CROSS HARBOR FREIGHT PROGRAM

Environmental Impact Statement (EIS) Methodology

U.S. Department of Transportation
Federal Highway Administration

THE PORT AUTHORITY
OF NY & NJ

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Cross Harbor Freight Program
## Environmental Impact Statement (EIS) Methodology

INTRODUCTION

The Federal Highway Administration (FHWA) and the Port Authority of New York and New Jersey (PANYNJ), serving as co-lead agencies, are preparing an Environmental Impact Statement (EIS) to evaluate alternatives to improve the movement of goods in the region by enhancing the transportation of freight across New York Harbor. The Cross Harbor Freight Program EIS will analyze alternatives that would provide near-term and long-term strategies for improving the regional freight network, reducing traffic congestion, improving air quality, and providing economic benefits.

The greater New York/New Jersey/Connecticut region is the financial center of the U.S. economy and the nation's largest consumer market. Regional forecasts of truck growth vary depending on the source, year, and geography, but available sources agree that truck tonnage is anticipated to increase substantially by 2035. The overwhelming dependence on trucking in the freight distribution network is expected to remain, and will result in serious regional highway congestion, deleterious effects on environmental quality, and extended travel delays. The continuation of this trend without improvement will threaten the economic vitality of the greater New York/New Jersey/Connecticut region.

The following describes the process and methodology that will be undertaken for the development and evaluation of project alternatives and the preparation of the EIS, which will ultimately select a Preferred Alternative or Alternatives in the Tier I EIS Record of Decision. The process consists of five major steps—scoping, fatal flaw analysis, screening analysis, detailed evaluation, and the Tier I EIS—that are intended to winnow the number of alternatives through a comprehensive evaluation process. The 5-step process includes numerous tasks involving separate processes, decision points/action items, and analysis modeling that are described in this report (see Appendix A for a diagram illustrating the sequence of these individual tasks). Detailed technical and analytical methodologies associated with the tasks are provided in Appendices B and C. The following is an overview of the five major steps:

1. **Scoping** – Determines the project's goals and objectives, alternatives to be considered, and scope of issues to be examined in the Tier I EIS. Also refines the project purpose and need.

2. **Fatal Flaw Analysis** – Eliminates clearly infeasible alternatives from further consideration.

3. **Screening Analysis** – Reduces the range of reasonable alternatives that do not meet the goals and objectives based on freight demand forecasting and broad qualitative criteria.

4. **Detailed Evaluation** – Evaluates alternatives for potential regional and localized effects based on specific and more rigorous quantitative performance measures.

Scoping	Fatal Flaw Analysis	Screening Analysis	Detailed Evaluation	Tier I EIS
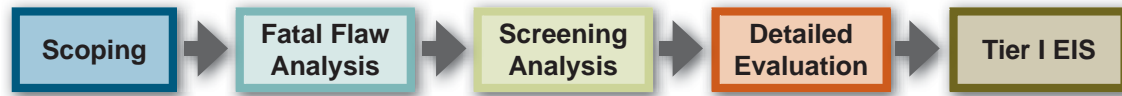
5. **Tier I EIS** – Documents and presents the results of the detailed evaluation, summarizes the process and results of Steps 1-4, and includes additional environmental analyses and compliance with environmental laws and regulations, as appropriate.

1. SCOPING

The first step is scoping, and it begins with the issuance of a Notice of Intent (NOI) and initiation of the public scoping process. A NOI for the Cross Harbor Freight Program was issued in the Federal Register on May 13, 2010; the Scoping Document is being issued concurrently with this document. As described in the NOI, the EIS analyses will be conducted using "tiering," as described in 40 CFR 1508.28, which is a staged process applied to the environmental review of complex projects. Several pre-scoping meetings were held with the Technical Advisory Committee and Stakeholder Advisory Committee prior to the issuance of the NOI. These initial agency coordination meetings included discussions regarding project goals, alternatives, and the process for the alternatives evaluation and Tier I EIS.

