West	11,563	80.7%	1.4%	3.5%	14.7%	26.4%	**31.7%**	$40,386	11.9%	Noise
Montauk Branch East	10,064	70.5%	4.8%	9.7%	15.0%	19.6%	**39.2%**	$43,185	11.8%	Noise
Fremont Sec. Seg. 1	11,949	74.6%	0.5%	18.7%	6.2%	11.2%	**32.2%**	$46,441	10.4%	Noise
Fremont Sec. Seg. 2	18,651	31.5%	1.5%	46.4%	20.5%	30.4%	**83.8%**	$37,550	18.0%	Noise
Fremont Sec. Seg. 3	13,023	72.1%	1.2%	8.7%	18.0%	18.5%	**37.3%**	$39,871	14.9%	Noise

TOTAL STUDY AREA

Under the New Jersey tunnel alignment, approximately 151,000 people live in the potentially impacted study areas, of which 77,000 or 51 percent, represent minority populations. Under the Staten Island tunnel alignment, the total impacted population is approximately 170,000 with the minority representation of 91,000 or 54 percent.

NEW JERSEY

As of the year 2000, the total impacted population along the Greenville Branch is slightly over 1,300 people. As shown in Table 17-1, the population is overwhelmingly minority (93 percent). More than half of the population (67 percent) is Black followed by White (17 percent) and Other (13 percent). The Hispanic population represents approximately 22 percent of the total population in 2000. Although the majority of residents living in Hudson County are minority, the county has more White residents (56 percent) and has a higher Hispanic population (40 percent) than the Greenville Branch study area. Although the poverty level along the Greenville Branch (19 percent) is higher than Hudson County (16 percent), it is lower than the project-wide City threshold of 21 percent, and the median household income along the Greenville Branch is approximately $45,000, which is higher than the $40,000 in Hudson County. Figure 17-4 shows that the Greenville Branch is made up of 9 blocks of which 7 are predominately minority. The study area is also made up 6 block groups and 2 of those blocks have residents that live below poverty.

Covering a larger area, Segment 2 of the National Docks Secondary has a potentially impacted population of almost 8,000 people. Similar to the Greenville Branch, the population along this segment is also predominately minority (82 percent) with Black representing about 38 percent, Whites represent 26 percent, and Asians representing 22 percent. In addition to being a minority population, Segment 2 of the National Docks is also a low-income community with 22 percent of the total population living below the poverty level, as compared to 16 percent in Hudson County. The median household income of $34,000 is less than the median household income along the Greenville Branch and Hudson County. As shown in Figure 17-4, Segment 2 is predominately minority with 26 of the 27 blocks having a minimum of 55 percent minority population. With poverty levels higher then the county, the study area is made up of 14 block groups and half have residents living below the poverty threshold.

STATEN ISLAND

The study area along Segment 1 of the Northern Staten Island Railroad has approximately 7,000 people, as of the year 2000 (see Table 17-1). Unlike Richmond County where White residents made up roughly 78 percent of the total population in Staten Island, Segment 1 was almost split between White (38 percent) and Black (39 percent). With the Hispanic population making up approximately 30 percent of the population, the minority population comprises 72 percent of the total population in Segment 1 compared to 29 percent in Richmond County. The median household income in Segment 1 ($38,000) is less than Richmond County ($55,000), and approximately 23 percent of the total population in Segment 1 lives below the poverty level as compared to only 10 percent in Richmond County and 21 percent in New York City. Therefore, Segment 1 of the Staten Island Railroad is considered a low-income community. Segment 1 is made up of 46 blocks and 35 of them are predominately minority residents (see Figure 17-4). The study area is also made up of 10 block groups that were the basis for the income analysis. Half of the block groups are made up of residents living below poverty.

Segment 2 of the Staten Island Railroad is less populated than Segment 1 with 4,600 people. As shown in Table 17-1, Segment 2 is also a minority community with roughly 80 percent of the total population in the study area minority. Similar to Segment 1, the racial make-up of Segment 2 is mostly made up of Black (37 percent) and White (31 percent). Segment 2 has a Hispanic population of 40 percent and 29 percent of residents classify themselves as Other. The median household income of $37,000 is similar to Segment 1 ($38,000) but less than Richmond County ($55,000). Almost 25 percent of the total population in this segment lives below the poverty level, compared to 10 percent in all of Richmond County and 21 percent in New York City. As shown in Figure 17-4, Segment 2 is made up of 46 blocks and 45 are minority blocks. Similarly, the segment is made up of 9 block groups of which 4 have residents who live below the poverty level.

BROOKLYN

The least populated of all the study areas in Brooklyn, Segment 2 of the Bay Ridge Branch has less than 3,600 people as of the year 2000 (see Table 17-1). Approximately 75 percent of the total population living along Segment 2 is minority. The Segment 2 study area is mostly Asian (55 percent) and White (30 percent). Hispanic residents comprise almost 15 percent of the total population. Residents living along Segment 2 earned the least income with median household income at $28,029, compared to Brooklyn's median household income of $32,135. Twenty-six (26) percent of the population in Segment 2 lives below poverty level, slightly higher than Kings County (25 percent) and New York City (21 percent). Segment 2 of the Bay Ridge Branch is therefore considered a low-income community. Figure 17-4 shows that Segment 2 is made up of 16 blocks, of which 13 are minority. Similarly, of the 6 block groups that make up this segment, 5 are made up of residents who live below the poverty level.

Segment 3 of the Bay Ridge Branch as a whole is neither a low-income nor minority area. Forty-four (44) percent of this area's estimated 60,000 residents are members of a minority group (less than the 50 percent threshold), and 19.6 percent of the population lives below the poverty level, compared to a much higher 25 percent living below poverty in Kings County and 21 percent in New York City. The segment is made up of 206 blocks of which 72 are predominately minority (see Figure 17-4). Figure 17-4 also shows that Segment 3 is made up 59 block groups of which 25 contain residents living below the poverty level.

As shown in Table 17-1, Segment 4 of the Bay Ridge Branch had slightly less than 11,000 people in 2000. It also had the highest percentage of minorities (98 percent) of any other study area within the project. Approximately 74 percent of the total population is made up of Black residents and 24 percent of the population was Hispanic. Although the median household income of $34,000 is higher than Kings County ($32,000), the percentage of people living below the poverty level (28 percent) is greater than Kings County (25 percent) and New York City (21 percent), and is therefore considered a low-income community. As shown in Figure 17-4, the study area is made up of 73 blocks and 72 of them have predominately minority residents. Segment 4 is made up of 35 block groups of which 21 have residents living below the poverty level.

QUEENS

The Queens portion of the Bay Ridge Branch contains an estimated 11,000 people. As indicated in Table 17-1, the study area is not a minority or low-income community. Forty-nine (49) percent of the area is minority, less than the 50 percent threshold and the 67 percent in Queens.

Fifteen (15) percent of households live in poverty, which is slightly above the 14.6 percent in Queens, and below the 21 percent in New York City. The median income of this segment ($38,727) is less than the Queens median of $42,439. Figure 17-4 shows the distribution of the minority populations in the segment--approximately 23 blocks out of the 52 that make up the Queens portion of the Bay Ridge Branch are minority. Similarly, of the 17 block groups that define the boundaries for the income analysis, only 3 are made up of low-income residents (see Figure 17-4).

The Montauk Branch West study area is made up of approximately 12,000 people and is not a minority or low-income community. The minority residents represent less than 32 percent of the total population and less than 12 percent of the population is living in poverty (see Table 17-1). The minority representation and the poverty level in the study area is less than Queens County where minorities make up 67 percent and 15 percent of the population live in poverty, and the New York City comparisons of 65 percent minority and 21 percent in poverty. As shown in Figure 17-4, specific blocks along the Montauk West Branch are predominately minority. The study area is made up of 65 blocks of which 12 have minority populations that make up more than 50 percent. Figure 17-4 shows that only one block group out of the 17 that make up the Montauk West Branch is low-income.

Montauk Branch East has about 10,000 people and is the smallest impacted populated of the all the study areas in Queens (see Table 17-1). With only 39 percent minority residents and less than 12 percent living in poverty, the Montauk Branch East is not a minority or low-income community. Similar to Montauk Branch West, Montauk Branch East's minority population as well as poverty level is less than Queens County and guidance thresholds. The median income of the segment ($43,185) is slightly higher than the Queens median income ($42,439). As shown in Figure 17-4, the central and eastern portions of the segment have concentrations of minority residents—of the 91 blocks that make up the study area, 22 are predominately minority. Figure 17-4 also shows areas within Montauk East that have populations living below the poverty level. As can be seen, only three block groups out of 28 have residents living in poverty.

Segments 1 and 3 of the Fremont Secondary Line have approximately 12,000 and 13,000 people living within the study area boundaries, respectively. Neither segment is a minority or low-income community with minorities representing less than 40 percent of the total population and the poverty level below 15 percent (see Table 17-1). This minority percentage is less than that of New York City (65 percent) and Queens County (67 percent), and below the federal guidance threshold of 50 percent. The poverty level of Queens County is approximately equal to Segment 3 but higher than Segment 1 (all are below the New York City poverty percentage of 21). The median income of Segment 1 ($46,411) is above that of Queens County ($42,439), but the median income of Segment 3 is below ($39,871). Both of the segments have minority concentrations dispersed along their study area corridors (see Figure 17-4). Segment 1 had 20 blocks out of 71 that were made up of mostly minority people while Segment 3 had 14 blocks out of 59. As shown in Figure 17-4, poverty levels in both segments were less concentrated with Segment 1 having only 1 out of 21 block groups that had people living in poverty and Segment 2 had 3 out of 15 block groups.

With the highest number of people among all of the study areas in Queens, Segment 2 of the Fremont Secondary Line has roughly 19,000 residents (see Table 17-1). Unlike the other study areas in Queens, Segment 2 is the only minority study area (84 percent), which is also higher than Queens County (67 percent). Similar to all of the other study areas in Queens, Segment 2 is not a low-income community with 18 percent of households living in poverty (less than the 21

percent in New York City), although the median income of $37,550 is less than that of Queens County ($42,439). However, out of the 14 block groups that define the study area for the income analysis, five have people living below the poverty level (see Figure 17-4).

D. SIGNIFICANT ADVERSE ENVIRONMENTAL EFFECTS

Evaluated in this section are the noise, neighborhood character, air quality, and construction impacts for all study areas (those with and without populations of concern that meet the above thresholds) that would experience adverse impacts. Section E of this chapter, "Conclusions on Disproportionate Project Impacts," discusses where these environmental effects are expected to be disproportionately impacting low-income or minority populations.

The next step in the process is the identification of significant adverse environmental or human health effects to be addressed in the environmental justice assessment. Guidance provided by the above referenced documents indicates that adverse environmental and human health effects to be considered include social and economic effects; air, noise, water pollution, and soil contamination; destruction or disruption of man-made or natural resources; destruction or diminution of aesthetic values; destruction or disruption of community cohesion or a community's economic vitality; destruction or disruption of the availability of public and private facilities and services; vibration; adverse employment effects; displacement of persons, businesses, farms, or nonprofit organizations; increased traffic congestion; isolation, exclusion or separation of minority or low-income individuals within a given community or from the broader community; and the denial of, reduction in, or significant delay in the receipt of, benefits of FHWA programs, policies, or activities.[*]

Of these environmental justice impacts, one or more of the project alternatives would have the potential to result in significant hazardous materials, traffic, air, vibration, noise, neighborhood character, and construction impacts (as assessed in the technical chapters of this EIS). Significant hazardous materials, traffic, and vibration impacts will be fully mitigated by measures committed to by the project sponsors and under requirements of federal, state and local regulations. Therefore, this environmental justice assessment focuses on significant noise, neighborhood character, air quality, and construction impacts as described in Chapter 3, "Land Use, Zoning and Public Policy, Neighborhood Character, and Social Conditions," Chapter 9, "Air Quality," Chapter 10, "Noise and Vibration," and Chapter 16, "Construction and Construction Impacts." As described in the assessment below, many of the noise and neighborhood character impacts could be mitigated with the use of sound barriers and other noise mitigation, while some are unmitigable. In addition, the businesses to be displaced at West Maspeth Yard for the Tunnel Alternative were considered, as discussed in Chapter 4, "Economic Conditions and Impacts."

In general, the temporary adverse impacts during construction and the benefits that would result from operation of the project would be distributed evenly throughout the long and linear corridor study area, an area that includes populations of concern for environmental justice (i.e., low-income and/or minority populations) as well as populations that are not of concern. The significant adverse impacts that would occur to low-income and minority populations are summarized below.

[*] Section 2.f., *Final Order on Environmental Justice*, U.S. Department of Transportation, April 1997.

Since the TSM and Expanded Float Operations Alternatives do not result in significant noise, air, construction, or neighborhood character impacts, there are no environmental justice impacts associated with these alternatives. Therefore, the assessment addresses the No Action Alternative and Tunnel Alternative only.

NO ACTION ALTERNATIVE

Under the No Action Alternative, activities unrelated to the proposed project would occur. Construction activity consisting primarily of track work and roadway improvements would be expected to occur within the New Jersey rail corridor study areas. Several developments and public policy changes are expected to affect the New York study areas. In Staten Island, reactivation of rail service as well as rezoning of parcels are expected. In Brooklyn, numerous parcels would be developed in the general vicinity of the study areas, as well as a possible extension of Flatbush Terminal. Projects likely to occur in Queens study areas include the construction of 70 housing units at Admiral Avenue. These projects are not part of the Cross Harbor Freight Movement Project, and would be built or implemented with or without the project.

TUNNEL ALTERNATIVE

ADVERSE NEIGHBORHOOD CHARACTER IMPACTS

The Tunnel Alternative has the greatest potential to result in significant noise impacts due to an increase of train activity on existing rail lines or in rail yards which currently have little or no train traffic. The majority of the study areas, are located in places where there are existing industrial land uses, and where existing rail lines and yards are in operation. Consequently, additional rail usage and related land uses are in keeping with the character of the study areas.

Under the Double Tunnel System, adverse neighborhood character impacts were identified for the following study areas: portions of the Northern Staten Island Study Area-Segment 2; Bay Ridge Branch Segment 3; and the Queens portion of the Bay Ridge Branch Study Area. The Northern Staten Island Study Area-Segment 2 meets the thresholds identified above for populations of concern. Under the Staten Island tunnel alignment, all of these study areas would be affected. Under the New Jersey alignment, only the Bay Ridge Branch Study Area-Segment 3 and Queens portion would be affected.

Under the Single Tunnel System, adverse neighborhood character impacts would occur only in the Northern Staten Island Study Area–Segment 2 for the Staten Island tunnel alignment. No adverse neighborhood character impacts would be generated by the New Jersey alignment of the Single Tunnel System.

Northern Staten Island – Segment 2

Under the Staten Island alignment of the Double Tunnel System, 64 trains would travel along the currently inactive Staten Island Railroad. The rail line is elevated on a viaduct for part of the Segment 2 study area between Nicholas Avenue and Richmond Terrace and slightly below grade from this point to Alaska Street. The elevated portion of the rail line travels through the Port Richmond community which is primarily residential with some commercial and industrial uses, while the below grade portion travels through a heavily industrial area. As set forth in Chapter 10 “Noise and Vibration,” it is anticipated that there would be significant noise impacts on residences within 871 feet of the elevated portion of the rail line, and for community facilities

and open spaces within 190 feet of the this portion of the rail line. Due to these significant impacts over large distances, there would be an adverse impact on neighborhood character. These impacts are unmitigable because there is no feasible mitigation for rail lines that are elevated on viaducts. In the non-elevated portion, there would be no adverse impacts on neighborhood character.

Under the Staten Island alignment of the Single Tunnel System, 24 trains would travel along the rail segment. As discussed in Chapter 10, these train passbys would result in severe noise impacts. The affected area would, however, be smaller than under the Double Tunnel System. Residences within approximately 452 feet and community facilities and open spaces within 140 feet would be affected. There would be an adverse impact on neighborhood character.

Bay Ridge Branch of the LIRR - Segment 3

Under either alignment of the Double Tunnel System, freight traffic along the Bay Ridge Branch would increase to 72 trains from 2 trains daily under the No Action Alternative. Along this section of the Bay Ridge Branch, there are a mix of residential (including low-, mid-, and high-rise buildings) and industrial uses, as well as many community facilities. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be significant noise impacts on residences within 580 feet of the rail line and on community facilities within 75 feet of the rail line. Due to this significant impact on residential uses over a large distance, there would be an adverse impact on neighborhood character. Significant noise impacts on the schools would be mitigated as described in Chapter 10. Adverse neighborhood character impacts could be mitigated with the placement of noise barriers that are effective for buildings of two stories or less, which represents a large proportion of buildings in the study area.

Under the Single Tunnel System, freight traffic along Segment 3 would be increased to 32 trains under the Staten Island alignment and 36 trains under the New Jersey alignment. As discussed in Chapter 10, this would result in severe noise impacts. The affected area would, however, be smaller than under the Double Tunnel System and neighborhood character would not be adversely affected. Residences within approximately 260 feet would be significantly impacted. No community facilities would be significantly impacted. As under the Double Tunnel System, noise impacts could be mitigated with the placement of noise barriers.

Bay Bridge Branch of the LIRR (Queens Portion)

Under the Double Tunnel System, freight traffic along this section of the Bay Ridge Branch would increase to 72 trains from 2 trains daily under the No Action Alternative. Along this section of the Bay Ridge Branch there are a mix of residential and industrial facilities, as well as a number of community facilities and an open space, Evergreen Park. The detailed noise impact assessments provided in Chapter 10, "Noise and Vibration," indicate that there would be significant noise impacts on residences within approximately 496 feet of the right-of-way, and on community facilities and open space within 150 feet. Due to the significant noise impact on residential uses over large distances, there would be an adverse impact on neighborhood character. Significant noise impacts on the school will be mitigated as described in Chapter 10. Adverse neighborhood character impacts could be mitigated with the placement of noise barriers that are effective for buildings of two stories or less.

Under the Single Tunnel System, freight traffic would increase to 50 passbys per day under the Staten Island alignment and 54 under the New Jersey alignment, partially due to the local trains

traveling between Fresh Pond Yard and the New Lots rail sidings. The detailed noise impact assessments presented in Chapter 10 indicate the impacts along Segment 4 would not be severe and would not affect a large area. Residences within approximately 248 feet and community facilities within approximately 75 feet would experience noise impacts. Neighborhood character would not be adversely impacted.

ADVERSE NOISE IMPACTS

Under the Double Tunnel System, adverse noise impacts were identified for several study areas. Under the Staten Island tunnel alignment, 13 study areas would be affected, while under the New Jersey tunnel alignment, 11 study areas would be affected. Six of these study areas, Greenville Branch, National Docks Secondary [Segment 2], Northern Staten Island [Segments 1 and 2], Bay Ridge Branch [Segment 4], and Fremont Secondary, [Segment 2], meet the thresholds identified above for populations of concern. Three of these study areas, Northern Staten Island [Segments 1 and 2] and National Docks Secondary [Segment 2] would not be impacted under the New Jersey alignment. Greenville Branch would not be impacted under the Staten Island alignment. The noise impacts at Greenville Branch, National Docks Secondary [Segment 2], and Bay Ridge Branch [Segments 2 and 4] are predicted to be "impacts," rather than "severe impacts," as discussed in Chapter 10, and therefore may not be perceptible to residents.

Under the Staten Island alignment of the Single Tunnel System, severe noise impacts were identified for 4 study areas, two of which are communities of concern (Staten Island Segments 1 and 2). Under the New Jersey alignment of the Single Tunnel System, severe noise impacts were identified for 2 study areas, neither of which are communities of concern.

While the Single and Double Tunnel Systems would result in adverse noise impacts along many segments of the rights-of-way, not all of the segments would be impacted to the same degree. In some cases, the noise impact would result in an overall neighborhood character impact (see above), while in others only the first row of houses abutting the rail line would experience an impact. Table 17-2 compares the estimated number of affected residences for each alignment of the Double Tunnel System.

New Jersey

The Staten Island alignment of the Single or Double Tunnel System would result in an adverse noise impact along Segment 2 of the National Docks Secondary. The New Jersey alignment of the Single or Double Tunnel System would result in a noise impact along the Greenville Branch. As described in Chapter 10, the impacts along these rail lines would not be considered "severe" impacts, and would affect only residential and/or other nighttime land uses within a short distance.

Staten Island

Land uses along the right-of-way of the Staten Island Railroad would only be impacted by the Staten Island tunnel alignment. Under both the Single and Double Tunnel Systems, a severe impact would occur along Segments 1 and 2 for Category 2 uses. Category 3 uses in Segment 2 would experience a severe impact and in Segment 1 it would not be severe. As discussed above, due to the distance the noise impact would involve in Segment 2, it was determined that the Staten Island tunnel alignment would have a neighborhood character impact in this segment under both the Single and Double Tunnel Systems.

Brooklyn

Both the Single and Double Tunnel Systems would result in severe noise impacts on Category 2 land uses along Segment 3 of the Bay Ridge Branch. As discussed above, the Double Tunnel System would cause severe noise impacts over a large area, thereby adversely affecting neighborhood character. Under the Single Tunnel System, the affected area is smaller and neighborhood character would not be adversely affected. Segment 4 of the Bay Ridge Branch would experience impacts under the Single and Double Tunnel Systems (as explained in Chapter 10, these would not be categorized as severe impacts).

Queens

Under the Double Tunnel System, the portion of the Bay Ridge Branch in Queens would experience severe noise impacts for both Category 2 and 3 land uses under either tunnel alignment as would Category 2 uses around Fresh Pond Yard and Montauk Branch West. In addition, Category 2 uses along all segments of the Fremont Secondary would experience severe impacts. Category 3 uses along all the Queens Portion of the Bay Ridge Branch would experience severe impacts. Noise impacts along the Queens Portion of the Bay Ridge Branch would result in neighborhood character impacts.

Under the Single Tunnel System, the Montauk Branch West would experience severe impacts on Category 2 uses. Neighborhood character would not be adversely impacted.

Noise Mitigation

On a preliminary basis, use of sound barriers is being considered for locations where significant impacts are predicted to occur, along rail lines where the track is located either at-grade, in cut section, or on an embankment and along sections of Fresh Pond Yard. These sound barriers would be most effective in mitigating noise impacts on buildings with two stories or less. Under the Double Tunnel System, areas that would be evaluated for noise wall mitigation along rail lines include non-industrial areas along the Staten Island Railroad, Bay Ridge Branch, Montauk Branch, and Fremont Secondary. Under the Single Tunnel System, noise wall mitigation would be evaluated for areas along the Staten Island Railroad, Bay Ridge Branch, and Montauk Branch. Sound barriers are not proposed for sections of these rail lines along elevated viaducts, because they would be ineffective due to openings in the track support structure and the track support structure could not support the weight of the barriers without significant and costly structural improvements. At such locations, substantial modifications or replacement of the guideway structure to provide a solid guideway would be needed.

Locations with elevated viaducts where severe impacts are predicted to occur under the Double Tunnel System include the Staten Island Railroad (a portion of Segment 2) and Fremont Secondary (a portion of Segment 2 and all of Segment 3). Under the Single Tunnel System, Segment 2 of the Staten Island Railroad would be the only location with elevated viaducts where severe impacts area predicted to occur. The Staten Island Railroad would be impacted under the Staten Island tunnel alignment only and would be unmitigable. The feasibility and effectiveness of installing sound barriers and of implementing other path treatment measures is being evaluated, and the results of that evaluation will be presented in the FEIS. The Greenville Branch and National Docks Secondary (Segment 2) would experience noise impacts, but not severe noise impacts. As explained in Chapter 10, the predicted increases for these segments are less than 3 dBA, and may not be perceptible to residents. However, as discussed below, the necessity and feasibility of noise barriers and/or other mitigation measures along these segments will be investigated further as the project proceeds.

SIGNIFICANT AIR QUALITY IMPACTS

While the project would result in air quality benefits throughout the New York-New Jersey metropolitan area, localized air quality impacts would occur at several locations. Under both the Single and Double Tunnel System, the increase in $PM_{2.5}$ concentrations near Fresh Pond Yard and West Maspeth Yard could only be partially mitigated based on the new interim NYSDEC and NYCDEP significant impact criteria. As explained in Chapter 9, $PM_{2.5}$ and NO_2 emissions at the northern portal of the East New York Tunnel along Segment 4 of the Bay Ridge Branch may exceed the National Ambient Air Quality Standards (NAAQS). In addition, increases in $PM_{2.5}$ concentrations at the closest residential receptors along Segments 2, 3, and 4 of the Bay Ridge Branch, as well as portions of the Greenville Branch and possibly other rail segments, would also exceed the same interim criteria. However, on a neighborhood scale (averaged over 1 kilometer) the increases would not be significant.

SIGNIFICANT CONSTRUCTION IMPACTS

In terms of construction impacts, due to the available rail and barge access that would minimize truck use, as well as the relative isolation of many of the construction sites, only two areas would encounter construction activities long enough and disruptive enough to be significantly impacted by those activities. One area is the cut and cover section in Segment 3 of the Staten Island Railroad where tunnel boring operations for the rock tunnel in Staten Island would be accessed. The other is the Brooklyn cut-and-cover section in Segment 2 of the Bay Ridge Branch which would serve as the shaft site for the tunneling operation under the harbor for the Staten Island alignment. In both cases, the impacts relate to the nearly 24-hour operation of the tunneling work as well as the noise and air pollutant emissions from the equipment at the shaft sites. While many of the impacts could be mitigated to one degree or another, the disruptive nature of the work and the duration of such work in close proximity to residential uses would constitute an unavoidable adverse impact under both the Single and Double Tunnel Systems.

SIGNIFICANT DISPLACEMENT IMPACTS AT WEST MASPETH YARD

An analysis of the businesses to be displaced at West Maspeth Yard for the Tunnel Alternative is presented in Chapter 4, "Economic Conditions and Impacts." The area surrounding West Maspeth Yard is considered neither low income nor minority**.** A preliminary assessment of the characteristics of the businesses to be displaced and their "uniqueness" was performed. For the Double Tunnel System, between 44 and 52 businesses would be displaced. For the Single Tunnel System, 25 to 29 businesses would be displaced. The majority of the businesses to be displaced are in wholesale trade, motor freight and transportation, business services, and printing/publishing (see Tables 4-13 and 4-21). The initial analysis concluded that these businesses do not possess unique characteristics that would restrict relocation.

As explained in Chapter 4, it is planned that all displaced businesses will be relocated within the greater Maspeth area, and that no jobs will be lost as a result of the relocations. As the project proceeds, additional information about these businesses will be obtained.

E. CONCLUSIONS ON DISPROPORTIONATE PROJECT IMPACTS

As discussed above, the Tunnel Alternative would result in adverse impacts in many of the areas studied as part of the project. As identified above, some of these adversely impacted study areas include low-income and/or minority communities while others are neither

low-income nor minority. It is clear that the adverse impacts associated with the Tunnel Alternative would not affect only low-income or minority communities. The adverse impacts would be located along several locations throughout the project study area, which is a long and linear area following existing rail lines in the New York-New Jersey metropolitan region.

Whereas environmental justice assessments often focus on the demographics of one community in which a new facility (such as a landfill or power plant) is planned to be sited and compare it to the demographics of the surrounding communities, this project would be based around existing rail lines that traverse many communities. This environmental justice assessment therefore must consider the demographics of all the impacted communities, the county and/or borough, and the region as a whole, rather than just one community and its immediate surroundings.

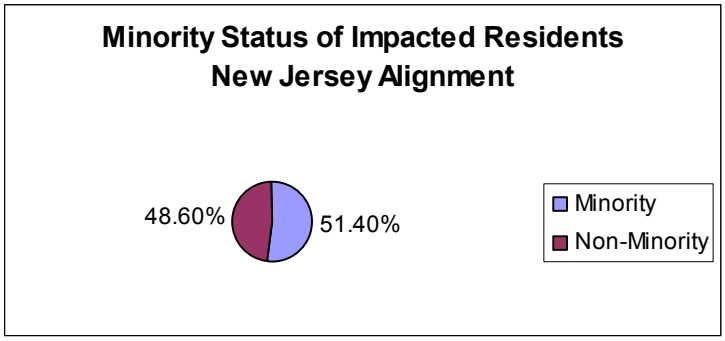
The final step in this analysis is the determination as to whether the minority and/or low-income communities are experiencing a disproportionate share of environmental and/or human health effects in comparison to the greater population. This has been determined by: (1) considering the overall project study area and the number of minority and/or low-income residents who would be adversely impacted; (2) considering the rail segment study areas and the number of minority and/or low-income communities that would be adversely impacted; and (3) comparing the severity and pervasiveness of the adverse impacts among the minority and/or low-income communities and the non-minority/non-low-income communities. The feasibility and effectiveness of mitigation measures are also discussed.

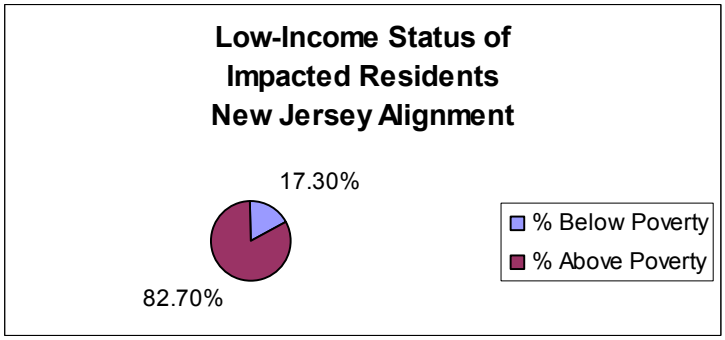
EVALUATION OF DISPROPORTIONALITY BY PROJECT STUDY AREA

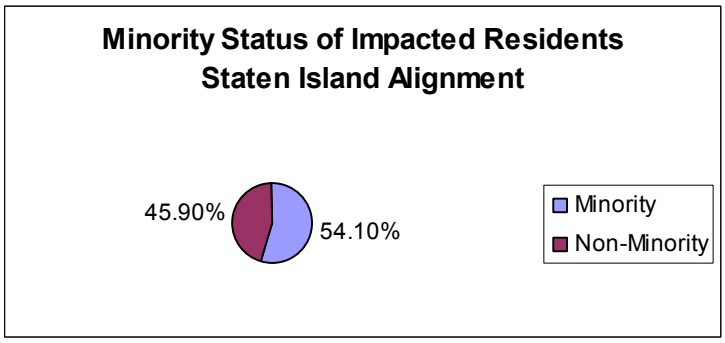
To obtain an overall project-wide perspective of the impacts, compared in Table 17-2 is the total number of residents affected by noise impacts in all study areas for each alignment of the Double Tunnel System, as well as the minority and low-income percentages. This indicates whether most of the adversely impacted residents are minority or low-income.

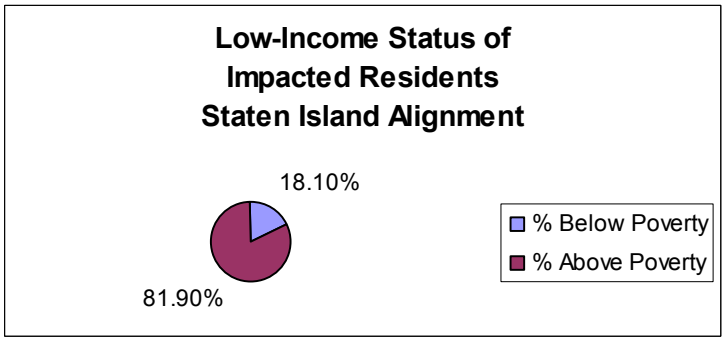
Table 17-2
Noise-Impacted Population for Double Tunnel System

New Jersey Alignment			Staten Island Alignment		
Total Pop. Impacted	Percent Minority	Percent Below Poverty Level	Total Pop. Impacted	Percent Minority	Percent Below Poverty Level
151,128	51.4%	17.3%	169,336	54.1%	18.1%


Minority Status of Impacted Residents
New Jersey Alignment
48.60%
51.40%
Minority
Non-Minority


Low-Income Status of
Impacted Residents
New Jersey Alignment
17.30%
82.70%
% Below Poverty
% Above Poverty


Minority Status of Impacted Residents
Staten Island Alignment
45.90%
54.10%
Minority
Non-Minority


Low-Income Status of
Impacted Residents
Staten Island Alignment
18.10%
81.90%
% Below Poverty
% Above Poverty

For the New Jersey alignment of the Double Tunnel System, an estimated total of 151,000 residents would be adversely impacted by noise (without mitigation). Fifty-one percent of these residents are minority and approximately 17 percent live in poverty. For the Staten Island alignment of the Double Tunnel System, approximately 169,000 people would be adversely impacted by noise (without mitigation). Fifty-four percent of these residents are minority and about 18 percent live below the poverty level. While these minority percentages are greater than the 50 percent threshold discussed above, they are less than the 65 percent threshold, which is the average minority population for New York City and for Hudson County. The low-income percentages of 17 percent (New Jersey alignment) and 18 percent (Staten Island alignment) are lower than the project-wide poverty threshold of 21 percent. From the above project-wide analysis, the adverse noise impacts would not disproportionately impact minority and/or low-income residents.

As discussed above and in Chapter 10, the Single Tunnel System would also result in noise impacts in many of the study areas. However, the impacts would be less severe and would affect a smaller portion of the communities than under the Double Tunnel System. While the noise impacts for the Single Tunnel System would be lesser than for the Double Tunnel System, the conclusions of the environmental justice assessment are applicable to both systems.

While Table 17-2 provides an overall evaluation of environmental justice from a project-wide perspective, it is necessary to look more closely at the individual study areas with respect to whether a disproportionate number of low-income and/or minority study areas are impacted, the severity of the impacts, and, as necessary, feasible mitigation measures.

EVALUATION OF DISPROPORTIONALITY BY COMMUNITY

Table 17-3 summarizes the noise impacts that would occur to residents from the Single and Double Tunnel Systems, the severity of the impacts, and if the study area was identified as a community of concern in Table 17-1. As discussed above and in Chapter 10, adverse noise effects are classified into “impacts” and “severe impacts.”

As shown in Table 17-3, the noise impacts would occur along study areas identified as communities of concern as well as in non-minority/non-low-income communities. Of the 13 communities that would experience adverse noise impacts, 7 were identified above as communities of concern (see Table 17-1), and 6 were identified as neither minority nor low-income. This is consistent with the long and linear corridor through which these rail lines are located. The existing rail lines traverse through minority and low-income communities as well as non-minority and non-low-income communities. From this perspective, the project would not disproportionately impact communities of concern. However, the severity of the noise impacts and the size of the affected area must also be considered, as is done in the following section.

EVALUATION OF DISPROPORTIONALITY BY IMPACT SEVERITY

The adverse environmental impacts that would result from the Tunnel Alternative would vary in severity among the affected communities. To determine if there would be disproportionately severe impacts on communities of concern, it is necessary to assess compare the severity of the impacts identified in low-income and/or minority communities with the severity of the impacts found in non-low-income/non-minority communities.

Table 17-3
Comparison of Residential Noise Impacts and Demographics, by Study Area

	Community of Concern?	Noise Impacts (Double Tunnel System)	Noise Impacts (Single Tunnel System)
New Jersey			
Greenville Branch	Yes	Impact*	Impact*
National Docks Segment 2	Yes	Impact**	Impact**
Staten Island			
Northern Staten Island Segment 1	Yes	Severe Impact**	Severe Impact**
Northern Staten Island Segment 2	Yes	Severe Impact**	Severe Impact**
Brooklyn			
Bay Ridge Branch Segment 2	Yes	Impact	No Impact
Bay Ridge Branch Segment 3	No	Severe Impact	Severe Impact
Bay Ridge Branch Segment 4	Yes	Impact	Impact
Queens			
Fremont Secondary Segment 1	No	Severe Impact	Impact
Fremont Secondary Segment 2	Yes	Severe Impact	Impact
Fremont Secondary Segment 3	No	Severe Impact	No Impact
Bay Ridge Branch Queens Portion	No	Severe Impact	Impact
Montauk East	No	Severe Impact	Impact
Montauk West	No	Severe Impact	Severe Impact

Notes:
***** Applicable to New Jersey alignment only
** Applicable to Staten Island alignment only

Adverse noise impacts are further categorized into "impacts" or "severe impacts" in accordance with the FTA methodology in Chapter 10, "Noise and Vibration." Environmental justice guidance states that agencies should identify and address disproportionately high and adverse human health and environmental impacts. With respect to noise, "severe impacts" would be considered "high and adverse." Therefore, the focus of this section is the study areas that would experience severe noise impacts. Included in Table 17-3 are the study areas that would experience severe noise impacts. These severe noise impacts would occur in communities of concern as well as in communities that are neither minority nor low-income, and are not disproportionately located. Factors such as the size of the impacted area, the number of residents affected, and the feasibility of mitigation measures should also be considered when comparing impact severity. These factors were used in Chapter 3, "Land Use" to determine which, if any,

study areas would experience noise impacts to a degree that would adversely change the overall neighborhood character. The noise would extend over a large area along some rail segments but only to the first row of houses along other segments. As determined in Chapter 3, the Double Tunnel System would result in severe noise impacts and adverse neighborhood character impacts in the following three communities: Segment 2 of the Staten Island Railroad, Segment 3 of the Bay Ridge Branch, and the Queens portion of the Bay Ridge Branch. Of these three communities, Segment 2 of the Staten Island Railroad was identified as a community of concern. Neither Segment 3 nor the Queens portion of the Bay Ridge Branch is a community of concern. The neighborhood character analysis considered the existing neighborhood character, the size of the area that would be impacted (as shown in Chapter 10), and the estimated number of impacted residents (as shown in Table 17-1).

As provided in regulatory guidance, mitigation measures should be taken into account. In order to determine how many residents would benefit from mitigation measures, further work (such as additional site-specific data collection and sound barrier design) will be performed prior to the FEIS. Existing information was used in Chapters 3 and 10 of this DEIS to estimate the feasibility and effectiveness of sound barriers. While the severe adverse impacts along Segment 3 and the Queens portion of the Bay Ridge Branch could be largely mitigated by constructing noise barriers, such mitigation would not be feasible along the elevated Segment 2 of the Staten Island Railroad. It could be concluded that, after mitigation, the only community with neighborhood character and severe noise impacts would be a low-income and minority community (i.e., Segment 2 of the Staten Island Railroad).

While the demographic analysis performed in this chapter used the Double Tunnel System noise impacts to delineate the study areas, the Single Tunnel System would also result in severe noise impacts along Segment 2 of the Staten Island Railroad and Segment 3 of the Bay Ridge Branch. The noise impacts along the Queens portion of the Bay Ridge Branch would not be severe under the Single Tunnel System. Although the number of affected residents would be less under the Single Tunnel System than those presented in Table 17-1, the general conclusions of the analysis would be the same. The Staten Island alignment of the Single Tunnel System or the Double Tunnel System would result an unmitigated severe impact, which may be disproportionate.

In accordance with NEPA guidance, the identification of a disproportionate adverse impact on a community of concern "does not preclude a proposed agency action from going forward, nor does it necessarily compel a conclusion that a proposed action is environmentally unsatisfactory. Rather, the identification of such an effect should heighten agency attention to alternatives (including alternative sites), mitigation strategies, monitoring needs, and preferences expressed by the affected community or population."[1] Therefore, if the Staten Island alignment is selected as the preferred alternative, further investigation of mitigation measures and additional community input would be required. As stated in Section B above, USDOT's Final Order on Environmental Justice states that if a program or activity is determined to have disproportionately high and adverse effects on minority and/or low-income populations, it will be carried out only if: 1) further mitigation measures or alternatives that would avoid or reduce the disproportionately high and adverse effects are not practicable; 2) a substantial need for the program, policy, or activity exists, based on the overall public interest; and 3) alternatives that would have less adverse effects on protected populations that would still satisfy that need would

[1] Council of Environmental Quality's *Environmental Justice: Guidance under the National Environmental Policy Act*, December 10, 1997.

either have other adverse social, economic, environmental, or human health impacts that are more severe, or would involve increased costs of extraordinary magnitude.

The consideration of alternatives would include considering the New Jersey alignment of the Single or Double Tunnel Systems. Similar to the Staten Island alignment, Segment 3 of the Bay Ridge Branch (neither low-income nor minority) would have adverse neighborhood character and severe noise impacts with the New Jersey alignment of the Single or Double Tunnel System, and the Queens portion of the Bay Ridge Branch would be severely impacted under the Double Tunnel System. The Staten Island segments would not be built under this alternative. However, the Greenville Branch in New Jersey (a community of concern) would experience adverse noise impacts with either the Single or Double Tunnel System. As discussed in Chapter 10, the noise impacts in the Greenville Branch study area would be a change of less than 3 dBA, far less severe than impacts identified in other areas, and would likely be imperceptible. It should be considered, however, that this community has a high minority percentage (92.5 percent), which is greater than that of Hudson County overall (65 percent), and may also experience adverse air quality impacts. The impacts upon this community would not, however, be disproportionate relative to the impacts identified in other communities. Based on the above analysis, the need for mitigation in all adversely impacted study areas will be further investigated during development of the FEIS, and special outreach efforts will be utilized to garner and address the input of communities of concern.

CONCLUSION

The existing rail lines that would form the basis of the project traverse a variety of communities. The adverse impacts that would result from the Tunnel Alternative would affect communities of varying demographics, as would be expected from any large transportation project in the New York-New Jersey Metropolitan area. The benefits of the project, including reduced regional traffic congestion, improved regional air quality, travel efficiencies, and cost savings, and new jobs, would apply to the entire metropolitan region. The adverse impacts associated with the project would be mitigated to the extent feasible. In accordance with NEPA, any communities with severe adverse impacts would be further studied to pursue additional mitigation and/or monitoring needs, and further community input would be sought to avoid or minimize disproportionate impacts.

The above environmental justice analysis concluded that the project would not result in disproportionately high and adverse impacts in communities of concern prior to mitigation. As discussed, however, the potential exists for one community of concern – Staten Island Segment 2 – to be the only unmitigable study area with severe impacts. This may be considered disproportionate, and will be investigated further before the FEIS. ✷

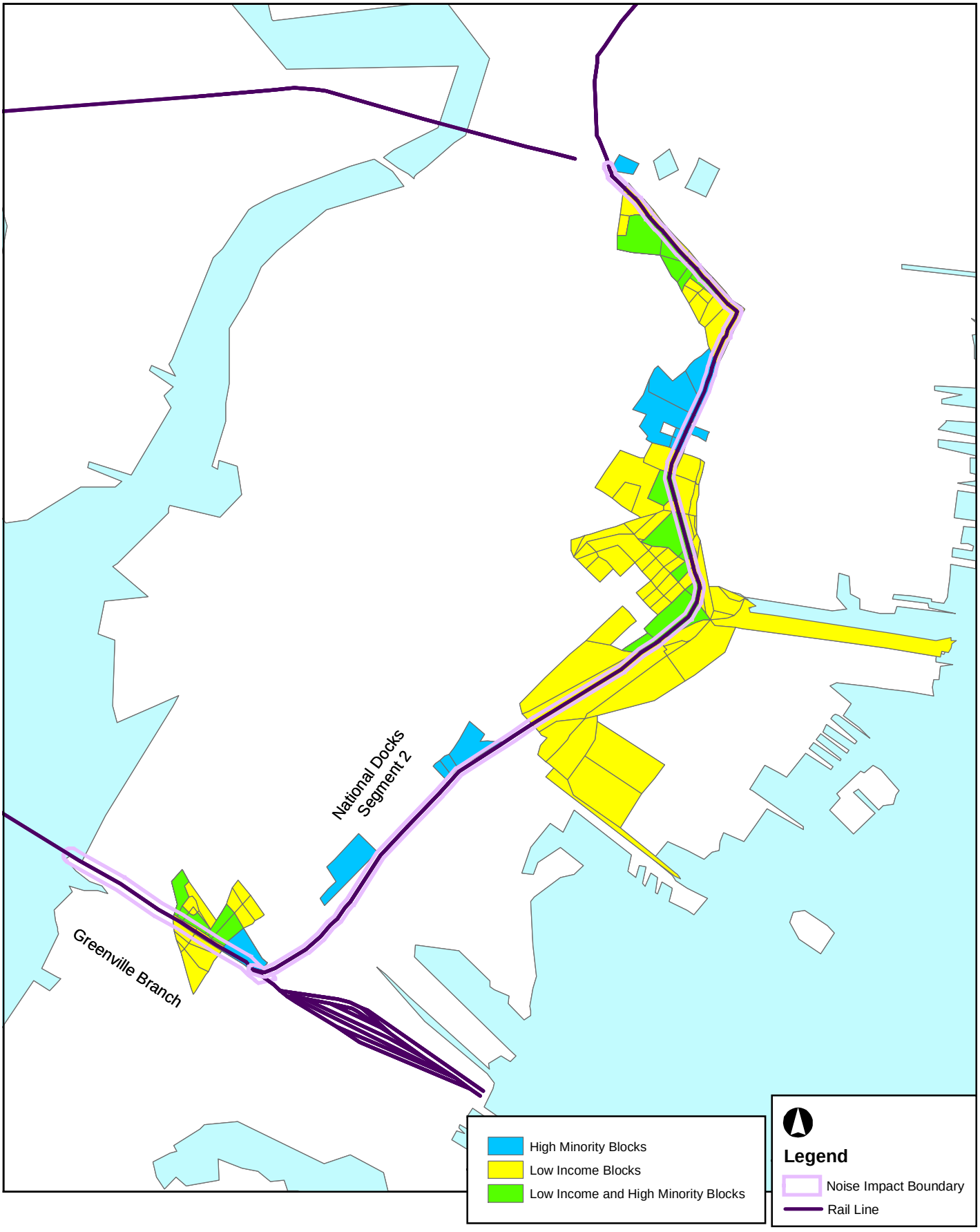


Figure 17-1
Noise Impacted Blocks-New Jersey
CROSS HARBOR FREIGHT MOVEMENT PROJECT