The purpose of the scoping process is to assure that the full range of issues related to the proposed action is addressed in the Tier I EIS, and that potential significant adverse impacts are identified and advanced for further study to Tier II, as appropriate. FHWA and PANYNJ are undertaking an extensive public scoping process that will allow the public and affected agencies to provide comments on the scope of the environmental review process. The Draft Scoping Document will frame the environmental review to follow, and will facilitate a public discussion of project alternatives and the environmental issues to be considered in the EIS.

The two major tasks associated with the scoping process, described below, are: (1) needs assessment; (2) identification of project goals and objectives and (3) development of a long list of alternatives.

NEEDS ASSESSMENT

As the first task, a needs assessment was undertaken to identify the need for the project and to develop a comprehensive statement of the project's purpose. The Cross Harbor Freight Program Needs Assessment, being issued concurrently with the Draft Scoping Document, identified substantial constraints and problems with the existing freight system, including rail, marine, and highway infrastructure, and its ability to accommodate future growth in freight movement across New York Harbor between the east-of-Hudson and west-of-Hudson regions. The scoping process allows for the refinement of the purpose and need.

GOALS AND OBJECTIVES

The primary purpose of the project is to improve the movement of freight across New York Harbor between the east-of-Hudson and west-of-Hudson regions. A project's goals and objectives are the foundation of its purpose and need under the National Environmental Policy Act of 1969 (NEPA). They are used as the basis for developing the criteria and methodology for evaluating the project alternatives. Four goals have been established for the Cross Harbor Freight Program. These goals

are intended to remedy some of the problems stated in the Needs Assessment. Objectives have also been identified that further define the goals and provide specific and measurable means by which to evaluate and compare project alternatives. The four project goals and respective objectives are as follows:

GOAL 1: Reduce the contribution of Cross Harbor trucks trips to congestion along the region's major freight corridors relative to the No Build scenario.

> Objectives:
> A. Reduce the vehicle miles traveled by freight trucks which cross the Hudson River.
> B. Reduce the travel-time and delay on regional highway network.
> C. Maximize efficient use of available capacity on existing transportation infrastructure.
> D. Maintain or improve regional rail network performance.

GOAL 2: Provide Cross Harbor freight shippers, receivers, and carriers with additional, attractive modal options to existing interstate trucking services.

> Objectives:
> A. Increase the number of modal options available for Cross Harbor freight transportation.
> B. Provide modal options and choices that offer attractive and competitive performance, consistent with business requirements.

GOAL 3: Expand facilities for Cross Harbor goods movement to enhance system resiliency, safety and security, and infrastructure protection.

> Objectives:
> A. Provide Cross Harbor freight facilities and services that improve system redundancy and resilience in the event of a major interruption of service on existing interstate highway corridors serving the region.
> B. Support contingency planning for emergency alternative Cross Harbor goods movement operations.
> C. Reduce the number of freight vehicle related accidents.
> D. Develop effective alternative options for transporting overweight/non-standard cargo to support infrastructure protection for regional bridges and highway network.

GOAL 4: Support development of integrated freight transportation/land use strategies.

> Objectives:
> A. Maximize underutilized freight transportation infrastructure and related land uses.
> B. Support services to existing freight distribution centers in the region.
> C. Integrate rail freight services with local land use and transportation planning objectives.
> D. Integrate rail freight development with statewide freight and passenger rail plans.

LONG LIST OF ALTERNATIVES

The alternatives evaluation begins with the development of a long list of alternatives comprising combinations of freight movement methods and existing or potential facility locations. This universe

of project alternatives is appropriate for a Tier I EIS, which aims to select a mode, alignment, and logical termini for the proposed project.