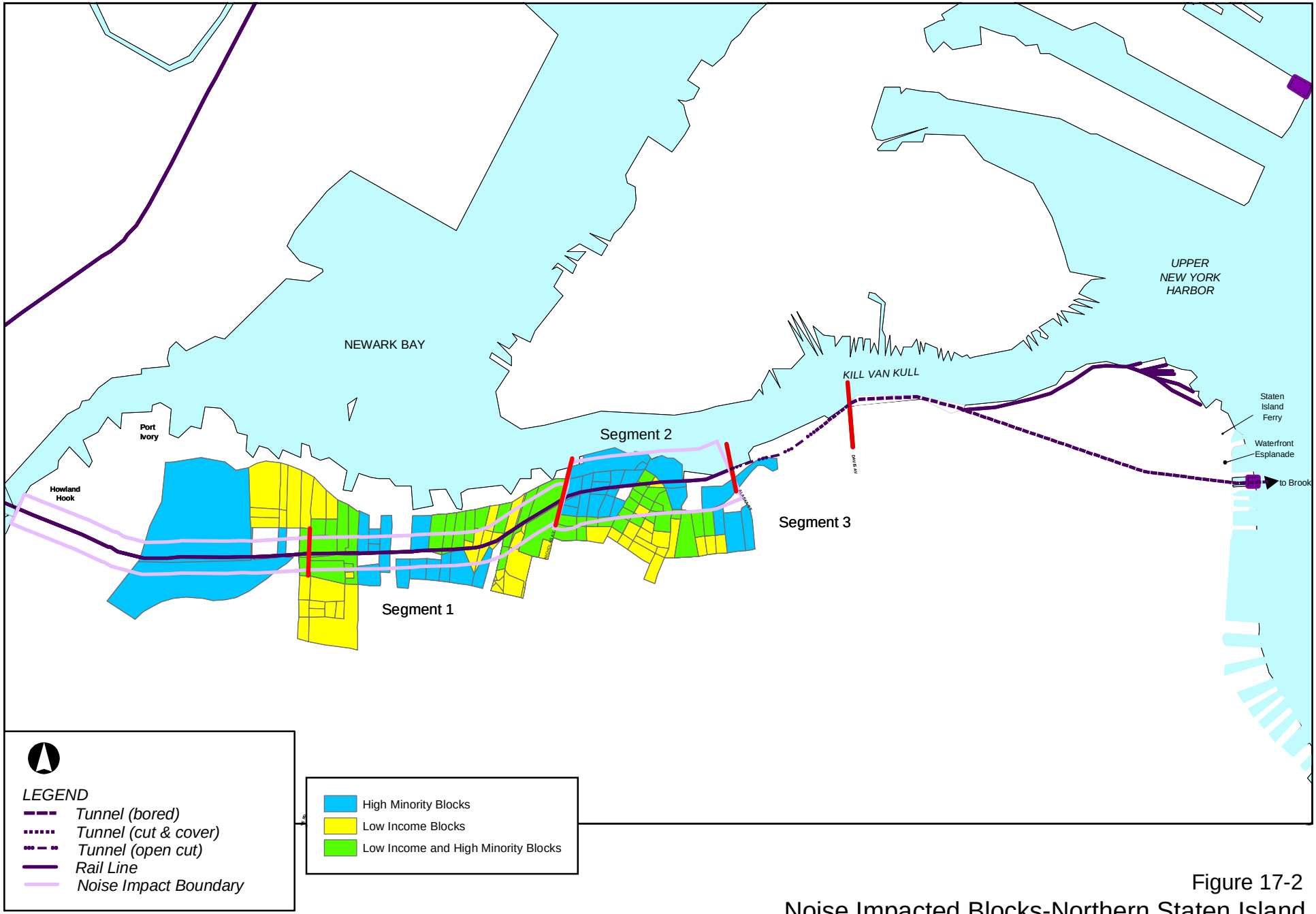


Figure 17-2

Noise Impacted Blocks-Northern Staten Island

CROSS HARBOR FREIGHT MOVEMENT PROJECT

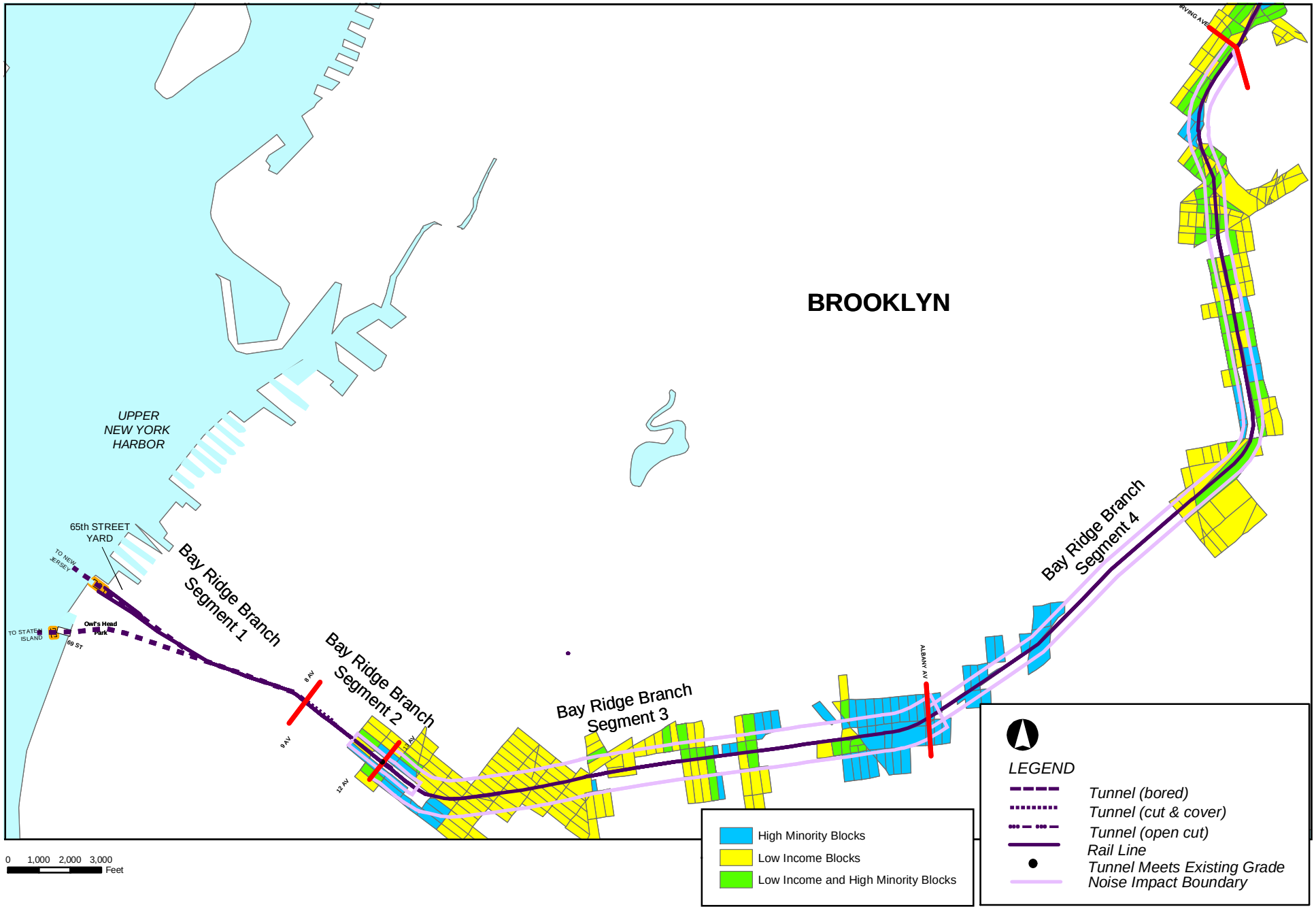


Figure 17-3

Noise Impacted Blocks-Brooklyn

CROSS HARBOR FREIGHT MOVEMENT PROJECT

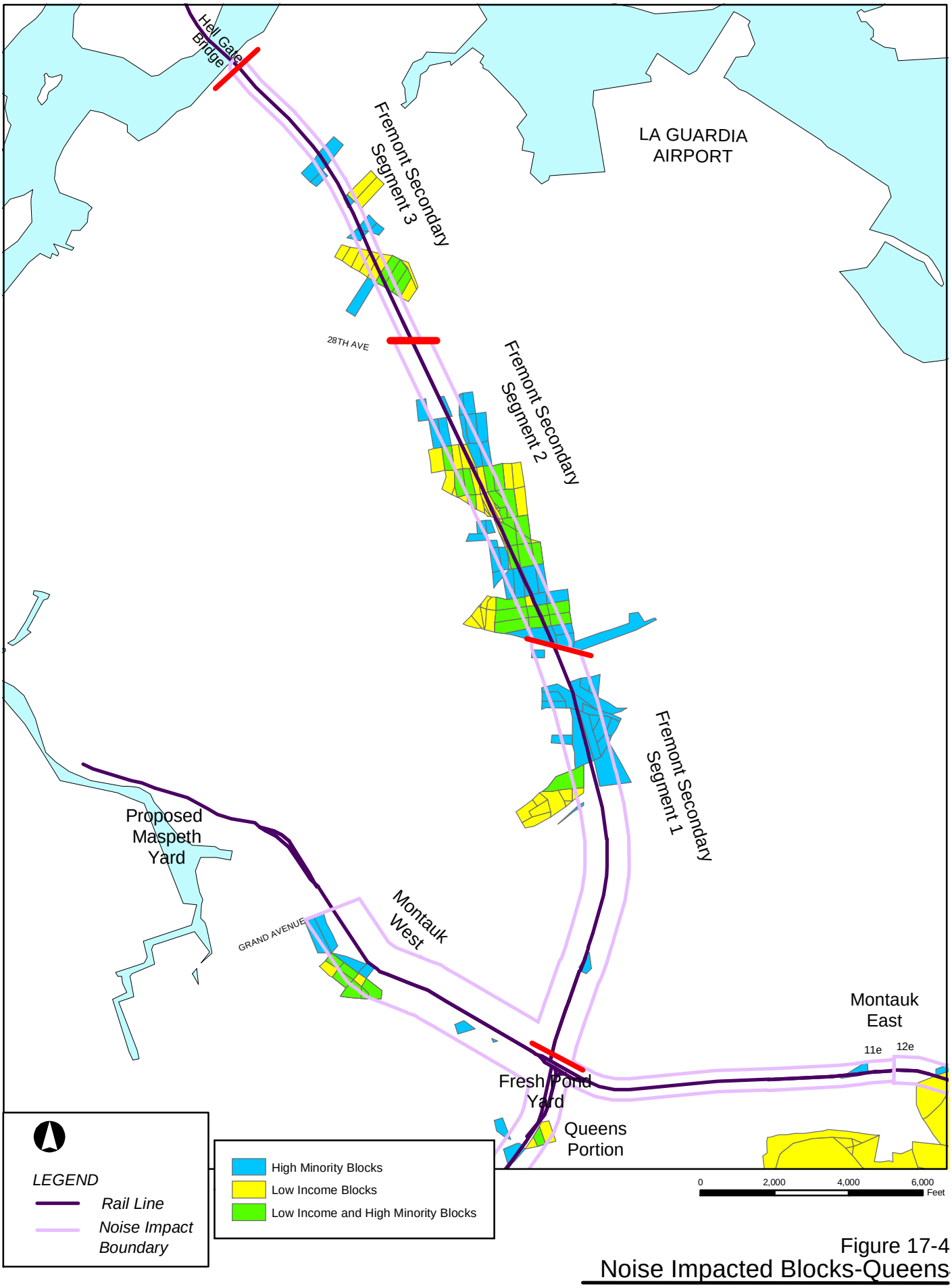


Figure 17-4
Noise Impacted Blocks-Queens
CROSS HARBOR FREIGHT MOVEMENT PROJECT

Chapter 18: Secondary and Cumulative Impacts

A. INTRODUCTION

This chapter evaluates secondary and cumulative effects of the project as required under NEPA. Secondary impacts are those that are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable" (40 CFR 1508.8). Generally, these impacts are induced directly or indirectly by the proposed project. Secondary effects can occur within the full range of impact types, such as changes in land use; economic vitality; neighborhood character; traffic congestion, with its associated effects on air quality and noise; water resources; and other natural resources.

Cumulative impacts result from the incremental consequences of an action (e.g., the project) when added to other past and reasonably foreseeable future actions (40 CFR 1508.7). The cumulative effects of an action may be undetectable when viewed in the individual context of direct and even secondary impacts, but nevertheless when added to other actions can eventually lead to a measurable environmental change.

B. SECONDARY IMPACTS

Chapters 3 through 17 describe potential primary and secondary effects of the No Action, TSM, Expanded Float Operations Alternative, and Tunnel Alternative for a range of technical areas. As outlined in Chapter 1, "Project Purpose and Need," an important goal of the Cross Harbor Freight Movement Project is to produce beneficial secondary impacts in the New York metropolitan region. These include: sustained regional economic growth, a trend towards more efficient freight transportation system, and reduction in use of long haul trucking. The adverse secondary effects of the project alternatives identified in the previous chapters arise from increases in train service and in freight yard development and activity and relate to neighborhood character, traffic, and noise. In comparing secondary effects among alternatives, the relevant assessments in the technical chapters of the EIS clearly demonstrate that only the Tunnel Alternative would generate significant beneficial secondary impacts and that its secondary adverse impacts could be mitigated to the maximum extent feasible.

As described in Chapter 4, "Economic Conditions and Impacts," the major infrastructure improvements that would be implemented under the Tunnel Alternative have the potential to induce warehousing, distribution, and manufacturing businesses to the region. Areas in Brooklyn and Queens, in particular, have the potential to attract new activity (primarily warehousing/distribution). Manufacturing employment has been in great decline in New York City over the past 25 years. While this project would not reverse that trend, it is possible that some existing manufacturing/warehousing firms that otherwise would leave the city could benefit from significantly improved freight rail service, and lead to a business retention benefit. Evidence from case studies shows that freight-based infrastructure investments, such as the Cross Harbor project, can lead to increased economic activity, particularly warehousing and other freight intensive activities. Freight-based infrastructure investments can improve

transportation capacity, efficiency, reliability, and the levels of service. Major transportation investments can create cost savings for businesses, making areas more attractive for business relocation and retention.

The economic benefits generated by the project are quantified in detail in Chapter 4. Three types of jobs would be created—direct effect jobs resulting from the improved efficiency of freight transportation in the region (reduced cost of shipping/receiving goods), direct business attraction/retention jobs created in proximity to the new rail freight infrastructure, and multiplier effect jobs created by spillover economic activity from the direct beneficiaries. As described in Appendix 7, "Land Use and Economic Conditions," an extensive land use-based analysis was conducted to estimate the potential for job creation (business attraction and retention) along the rail alignment primarily in Brooklyn, Queens and Bronx, and in particular in the vicinity of West Maspeth and potential bulk yards. The following steps were undertaken:

1. A distinction was made between the job generating characteristics of bulk and intermodal rail service;
2. Interviews were conducted with public and private sector experts in the local real estate market;
3. Existing and vacant industrial sites in proximity to the rail facilities were identified from land use maps and real estate data obtained for this study from Greiner-Maltz, and estimates made as to the available development acreage;
4. An impact area of varying mileage from different types of rail facilities was established (i.e., larger potential impact area for an intermodal yard);
5. Conservative assumptions were made about the percentage of land which would be developed, and the square footage of warehousing and manufacturing facilities which could be created on this land; and
6. The job creation characteristics of this development were then estimated.

The projected amount of developed vacant land throughout the project study areas due to Cross Harbor infrastructure and service improvements is shown below for the Single and Double Tunnel Systems. Additional detail is provided in Appendix 7.

Table 18-1
Vacant Land Projected to be Developed due to Double Tunnel System

Location	Gross Square Feet of Warehousing Space	Gross Square Feet of Manufacturing Space
Bay Ridge Branch	25,112	11,049
65th Street Yard	3,910	1,720
Maspeth – Brooklyn	300,615	140,633
Maspeth – Queens	324,217	153,407
Oak Point Yard	779,859	343,132

Table 18-2
Vacant Land Projected to be Developed due to Single Tunnel System

Location	Gross Square Feet of Warehousing Space	Gross Square Feet of Manufacturing Space
Bay Ridge Branch	21,797	9,591
65th Street Yard	3,394	1,493
Maspeth – Brooklyn	119,645	55,972
Maspeth – Queens	129,038	61,056
Oak Point Yard	676,918	297,839

This induced economic development growth could result in potential secondary environmental effects including regional or local increases in traffic, noise levels, and air emissions. However, multiplier jobs would be distributed throughout the region and thus would be so widely dispersed as to have no cumulative impact. Business attraction and retention jobs would be more concentrated along the rail alignment and nearby yards, but even so would be widely distributed across the East-of-Hudson subregion, particularly in areas currently underutilized. For example, carload and transload freight (and supporting jobs) would be distributed all along the East-of-Hudson rail infrastructure. Quantification of specific environmental impacts related to this induced development would be imprecise, as the businesses would be spread out over large areas within Brooklyn and Queens and would develop over a period of time.

The greatest concentration of new jobs would be those associated with the intermodal yard at West Maspeth, which would also experience the greatest concentration of new truck activity. It is estimated that most effects of the induced development would occur in Brooklyn and Queens within four miles of the West Maspeth Yard. Businesses would need to be located within this distance to significantly benefit from the improved transportation access the yard would offer. These induced businesses–primarily warehousing and distribution companies–would likely locate in existing industrial areas within manufacturing zoning districts. Trucks would travel from West Maspeth Yard or other East-of-Hudson yards to these businesses to pick-up and deliver goods. The traffic impacts from the increased truck activity directly related to West Maspeth Yard activities were analyzed and presented in Chapter 8, "Transportation." In terms of increased jobs, industrial employees do not typically travel during peak traffic periods and would therefore not create adverse secondary impacts.

Due to the projected decreases in manufacturing jobs in the region under the No Action Alternative, these new jobs would be replacing jobs that would otherwise leave the City and region. Based on economic forecasts for the region, the Tunnel Alternative would retain and attract 3,000 to 5,500 thousand jobs for an industry that is expected to lose 35,000 jobs over the next 25 years. No existing jobs in freight related industries would be lost in New Jersey as a result of the project. It is possible that a small amount of the future growth in these jobs would be shifted to locations East-of-Hudson as yard, warehousing, and distribution activities arise along the new rail alignment.

For these reasons, there is not expected to be adverse secondary environmental effects from this induced growth either on a regional or local level.

C. CUMULATIVE EFFECTS

OVERVIEW

The Council on Environmental Quality's (CEQ's) "Considering Cumulative Effects Under the National Environmental Policy Act" (January 1997) offers a framework for examining cumulative impacts of a proposed action. Overall, this guidance is clear that an EIS under NEPA must consider that the effect of a project, in combination with other conditions and potential actions, may have an impact that could not be identified in an examination of impacts from the project alone. To this end, the CEQ outlines a process for the identification and evaluation of cumulative effects. It includes the following:

- Scoping, in which the cumulative effects issues are determined, geographic scope and time frame for the analysis are established, and other actions affecting the issues and areas of concern are identified.
- Analysis of the affected environment, in which the resources of concern identified in scoping are characterized in terms of their response to change, the stresses affecting these resources are also characterized, and a baseline condition for the resources is defined.
- Determination of environmental consequences, in which cause-and-effect relationships between the types of actions being taken and the stresses on resources are defined, the magnitude of impacts are determined, alternatives or mitigation to avoid adverse cumulative impacts are proposed, and the cumulative effects of the selected alternative are monitored.

Those steps were followed in preparation of this EIS for the Cross Harbor Freight Movement Project. During the scoping process a list of projects with potential cumulative impacts was developed through close coordination with numerous transportation planning agencies and a review of these agencies' capital and transportation improvement plans. The scoping process described the methods to be used to analyze cumulative impacts, and the analysis of the affected environment and consequences of the proposed action considered the cumulative effects of the Cross Harbor Freight Movement Project together with other projects expected to occur in the area.

Following CEQ guidelines, an analysis of cumulative impacts considers resources, ecosystems, and human communities that could be potentially affected by the action and whether those could also be affected cumulatively by the action in combination with other reasonably foreseeable actions. To this end, this EIS considers as the future baseline condition, or No Action Alternative, the combination of existing conditions together with known development plans, public policies, projected population and employment growth, and other general background growth. It includes rail infrastructure that currently exists or that has been committed to within regional transportation plans, capital plans, or that is otherwise likely to be implemented through public or private investment by the future analysis years for the EIS—2010 and 2025. These No Action Alternative projects have been assessed in combination with the TSM, Expanded Float Operations and Tunnel Alternative in Chapter 3 through 17 for a range of technical areas. This chapter also addresses the cumulative effects of the alternatives in combination with other reasonably foreseeable actions that are not yet to the point where they have been included in capital budgets or identified in the long-term planning of transportation agencies.

The following projects were considered in the No Action Alternative analyses:

- PANYNJ plans to construct a connection between the Staten Island Railroad and the Chemical Coast Line in New Jersey (southbound and northbound).
- Implementation of a number of rail infrastructure projects on New Jersey rail lines.
- City of Bayonne plans to develop a portion of the former MOTBY for port development.
- OOCL (a private shipping company) plans to expand the Global Marine Terminal.
- NYCEDC plans to reactivate the Staten Island Railroad including reconstruction of Arlington Yard, track improvements between Arlington Yard and the Arthur Kill Lift Bridge, and extension of the Travis Branch.
- PANYNJ and NYSDOT plan to twin the Goethals Bridge by constructing a second bridge adjacent to the existing Goethals Bridge and upgrading the existing bridge to current engineering standards; and short-term improvements proposed to reduce congestion on the existing span and on the Staten Island Expressway.
- PANYNJ plans to expand Howland Hook Marine Terminal involving improvements to the existing site and the development of the adjacent Port Ivory site into an intermodal rail terminal.
- NYCEDC plans to develop intermodal rail facilities including on-dock rail yards and other short-term improvements at the South Brooklyn Marine Terminal and Red Hook Container Terminal.
- NYCEDC plans to redevelop South Brooklyn Marine Terminal for maritime use.
- NYCDOS plans to construct the Review Avenue Transfer Station that would transport municipal solid waste by barge or rail via the Montauk Branch
- NYSDOT plans to increase clearance heights to 17 feet, 6 inches to accommodate TOFC along the Hudson Line between Selkirk, NY and the Bronx.
- NYCDOS plans to potentially expand municipal solid waste facilities at Harlem River Yard and/or at American Marine Rail adjacent to Oak Point Yard that would transport municipal solid waste by barge or rail via the Hudson Line.
- NYSDOT plans to construct a new rail freight yard at the former Pilgrim State Psychiatric Hospital site in Islip, NY, and associated improvements along the LIRR Main Line.
- USACOE plans to deepen navigational channels in the Port of New York and New Jersey (PANYNJ) to provide up to 50-foot depth in selected channels.
- NJDOT plans to implement Portway, a multi-phase transportation improvement program to improve access to and between the Newark/Elizabeth air/seaport complex, intermodal rail facilities, trucking and warehousing/transfer facilities and the regional surface transportation system. The project is intended to relieve congestion and improve access for trucks.
- PANYNJ plans to expand its Expressrail facility at Port Elizabeth and improving on-dock rail at Port Newark.
- Expansions of the IRT Nostrand Avenue subway beyond Flatbush Terminal along the north side of the Bay Ridge Branch.

- The implementation of the Regional Transportation Plan (RTP), Transportation Improvement Program (TIP), and Congestion Management System (CMS) for the New York Metropolitan Region and for New Jersey.
- Implementation of a dedicated truck route along Edgewater Road.
- NYCEDC plans to upgrade tracks at the south Brooklyn waterfront along 1st Avenue between 39th and 65th Streets to serve port facilities along the Brooklyn waterfront.

Specifically, the consideration of project impacts in Chapters 3 through 17 of the EIS included regional traffic and transportation plans, as well as projected growth in population and employment throughout the region, and the movement of goods in the region. The regional transportation projects that have been approved and will be implemented by 2010 and 2025 were included in the transportation modeling estimates made for all project alternatives for the years 2010 and 2025, as appropriate, and are thus considered in the evaluation of the impacts of the project alternatives. In addition, a number of major proposed future land use projects were included in the transportation and other EIS analyses of project impacts. These considerations account for a major portion of cumulative effects analysis of project alternatives.

As discussed in Chapter 1, "Project Purpose and Need" and Chapter 2, "Project Alternatives," several projects being considered were not included in the future baseline conditions because they are in the early stages of development and specific information (such as a preferred alternative) is not available to quantitatively analyze their potential cumulative effects with the Cross Harbor Freight Movement Project. These major projects are considered to have regional cumulative effects:

- NYSDOT has completed the Staten Island Expressway MIS, which included an evaluation of an array of transportation improvements such as HOV lanes, toll-paying SOV lanes, light rail in the median, access ramps, and added travel lanes. Based on the MIS findings, the alternatives recommended for further study include: (1) Travel Demand Management; (2) Transportation System Management; and (3) Special Use Lanes/Bus Transitway.
- NYSDOT is studying alternatives to reconstruct the Gowanus Expressway including construction of a Gowanus tunnel, a no-build alternative requiring $15-25 million/year in expenditures for repairs; a major rehabilitation; and a relief viaduct involving the construction of a structure over the expressway to aid traffic flow during reconstruction which would later be used as a bus/HOV lane.
- NYMTC/NYSDOT is conducting the South Brooklyn Transportation Investment Study. The study area includes South Brooklyn-south of the Long Island Expressway, east of I-278, and west of the Nassau County line. The area includes truck routes to the Verrazano-Narrows Bridge. The study will develop multi-modal transportation improvement alternatives to optimize the movement of people and goods through the area.
- NYSDOT is conducting the Bronx Arterial Needs MIS, a study that will focus on improving the Cross Bronx Expressway (I-95) and the Major Deegan Expressway (I-87).
- NYSDOT is planning the implementation of a dedicated truck route along Edgewater Road. This route is included in the NYSDOT's Bruckner-Sheridan Expressway project.
- USACOE, USEPA, PANYNJ, NJDOT, NYSDOT, ESDC and NYCEDC have begun work on a regional Comprehensive Port Improvement Plan (CPIP) and EIS to develop a long-term strategy for the PANYNJ.