This list includes a variety of alternatives that were identified and studied in previous reports, including the Cross Harbor Freight Movement Major Investment Study (MIS), commissioned by the New York City Economic Development Corporation (NYCEDC) and completed in the spring of 2000. Four alternatives from the MIS were advanced for study in a Draft EIS, which was published in April 2004 by FHWA and the Federal Railroad Administration (FRA), acting as co-lead agencies, and NYCEDC, acting as the project sponsor.

A complete description with figures depicting the long list of alternatives for the Cross Harbor Freight Program is included in the Scoping Document. These alternatives generally fall into the following three classes:

1. No Action Alternative

2. Management Alternatives – Transportation System Management (TSM) and Transportation Demand Management (TDM)

3. Build Alternatives – Float Alternatives, Rail Tunnel Alternatives, and Rail/Vehicle Tunnel Alternatives.

2. FATAL FLAW ANALYSIS

The long list of alternatives will include a wide range of potential alternatives. To ensure a meaningful alternatives analysis and environmental review, NEPA requires consideration of project alternatives that are considered feasible and reasonable. Therefore, the second step in the process is to undertake a fatal flaw analysis, which is intended to eliminate alternatives that are not feasible early in the evaluation process. Basic feasibility criteria will be established for this project to eliminate non-viable alternatives from the long list. The feasibility criteria, or "fatal flaw" criteria, include:

- Clearly inconsistent with or unlikely to meet the project goals and objectives.

- Requires technologies, service concepts, etc., whose feasibility and effects cannot be reliably tested through the evaluation process.

- Requires the use of resources or properties which are highly unlikely to be available, or whose use would create a conflict with the project goals and objectives.

- Incompatible with existing or planned operations of current rail providers.

- Results in severe impacts and/or cost implications to existing rail or highway infrastructure.

- Results in severe adverse environmental effects that would make approval or permitting unlikely.

Public and agency input on the fatal flaw feasibility criteria will also be considered during the scoping process. From the long list of alternatives, each would be evaluated in relation to the feasibility criteria to determine if the alternative will be fatally flawed and eliminated, or it will be carried forward for further evaluation in the next step, the screening analysis.

3. ALTERNATIVES SCREENING PROCESS

As a result of the fatal flaw analysis, a range of potentially feasible project alternatives will be identified and then carried forward to Step 3—the alternatives screening process. The purpose of the screening process is to reduce the number of alternatives to be further analyzed in the detailed evaluation. If similar alternatives have comparable outcomes, the alternative with the best results will be carried forward and the other similar alternatives, with less favorable outcomes, will be eliminated.

The screening process begins with a market analysis to collect detailed information about existing freight logistics and demand. This information is then used to develop the mode choice model. The mode choice model will provide estimates of future freight flows by mode for each alternative. The resultant freight flows will enable a comparison of each alternative's ability to attract freight and provide an important measure in determining a given alternative's ability to meet the first two project goals. The alternatives will also be qualitatively evaluated to determine if they are consistent with the broad objectives associated with the project goals (described above).

The following describes the individual tasks in the screening process. The full extent of the technical methodologies that will be used to evaluate logistics and market demand for the screening analysis can be found in Appendix B.

MARKET ANALYSIS

The screening process and development of the mode choice model begins with a market analysis to understand freight logistics and demand throughout the 54-county Cross Harbor modeling study area. These are closely related issues, because decisions about how to move freight—by what mode, and what route—generate demand over the transportation system. The market analysis comprises three major tasks:

- Determine existing freight flows
- Identify freight markets
- Specify level of service parameters for proposed alternatives

To address freight logistics, research will be undertaken to identify and describe, in qualitative and quantitative terms, the types of existing freight movements that occur today to serve shippers and receivers in the east-of-Hudson market, emphasizing the critical differences between direct moves (from shipper to receiver via a single mode), intermodal moves (from shipper to receiver via multiple modes), and indirect moves (via intermediate warehouse and distribution facilities located in the NY/NJ region). The second task, freight market research, will be undertaken to gather information in order to understand the factors used by decision-makers to select a particular mode of transportation. Based on the information provided from the market research, the third task will be to specify key attributes or level of service parameters for each alternative.