- NYSDOT is examining four alternatives for replacement or rehabilitation of the Kosciusko Bridge, which carries the BQE over Newtown Creek adjacent to the West Maspeth Intermodal Yard.
- PANYNJ's Access to the Region's Core (ARC) study is evaluating alternatives to increase the region's capacity for rail access between northern New Jersey, and the Manhattan central business districts. While the project is primarily focused on passenger rail access to Manhattan, the study has retained a freight movement "option" that would allow freight trains to move from northern New Jersey through to Long Island, using a partially-dedicated freight track.
- NYCEDC is considering plans to develop a container port on the Brooklyn Waterfront between 29th and 57th Streets. It is envisioned that the port may process up to 2 million TEUs annually.
- LIRR is initiating planning to increase the capacity of its mainline between Jamaica and Hicksville from two to three tracks. The third track would be useful for more flexible movement of freight between Fresh Pond Yard and points east.
- NYMTC is developing a Regional Freight Plan to address congestion and constraints on the region's freight distribution network. The plan is evaluating rail, highway, water, and air transport and will make recommendations for infrastructure and operational improvements for goods delivery in the 30-county region.
- NYSDOT is developing the Long Island Transportation Plan 2000 (LITP 2000), a regional, long-range planning initiative to address the severe traffic congestion that presently exists on Long Island and improve the movement of people and goods throughout Long Island. Although the majority of the transportation strategies being considered focus on the automobile, ways in which to improve the movement of freight related cargo such as the development of a rail yard at the former Pilgrim State Psychiatric Hospital site and clearance work to enable rail access to Long Island in keeping with the downstate rail clearance program is under review.

TRANSPORTATION EFFECTS

Many of the above initiatives are transportation improvement projects intended to remedy some of the problems in the region's highway and bridge network. As such they are being planned to improve transportation operations in their respective corridors and, in some cases, are being advanced to address specific local issues. In many ways, the Cross Harbor Freight Movement Project complements these projects since none of them focus exclusively on goods movement throughout the region or cross harbor access. In addition, by improving specific elements of the region's transportation system they complement the Cross Harbor Freight Movement Project in meeting the future demands of projected freight movement. Due to the large increase in freight demand predicted over the next 25 years, it would be expected that both the Cross Harbor Freight Movement Project as well as the planned highway improvements would be needed over the long term.

Many of the highway projects planned over the next 25 years would most likely lead to a reduction in future congestion as currently planned in the project's freight forecasting methodology. Therefore, the EIS's forecasted demand for the tunnel may be slightly greater than what would occur with all of the highway improvement projects in place. However, the

difference in demand for the tunnel would not be significant and, in any case, may simply push back the full forecasted demand by a couple of years.

ENVIRONMENTAL EFFECTS

Only the Tunnel Alternative has the potential to generate significant cumulative effects. The major adverse environmental impacts of the Tunnel Alternative would occur both during construction and operation of the project. Possible cumulative effects between the Tunnel Alternative and those future planning initiatives discussed above are considered for the project's significant construction and operation related impacts.

While most of the future projects areas of potential effect would not overlap with the Cross Harbor Project's adverse impacts, two initiatives could result in possible cumulative effects. The Kosciusko Bridge, for which NYSDOT has initiated an alternatives analysis and EIS, is adjacent to the north side of the West Maspeth Intermodal Yard. The goal of that project is to rehabilitate or reconstruct the bridge and alleviate some of the traffic problems in the surrounding area caused by operational deficiencies on the bridge. As such, any improvement to the bridge would lessen the potential traffic impacts of the Cross Harbor Project in the area. Therefore, the analysis in this EIS is conservative in that it does not assume any benefit to the existing traffic operations in the area due to NYSDOT's project.

Another project with potential cumulative operational effects is NYCEDC's planning for a container port on the Brooklyn waterfront. While the potential container port would significantly increase vehicular activity in the area, the Cross Harbor Project would only result in a minor effect in the same area. This is due to the fact that the 65th Street Yard would only be used as a destination for local bulk freight and not as an intermodal terminal. In fact, due to the Cross Harbor's reduction in truck traffic on the Gowanus Expressway, conditions on that roadway would benefit the potential port project with respect to local traffic conditions. Furthermore, if the port was built, a comparison of daily VMT shows that the tunnel would decrease regional traffic with a port by almost 10 percent. The port would, however, increase demand for the tunnel and possibly increase the number of trains along the Bay Ridge Branch and Brooklyn Waterfront. While noise and other impacts of the Cross Harbor Project were assessed cumulatively for the proposed automobile marine terminal, the container port project is in early planning stages. Potential cumulative impacts cannot be determined at this time; however, mitigation measures, such as noise barriers along the Bay Ridge Branch, implemented under the Tunnel Alternative, would potentially mitigate some of the cumulative noise impacts or the two projects.

In addition to operational impacts, the construction-related impacts of the Cross Harbor Freight Movement Project encompass two areas. There are direct impacts such as the filling of Maspeth Creek under the Double Tunnel System or the tidal wetlands for the new span and embankment at the Arthur Kill Lift Bridge under the Staten Island alignment of the Single Tunnel System. There are also indirect effects such as the increased vehicular traffic, noise and air pollutant emissions in the vicinity of the major construction areas.

With respect to the project's major direct construction effects the areas of concern include cultural resources (archaeological and historic structures), contaminated materials, water quality and natural resources. While the project's proposed mitigation would avoid any significant adverse effects with respect to cultural resources and contaminated materials, the impacts to natural resources would lead to a loss of habitat that could result in cumulative adverse effects if not replaced. The most significant adverse effects would accrue from the loss of wetlands (Old

Place and Bridge Creek) in northwestern Staten Island and the open water of Maspeth Creek. Due to the importance of these resources, and to avoid adverse cumulative effects of other projects which may also fill wetlands or alter terrestrial habitat, it would be expected that the required mitigation for the Cross Harbor Project in those areas would be greater than a 1:1 replacement ratio.

Another direct adverse effect of the Tunnel Alternative would be the displacement of a large number of businesses (primarily trucking and warehousing) to allow expansion of the intermodal yard in West Maspeth, Queens. With respect to cumulative effects, an area of concern is the continued loss of manufacturing space in New York City. While the project would require the acquisition of this property as discussed previously in Chapter 4, the project would result in a net addition in manufacturing and transportation related businesses and employment. Furthermore, as discussed in Chapter 4 and Chapter 17, "Environmental Justice," vacant industrial buildings and land are available in the area for relocation of the displaced businesses, which are largely wholesale trade, motor freight and transportation, business services, and printing/publishing. Therefore, with respect to economic conditions, the displacement of the businesses for the construction of the intermodal yard would not lead to increased adverse secondary or cumulative effects.

The last area of concern involves the potential cumulative effects in the areas surrounding the major construction sites. As discussed in Chapter 16, "Construction and Construction Impacts," major construction activity lastly several years would occur at the cut-and-cover sections in Staten Island, Greenville Yard and Brooklyn as well as at 65th Street Yard, the West Maspeth Yard, the three cofferdams and the staging area in Arlington Yard. Due to the surrounding uses of the and isolation of most of the construction sites, and the availability of barge and rail transport for materials and spoils removal, only the activity in the cut-and-cover construction areas in Brooklyn and Staten Island and at the West Maspeth Yard site would adversely affect the surrounding communities. Even at these locations, truck activity would be minor due to the availability of rail access and the adverse impacts in these areas would be related to increased noise and particulate levels from the construction equipment on the site itself. As discussed in Chapter 16, these adverse impacts would be mitigated to the extent practicable. However, no additional cumulative effects would occur as a result of other projects due to the very local nature of these construction impacts (i.e. uses adjacent to the shaft and staging sites) and the limited duration of the activities. ✷

A. INTRODUCTION

This chapter focuses on two concepts: the permanent commitment of resources as compared to the benefits of the project and the relation between expending environmental resources in the short-term and gaining productivity in the long-term. Both of these concepts are discussed in regard to the No Action, the TSM, the Expanded Float Operations, and the Tunnel Alternatives.

B. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources that may be irreversibly and irretrievably committed to the Cross Harbor Freight Movement Project include construction materials, energy, labor, funds, and land. Construction materials, energy supplies, and labor used to construct any of the alternatives are generally not retrievable. They are not in short supply, however, and their use would not have an adverse impact on their continued availability for other projects. Also, labor expenditures are consistent with governmental incentives to spur growth.

While the No Action Alternative would require a greater commitment of resources in the future due to its failure to improve the accessibility and efficiency of the freight transportation system (see energy consumption comparison, below), it would not, in and of itself, require a commitment of those resources.

The total commitment of funds required for construction of the TSM Alternative is negligible. However, the TSM Alternative would result in only a nominal benefit to regional freight mobility and the economic growth of the region.

Capital expenditures for the Expanded Float Operations Alternative would be approximately $80 million. Some commitment of resources would be required but not significantly greater than the TSM or No Action Alternatives. The Expanded Float Operations Alternative would reduce future energy consumption by approximately 180 million BTUs and only a small commitment of land would be required.

The total commitment of funds required for construction of the Single Tunnel System, including land acquisition, is estimated at approximately $4.7-4.8 billion. (The land acquisitions required for the construction of West Maspeth Yard are explained in Chapter 4, “Economic Conditions and Impacts”). However, operation of the Single Tunnel System would reduce annual energy consumption by approximately 4 trillion BTUs as compared to the No Action Alternative. This result would be due to a reduction in annual commodity truck miles traveled as a result of the Single Tunnel System. The total commitment of funds required for construction of the Double Tunnel System, including land acquisition, is estimated at approximately $7.4-7.7 billion. Operation of the Double Tunnel System would reduce annual energy consumption by approximately 8 to 9 trillion BTUs as compared to the No Action Alternative, also due to a reduction in annual commodity truck miles traveled. The Double Tunnel System would require a

substantial commitment of land as part of the project. As discussed in Chapter 4, "Economic Conditions and Impacts," the construction of West Maspeth Yard for the Double Tunnel System would require about 150 acres of land.

These resources would be committed to benefit residents of the city, state, and region by an improved transportation system. Benefits of the Tunnel Alternative would include a much enhanced ability to move goods throughout the region; a more modally balanced goods movement system in the region; increased economic development in the region; a reduction in the reliance on trucks to move goods in the region; and increased capacity system redundancy for cross harbor freight movement.

C. RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term effects on the environment result from construction impacts. Long-term effects relate to the maintenance and enhancement of long-term productivity—in particular, the consistency of the project with long-term regional and local planning objectives. The short- and long-term effects of each alternative are summarized below.

SHORT-TERM USES

The TSM and Expanded Float Operations Alternatives would have minor short-term effects related to their construction. At the same time, these alternatives would create jobs as well as related economic benefits during construction.

The Tunnel Alternative would have more substantial impacts during construction (see the discussion in Chapter 16, "Construction and Construction Impacts") than the other three alternatives. As discussed in Chapter 16, the impacts of both the Single Tunnel System and the Double Tunnel System would be predominantly associated with noise and vibration, dust, and traffic congestion, and their related effects on neighborhood character as a result of new construction, particularly near cut-and-cover portions of the work or near the access shaft sites. As a mitigating component of short-term uses of the environment, the Single Tunnel System and the Double Tunnel System would create significant economic benefits during construction, in the form of jobs and the direct and indirect demand for goods and services.

LONG-TERM PRODUCTIVITY

As described in Chapter 1, "Project Purpose and Need," planning for a Cross Harbor Freight Tunnel began in the 1920s. Long-term benefits to productivity, and related long-term increases in productivity, addressed by the Tunnel Alternative would include the following:

- Improved freight mobility in the region.
- Reduced congestion on region's bridge and highway network.
- Accommodation for projected future commodity growth.
- Support for the region's economic development.
- Reduced truck traffic in the region.
- Significant reductions in mobile source air pollutants.

SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

Local short-term impacts in use of resources resulting from the Tunnel Alternative would be consistent with the maintenance and enhancement of long-term productivity for the city, state, and region. Some resources that would be valuable in the long term are being spent to achieve higher productivity per unit resource in the long term. By investing these resources in future productivity, and over the long term, fewer resources would be needed to achieve the same level of unit productivity. This savings in per-unit productivity in the long term would be manifest in terms of energy consumption, land use, and financial cost. ✷

Chapter 20: Financial Analysis

This chapter presents several concepts related to the financial structure of the Cross Harbor Freight Movement Project: a benefit-cost analysis which relates the benefit discussion in Chapter 4 to the cost of the project; discussion of potential business models, and financing opportunities. It begins with a discussion of the various ways in which capital costs are expressed to support this analysis. The information included in this chapter is not required by the National Environmental Policy Act (NEPA), but is provided in order to present the most complete information available about the project. NEPA regulations do not govern methodologies for calculating this information. State-of-the-practice methodologies for economic analyses have been used.

A. DIFFERENT WAYS TO EXPRESS CAPITAL COST

Depending on the analysis being done, there are several ways that analysts express costs. Unless the differences are understood, this can lead to confusion. This section describes the different ways that costs are expressed in this DEIS document:

- **Constant 2002 Dollars.** Sometimes called "real" dollars, expressing cost in constant dollars reflects the "real" cost of a project based on the buying power of "today's" dollars. This lets readers understand the value of the dollars being spent without making assumptions for inflation. The use of 2002 dollars as a benchmark reflects the year in which this analysis was initiated. This analysis can be updated to 2004 dollars in the FEIS, but this change will not significantly impact the conclusions of the analysis.
- **Inflation to Mid-Year of Construction.** Cost estimates used in engineering documents are often inflated to the projected mid year of construction. This is done to let readers know that the actual dollars expended will be higher than those provided in a constant dollar estimate. By inflating dollars to the mid-year of construction, the analyst assumes that the expenditure of the project will be constant over the construction period, and that the inflation rate will be constant. The cost estimates in Chapter 4, "Economic Conditions," were expressed reflecting the mid-year of construction (2007), assuming a four-year construction period starting in 2005.
- **Years of Expenditure (YOE) Dollars.** Sometimes called "nominal" dollars, expressing cost in year of expenditure dollars is usually used for the financial analysis of a capital project. This is because the finances of a project depend on inflation as well as interest rates from bonds or loans that also depend on inflation. In the financial analysis done for this project, the overall rate of inflation through the analysis period was assumed to be 3 percent per year, generally matching long term historical trends.
- **Discounted Dollars.** Benefit-cost analysis relies on discounted dollars to reflect the time value of money when comparing cost and benefit streams that occur over a period of time. The discount rate represents the "opportunity cost" of taking dollars out of the private economy, where it might otherwise achieve a particular return on investment. The discount

rate reflects the analysts' assumptions about that alternative return on investment. For this study, a real discount rate of 7 percent (which excludes inflation) was used, which is the rate that the U.S. Office of Management and Budget requires for federal projects.

In this chapter, the benefit-cost analysis used discounted dollars. The financial analysis was done in year of expenditure dollars, and converted back to 2002 dollars for ease of comparison. This explains why the capital costs shown in these sections do not match the actual construction cost estimates shown in Chapter 16 ("Construction and Construction Impacts"), and based on mid-year of construction.

B. BENEFIT-COST ANALYSIS

A benefit-cost analysis was performed for each Cross Harbor project alternative using the estimated economic, user and societal benefits as described in Chapter 4, and the estimated cost of each project.[1] The analysis was performed for the following four geographic areas:

- **Metropolitan New York Region** includes the five borough/counties of New York City, the two counties of Long Island, the counties of Southwestern Connecticut, the counties of North Jersey Transportation Planning Authority (NJTPA), and the lower Hudson Valley counties.[2]
- **New York State** is the sum of benefits for all of New York State (including those areas defined above in the Metropolitan New York region exclusive of the New Jersey and Connecticut counties).
- **New Jersey** includes the counties of the NJTPA region also included in the Metropolitan New York regional definition, plus the rest of the counties in the state.
- **United States** includes the entire country (all 50 states).

This section highlights the methodological approach used to capture the benefits of each alternative; provides a review of the estimated benefits; shows the capital, operating, and maintenance costs; describes the detailed assumptions and methodology; and finally presents the benefit-cost analysis results for each alternative.

The benefits of project construction spending are described separately in Chapter 16. The impact of construction-related spending is not included in the benefit-cost analysis presented here because while this impact will contribute to regional economic activity, similarly sized alternative investments would also likely contribute an equal impact regardless of their benefit to the transportation system. In other words, this is a prime example of an opportunity cost. If the funds are not spent on the Cross Harbor project, they may be spent on something else that would have similar construction-related benefits. This approach is consistent with current literature on cost/benefit impact analysis (see Transit Cooperative Research Program [TCRP] Report H-19

[1] As generally defined, a benefit-cost analysis is a systematic quantitative method of assessing the desirability of public projects or policies when it is important to take a long view of future effects.

[2] The counties included in the analysis are: New York: New York (Manhattan), Bronx, Queens, Kings (Brooklyn). Richmond (Staten Island), Nassau, Suffolk, Westchester, Putnam, Dutchess, Rockland, Orange, Ulster and Sullivan: Connecticut: Fairfield, New Haven, Litchfield; New Jersey: Hudson, Bergen Essex, Union, Middlesex, Passaic, Morris, Sussex, Warren, Hunterdon, Somerset, Monmouth, and Ocean.

"Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners"). While some projects do include construction spending in benefit-cost analyses, and NEPA regulations do not address this issue, we have presented a conservative analysis consistent with the state-of-the practice in economic impact analyses by not including construction spending in the benefit calculation.

APPROACH

Traditional benefit-cost analysis (B/C) compares the discounted value of user benefits to the discounted value of all costs (construction as well as operations and maintenance) over a specified period of time. In order to more fully account for the benefits of transportation improvements, however, B/C analyses are increasingly considering not only the user benefits, but also the multiplier effects of those benefits. This more robust economic impact analysis formed the basis of the B/C analysis for this project.

The framework of the B/C analysis for each project alternative is shown in Figure 20-1. This framework remains consistent for each project alternative, but inputs to the analysis do change based on the magnitude of benefits generated by each project alternative and their respective geographic distribution.

The benefits presented in this section are monetized benefits in the project design year of 2025, the same year for which all other project impacts have been analyzed in Chapters 1 through 19. However, in order to calculate the B/C ratio later in the chapter, a stream of costs and benefits for the project's opening year through its useful life must be calculated and converted to Net Present Value (NPV)[1]. Table 20-1 summarizes the benefits of the project.

BENEFITS OF THE PROJECT ALTERNATIVES

As shown in Figure 20-1, two types of benefit streams were analyzed to estimate the total benefits of the project—Economic benefits, and User and Societal benefits. Each is explained below.

ECONOMIC BENEFITS—PERSONAL INCOME

Economic benefits are measured by forecast gains in personal income to the region and are quantified through economic simulation modeling. Economic benefits measure the macroeconomic impacts of the Cross Harbor project based on two factors: travel efficiencies and the resulting cost savings for businesses, and induced business attraction/retention benefits. Economic impacts do not assess other societal benefits such as reductions in personal travel time, accident rates, air pollution and wear and tear on the transportation infrastructure. These impacts are discussed separately below. An increase in personal income, a primary economic benefit of each alternative, is estimated through the Regional Economic Models, Inc. (REMI) economic simulation modeling. The REMI model provides regional detail to estimate personal income impacts for each jurisdiction under the B/C analysis. The direct impacts as a result of the Cross Harbor project lead to macroeconomic impacts, such as changes in personal income, which vary by region. REMI uses the direct inputs described below (travel efficiencies and cost savings for business trips, and induced business attraction/retention benefits) to estimate the total economic impacts for the various regions, including multiplier effects.

[1] See definition of Net Present Value on page 20-9.

Table 20-1
Benefits by Project Alternative
in 2025 (in Millions of 2002 Dollars)

	Personal Income Benefit	User and Societal Benefits				TOTAL BENEFITS
		Non-Business Highway Travel	Public Agency Savings	Environ-mental	Safety	
Single Tunnel System (New Jersey Alignment)						
Metro New York Region	$890 M	$10.4 M	$3.1 M	$1.3 M	$0.3 M	$905.1 M
New York State	$850 M	$4.6 M	$2.9M	$0.7M	$1.4 M	$859.6 M
New Jersey	$120 M	$9.4M	$3.7M	$1.4M	$0.7M	$135.2 M
United States	$205 M	$15.9 M	$29.4 M	$3.5 M	$21.0 M	$274.8 M
Single Tunnel System (Staten Island Alignment)						
Metro New York Region	$820 M	$10.3 M	$2.9 M	$0.9 M	$0.2 M	$834.3 M
New York State	$780 M	$4.6 M	$2.7 M	$0.6 M	$1.4 M	$789.3 M
New Jersey	$105 M	$9.3M	$3.8M	$1.2M	$0.7M	$120.0 M
United States	$170 M	$15.7 M	$27.3 M	$3.0 M	$19.7 M	$235.7 M
Double Tunnel System (New Jersey Alignment)						
Metro New York Region	$1,600 M	$32.3 M	$7.8 M	$3.9 M	$0.6 M	$1,644.6 M
New York State	$1,510 M	$14.6 M	$5.2 M	$1.4 M	$2.4 M	$1,533.6 M
New Jersey	$210 M	$29.4M	$6.4M	$2.8M	$1.1M	$249.7 M
United States	$490 M	$49.7 M	$51.1 M	$7.1 M	$35.5 M	$633.4 M
Double Tunnel System (Staten Island Alignment)						
Metro New York Region	$1,400 M	$32.3 M	$7.7 M	$3.9 M	$0.6 M	$1,444.5 M
New York State	$1,300 M	$14.6 M	$4.7 M	$1.4 M	$0.2 M	$1,320.9 M
New Jersey	$190 M	$29.4M	$6.4M	$2.8M	$1.1M	$229.7 M
United States	$380 M	$49.6 M	$46.5 M	$6.7 M	$31.9 M	$514.7 M
Expanded Float Operations						
Metro New York Region	$8 M	$1.3 M	$0.3 M	$0.1 M	$0 M	$9.7 M
New York State	$7 M	$0.6 M	$0.1 M	$0 M	$0 M	$7.7 M
New Jersey	$1 M	$1.2M	$0.2M	$0.1M	$0M	$2.5 M
United States	$10 M	$2.0 M	$0.4 M	$0.2 M	$0.7 M	$13.3 M

Travel Efficiencies and Cost Savings for Business Trips

Improved travel efficiencies resulting from the project alternatives lead to cost savings for three types of business trips:

1. New rail trips using the Cross Harbor project, which represent diversions from trips formerly made by truck;
2. Existing rail trips that formerly used a longer route to and from East of Hudson locations, but switch to the shorter Cross Harbor route; and
3. Business-oriented highway trips (truck and on-the-clock auto) benefiting from reduced highway congestion due to the diversion of truck trips to the Cross Harbor alternatives.

Rail benefits (1 and 2) were derived from a shipper's choice model and other rail modeling efforts (as described in Chapter 8 and the Transportation Appendix) and encompass cost, travel time, and reliability impacts. Highway benefits (3) were estimated for 2025 from the New York Metropolitan Transportation Council (NYMTC) "Best Practices" travel demand model. The results of the 2025 NYMTC model forecasts were used to calculate monetized (i.e., dollar value) benefits specifically for business trips. The highway benefits include vehicle operating cost savings, travel time savings, and cost savings associated with a reduction in accidents in the study area.

These travel efficiency benefits will accrue to businesses expected to be present in the No Action Alternative. The benefits will vary by region depending on each region's share of origins and destinations for highway and rail trips. For example, most trips that benefit from the project will have an East-of-Hudson (EOH) region origin or destination and therefore the EOH region will receive a share of the benefit. However, since the origin or destination and part of the trip likely will occur outside of the region, some but not all of the benefits will accrue to the region. For example, a trip originating in New Jersey destined for the East-of-Hudson portion of the New York Metropolitan region would generate economic benefits in both New Jersey and New York.

Induced Business Attraction/Retention Benefits

The combination of greatly enhanced rail service to EOH markets, the proposed West Maspeth intermodal yard, and various bulk yards and sidings is expected to generate additional economic benefits to the region in the form of business attraction and retention. Freight-intensive businesses could be expected to locate close to the new rail infrastructure, producing positive impacts for areas such as Brooklyn, Queens, Bronx, and Long Island in the form of more economic activity and personal income.[1] The methodology used to estimate this impact is described in detail in the Economic Appendix. It is important to note, however, that conservative assumptions were made in every aspect of this analysis—the amount of available vacant land, its likely development potential, and the number of jobs (and income) which would be created. In a sense, this type of analysis is analogous to estimates of real estate development likely to be

[1] Although the Expanded Float Operations Alternative is expected to create some travel efficiency benefits and production cost savings, the improvements are incremental and do not radically change freight transportation options to the EOH region in the way that the tunnel options do. Therefore, it is not expected that business attraction/retention benefits will be significant for this alternative and cannot be reliably estimated. The TSM Alternative is not expected to produce measurable travel efficiency benefits.

generated by new highway and transit investments. These types of forecasts have often been known to be overly optimistic, so this analysis was done in a deliberately conservative manner.

Estimate of Economic Benefits

Table 20-1 displays the economic benefit of each project alternative in the form of increased personal income for the forecast year-of 2025. The personal income benefits of each project alternative would begin to accrue in 2010 and gradually accumulate through 2035 as forecast by the REMI economic simulation model. The two generators of personal income benefits—jobs created through induced business attraction/retention, and travel efficiencies and cost savings for business trips—are forecast for the year 2025. Estimates of employment growth in the Metropolitan New York region were forecast for 2025, fifteen years after the anticipated completion of Cross Harbor improvements. To account for the time lag inherent with business attraction due to improved transportation connectivity and reliability, employment impacts due to business attraction and retention are expected to accrue over a fifteen-year period as businesses adjust their logistics and locational decisions over time to capture the full benefits of Cross Harbor improvements. Similarly, the benefit of improved travel efficiency and cost savings for business trips was forecast for 2025, and either scaled down through 2010 or scaled up through 2035 based on growth in regional VMT (allowing for the full forecasted benefit of diverted truck traffic to build up over time).

While the business travel efficiency benefits of each alternative will spread throughout the region and the U.S., the business attraction/retention benefits are limited to the EOH portion of the metropolitan region. This distinction largely accounts for the variability of benefits across the different regional definitions. For the purpose of the B/C analysis, personal income benefits were held constant after 2035. The benefits of the Expanded Float Operations are expected to be greater for the U.S. than for either the Metropolitan New York region or New York State because there are no anticipated regional business attraction/retention benefits associated with this alternative. Similarly, while New Jersey will benefit from the improvement business travel efficiency expected to be experienced throughout the region, it is not expected to receive significant business attraction/benefits which will accrue primarily to East-of-Hudson locations. However, as shown below, New Jersey will accrue significant societal and user benefits.

USER AND SOCIETAL BENEFITS

The non-business transportation and environmental benefits represent a significant benefit of each Cross Harbor project alternative. A combination of the FHWA's Surface Transportation Efficiency Analysis Model (STEAM) and the NYMTC Best Practices Model produced estimates of benefits to non-business highway auto users, the environment (in terms of reduced vehicle emissions), society (in terms of accident reductions), and public agencies (in terms of reduced expenditures on highway maintenance and construction). These benefits are due primarily to the diversion of some freight traffic from truck to rail and the resulting reduction in future freight truck VMT over what it would have been absent the implementation of the Cross Harbor alternatives. A more detailed definition of these benefits is provided below:

User Benefits

Highway Travel Efficiencies and Cost Savings for Non-Business Trips

Auto user benefits in the form of travel time savings and vehicle operating cost savings (fuel and non-fuel) for non-business trips were estimated. Non-business trips include personal and

commuting trips that do not directly impact the cost or productivity of doing business (and therefore are excluded from the economic impact analysis) but do provide a societal benefit. The benefits of non-business travel were first presented in Chapter 4, and consistent numbers are shown in this chapter. Benefits were allocated to regions based on origin-destination travel patterns.

Societal Benefits

Reduced Public Agency Costs to Replace Infrastructure

The reduction of large long-haul truck trips due to the diversion to the Cross Harbor project will reduce costs for public agencies as existing infrastructure will not need to be replaced as frequently, and it is projected that maintenance expenditures can be reduced. The benefits of less wear and tear on the roads were allocated to regions based on reductions in commodity-truck VMT by highway segment.

Environmental Benefits

Three types of environmental benefits can be attributed to reduced highway congestion: reduced air emissions from vehicles, reduced noise, and reduced global warming effects. Environmental benefits cannot easily be allocated to regions due to the widespread geographic nature of the impacts, but were distributed based on changes in VMT by highway segment (the best proxy variable available).[1]

Safety Benefits

These benefits represent enhanced safety from a lower accident rate attributable to fewer truck trips on the national highway system. This monetized measure captures the benefits that society accrues from a lower accident rate (i.e., fewer lost workdays due to injuries/deaths caused by accidents, and reduced medical and insurance costs). Safety benefits were allocated to regions based on reductions in commodity-truck VMT by highway segments.

Estimation of User and Societal Benefits

Table 20-1 displays the user and societal benefits by project alternative for the 2025 forecast year. For the purpose of the B/C analysis, these benefits begin to accrue in 2010 and continue to grow through 2040.[2] These benefits are expected to be concentrated within the Metropolitan

[1] The vehicle emissions portions of the environmental benefits were originally calculated using emissions factors from the U.S. Environmental Protection Agency's Mobile5 program. Beginning on January 1, 2004, use of Mobile6 was required by USEPA. The regional air quality impacts described in Chapter 9 Section D were estimated using the STEAM program and were updated to reflect Mobile6 emissions factors. The benefit estimation included in this Chapter was not updated for the DEIS and is still based on Mobile5 emissions factors. This analysis will be updated for the FEIS. However, the quantification of the emissions benefits of the project alternatives constitute a relatively small share of the total economic benefits of the project – about 0.2%. It is estimated that the change in emissions factors resulting from using Mobile6 instead of Mobile5 would result in a 0.2% increase in the total benefit estimate of the project alternatives due a change in the treatment of CO emissions. Thus, it can be stated that the benefit calculation included in the DEIS is slightly conservative.

[2] Growth in user and societal benefits is based on estimated growth in vehicle miles of travel (VMT). This analysis assumed a 2010 opening year for the project. The opening date may be updated in the FEIS but is unlikely to have a significant impact on the analysis.

New York region (including the New Jersey part of the region), and were estimated for each jurisdiction within the region.[1] These benefits will also accrue to the rest of the U.S.

COSTS OF THE PROJECT ALTERNATIVES

Table 20-2 details the estimated capital cost of construction, and annual operating and maintenance expenditures for each project alternative. For the purpose of the B/C analysis, the capital cost of construction for the two tunnel systems and alignments was allocated evenly over a four-year period (2006-2009) and then converted to constant 2002 dollars. Annual operating and maintenance expenditures for each of the tunnel options were assumed to begin in 2010 when service is expected to commence. The annual operating and maintenance cost ($20.4 million for the Single Tunnel System—New Jersey tunnel alignment, $22.2 million for the Single Tunnel System—Staten Island tunnel alignment, and $29.9 million for either alignment of the Double Tunnel System) was held constant throughout the B/C analysis, which is akin to the assessment of the transportation benefits (both are forecast in 2025 in 2002 Dollars).[2] The capital cost of construction for the Expanded Float Operations Alternative was allocated to a single year (2005), and operating and maintenance expenditures were assumed to begin to accrue in 2006.

Table 20-2
Capital and Annual Operating and Maintenance Costs per Project Alternative (in Millions of 2002 Dollars)

	Total Capital Cost	Annual Operating and Maintenance Cost
Single Tunnel System - New Jersey Alignment	$3,892 M	$20.4 M
Single Tunnel System - Staten Island Alignment	$3,839 M	$22.2 M
Double Tunnel System - New Jersey Alignment	$6,370 M	$29.9 M
Double Tunnel System - Staten Island Alignment	$6,480 M	$32.5 M
Expanded Float Operations	$80 M	$18.2 M

DETAILED BENEFIT-COST ANALYSIS METHODOLOGY AND ASSUMPTIONS

The B/C analysis for each project alternative incorporates the following basic methodology and assumptions:

- **Stream of Benefits and Costs.** The transportation and economic benefits for each of the tunnel options was assumed to begin to accrue in 2010 and gradually increase through the 2040 at which point they were held constant throughout the remainder of the B/C analysis to

[1] Reduced fuel costs for nationwide highways, not included in the NYMTC model, are also estimated as a calculation outside of STEAM. These occur due to fewer long-haul truck trips.

[2] Operating and maintenance costs are forecast for the year 2025 (in 2002 dollars), and include a built in contingency fund to account for any significant future operational/maintenance costs that may occur.

the year 2109, creating a stream of benefits over a one hundred year period.[1] Operating and maintenance costs for each of the tunnel options were assumed to begin to accrue in 2010 and were then held constant throughout the analysis period extending through the 100-year life of the project. The capital cost of building the tunnel options was assumed to be spread evenly over a 5-year period (2005-2009). The capital cost of the Expanded Float Operations project alternative was assumed to all be spent in 2005. Operating and maintenance costs for the Expanded Float Operations project was assumed to begin in 2006, and were held constant throughout the analysis.

- **Real Discount Rate of 7 Percent.** A real discount rate of 7 percent was used to reflect the time value of money, and eliminate the expected effect of inflation as future benefits and costs are expressed in real terms (2002$).[2]
- **Residual Value.** The primary B/C analysis period is thirty years after the opening of the project (2010 to 2039 for the Tunnel Alternative). However, it is expected that the life of a tunnel will exceed this period, so a residual value was calculated based on a 100-year life. Benefits and costs beyond 2039 were heavily discounted but do still have a present value worth estimating. The residual value (beyond 2039) of both benefits and costs was included in the analysis.
- **Net Present Value (NPV).** The net present value of a project alternative is simply the difference between the discounted present value of benefits and the discounted present value of costs. A positive NPV indicates that benefits exceed costs, and is the most reliable B/C measure. Benefits were estimated for a 100-year period from the project opening in 2010 to 2019. Benefits increased from 2010 to 2035, and were held constant thereafter (residual benefits as defined above).
- **Benefit-Cost Ratio.** The B/C ratio was calculated by dividing the total discounted benefits by total discounted costs. Essentially, a B/C ratio of 2 to 1 means that for every dollar invested (the cost), two dollars is generated (the benefit). A B/C ratio above 1.0 indicates that benefits exceed cost.

It is important to understand that there is a considerable amount of uncertainty reflected in the B/C analysis. Costs and benefits can change, and the choice of discount rate can have a significant impact on the analysis outcome. Typically, strong projects have a high enough B/C ratio so that even if less favorable assumptions are used, there is still a benefit that exceeds the cost. In practice, B/C ratios of roughly 2.0 are considered an acceptable benchmark given no other non-economic criteria, though this varies from agency to agency based on their individual policies.

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[1] A 100-year analysis period is consistent with the expected operational life of a major infrastructure investment such as a tunnel.

[2] The discount rate represents the "opportunity cost" of taking dollars out of the private economy. Essentially, the discount rate denotes the time value of money (a dollar today is worth more than a dollar next year since it can be invested). The 7 percent discount rate is consistent with guidelines put forth by the U.S. Office of Management and Budget in Circular No. A-94 (www.whitehouse.gov/OMB).

RESULTS OF BENEFIT-COST ANALYSIS: SINGLE TUNNEL SYSTEM

Table 20-3 displays the Net Present Value (NPV) of the benefits for the Tunnel Alternative and Expanded Float Operations Alternative. Presented are the data for the Metropolitan New York region, New York State, New Jersey, and the United States. It is important to note that personal income (earnings of workers) benefits generated by the REMI economic simulation model was allocated based on place of residence rather than place of work. In other words, personal income was adjusted to reflect commuting patterns.

Table 20-3
Benefit Analysis by Project Alternative
(All Dollar Levels in Millions of 2002 Dollars)

	Metro New York Region	New York State	New Jersey	United States
Single Tunnel System (New Jersey Alignment)				
NPV of Personal Income	$4,180 M	$3,962 M	$567 M	$1,079 M
NPV of Non-Business Highway Benefits	$84 M	$34 M	$70 M	$117 M
NPV of Public Agency Savings	$23 M	$21 M	$27 M	$217 M
NPV of Environmental Benefits	$10 M	$5 M	$10 M	$26 M
NPV of Safety Benefits	$2 M	$10 M	$5 M	$155 M
Residual Value of Benefits*	$1,325 M	$1,253 M	$175 M	$413 M
Total Discounted Benefits	$5,624 M	$5,285 M	$854 M	$2,007 M
Single Tunnel System (Staten Island Alignment)				
NPV of Personal Income	$3,845 M	$3,634 M	$506 M	$844 M
NPV of Non-Business Highway Benefits	$76 M	$34 M	$69 M	$116 M
NPV of Public Agency Savings	$21 M	$20 M	$27 M	$202 M
NPV of Environmental Benefits	$7 M	$4 M	$9 M	$22 M
NPV of Safety Benefits	$1 M	$10 M	$5 M	$146 M
Residual Value of Benefits*	$1,222 M	$1,154 M	$175 M	$347 M
Total Discounted Benefits	$5,172 M	$4,856 M	$791 M	$1,677 M
Double Tunnel System (New Jersey Alignment)				
NPV of Personal Income	$7,545 M	$7,087 M	$1,021 M	$2,793 M
NPV of Non-Business Highway Benefits	$239 M	$108 M	$217 M	$367 M
NPV of Environmental Benefits	$29 M	$10 M	$21 M	$52 M
NPV of Infrastructure Savings	$58 M	$38 M	$47 M	$378 M
NPV of Safety Benefits	$4 M	$18 M	$8 M	$262 M
Residual Value of Benefits*	$2, 406 M	$2,248 M	$329 M	$961 M
Total Discounted Benefits	$10,281 M	$9,509 M	$1,643 M	$4,813 M

Table 20-3 (cont.)
Benefit Analysis by Project Alternative
(All Dollar Levels in Millions of 2002 Dollars)

	Metro New York Region	New York State	New Jersey	United States
Double Tunnel System (Staten Island Alignment)				
NPV of Personal Income	$6,558 M	$6,140 M	$897 M	$2,100 M
NPV of Non-Business Highway Benefits	$239 M	$108 M	$217 M	$367 M
NPV of Environmental Benefits	$29 M	$10 M	$21 M	$50 M
NPV of Infrastructure Savings	$57 M	$35 M	$47 M	$344 M
NPV of Safety Benefits	$4 M	$16 M	$8 M	$236 M
Residual Value of Benefits*	$2,101 M	$1,954 M	$295 M	$774 M
Total Discounted Benefits	$8,988 M	$8,263 M	$1,485 M	$3,871 M
Expanded Float Operations Alternatives				
NPV of Personal Income	$49 M	$42 M	$11 M	$40 M
NPV of Non-Business Highway Benefits	$1.3 M	$0.6 M	$2 M	$1.2 M
NPV of Environmental Benefits	$1 M	$0 M	$1 M	$1 M
NPV of Infrastructure Savings	$2 M	$1 M	$1 M	$3 M
NPV of Safety Benefits	$0 M	$0 M	$0 M	$5 M
Residual Value of Benefits*	$13 M	$10 M	$4 M	$11 M
Total Discounted Benefits	$66.3 M	$53.6 M	$19 M	$61.2 M

* Benefits for the 70 years of operation beyond 2039, as part of a 100-year life cycle analysis of infrastructure assets.

As shown in Table 20-3, the Metropolitan New York region is expected to be the primary beneficiary of this project. As the primary impact area, it receives the full impact of induced business attraction/retention (personal income), and a sizeable portion of the travel efficiency and cost savings for business trips originating/terminating in the region. However, New York State, New Jersey, and the rest of the U.S. also derive significant benefits for the project.[1]

A complete B/C analysis was conducted for the Metro New York Region, the prime beneficiary of the project. As shown in Table 20-4, the project has a B/C ratio for the region of 1.9 for the New Jersey alignment and 1.8 for the Staten Island alignment. It is important to note, however, that the benefits to the Metropolitan New York region extend across three states—New York, New Jersey and Connecticut—with a significant share of the benefits (see below) accruing to the counties of the NJTPA, as defined on page 20-2.

[1] The analyses for New York State and New Jersey include all of the counties in each state, including those counties in the Metro New York region.

Table 20-4
Summary of Costs and Benefits in the New York Metro Region
(All Dollar Levels in Millions of 2002 Dollars)

	Single Tunnel System		Double Tunnel System		
	NJ Alignment	SI Alignment	NJ Alignment	SI Alignment	Expanded Float Operations
Costs					
NPV of Capital Costs	$2,766 M	$2,728 M	$4,400 M	$4,480 M	$65 M
NPV of Operating Costs	$158 M	$171 M	$231 M	$251 M	$191 M
Residual Value of Costs*	$24 M	$26 M	$35 M	$38 M	$21 M
Summary					
Total Discounted Benefits	$5,624 M	$5,172 M	$10,281 M	$8,988 M	$80 M
Total Discounted Costs	$2,900 M	$2,930 M	$4,670 M	$4,770 M	$280 M
NPV (Benefits Minus Costs)	$2,720 M	$2,250 M	$5,610 M	$4,220 M	($200 M)
B/C Ratio	1.9	1.8	2.2	1.9	0.29

* Benefits and costs for the 70 years of operation beyond 2039, as part of a 100-year life cycle analysis of infrastructure assets.

Comparing the results by alternative, there are several reasons why the Single Tunnel System—New Jersey tunnel alignment has a slightly higher B/C ratio than the Single Tunnel System—Staten Island tunnel alignment across all regional comparisons. The Single Tunnel System—New Jersey tunnel alignment is expected to have slightly higher capital costs due to the need to construct a 4,300-foot-long two-track Immersed Tube Tunnel (ITT) section on the New Jersey side so as not to preclude the possibility of constructing the second tunnel tube across the harbor at a later date. However, this is offset by the lower operating costs of the New Jersey alignment due to the shorter overall length of the tunnel relative to the Staten Island alignment, which must traverse the full length of the north shore of Staten Island. In addition, the New Jersey alignment is forecast to have higher benefits due to a more direct rail routing into the tunnel on the New Jersey side, which results in more diversion of freight from truck to the rail tunnel than does the Staten Island alignment.

RESULTS OF BENEFIT-COST ANALYSIS: DOUBLE TUNNEL SYSTEM

Table 20-3 above displays the NPV of the benefits for the Double Tunnel System—New Jersey and Staten Island alignments. Presented are data for the Metropolitan New York region, New York State, New Jersey, and the United States.

As with the Single Tunnel System, the Metropolitan New York region is expected to be the primary beneficiary of this project and gains in relative economic competitiveness compared to the rest of the U.S. As shown in Table 20-4, the Double Tunnel System has a B/C ratio for the region of 2.2 for the New Jersey alignment and 1.9 for the Staten Island alignment.

RESULTS OF BENEFIT-COST ANALYSIS: EXPANDED FLOAT OPERATIONS AND TSM ALTERNATIVES

The results of the B/C analysis for the Expanded Float Operations Alternative are shown in Tables 20-3 and 20-4 above. The B/C ratio for the Expanded Float Operations Alternative is 0.29 in the Metropolitan New York region. The B/C ratio for the Expanded Float Operations Alternative indicates that for every dollar spent only 29 cents in benefits would be realized, which produces a negative NPV and return on investment. New Jersey is expected to receive a total discounted benefit of $26 million under the Expanded Float Operations Alternative. In other words, the cost of this alternative substantially exceeds any realistic estimate of benefits likely to be realized. As noted earlier, the transportation efficiency benefits of the Expanded Float Operations Alternative are expected to be too small (due to the small diversion of traffic from truck to rail) to generate the business retention/attraction benefits that drive the anticipated benefits of the Tunnel Alternative.

As was noted in earlier chapters, the diversion results for the TSM Alternative were so insignificant (less than one-fifth of the small diversion of the Expanded Float) that an independent NYMTC model run for this alternative was not conducted because essentially little measurable truck diversion was expected to result. Without the NYMTC model run, none of the subsequent analytical tools used to quantitatively assess this alternative (such as STEAM, REMI, etc.) could be performed. The TSM alternative has similar capital costs to the Expanded Float alternative—about $60 million in landside capital costs, a two million dollar allowance for signal and switch improvements to the Hudson Line, and less than $20 million in marine vessel costs. The TSM alternative would not incur the incremental $20 million in additional Operating and Maintenance costs of the Expanded Float. Thus, for slightly lower costs, the TSM alternative would achieve about one-fifth of the benefits of the Expanded Float, resulting in a B/C ratio significantly lower than the 0.29 for the float alternative. Even if greater than anticipated benefits were achieved from the operational improvements than currently envisioned, the B/C ratio is unlikely to exceed that of the Expanded Float Operations Alternative.

C. FUNDING AND REVENUE-POLICY FRAMEWORK

The Tunnel Alternative would require a significant up-front capital outlay for construction, as well as an ongoing stream of revenue for operations and maintenance. A typical policy framework for assessing funding opportunities involves identifying the potential beneficiaries of the project, and their ability to contribute some of these prospective benefits to the cost of construction.

Since freight transport in the United States is privately owned and operated, a rail freight tunnel would normally be conceived, funded, built and operated by a freight railroad company. However, almost all of the East-of-Hudson rail freight infrastructure is publicly owned by the State of New York and to a lesser extent the City of New York. Therefore, the impetus for building the tunnel comes not from the railroad companies, but from the public sector that seeks a variety of different benefits for several populations:

- The traveling public of the Metropolitan New York region (New York and New Jersey) and beyond from congestion reduction due to diversion of tractor-trailer trucks from the regional and national roadway network.
- Residents of the Metropolitan New York region who would reap environmental benefits from reduced highway emissions.

- Businesses of the Metropolitan New York region that might benefit from transportation cost reductions of goods and services, as well as increased reliability of deliveries.
- Residents of New York City and Long Island from the possible growth of rail freight related industrial, warehousing and distribution activity East-of-the-Hudson.
- New York City and New York State, from added tax revenues due to relocated or expanded businesses that might arise because of the project.
- New York City, New York State, and Connecticut from increased system redundancy of the transportation system, particularly along the I-95 corridor.
- New Jersey, which captures a significant amount of the congestion reduction and air quality benefits from diverting shipments from truck to rail. New Jersey also benefits from the business attraction that would occur in the East-of-Hudson region, in that New Jersey residents might fill some of the new jobs created.
- The U.S. as a whole due to the various benefits of reduced long-haul trucking on congested routes and overall improvement in the economic efficiency of the freight transport system.
- Transportation agencies that would benefit from reduced wear and tear on the highway system and bridges resulting from excessive truck impacts.

Even if a tunnel was built by parties other than the freight railroads, the railroads would benefit from the tunnel. The project would provide an additional infrastructure option and new markets for the railroads. The new yard space in West Maspeth, or East-of-Hudson in general, could free up capacity in the railroads' West-of-Hudson yards, allowing for additional growth there. There is also the possibility of capturing marginal revenue from this last leg of the freight trip. The tunnel is forecasted to bring up to 12.6 million tons of new business to the railroads (Double Tunnel System—New Jersey tunnel alignment) because of improved service to East-of-Hudson markets.[1] The Single Tunnel System would generate about 9.6 million tons of new business. The Single Tunnel System, however, would be expected to have lower levels of service and traffic volume (as well as profit) than the Double Tunnel System, so incremental railroad revenue would be a less viable source of funding for the Single Tunnel System. The proposed new rail tunnel would generate an economic surplus that would be enjoyed by various participants.[2]

It is logical to consider deriving funding from the following sources:

- First, from users of the tunnel, through tolls or user charges;
- Second, from business beneficiaries, through tax mechanisms; and
- Third, from more general benefiting populations, through grants or general subsidies.

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[1] It is forecast that 14.8 million annual tons of traffic will be diverted to the tunnel, but only 12.6 million of that total is actually new rail traffic generating additional revenue for the railroad operators. Existing dray traffic off-loaded in New Jersey and trucked to the East-of-Hudson region (new to the East-of-Hudson region's rail network, but not new to the railroads) was excluded from the calculation of the railroad's increased revenue because the railroads derive minimal incremental profit from these moves.

[2] As broadly defined, economic surplus is simply the net benefit (or in some cases profit) after subtracting operating expenses and related costs of a project.

It is also possible that up-front funding may be obtained from private, profit-seeking entities. Ultimately, however, the revenue stream to pay the costs and profits of these private sector entities would come from one of the above sources.

Given the policy framework described above, several scenarios depicting financial arrangements for the Cross Harbor project were developed. No matter how financing is organized, however, one aspect is clear—the project would need a committed and preferably dedicated source of revenue to pay off the debt incurred to build the facility (it is assumed that user fees will cover the cost of operation). The section below covers some of the ownership and structural issues, followed by a discussion of revenue sources.

POTENTIAL SPONSORS

The requirements to become the sponsor of the project are fairly straightforward. The best choice of sponsor would be the organization that has the best legal and institutional infrastructure to undertake the project. It must be able to let contracts, oversee design and construction, have an interest in the project, issue bonds, and ideally have experience in dealing with rail freight and regional transportation issues.

The sponsor would need to arrange for financing, design, construction, operations, and maintenance of the facilities, and might find it advantageous to split these activities among different parties. Some options for sponsor of the project are described below.

PORT AUTHORITY OF NEW YORK AND NEW JERSEY (PANYNJ)

PANYNJ is a logical potential choice as sponsor of the Cross Harbor project. It already has within its mission a mandate to address bi-state transportation issues, owns and operates ports and existing bridges and tunnels crossing the harbor, and is in the freight business. The PANYNJ was created in the 1920s for the specific purpose of improving cross harbor rail freight service. It is currently participating with the railroad companies in improving rail assets in both the East-of-Hudson and West-of-Hudson regions.

PANYNJ is a robust organization accustomed to operating facilities that collect user fees. It regularly issues bonds for major infrastructure projects, and has bonding capacity.

The other advantage of PANYNJ being the project sponsor is that it could treat the cross-Hudson transportation system as a single network, adjusting capacity, tolls, user fees and fares as necessary to optimize the level of service provided and revenues accrued. This could be done similarly to how the MTA helps to support public transportation in the region with toll revenue from its bridge and tunnel operations.

STATE OF NEW YORK

The State of New York will receive direct benefits from the project, and would therefore be a potential project sponsor. The state has the power to own, finance, and operate such a facility, and would see economic benefits as accruing not only to New York City, but also to Long Island and the lower Hudson Valley counties. The project could be viewed as a westward extension of the freight rail system on Long Island, which is already owned by the state (Long Island Rail Road and MTA). Like the PANYNJ, the state, through its Department of Transportation (NYSDOT), has experience in the development and management of large transportation infrastructure projects. Unlike the PANYNJ, it has no bi-state mandate.

THE CITY OF NEW YORK

The City of New York has been leading the efforts on the project until now. The City of New York could treat this project as part of a larger economic development effort that might include improved port facilities in Brooklyn and other ancillary development that would accompany the proposed West Maspeth yard. The City has less experience in the development of large scale transportation infrastructure projects than either the PANYNJ or NYSDOT and does not have a bi-state mandate.

SPECIAL PURPOSE AUTHORITY

Special purpose authorities are a common way to build projects that have special needs and have unique constituencies that do not fit easily into existing organizations. A special purpose authority with representation by likely beneficiaries of the project in New York City, Long Island, New Jersey, and Connecticut may be an appropriate mechanism for this regional project. A broader special purpose authority whose mission is to improve freight transportation in the northeast and mid-Atlantic region may also be a possibility. These mandates are different and larger than the PANYNJ's traditional mandate. The Cross Harbor project might be defined as one component of such a larger system, including infrastructure improvements elsewhere. This broader authority might also be able to develop an organizational framework to raise needed revenue for the project (and others). Such an authority could be structured as either simply a management tool, relying on funding from others, or could encompass within it the ability to charge users in such a way as to be self-supporting. Even if capital contributions from other agencies were required for the actual construction, the special purpose authority could still be the operator.

6320 CORPORATIONS

A twist on the traditional public sector special purpose authority is the 6320 corporation, which is an entity created under the federal tax code that allows public and private investment and management to exist within the same non-profit corporate structure. Such a framework is appropriate when the private sector interests and beneficiaries require a say in the structuring and management of a project or undertaking, but still want to access the benefits of traditional non-profit ownership and tax-exempt financing. To date, the 6320 corporations which have been established in the transport arena have relied heavily on underlying private sector contracts to provide services—which can have an element of reasonable profit within them—and used the corporation to lower the costs of borrowing.

ANCHOR TENANTS

One opportunity to help finance the project would be for the project sponsor to line up one or more anchor tenants at West Maspeth (or potentially other locations) that would be in a position to provide a steady stream of rail traffic for use in the tunnel. For example, a potential anchor tenant might include United Parcel Service (UPS), which already has a regional distribution center across the street from the proposed West Maspeth yard. UPS is the largest purchaser of freight rail services in the country, and could be an important customer for the railroads through the Tunnel Alternative.

It is possible that a private sponsor may be willing to develop the terminal operation with several anchor and perhaps smaller tenants. This is consistent with recent events in the maritime and air freight industries. One of the more high-profile examples is the development of the Alliance

Airport in Fort Worth, Texas.[1] This was a private venture done in partnership with local and federal public agencies to develop an industrial airport and surrounding property.

POTENTIAL REVENUE SOURCES

Although it is always possible that the tunnel alternative could be funded on a pay-as-you go basis with grants, the size of the project most likely dictates that some type of debt financing would be necessary. Debt financing would require a steady, reliable stream of revenue to pay back the debt. Therefore, it would be logical to seek funding from the sources described below:

TOLLS OR USER CHARGES ON THE CROSS HARBOR TUNNEL

Tolls and user charges have been used historically to provide a revenue stream to pay back investors for major infrastructure projects. It is common for bridges, tunnels, turnpikes, airports and seaports to capture revenue from user fees. As discussed below, the revenue stream from the tunnel will likely only be sufficient to cover operating and maintenance costs, and not to significantly support the capital costs of the project.

For comparative purposes, the tolls charged on the recently opened Alameda Corridor rail project that serves the ports of Long Beach and Los Angeles are $30 per loaded waterborne container, $4.00 per empty waterborne container and for non-waterborne containers, and $8.00 per loaded railcar. Empty railcars are free. Loaded containers that do not use the corridor, but are shipped by rail along other routes, are also charged at the same rate as those that do.

For the purpose of the financial structures presented in this section, a user fee of $2.00 per ton was assumed in order to cover the estimated annual operation and maintenance expenditures of either the Single Tunnel or Double Tunnel Systems. A price sensitivity analysis indicated that a $2.00 per ton user fee would cause only 4 percent of potential tunnel users to switch back to other modes of shipment. [2] A $2.00/ton user fee would result in charges of $44/container (slightly higher than in Alameda) and $140/railcar—much higher than in Alameda. The Alameda cost structure results in a significant cross-subsidy from containers to carloads. Clearly, there would be many ways to vary this pricing structure to produce the required revenue stream.

VALUE CAPTURE FROM BUSINESS BENEFICIARIES

A common means of raising revenue for infrastructure projects that provide benefits to the private sector is to capture some of the value of the benefits through tax mechanisms. One method involves dedicating to the capital needs of the project the additional taxes that accrue to the local jurisdictions from the increasing value of property brought about by the investment—this is called tax increment financing. Another way to have business beneficiaries contribute to infrastructure improvements is to create a special benefit assessment district.

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[1] Alliance is the centerpiece of AllianceTexasSM. Strategically located in the center of North America, Alliance is an international trade and logistics complex built around the world's first industrial airport, Fort Worth Alliance Airport. Alliance is home to more than 100 companies, including 34 from the Fortune 500.

[2] A user fee of $2.00 per ton is still applicable to the Single Tunnel System because it will have proportionately lower revenues and operating costs than the Double Tunnel System. This sensitivity analysis should not be considered definitive as the Shipper Choice Model was not designed to test the sensitivity of tunnel user fees.

While analyzing the business attraction benefits of the proposed Cross Harbor project, the development landscape in Brooklyn, Queens, Long Island and the Bronx was assessed. Many of the areas with development potential are already eligible for tax breaks or incentives for new or expanded development. Therefore, value capture taxes would have the opposite effect from the positive impacts that are being sought with the existing tax incentives which are designed to attract new businesses to the area. It seems reasonable to assume that value capture would not be an appropriate mechanism under these circumstances.

For similar reasons, it was decided not to analyze the potential of raising revenue from the railroads. The major freight railroads in the U.S. are relatively undercapitalized, and any fee assessed them could be passed on to the users, thereby diminishing the demand for the tunnel (as noted above, the analysis indicates that user fees could at most cover O&M costs before beginning to degrade demand for the tunnel).

POTENTIAL FEDERAL FUNDING PROGRAMS

Under the current landscape of transportation infrastructure finance, there are no significant funding sources to facilitate rail freight projects. The reason for this is straightforward: rail freight is a private sector, intensely competitive business. However, the landscape regarding public involvement in financing freight rail projects is possibly changing. There is considerable dialogue about a higher level of federal involvement in freight infrastructure projects, and potentially new federal programs aimed at rail freight. Discussions are underway, with possible action happening during the reauthorization for Transportation Equity Act of the 21st Century ("TEA 21") in the next couple of years. The Administration's proposal for TEA-21 Reauthorization (called SAFETEA) contains several proposals to broaden the ability of the Federal Government to participate in freight projects:

- **Freight Gateways Program.** In addition to other things, this program would provide capital funding to address infrastructure and freight operational needs at freight transportation gateways. States would be allowed to obligate funds apportioned to it for publicly owned intermodal freight transportation projects that provide community and highway benefits by addressing economic, congestion, security, safety, and environmental issues associated with freight transportation gateways.[1] Eligible projects may include publicly-owned intermodal freight transfer facilities, access to such facilities, and operational improvements for such facilities (including capital investment for Intelligent Transportation Systems), except that projects located within the boundaries of port terminals shall only include the transportation infrastructure modifications necessary to facilitate direct intermodal access into and out of such a port.[2] Public-private partnerships would be allowed.
- **Freight Intermodal Connections.** A funding set-aside is proposed within the National Highway System (NHS) funding program for NHS routes connecting to intermodal freight terminals. These routes will share the funding set aside with Strategic Highway Network (STRAHNET) connectors to strategic military deployment ports. [3]

[1] SAFETEA Sec. 1205 (a), § 325 (d) (1).

[2] SAFETEA Sec. 1205 (a), § 325 (d) (2).

[3] SAFETEA Sec. 1205, (c)

- **TIFIA Eligibility.** TIFIA (Transportation Infrastructure Finance and Innovation Act) was created in TEA-21 to provide credit assistance to major projects of national significance. Under the SAFETEA proposal, it would be amended to expand freight transportation facilities eligible for credit assistance. Eligible facilities would include public and private freight facilities, as well as public and private intermodal freight facilities. Any improvements at port terminals, however, are eligible for TIFIA credit assistance only if they are necessary to facilitate direct intermodal access and egress to and from the port. Projects receiving both public and private sector funds, including private facilities receiving public funding, would be eligible to apply for TIFIA credit assistance. Also, the threshold project cost eligibility for TIFIA credit assistance would be reduced from $100 million to $50 million.[1]

- **Private Activity Bonds.** Private activity bonds are tax-exempt bonds that are issued for projects that are owned or leased by private enterprises. Under SAFETEA, such bonds would be allowed for surface freight transfer facilities. These facilities are defined as "facilities for the transfer of freight from truck to rail or rail to truck (including any temporary storage facilities directly related to such transfers)." This category does not include air/rail or air/truck facilities, but those facilities may be eligible under existing law for tax-exempt financing under the exemption for airport facilities.[2]

The proposed Transportation Equity Act Legacy for Users (TEALU), the House bill to reauthorize TEA-21, includes the following six proposed programs that are specifically designed to improve the movement of freight:[3]

- Provides close to $2 billion in funding to border states for highway projects that will improve the safe and efficient movement of people and goods at or across the border between the United States and Mexico and the United States and Canada.

- Provides $3 billion in additional funding over six years to states for improvements on freight intermodal connectors. This funding will facilitate and support improvements to public roads leading to and from major intermodal facilities.

- Provides $3 billion to fund projects of regional and national significance. This program is designed to fund projects that will have a significant impact on the movement of goods and people beyond the immediate local area of the project. It specifically includes project that will improve economic productivity by facilitating international trade, relieving congestion, and improving transportation safety by facilitating passenger and freight movement. Freight railroads projects are specifically identified as being eligible.

- Provides $5 billion to fund a National Corridor Infrastructure Improvement program. This program is designed to fund regional and multi-state corridor projects that will improve mobility and economic growth in areas underserved by existing highway infrastructure.

- Creates a new program to fund the construction of dedicated truck lanes. Projects funded from this program will improve the safe and efficient movement of freight by separating truck traffic from traffic in regular lanes.

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[1] SAFETEA Sec. 1304(a)(3)

[2] SAFETEA Section 9004.

[3] HR 3550. All dollar amounts are tentative and subject to frequent change.

- Provides $150 million to complete the core deployment and to encourage the expanded deployment of the Commercial Vehicle Information Systems and Networks (CVISN) program. The CVISN program is designed to improve commercial motor vehicle efficiency by allowing motor carriers to by-pass safety inspections and weigh stations, based on their safety records, which allows for the vehicle to avoid downtime during roadside inspections.

The most direct way to obtain federal funding would be through the Federal transportation reauthorization bill. A range of federal participation based on a percentage of the total capital cost is possible and is evaluated in the finance plan. The rationale for Federal involvement, potentially from FHWA, is the potential benefits to the national highway system from diversion of freight from trucks to rail. Federal participation may be through direct grants, through loans (such as the TIFIA program) or through credit enhancements (also through the TIFIA).

A potential objection to using existing federal dollars for rail infrastructure is that the most likely source is the Highway Trust Fund, and there are major impediments to such funds being used for rail projects. However, a reasonable connection can often be made between rail projects and improvements to the highway system, as has been demonstrated in the analysis of this project. Some recent suggestions for dedicated sources of funding for freight projects include:

- The current 4.3-cent tax on diesel fuel paid by the freight railroads that currently flows directly to the U.S. General Fund.
- A new user fee on international freight moving in and out of marine and land ports.
- A new user fee on rail freight movement in general that might be applied at the regional level to fund regional rail freight projects.
- Special programs to be funded by the federal government through tax credit bonds.

As the freight finance landscape changes over the next few years, it is reasonable to expect that a capital funding plan could be made up of the elements described below:

TOLL REVENUE CROSS-SUBSIDIES

One of the goals of the Cross Harbor project is to increase the capacity and reliability of freight movement across the Hudson while decreasing the impact of freight movement on roadways and the environment. Therefore, it may be reasonable to tap existing freight movements across the Hudson for a portion of the required revenue. The existing truck toll on these bridges is in the $20 to $30 range for the largest five-axle trucks.

If this concept was adopted there are a variety of different ways it could be implemented. The assumed charge on the George Washington and Verrazano Narrows bridges could be split among all of the PANYNJ and MTA bridge crossings, thereby lowering the price at any one facility. Also, it might be prudent to extend the surcharge to the New York State Thruway's Tappan Zee Bridge, to avoid potential diversion of trucks to that facility.

There is a history of cross-subsidies among modes on New York area bridges and tunnels. The MTA uses a percentage of its toll revenues to subsidize transit. The PANYNJ also cross subsidizes, in that all revenues of the organization are pooled for distribution on an as-needed basis to their various operating divisions. The PATH (Port Authority Trans Hudson) commuter rail service is heavily subsidized by other Port Authority operations.

OPERATIONAL OPTIONS

The traditional way to operate a project is for the sponsor to be the responsible party for operations and maintenance. This is how most toll roads and bridges in this country are operated. Overseas, however, it has been much more common for operations to be contracted out, with terms bid and negotiated. This approach is becoming more acceptable in the United States, and provides a potential opportunity for the sponsor to make the most of its limited capital.

In the case of the Cross Harbor project, there are two potential parts of the operation that might be handled through private contractors: the operation and maintenance of the tunnel, and of the ancillary facilities. The scope and duration of such contracts would be determined by the type of financing used—for example, using tax-exempt financing puts constraints on the duration and type of compensation allowable in operating contracts. Generally, the intent of contracting out such services is to pass the risk onto a party better able to bear it and price it appropriately, and then to "incentivize" the contractor to operate as efficiently as possible. These contracts also provide a logical way to disaggregate the components of both cost and risk, and to better allocate benefits.

To be specific in this case, it would be appropriate to contract out the maintenance of the track bed, signal system and tunnel infrastructure to any number of public or private rail entities which already have the resources, equipment and experience, rather than creating a new entity.

The same argument holds for the ancillary yards. Depending on their ultimate location and configuration, they could be operated under contract by any number of freight companies or railroads. As a model for this type of analysis, private development of the West Maspeth intermodal yard is assumed in some of the financing scenarios described below.

In either case, the sponsor—be it public, private or some combination—can set service standards through the contracts, and retain oversight and policy control.

D. POTENTIAL FINANCIAL STRUCTURES AND CASH FLOW

Illustrative examples of potential financial structures and resultant cash flow are provided in the subsections below. Both the Single Tunnel and Double Tunnel Systems are addressed. In each case, the New Jersey Alignment, which generates the greatest benefits, is used as the financing model. The numbers would be just slightly different for the Staten Island Alignment.

The project would require a significant up-front capital outlay for construction, as well as an ongoing stream of revenue for operations and maintenance. This section outlines four financial structures that may serve as appropriate frameworks for financing the construction and operation of this project. It is important to note that these example financial structures are meant to be just that—examples. The exact dollar values could vary depending on the type of financing instruments used and other factors beyond reasonable estimation (i.e., interest rate fluctuations, the bond issue balance reinvestment rate, etc.). In addition, it is unlikely that all of the debt for this project would be issued at one time, as is assumed below, but that debt would be issued periodically as part of a plan of finance. However, this simplifying assumption is made in the analysis contained herein.

Although it is always possible that the project would be funded entirely on a pay-as-you go basis with grants, the size of the project most likely dictates that some type of debt financing would be necessary. Debt financing would require a steady, reliable stream of revenue to pay back the

debt. Four illustrative financial structures that may be appropriate for the Single Tunnel System and the Double Tunnel System were developed:

- Scenario A: Traditional Public Financing (see Table 20-5);
- Scenario B: Traditional Public Financing with Private Sponsorship of West Maspeth Yard (see Table 20-6);
- Scenario C: Traditional Public Financing with Private Sponsorship of West Maspeth Yard and a $4.00 Truck Toll Surcharge (see Table 20-7);
- Scenario D: Traditional Public Financing with a $5.15 Truck Toll Surcharge for the Single Tunnel System and $10.31 for the Double Tunnel System[1]. The toll was derived by eliminating the private sponsorship of West Maspeth in Scenario C, holding the public sponsorship commitment roughly constant, and assigning the balance of dollars to the truck surcharge (see Table 20-8).

Each of the four scenarios assumes the following:

- Federal participation of 25, 50, or 80 percent of the capital cost in the form of grants.
- Bonding of the construction amount not covered by other sources, to be repaid directly through a special purpose authority, or the Port Authority. In the latter case, the financial structure would address not only the Cross Harbor project, but other Port Authority projects as well. Bonding assumptions were as follows:
  - Issued in 2005 with a payback period of 40 years.
  - Current market rates for an "A" Rated issuer are used, plus 100 basis points. In the current market (as of mid-March 2003), an "A" Rated issuer would have an average borrowing cost of about 5.00 percent for a 40-year borrowing. Since interest rates are at historic all-time lows, and it is unlikely that borrowing rates will be this low when the project is constructed, this analysis assumes a borrowing cost of 6.00 percent. Therefore, all reported results are reflective of this rate. If bonds could be issued using the current market borrowing rate of 5.00%, the annual debt service amount would be approximately 13% lower than presented in this analysis.
  - Balances on reserve funds could be reinvested at 2.50 percent. In the current reinvestment market, the 2-Year Treasury is yielding approximately 1.50 percent, while the estimated borrowing cost for this project (as explained in the bullet point above) is about 5.00 percent. This is a spread of about 350 basis points (5.00 percent - 1.50 percent = 3.50 percent). Using this same spread of 350 basis points and applying it to the 6.00 percent borrowing rate, a 2.50 percent reinvestment rate seems reasonable. This reinvestment rate would be applied to the project fund balance during construction of the project and to the debt service reserve fund.
  - Debt service reserve fund equal to one year debt service.
  - Underwriters discount plus costs of issuance total to 1.0 percent.
- Tunnel Users Fee set to cover operations and maintenance expenses of the tunnel. This is estimated to be $2.00 per ton starting 2 years after the project opens, increasing periodically

[1] In actual practice, the surcharge would be rounded.

to track inflation. This analysis assumes that no fees will be charged for the first two years because it will take a minimum of two years for the market to build, thereby making a user fee more acceptable. In practice, other user fee rates might be used, such as fees on a per-car basis.

Other assumptions and analysis of each scenario are provided below. Note that for consistency with other sections of this report, all dollar values in this financial analysis are expressed in 2002 dollars. More details regarding the assumptions and cash flows for the Single Tunnel System financing scenarios, expressed in both year of expenditure as well as constant 2002 dollars, can be found in the supporting documents to this EIS.

Table 20-5
Summary of Finance Scenario A:
Traditional Public Financing—Single and Double Tunnel Systems

Current Market Rate Plus 100 Basis Points: 6.00 Percent

	Federal Contribution		
	25 Percent	**50 Percent**	**80 Percent**
SINGLE TUNNEL SYSTEM			
Assumptions			
Cost of Project (millions 02$)	$3,825.7	$3,825.7	$3,825.7
Federal Dollar Contribution (millions 02$)	$956.4	$1,912.8	$3060.5
Private Investment	0%	0%	0%
Private Dollar Contribution (millions 02$)	$0.0	$0.0	$0.0
Highway Bridge Toll Surcharge	None	None	None
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)*	$3,109.4	$2,073.0	$829.2
Annual Debt Service (millions 02$)**	$208.6	$139.0	$55.6
Average Annual Sponsor Commitment (millions 02$)	$122.1	$81.7	$33.3
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$4,884.5	$3,270.0	$1,332.5
DOUBLE TUNNEL SYSTEM			
Assumptions			
Cost of Project (millions 02$)	$6,400.0	$6,400.0	$6,400.0
Federal Dollar Contribution (millions 02$)	$1,600.0	$3,200.0	$5,120.0
Private Investment	0%	0%	0%
Private Dollar Contribution (millions 02$)	$0.0	$0.0	$0.0
Highway Bridge Toll Surcharge	None	None	None
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)	$5,201.4	$3467.6	$1,387.0
Annual Debt Service (millions 02$)	$348.9	$232.6	$93.0
Average Annual Sponsor Commitment (millions 02$)	$204.1	$136.5	$55.5
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$8,162.5	$5,461.6	$2,220.5

Note:

***** See pp 20-22 to 20-23 for detailed description of bonding assumptions.

** Annual debt service is shown for 2005 in 2002 dollars. Though the annual debt service will be constant in year of expenditure dollars, it will steadily decline in 2002 dollars over time.

Table 20-6
Summary of Finance Scenario B: Traditional Public Financing with Private Sponsorship of West Maspeth Yard—Single and Double Tunnel Systems

Current Market Rate Plus 100 Basis Points: 6.00 Percent

	Federal Contribution		
	25 Percent	**50 Percent**	**80 Percent**
SINGLE TUNNEL SYSTEM			
Assumptions			
Cost of Project (millions 02$)	$3825.7	$3825.7	$3825.7
Federal Dollar Contribution (millions 02$)	$880.4	$1760.8	$2817.3
Private Investment	8%	8%	8%
Private Dollar Contribution (millions 02$)	$304.0	$304.0	$304.0
Highway Bridge Toll Surcharge	None	None	None
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)*	$2862.4	$1,908.3	$763.3
Annual Debt Service (millions 02$)**	$192.0	$128.0	$51.2
Average Annual Sponsor Commitment (millions 02$)	$112.5	$75.3	$30.7
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$4,499.6	$3,013.3	$1,229.9
DOUBLE TUNNEL SYSTEM			
Assumptions			
Cost of Project (millions 02$)	$6,400.0	$6,400.0	$6,400.0
Federal Dollar Contribution (millions 02$)	$1,184.0	$2,368	$3,788.8
Private Investment	26%	26%	26%
Private Dollar Contribution (millions 02$)	$1,664.0	$1,664.0	$1,664.0
Highway Bridge Toll Surcharge	None	None	None
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)	$3,849.0	$2,566.0	$1,026.4
Annual Debt Service (millions 02$)	$258.2	$172.1	$68.8
Average Annual Sponsor Commitment (millions 02$)	$151.4	$101.4	$41.5
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$6,055.7	$4,057.1	$1,658.7

Note:

***** See pp 20-22 to 20-23 for detailed description of bonding assumptions.

****** Annual debt service is shown for 2005 in 2002 dollars. Though the annual debt service will be constant in year of expenditure dollars, it will steadily decline in 2002 dollars over time.

Table 20-7
Summary of Finance Scenario C: Traditional Public Financing with Private Sponsorship of West Maspeth Yard and a $4.00 Truck Toll Surcharge—Single and Double Tunnel System

Current Market Rate Plus 100 Basis Points: 6.00 Percent

	Federal Contribution		
	25 Percent	**50 Percent**	**80 Percent**
SINGLE TUNNEL SYSTEM			
Assumptions			
Cost of Project (millions 02$)	$3825.7	$3825.7	$3825.7
Federal Dollar Contribution (millions 02$)	$880.4	$1760.8	$2817.3
Private Investment	8%	8%	8%
Private Dollar Contribution (millions 02$)	$304.0	$304.0	$304.0
Highway Bridge Toll Surcharge	$4.00/truck	$4.00/truck	$4.00/truck
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)*	$2,862.4	$1,908.3	$763.3
Annual Debt Service (millions 02$)**	$192.0	$128.0	$51.2
Average Annual Sponsor Commitment (millions 02$)	$86.1	$48.9	$6.7
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$3,444.2	$1,957.9	$267.8
DOUBLE TUNNEL SYSTEM			
Assumptions			
Cost of Project (millions 02$)	$6,400.0	$6,400.0	$6,400.0
Federal Dollar Contribution (millions 02$)	$1,184.0	$2,368.0	$3,788.8
Private Investment	26%	26%	26%
Private Dollar Contribution (millions 02$)	$1,664.0	$1,664.0	$1,664.0
Highway Bridge Toll Surcharge	$4.00	$4.00	$4.00
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)	$3,849.0	$2,566.0	$1,026.4
Annual Debt Service (millions 02$)	$258.2	$172.1	$68.8
Average Annual Sponsor Commitment (millions 02$)	$125.0	$75.0	$15.1
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$5,000.3	$3,001.7	$1,658.7

Notes:

***** See pp 20-22 to 20-23 for detailed description of bonding assumptions.

****** Annual debt service is shown for 2005 in 2002 dollars. Though the annual debt service will be constant in year of expenditure dollars, it will steadily decline in 2002 dollars over time.

Table 20-8
Summary of Finance Scenario D: Traditional Public Financing with a Truck Toll Surcharge—Single and Double Tunnel Systems

Current Market Rate Plus 100 Basis Points: 6.00 Percent			
	Federal Contribution		
	25 Percent	**50 Percent**	**80 Percent**
SINGLE TUNNEL SYSTEM ($5.15 Truck Toll Surcharge)			
Assumptions			
Cost of Project (millions 02$)	$3825.7	$3825.7	$3825.7
Federal dollar contribution	$956.4	$1,912.8	$3,060.5
Private Investment	0%	0%	0%
Private Dollar Contribution (millions 02$)	$0	$0	$0
Highway Bridge Toll Surcharge	$5.15/truck	$5.15/truck	$5.15/truck
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)*	$3,109.2	$2,072.8	$829.1
Annual Debt Service (millions 02$)**	$208.6	$139.0	$55.6
Average Annual Sponsor Commitment (millions 02$)	$88.4	$47.9	$6.7
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$3,535.0	$1,917.1	$269.1
DOUBLE TUNNEL SYSTEM ($10.31 Truck Toll Surcharge)			
Assumptions			
Cost of Project (millions 02$)	$6,400.0	$6,400.0	$6,400.0
Federal Dollar Contribution	$1,600.0	$3,200.0	$5,120.0
Private Investment	0%	0%	0%
Private Dollar Contribution (millions 02$)	$0	$0	$0
Highway Bridge Toll Surcharge	$10.31	$10.31	$10.31
Tunnel User Fee	$2.00/ton	$2.00/ton	$2.00/ton
Key Measures			
Capital Cost to be Bonded (millions 02$)	$5,201.4	$3,467.6	$1,387.0
Annual Debt Service (millions 02$)	$348.9	$232.6	$93
Average Annual Sponsor Commitment (millions 02$)	$137.4	$69.4	$10.8
Length of Sponsor Commitment	40 Years	40 Years	40 Years
Total Sponsor Financial Commitment (millions 02$)	$5,495.9	$2,777.5	$431.6

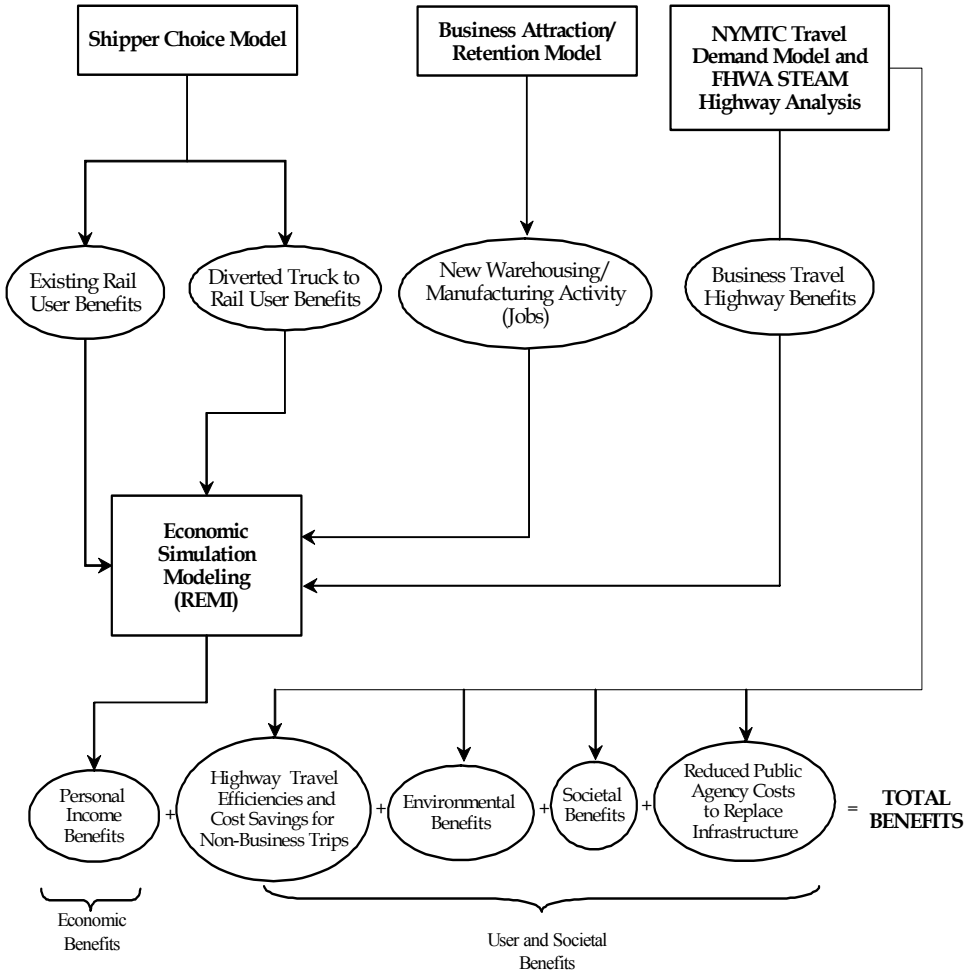
Notes:

***** See pp 20-22 to 20-23 for detailed description of bonding assumptions.

****** Annual debt service is shown for 2005 in 2002 dollars. Though the annual debt service will be constant in year of expenditure dollars, it will steadily decline in 2002 dollars over time.

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Figure 20-1. Benefit-Cost Analysis Framework



A. INTRODUCTION

A Community Outreach Program was conducted to educate and involve citizens throughout the New York City, northern New Jersey, and southwestern Connecticut regions, as part of the EIS process. The fundamental purpose of the Community Outreach Program is to establish a process for continuous input to the project up to the receipt of a Record of Decision. The overriding objective of the Community Outreach Program is to solicit input from as many sources as possible to allow decisions to be made in an informed manner with the full benefit of public involvement. To achieve this objective, a comprehensive program was established that encouraged dialogue between and among agencies, communities, and other interested parties and facilitated input from a broad range of constituencies.

Since the inception of the Community Outreach Program in July 2001 through January 2004, 61 meetings have been conducted. Through the use of a toll-free telephone information line, fax line, web site and correspondence, additional input was received from stakeholders. The results of the Community Outreach Program, since its inception in July 2001, are described in further detail below.

B. COMMUNITY OUTREACH PLAN

As part of the Community Outreach Program, a Community Outreach Plan was drafted, outlining the goals and objectives of the Program and the tools that would be used as the project progresses (see Community Outreach Plan, Appendix 8).

The specific objectives of the Community Outreach Plan were to:

- Engage a broad base of constituencies;
- Provide updated project information to facilitate meaningful public dialogue;
- Build consensus around a locally preferred alternative(s).

The Plan was designed to be flexible, able to accommodate new information and adapt those methods and mechanisms that demonstrate greatest success. Public participation was an integral part of each study phase. In order to provide extensive opportunity for public participation, the Plan included: 1) activities aimed at direct solicitation of input through such means as public meetings, and 2) the formation of Steering and Advisory Committees during the MIS to provide regular input on the project and an additional point of contact for the public.

The specific objectives of the Community Outreach Program were to:

- Provide members of the public with the necessary information and an opportunity to become actively involved in the development of the EIS;

- Solicit community feedback for the Scoping Document on the scope of alternatives, environmental issues to be covered, and the methods for their evaluation, followed later by comments on the draft EIS as to impacts on specific areas;
- Involve stakeholders and interested groups within minority and/or low-income neighborhoods; and
- Balance points of view among regional/local interests, environmental/commercial, and modes of transportation, to arrive at a consensus on a locally preferred alternative.

C. SCOPING

AGENCY PRE-SCOPING

To determine potential issues that should be addressed as part of the EIS, a series of Pre-Scoping Meetings were conducted with federal, state and city agencies from New York City/northern New Jersey. In all, five meetings were conducted in July and August of 2001. The issues raised at these meetings were used to help formulate a draft Scoping Document for the EIS. A table of these meetings is provided in Table 21-1 below.

Table 21-1
Pre-Scoping Meetings

Meeting Date	Agency(s)
6/29/01	Federal Agency Meeting (Coast Guard, NYSDOT, ACOE, EPA)
7/26/01	New York State Agency Meeting (11 NYS agencies)
7/26/01	New York City Agency Meeting (12 NYC agencies)
7/31/01	New Jersey Agency Meeting (3 NJ agencies)
8/2/01	Natural Resources/Water Quality Technical Meeting (ACOE, NMFS, EPA)

BOROUGH BOARD PRESENTATIONS

As part of the scoping process, requests to present at the Borough Board meetings of all five New York City Borough Presidents were made. Presentations were scheduled and held from October 2001 through January 2004 at the Borough Board meetings in Brooklyn, the Bronx, Queens, Manhattan and Staten Island. These meetings are shown in Table 21-2 below.

PUBLIC SCOPING MEETINGS

Following the December 7, 2001 publication of the project's Notice of Intent in the *Federal Register* (see Notice of Intent, Appendix 8) a series of seven Public Scoping Meetings were held in January 2002 throughout New York City and northern New Jersey (see Table 21-3). The meetings were publicized in local newspapers throughout the region. The purpose of these meetings was to discuss the proposed Scoping Document for the DEIS and accept comments from the public. At each of these meetings, attendees were given an opportunity to view presentation materials and boards, ask questions of the project team, and provide oral and/or written comments on the scoping document. Most importantly, the Public Scoping Meetings provided attendees with an opportunity to comment on study areas and/or pertinent issues that were excluded from the original scope of the EIS. All comments were recorded by a stenographer and are part of the public record. Transcripts of the Scoping Meetings are on file with the NYCEDC.

Table 21-2
Borough Board Presentations

Presentation Date	Borough Board
10/25/01	Bronx Borough Board
11/7/01	Staten Island Borough Board
11/15/01	Manhattan Borough Board
11/19/01	Queens Borough Board
3/21/02 6/13/02	Queens Borough President
5/20/02	Brooklyn Borough President
6/4/02	Brooklyn Borough Board
5/30/03	Brooklyn Borough Board
10/7/03	Brooklyn Borough Board
10/20/03	Queens Borough Board
12/3/03	Staten Island Borough Board
12/20/03	Manhattan Borough Board

Table 21-3
Public Scoping Meetings

Date	Meeting Location	Number of Attendees
Tuesday, January 15, 2002 11:00AM – 3:00PM	NYCEDC 110 William Street, 4th Floor NY, NY 10038	26
Thursday, January 17, 2002 5:00PM – 8:00PM	Snug Harbor Manor Lower Great Hall Room 1000 Richmond Terrace Staten Island, NY 10301	41
Tuesday, January 22, 2002 5:00PM – 8:00PM	Hostos College Savoy Multi-Purpose Room East 149th Street/Walton Avenue Bronx, NY 10451	4
Wednesday, January 23, 2002 5:00PM – 8:00PM	PS 1 309 47th Street, (b/w 3rd – 4th Aves.) Brooklyn, NY 11220	31
Tuesday, January 29, 2002 5:00PM – 8:00PM	LaGuardia College Little Theater 31-10 Thomson Avenue L.I.C., NY 11101	11
Wednesday, January 30, 2002 11:00AM – 3:00PM	Jersey City City Hall Council Chambers 280 Grove Street Jersey City, NJ 07302	15
Wednesday, January 30, 2002 5:00PM – 8:00PM	Elizabeth High School 600 Pearl Street Elizabeth, New Jersey 07202	8

A total of 51 comments were received via fax (2 comments), e-mail (5 comments), oral submission (37 comments) and letter (7 comments) during the Public Scoping period (see Scoping Comments, Appendix 8). All comments received were distributed for review among the project team and NYCEDC. Revisions were made to the Draft Scoping Document based upon the 51 comments received.

D. COMMITTEES AND WORKSHOPS

Steering and Advisory Committees were established to review and comment on the work prepared by the project sponsor.

STEERING COMMITTEE

Steering Committee members included representatives from environmental, transportation, and regulatory agencies in New Jersey State, New York State and New York City. The first Steering Committee Meeting was held on December 13, 2001 and was attended by 62 representatives of 37 agencies, organizations, and elected officials. The history of the project, the alternatives under consideration, and the project schedule were reviewed (see Committee List and Meeting Summary, Appendix 8).

An Engineering Workshop was conducted on May 29, 2002 for the Steering Committee to provide detailed engineering information for each alternative. At the workshop, issues including the rail clearance investigation, potential tunnel alignments, construction methods, and ventilation were presented and discussed. Forty-four people representing 32 organizations attended the Workshop.

A third meeting of the Steering Committee was held on April 29, 2003 to review the findings from the refined engineering, environmental and market analysis of the alternatives being evaluated in the DEIS. Fifty-three people representing 30 different organizations attended the meeting (see Meeting Summary, Appendix 8).

ADVISORY COMMITTEE

The Advisory Committee is comprised of a cross-section of elected officials, community boards, agencies, businesses, labor groups, advocacy groups, civic interests, and the members of the Steering Committee. Among the elected officials are U.S. Senators; Congress members; State Assembly members and Senators; City Council members representing Brooklyn and Staten Island; and Borough Presidents from Manhattan, Bronx and Queens. Business interests include representatives from shipping companies and railroads (see Committee List and Meeting Summary, Appendix 8). The Advisory Committee for the study was formed with an “open door policy,” meaning that interested parties can ask for other groups to be added to the Advisory Committee List.

Committee meeting invitations are sent by mail and e-mail at least two weeks in advance. While not every member of the Advisory Committee has participated in the meeting, every member does receive a full set of materials distributed at every meeting and a meeting summary, which reviews the issues reviewed and discussed and all issues and concerns raised by committee members.

The first Advisory Committee Meeting was held on December 13, 2001 and was attended by 61 people representing 54 civic organizations, businesses, and elected officials. The history of the

project, the alternatives under consideration and the project schedule were reviewed (see Meeting Summary, Appendix 8).

An Engineering Workshop for Advisory Committee members was held on June 26, 2002. Twenty-five people representing 21 organizations attended the Workshop. The third Advisory Committee meeting was held on April 29, 2003. The meeting focused on reviewing the findings from the refined engineering, environmental and market analysis of the alternatives being evaluated. Twenty-seven people representing 27 different organizations, elected officials, or businesses attended the meeting (see Meeting Summary, Appendix 8).

E. INTERAGENCY COORDINATION

Since the Agency Pre-Scoping Meetings, the project team has continued to meet with federal, New York State, New Jersey, and New York City agencies, in an effort to provide updates and coordinate study assumptions and analyses (see Table 21-4).

Table 21-4
Interagency Coordination Meetings

Meeting Date	Agency(s)
12/11/01	NJDOT
12/11/01	NJDEP, PANYNJ
5/8/02 – 6/13/03	LIRR, Metro-North Railroad, NYSDOT
6/12/02-6/13/02	NJ Transit, NJDOT, NY&A, MTA/NYCT, NYSDOT/Kosciusko Bridge EIS Project
3/18/03	NYSDOT/Gowanus Expressway EIS Project
6/13/03	U.S. EPA
7/16/03	Bayonne Local Redevelopment Authority
9/30/03	Jersey City Housing and Economic Development Corporation
10/20/03	NJTPA Freight Committee
10/21/03	NJDOT, NJ Transit
11/4/03	Comprehensive Port Improvement Plan (CPIP)

F. PUBLIC INVOLVEMENT OPPORTUNITIES

To complement the Interagency Coordination activities, the project team briefed elected officials, Community Boards, and community and civic members to provide them with an overview of the project and address questions or concerns they may have.

The briefings conducted between December 2001 and January 2004 is presented in Table 21-5 below.

G. OUTREACH TO MINORITY AND/OR LOW-INCOME POPULATIONS

Included in the Community Outreach Program is a component that addresses the specific needs of stakeholders and other interested groups within neighborhoods and communities identified as part of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The specific neighborhoods and communities discussed in this section were determined to be populations of concern using the methodology described in Chapter 17, "Environmental Justice."

Table 21-5
Community Briefings

Briefing Date	Elected Officials/Organization(s)
12/20/01	Staten Island Community Board # 1 Waterfront Committee
1/28/02	Office of the Jersey City Mayor
2/20/02	New York City Bar Association Transportation Committee
3/18/02	Queens Civic Congress
7/24/03	Kosciusko Bridge Stakeholders Advisory Committee
8/12/03	NYC Assemblyman Joseph Lavelle (Staten Island)
9/9/03	UPROSE
9/10/03	Alianza Dominicana
9/15/03	Brooklyn Community Board 14
9/17/03	Brooklyn Community Board 7
9/18/03	NYC Councilman Michael McMahon (Staten Island)
9/30/03	City of Jersey City
10/2/03	Queens Community Board 2
11/12/03	Brooklyn Community Board 1
11/18/03	Queens Community Board 2 Transportation Committee
12/4/03	Queens Community Board 5
12/9/03	Hudson County Executive Thomas DeGise
12/16/03	Maspeth ICO LDC

Six communities were identified in which minority and/or low-income populations meet the specified thresholds and the potential for significant impacts exists under the Tunnel Alternative. These areas include: 1) New Jersey – Hudson County (Jersey City); 2) Northern Staten Island; 3) Bay Ridge Branch – Segment 4 (East Flatbush, Brownsville, East New York & Bushwick); and 4) the Fremont Secondary – Segment 2 (Woodside).

The Environmental Justice component of the Public Outreach Program focused on public outreach opportunities within minority and/or low-income neighborhoods with the potential for significant impacts from the project. As part of these efforts, the economic benefits of the proposed project were also communicated. The Environmental Justice component of the Community Outreach Program sought to involve those constituents who do not normally attend Community Board or civic meetings and included those organizations, such as churches and community centers, which tend to be more connected with the targeted minority audiences. When conducting meetings with elected officials and Community Boards whose districts include a community of concern, the Project Team sought their help in identifying additional groups that should be contacted, and identifying venues and times for reaching these constituencies and specific issues that should be addressed.

The Project Team met with Brooklyn Community Board #16 (Segment 4) on June 24, 2003. The presentation included an overview of the project and a review of the environmental impacts of the rail freight tunnel alternative within this neighborhood (see Meeting handout in Appendix 8).

Additional elected official/Community Board meetings are being scheduled for the winter of 2004.

H. PUBLIC REVIEW/COMMENT ON DEIS

The DEIS will be published for public review on the Project web site; hard copies will also be placed in branch libraries throughout the New York City/Northern New Jersey region. Immediately following the publication of the DEIS a series of Public Hearings will be held throughout the New York City/Northern New Jersey region to gather public comments. Comments on the DEIS will also be accepted via mail and e-mail during the 60 day comment period. This would allow members of the community who were unable to attend the Public Hearings an opportunity to provide comments.

All comments received during the public comment period will be reviewed and addressed in the Final EIS (FEIS). Following the issuance of the FEIS, the public will be asked to provide final comments on the document before it is submitted to the federal sponsoring agencies for a Record of Decision.

I. PUBLIC OUTREACH TOOLS

The project established several tools at its inception in an effort to provide and receive information from the public.

NEWSLETTER

A newsletter was produced to promote the project and maintain public awareness. Information on the progress of the study, opportunities for comment, and key information on next steps was provided.

The first issue of the newsletter was printed and distributed in the winter of 2001. In this first issue, readers were provided with background on the project, its goals and objectives, and an overview of the alternatives being analyzed. Newsletter #1 was printed in English (10,000 copies), Spanish (2,000 copies), and Chinese (2,000 copies), and distributed at scoping meetings, Steering and Advisory committee meetings, and sent to those Committee members unable to attend. Multiple copies were sent to members of the Advisory Committee who were asked to distribute copies to their constituents. The newsletter was posted on the project web site, and newsletters were also sent to the entire database of over 600 (see Appendix 8 for newsletter copies in English, Spanish, and Chinese).

PUBLIC INFORMATION FOLDER

An information folder is being prepared to provide information on the findings of the draft environmental impact statement (DEIS). In addition, the folder will include sheets providing neighborhood-specific information on system operations, potential effects, and potential benefits. The information folder will be printed in English, Spanish, and Chinese, and widely distributed throughout the study area.

WEB SITE

A project web page, www.crossharborstudy.org, was established to provide visitors with updated information about the study and to provide them the opportunity to submit comments and input.

The project's web site is divided into 10 pages:

1. The Home page offers a brief description of the project.
2. The Overview page provides vital information about the history of the project, the region, and the EIS process.
3. The Project Map page, as the name suggests, offers a map of the study area.
4. The Alternatives page is a brief description of the No Action, TSM, Enhanced Float, and Tunnel Alternative.
5. The Schedule page provides a project schedule.
6. The Reports page offers the various reports that the Project produces and currently provides access to the MIS report and the Public Scoping Document.
7. The Stay Informed page is a listing of up-to-date publications from the project including Newsletters, Meeting Presentations and Summaries, and other help items like a Glossary of Terms.
8. The Comments page allows visitors to post comments to the project.
9. The Project Team page is a listing of the consultants working on the project.
10. The Links page provides hyperlinks to the web sites of companies, civic organizations, and government agencies with direct interest in the project.

E-MAIL

Visitors to the site can e-mail questions or comments to the project team, via crossharbor@ stvinc.com. Sixty-eight e-mails have been directed to the site.

TOLL-FREE INFORMATION LINE

The project maintained a toll free information line 1-877-XHAR-EIS (942-7347) that is staffed during regular work hours. Over 190 calls were fielded at the information line.

J. PUBLIC INPUT DOCUMENTATION

All facets of community participation are documented to provide guidance to the study, including public input, suggestions and public contact. All communications received from committee meetings, workshops, scoping and other public meetings, and the web site are logged and documented. Suggestions, comments or questions are sent to the appropriate project team member so that an informative and timely response can be provided. Anyone requesting to be added to the project mailing list is entered into the project database so they can receive meeting notices, newsletters and other project-related materials.

INQUIRY LOG

To keep track of public inquiries and comments received, an Inquiry Log has been created. The Inquiry Log keeps can track of the contact's name, address, e-mail address, telephone number, the issue of concern to the contact, the type of issue, the amount of time taken to respond, and the number of contacts made. The inquiry logs are maintained monthly and the cumulative

numbers are provided on the log's cover sheet (see Inquiry Logs in Appendix 8). Table 21-6 lists the number of contacts received by month since the inception of the project.

Table 21-6
Contacts Received by Month

Month	Number of Contacts	Telephone Calls	E-Mails
August 2001	6	4	2
September 2001	22	17	5
October 2001	31	30	1
November 2001	27	24	3
December 2001	13	10	3
January 2002	13	10	3
February 2002	11	7	4
March 2002	7	3	4
April 2002	4	2	2
May 2002	35	5	30
June 2002	23	17	6
July 2002 – March 2003*	0	0	0
April 2003	13	13	0
May 2003	25	22	3
June 2003	0	0	0
July 2003	11	11	0
August 2003	1	1	0
September 2003	7	7	0
October 2003	10	10	0
November 2003	5	5	0
December 2003	8	6	2
January 2004	6	0	6

Note: *Public outreach was on hold during this period pending additional work.

Telephone calls and e-mail messages received from and made to stakeholders tended to increase in volume in the weeks immediately preceding certain project meetings, such as the Steering and Advisory Committee Meetings (September through December 2001) and the Steering and Advisory Committee Engineering Workshops (May through June 2002).

DATABASE

An extensive database of federal, state and city agency representatives, elected officials, community boards, civic and advocacy organizations, and concerned members of the general public from the New York City and northern New Jersey regions was established at the start of the EIS. The database is updated regularly to reflect the inclusion of interested parties through community outreach efforts. As of January 2004, the database had more than 800 entries. Entries are coded by type (e.g., agency, elected official, civic) and the respective data fields include contact name, organization, address, phone/fax number, e-mail address and meetings attended (see Database, Appendix 8).

ISSUES LOG

An Issues Log has been created to track issues and concerns raised throughout the course of study. The issues log tracks issues categorized as engineering, environmental, and market demand. Maintained as a database computer file, the Issues Log lists meetings attended, information requested, key questions raised and the answer(s) provided. The Issues Log also lists important issues raised, whether resolved or unresolved and specific viewpoints on alternatives. Using this database, a matrix can be developed showing areas of consensus and those requiring resolution between or among competing interests.

As of January 2004, there are 725 entries in the issues log:

- 142 environmental entries;
- 225 market entries; and
- 328 engineering entries

(See Issues Logs, Appendix 8). ✷

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SUPPORTING DOCUMENTS

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Chapter 23: List of Agencies and Organizations

This DEIS was widely distributed and available for review at libraries, community boards, and other locations. Copies of the document or Executive Summary or a notification of availability of the DEIS were distributed to the mailing list shown in Section A below.

Section B provides a list of locations where copies of the DEIS are available for review.

A. LIST OF NOTIFIED PARTIES

FEDERAL AGENCIES

U.S. Department of Transportation (USDOT)
- Federal Transit Administration (FTA)
- Maritime Administration
- Office of the Secretary of Transportation
- Federal Railroad Administration (FRA)
- Federal Highway Administration (FHWA)

U.S. Army Corps of Engineers (USACOE)*

U.S. Environmental Protection Agency

U.S. Department of Homeland Security
- U.S. Coast Guard*
- Federal Emergency Management Agency
- Transportation Security Administration

U.S. Department of Agriculture
- Natural Resources Conservation Service

U.S. Department of Commerce
- National Marine Fisheries Service (NMFS)

U.S. Department of Energy

Advisory Council on Historic Preservation

U.S. Department of Housing and Urban Development

U.S. Department of Interior (USDOI)
- Office of Environmental Policy and Compliance
- U.S. Fish and Wildlife Service (USFWS) *
- National Park Service (NPS)

Natural Resources Conservation Service (USDA)

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* Also a Cooperating Agency.

NOAA Fisheries National Marine Fisheries Services (NMFS)*

NEW YORK STATE AGENCIES

New York State Department of Health (NYSDOH)

New York State Department of Environmental Conservation (NYSDEC)

New York State Department of State (NYSDOS)
Resources and Waterfront Revitalization

New York State Department of Transportation (NYSDOT)*

New York State Office of Parks, Recreation and Historic Preservation

New York State Department of Law

New York State Division of the Budget

New York State Empire Development Corporation

State of New York, Office of the Governor

NEW YORK CITY AGENCIES

Office of the Mayor

Fire Department of New York (FDNY)

New York City Council

New York City Department of City Planning (NYCDCP)

New York City Department of Environmental Protection (NYCDEP)

New York City Department of Health (NYCDOH)

New York City Department of Parks and Recreation

New York City Department of Sanitation (NYCDOS)

New York City Department of Transportation (NYCDOT)

New York City Corporation Council

New York City Department of Citywide Administrative Services

New York City Department of Design and Construction

New York City Department of Education

New York City Department of Housing Preservation and Development

New York City Economic Development Corporation (NYCEDC)

New York City Housing Authority

New York City Landmarks Preservation Commission (NYCLPC)

New York City Law Department

* Also a Cooperating Agency.

New York City Transit (NYCT)

New York Police Department (NYPD)

NEW JERSEY AGENCIES

City of Bayonne*

City of Elizabeth

City of Jersey City*

City of Newark

Jersey City Housing Authority

New Jersey Department of Health (NJDOH)

New Jersey Transit (NJT)

New Jersey Turnpike Authority (NJTA)

New Jersey Department of Environmental Protection (NJDEP)
- New Jersey Historic Preservation Office

New Jersey Department of Transportation (NJDOT)*

Office of the Hudson County Executive*

OTHER TRANSPORTATION AGENCIES

New York Metropolitan Transportation Council (NYMTC)

Metropolitan Transportation Authority (MTA)
- Metro North Railroad
- Bridges and Tunnels
- Long Island Rail Road (LIRR)*
- Capital Construction

North Jersey Transportation Planning Authority (NJTPA)

Port Authority of New York & New Jersey (PANYNJ)*

Connecticut Department of Transportation

ELECTED OFFICIALS

Office of Congressman Jerrold Nadler

Office of the Bronx Borough President

Office of the Brooklyn Borough President

Office of the Hudson County Engineer

Office of the Manhattan Borough President

* Also a Cooperating Agency.

Office of the Queens Borough President

Office of the Staten Island Borough President

COMMUNITY BOARDS

Bronx Community Boards 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12

Brooklyn Community Boards 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18

Manhattan Community Boards 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12

Queens Community Boards 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14

Staten Island Community Boards 1, 2, 3, and Community Board 1: Waterfront Committee

B. PUBLICLY AVAILABLE DEIS COPIES

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WEB SITE

Cross Harbor website: http://www.crossharborstudy.com/

LIBRARIES

MANHATTAN/STATEN ISLAND/BRONX/NEW JERSEY

New York Public Library 188 Madison Avenue New York, NY 10016	Bronx Public Library 2556 Bainbridge Avenue Bronx, NY 10458	Elizabeth Public Library 110 South Broad Street Elizabeth, NJ 07202
Staten Island Public Library 5 Central Avenue Staten Islands, NY 10301	Bayonne Free Library 697 Avenue C Bayonne, NJ 07002	Jersey City Public Library 472 Jersey Avenue Jersey City, NJ 07302

BROOKLYN LIBRARIES

Brooklyn Public Library Grand Army Plaza Brooklyn, NY 11238	Greenpoint Branch (CB#1) 107 Norman Avenue Brooklyn, NY 11222	Leonard Branch (CB#1) 81 Devoe Street Brooklyn, NY 11211
Williamsburg Branch (CB#1) 240 Division Avenue Brooklyn, NY 11211	Bushwich Branch (CB#1) 340 Bushwick Avenue Brooklyn, NY 11206	Midwood Branch (CB#12) 975 East 16th Street Brooklyn, NY
Kensington Branch (CB#12) Ditmas Avenue between East 4th & East 5th Streets Brooklyn, NY 11218	Borough Park Branch (CB#12) 1265 43rd Street Brooklyn, NY 11219	Ryder Branch (CB#12) 5902 23rd Street Brooklyn, NY 11204
Sunset Park Branch (CB#7) 5108 4th Avenue Brooklyn, NY 11220		

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Queens Public Library 89-11 Merrick Boulevard Jamaica, NY 11432	Court Square Branch (CB#2) 25-01 Jackson Avenue Long Island City, NY 11101	Queensbridge Branch (CB#2) 10-43 41st Avenue Long Island City, NY 11101
Sunnyside Branch (CB#2) 43-06 Greenpoint Avenue Long Island City, NY 11104	Woodside Branch (CB#2) 54-22 Skillman Avenue Woodside, NY 11377	Middle Village Branch (CB#2) 72-31 Metropolitan Avenue Middle Village, NY 11379
Elmhurst Branch (CB#5) 86-01 Broadway Elmhurst, NY 11373	Glendale Branch (CB#5) 78-60 73rd Place Glendale, NY 11385	Maspeth Branch (CB#5) 69-70 Grand Avenue Maspeth, NY 11378
Ridgewood Branch (CB#5) 20-12 Madison Street Ridgewood, NY 11385		

BOROUGH HALLS

Brooklyn Borough Hall 209 Joralemon Street Brooklyn, NY 11201	Queens Borough Hall 120-55 Queens Boulevard Kew Gardens, NY 11424	Bronx Borough Hall 851 Grand Concourse Bronx, NY 10451
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C. OTHER AGENCIES AND INTERESTED PARTIES

STEERING AND ADVISORY COMMITTEES

There are over 500 entities on these two committees that have received notification of the publication of the DEIS. Their names are not listed in this publication. The Steering Committee received a CD-ROM of the DEIS. The Advisory Committee received a list of repositories where the DEIS is available. ✷

Chapter 24: List of Preparers

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B.S. in Civil Engineering, Intermodal Transportation Coordinator of the NY FHWA. Sixteen years of experience with the FHWA, including projects in environmental management, transportation planning, and NEPA review. Currently a Federal Project Manager for the Comprehensive Port Improvement Plan EIS in addition to managing other NY area NEPA reviews.

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Master of Engineering, RPI; BSCE University of MD. Thirty-five years of experience with FHWA in highway projects including NEPA processing. Twelve of those years as environmental program specialist for FHWA Region (NY, NJ, Puerto Rico, New England states) and NY Division.

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Michael Saunders—Manager, Northwest Corridor Project

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Brian Larsen—Director, Capital Programs

BS/BS in Bioresource Engineering, Rutgers University. Five years of experience in project management of transportation related capital projects, including planning, engineering/design and construction phases.

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Master of Arts in Urban Planning. More than 20 years of project management experience of large, multi-disciplined teams for transportation and land development initiatives, including EISs, MISs, and master plans for major transportation projects.

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Marc R. Cutler—Deputy Project Manager

Masters in Urban Planning. Experienced in management of large, complex multi-disciplinary projects, including freight and passenger transportation planning, and management of community participation and group facilitation processes

Alex Brown—Deputy Project Manager of Transportation Planning

Masters of Business Administration (pending), Bachelors in Engineering. Experience in transportation and planning.

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Jeffrey N. Buxbaum, A.I.C.P. —Financial Analysis

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Kevin F. Tierney—Senior Associate

Masters in Transportation**.** Specializes in travel demand forecasting, transit planning, and transportation policy analysis. Principal Author of the Federal Highway Administration (FHWA) Travel Survey Manual.

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Masters in Civil Enginering. Experienced in the areas of transportation engineering, travel demand modeling and forecasting.

Alan Myers, A.I.C.P. —Simulation and Operations

Bachelors in Behavioral Science, University of Chicago; Graduate Studies in architecture at University of CA at Los Angeles. Experienced in the areas of intermodal freight planning, economic development and comprehensive planning, and intermodal freight education.

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Masters in Civil Engineering. More than 20 years of experience in modeling pollutant fate for transportation projects and project management in NEPA EISs.

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M.C.P., Environmental Policy & Planning Specialization. Fourteen years of planning and project management experience in environmental impact assessment, water resource issues, and natural resource protection.

Leslie A. Mesnick—EIS Manager

Masters in Environmental Engineering**.** Experience in brownfields redevelopment, site remediation, air permitting, wetland and land use permitting, and environmental impact statements.

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B.S. in Marine Science. Specializes in land use and natural resource evaluations in the preparation of Environmental Impact Statements.

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Sandy L. Collins—Natural Resources, CZM

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Fred Jacobs, Ph.D. —Water Quality

Ph.D. in Marine Science. More than 20 years of experience in national resources and water quality assessment.

Stephen S. Rosen, Ph.D.—Noise

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Weixiong Wu, Ph.D.—Noise

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Anne M. Locke—Visual, Historic, Archaeology

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Nathan Riddle—Visual, Historic, Archaeology

Masters in History, Masters in Historic Preservation. Specializes in history, archaeology, and the analyses of urban design and aesthetic considerations.

Andrea Burk—Visual, Historic

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Jennifer Morris—Visual, Historic

Masters in Historic Preservation. Specializes in history, archaeology, and analysis of urban design and aesthetic considerations.

Hatch Mott MacDonald
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Eng-Wong, Taub & Associates
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Babu Veeregowda, PE.—PTOE

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Craig Fraser—Senior Engineer

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Ph.D., Marine Studies. Senior Scientist, director of risk assessment studies for PBS&J. Twenty-four years of experience, including assessment studies on the effects of human activities on aquatic communities, ecological and human health risk assessment, environmental toxicology, aquatic ecology, and physiological ecology.

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B.S.; Urban and Regional Planning; CA State Polytechnic University, Pomona. More than 19 years of planning experience involving maritime facilities, land development, land use, circulation, backbone infrastructure and municipal planning-related projects, with a strong background in large-scale master planning for maritime and industrial land developments.

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Geotechnical Engineer with 37 years of experience. Serves as a project manager for geotechnical investigations, foundation engineering and consulting services during design and construction, and served on the Cross Harbor Freight Tunnel - EDC Feasibility Study as the Project Manager for the MIS and EIS phase evaluations.

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Geotechnical Engineer with 7 years of experience. Certification: OSHA 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response. Laboratory manager of Mueser Rutledge in-house Soils Laboratory, and has served on the Cross Harbor Freight Tunnel project on the EDC Feasibility Study for both the MIS and EIS phase evaluations.

Zetlin Strategic Communications—Public Outreach
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B.A., Vassar College; M.B.A., Columbia University. More than 16 years of experience developing and supervising public outreach campaigns for NY state and city projects. Deputy Assistant to the Governor for Legislative Liaison, Director of Media Information Services for MTA, and Vice President/Director of Public Affairs for LIRR.

Shane Ojar—Manager

B.A., NYU. Zetlin Manager of Planning and Studies with 11 years of experience. Currently managing NYCEDC's Cross Harbor Freight Movement EIS Project, the NY/NJ Port Authority's Comprehensive Port Improvement Plan, the NYMTC Southern Brooklyn Major Transportation Investment Study, and the No. 7 Subway Extension/Hudson Yards Area Rezoning Project.

John Milner Associates, Inc.—Archaeological Consultants
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Ph. D., Anthropology, NYU. More than 30 years of experience in cultural resources management, evaluating and mitigating the effects of large infrastructure and energy projects. Managed studies under the National Historic Preservation Act, NEPA, and New York SEQRA. Former consultant to the U.S. Dept. of Housing and Urban Development, and the Federal Energy Regulatory Commission.

Patrick A. Heaton, RPA—Project Archeologist

Master's in Anthropology, NYU. A Registered Professional Archaeologist with over 8 years of experience, including numerous archeological surveys and excavations in the northeastern U.S. and New York area. Mr. Heaton is the principal author of the Phase IA archeological studies for the Cross Harbor Project.

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Masters in Anthropology, a Registered Professional Archaeologist, and director of all Hartgen's cultural resource management activities, with more than 30 years of experience. Managed the

Route 9A, Miller Highway, and Goethals Bridge projects, and supervised hundreds of SEQR surveys and Section 106/NEPA projects.

Lori Blair—Project Manager

B.A. and Graduate Studies, Anthropology. More than 15 years of experience in conducting cultural resource management studies. She is a Project Manager at HAA, Inc. and the principal author of the larger Phase IA Archeological sensitivity assessments.

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M.A. in Anthropology, more than 20 years of experience in cultural resource management. Oversees archaeological research projects and historic preservation planning studies in the Northeast. Extensive experience in cultural resource studies of historic and prehistoric sites, and preparing documents in compliance with Section 106 of the National Historic Preservation Act.

Roderick S. Brown—Principal Archaeologist

M.A. in Quantitative Archaeology with more than 30 years of experience as a consulting archaeologist, including experience in archaeological investigations, geomorphological assessments, cartography, mapping, surveying, innovative research designs, and Section 106, state, and local reports. Co-Principal Investigator for the Greenville Yards Stage IA archaeological assessment.

Zachary J. Davis—Senior Archaeologist

M.A. in Anthropology and a Registered Professional Archaeologist. More than 10 years of professional experience as a consulting archaeologist conducting Section 106/NEPA and state mandated cultural resource investigation projects in New Jersey and New York. Co-Principal Investigator for the Greenville Yards Stage IA archaeological assessment. ✷

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Chapter 25: Acronyms and Abbreviations

A/D	arrival and departure
AADT	average annual daily traffic
ACHP	Advisory Council on Historic Preservation
ACM	Asbestos Containing Material
APE	area of potential effect
ARC	Access to the Region's Core
ASTs	Aboveground Storage Tanks
ATR	Automatic Traffic Recorders
AWOIS	Automated Wreck and Obstruction Information System
B&O	Baltimore & Ohio
B/C	benefit/cost
BAT	Brooklyn Army Terminal
BBT	Brooklyn-Battery Tunnel
BCA	Bird Conservation Area
BMPs	Best Management Practices
BMT	Brooklyn-Manhattan Transit
BPIP	Building Profile Input Program
BPM	best practices manual
BQE	Brooklyn-Queens Expressway
BRT	Brooklyn Rapid Transit
BTEX	benzene, toluene, ethyl benzene, & xylene
BTUs	British Thermal Units
CAAA	Clean Air Act Amendment
CAFRA	Coastal Area Facility Review Act
CARP	Contamination Assessment Reduction Project
CCMP	Comprehensive Conservation Management Plan
CEA	Critical Environmental Area
CEQR	(New York) City Environmental Quality Review
CFD	computational fluid dynamics
CFR	Code of Federal Regulations
CMP	Coastal Management Program
CMS	Congestion Management System
CMSA	Consolidated Metro Statistical Area
CNJ	Central New Jersey (Railroad)
CO	carbon monoxide
COC	contaminant of concern
COFC	container-on-flatcar
CP	Canadian Pacific
CPIP	Comprehensive Port Improvement Plan
CPUE	Catch Per Unit Effort
CRA	Conestoga Rovers & Associates
CRRNJ	Central Railroad of New Jersey

CSAO	Conrail Shared Assets
CSO	Combined Sewage Overflow
CZM	Coastal Zone Management
dBA	decibels
DEIS	Draft Environmental Impact Statement
DL&W	Delaware, Lackawanna & Western
DO	dissolved oxygen
DOS	Department of Sanitation
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EOH	East-of-Hudson
EPBM	earth pressure balance machine
FHWA	Federal Highway Administration
FIRE	finance, insurance & real estate
FRA	Federal Railroad Administration
FS	feasibility study
FTA	Federal Transit Administration
GCP	Grand Central Parkway
GIS	Geographic Information Systems
GRP	Gross Regional Product
GWB	George Washington Bridge
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HASP	Health and Safety Plan
HCM	Highway Capacity Manual
HEP	Harbor Estuary Program
HHMT	Howland Hook Marine Terminal
HOV	high-occupancy vehicle
HQ	Hazard Quotients
HSDB	Hazardous Substances Database
I&M	inspection and maintenance
IEC	Interstate Environmental Commission
IND	Independent Subway System
IOMT	Improvement of Operations and Maintenance Techniques
IPIP	In-Place Industrial Park
IRIS	Integrated Risk Information System
IRT	Interborough Rapid Transit
ISC	Interstate Sanitation Commission
ISCST3, ISC3	Industrial Source Complex Short Term
ITS	intelligent transportation systems
ITT	Immersed Tube Tunnel
LDC	local development corporation
LEL	lowest effects level
LIE	Long Island Expressway
LIRR	Long Island Rail Road
LITP	Long Island Transportation Plan
LOS	levels-of-service
LRTP	Long Range Transportation Plan
LVRR	Lehigh Valley Railroad
M&E	Morristown & Erie Railway

MIS	Cross Harbor Freight Movement Major Investment Study
MLW	mean low water level
MNR	Metro North Railroad
MOA	Memorandum of Agreement
MOTBY	Marine Ocean Terminal Bayonne
MPO	Metropolitan Planning Organization
MSW	Municipal Solid Waste
MTA	Metropolitan Transit Authority
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NEAT	Northeast Auto Marine Terminal
NEC	Northeast Corridor
NEPA	National Environmental Policy Act
NHL	National Historic Landmarks
NHPA	National Historic Preservation Act
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJDOL	New Jersey Dept. of Labor
NJDOT	New Jersey Department of Transportation
NJDPES	New Jersey Pollutant Discharge Elimination System
NJHPD	New Jersey Historic Preservation Office
NJSA	New Jersey Register of Historic Places Act
NJSM	New Jersey State Museum
NJSR	New Jersey State Register
NJT	New Jersey Turnpike
NJTPA	New Jersey Transportation Planning Authority
NMFS	National Marine Fisheries Service
NMHC	non-methane hydrocarbons
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPV	net present value
NR	National Register
NS	Norfolk Southern
NTIS	National Technical Information Service
NWI	National Wetlands Inventory
NY&A	New York & Atlantic Railroad
NYCDCP	New York City Department of City Planning
NYCDEP	New York City Department of Environmental Protection
NYCDOS	New York City Department of Sanitation
NYCDOT	New York City Department of Transportation
NYCDPR	New York City Department of Parks & Recreation
NYCEDC	New York City Economic Development Corporation
NYCHA	New York City Housing Authority
NYCHPD	New York City Housing Preservation & Development
NYCHRR	New York Cross Harbor Rail Road
NYCL	New York City Landmarks
NYCLPC	New York City Landmarks Preservation Commission
NYCT	New York City Transit
NYFD	New York Fire Department
NYMA	New York Metropolitan Area

NYMTC	New York Metropolitan Transportation Council
NYNHP	New York National Heritage Program
NYPD	New York Police Department
NYS&W	New York, Susquehanna & Western Railway
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
NYSDOT	New York State Department of Transportation
NYSHPO	New York State Historic Preservation Office
NYSM	New York State Museum
OPRHP	Office of Parks, Recreation and Historic Preservation
OSHA	Occupational Safety and Health Administration
P&W	Providence & Worcester
PAHs	polyaromatic hydrocarbons
PANYNJ	Port Authority of New York & New Jersey
PCBs	polychlorinated biphenyls
PCEs	passenger car equivalents
PIDN	Port Inland Distribution Network
PJR	Port Jersey Railroad
PM	particulate matter
PONYNJ	Port of New York and New Jersey
PPE	Personal Protective Equipment
PVC	polyvinyl chloride
QMT	Queens-Midtown Tunnel
RCRA	Resource Conservation and Recovery Act
REMI	Regional Economic Models, Inc.
RI	Remedial Investigation
ROD	Record of Decision
RPAD	Real Property Assessment Data
RRCS	Renewable Resources Consulting Services
RRIF	Rail Rehabilitation and Improvement Financing
RTP	Regional Transportation Plan
SAP	Sampling & Analytical Plan
SAV	submerged aquatic vegetation
SBMT	South Brooklyn Marine Terminal
SEL	severe effects level
SEQRA	New York State Environmental Quality Review Act
SHPA	State Historic Preservation Act
SHPO	State Historic Preservation Offices
SIE	Staten Island Expressway
SIP	State Implementation Plan
SIRT	Staten Island Rapid Transit
SMIA	Significant Maritime & Industrial Area
SNWA	Special Natural Waterfront Area
SO_X	Sulfur Oxide
SPDES	State Pollutant Discharge Elimination System
STB	Surface Transportation Board
STEAM	Surface Transportation Efficiency Analysis Model
STP	sewage treatment plants
SVOC's	Semivolatile Organic Compounds
SWPPP	stormwater pollution prevention plan

TAGM	Technical and Administrative Guidance Memorandum
TAZ	Traffic Analysis Zone
TBM	Tunnel Boring Machine
TEA	Traffic Enforcement Agent
TEQ	toxicity equivalency factor
TEU	20-foot equivalent units
TIFIA	Transportation Infrastructure Finance & Innovation Act
TIP	Transportation Improvement Program
TMDL	total maximum daily load
TNC	The Nature Conservatory
TNM	Traffic Noise Model
TOC	total organic carbon
TOFC	trailer-on-flatcars
TOGS	Technical & Operational Guidance Series
TOM	Train Operations Model
TSM	Transportation Systems Management
TSP	Total Suspended Particles
TSS	total suspended solids
UPS	United Parcel Service
URCS	Uniform Railroad Costing System
USACOE	United States Army Corps of Engineers
USDOI	United States Department of the Interior
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tanks
VHT	vehicle hours traveled
VIUS	Vehicle Inventory & Usage Survey
VMT	vehicle miles traveled
VNB	Verrazano Narrows Bridge
VOCs	volatile organic compounds
VTOL	Vertical Takeoff and Landing
WPCP	Water Pollution Control Plant
WRP	Waterfront Revitalization Program
YOE	Year of Expenditure

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Chapter 26: Index

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