POTENTIAL FREIGHT TRANSPORTATION MARKETS

To understand the market demand for each alternative, the analysis will first examine the four types of freight movements (listed below) that may be well served by Cross Harbor freight improvements. These freight movements are considered domestic moves, because international cargo that enters the country through the region's ports and airports are transported across the harbor in a secondary, domestic move.

1. **Existing rail markets** and services to the east-of-Hudson region, which could increase through normal business growth and improvements to rail services. This category also includes historic rail markets that might be recaptured, as well as emerging opportunities in commodity types that are typically well-served by traditional railcar service. Rail improvements within the market demand and forecasting study area may facilitate rail freight movement, but the specific origin/destination of rail freight moving to/from the east-of-Hudson region is also a critical factor. Some origin/destination regions are better served by rail than others, based on the availability of rail service at attractive prices and schedules, and/or the availability of service from multiple railroads.

2. **Long-haul trucking** (400 miles or more) of full truckloads from west-of-Hudson points to east-of-Hudson points. For freight moving more than 400 to 500 miles, rail is a competitive option because the distance is longer than a trucker can usually drive in a single 24-hour period. Long-haul freight that would otherwise move on truck could move by rail in a variety of ways: as intermodal shipping containers, either single-stacked or double-stacked; or as trailers-on-flatcars; or even as "piggyback" traffic, where the entire truck, including cab, is carried. Most importantly, long-haul truckload shipments already arrive in the east-of-Hudson region every day, and are already served by existing receiving facilities. If these shipments were to be handled by rail instead, they would not require new warehouse/distribution facilities in the east-of-Hudson region. New or expanded rail yards where freight could be lifted or rolled onto and off railcars would, however, be required.

3. **Rail drayage reduction**. Some current rail traffic terminates at rail yards in the west-of-Hudson region, and is broken down and trucked to its ultimate destination in the region. In cases where full rail containers are broken down into smaller truckloads, the operation typically occurs in major warehouse/distribution centers in northern New Jersey, or increasingly in Harrisburg or northeastern Pennsylvania. This operation cannot be relocated to the east-of-Hudson region without adequate investments in warehouse/distribution capacity. These operations also require adequate terminal space, whether the railcar is delivered directly to the customer, or whether its contents must be transferred to trucks, or possibly stored for an interim period. Railcar utilization is another significant factor. Simply put, the more loaded miles per year that railcars travel, the greater the revenues per year they generate. Railroads allocate their equipment to routes and services that generate higher revenues, and their willingness to serve lower-priority markets depends in part on railcar supplies. A final consideration would be whether rail schedules and services would actually provide faster end-to-end service by continuing on rail to east-of-Hudson points, or whether terminating traffic west-of-Hudson and trucking the remaining distance is more efficient. To fully understand this market opportunity, the analysis will consider the number of full loads on rail that are destined for east-of-Hudson today, the number of full loads likely to occur in the future, and the improvements necessary for alternatives involving enhanced cross harbor infrastructure to meet or beat current rail service.

4. **Short-haul trucking**. The region's marine terminals, warehouse/distribution facilities, and major shippers and receivers generate significant container, dry van (including full truckload and less-than-truckload), and bulk traffic. Local traffic is moving almost exclusively by truck due to the short distances. Using rail for these trips involves higher handling costs due to intermodal transfers, and slower end-to-end travel times. However, both old and new technologies could increase the potential to divert traffic from this market. Existing technologies, in addition to railcar floats, include truck floats, trailer-on-barge,

and container-on-barge. New technology includes trains carrying trucks through a tunnel and "automated guided vehicles" (AGVs). The requirements of capturing this market are more speculative at this time, but potentially feasible with existing technology. One benefit of this means of serving this market demand is that no additional warehouse/distribution space would be required, since the same truck moving across the harbor would serve both shippers and receivers.

For each of these types of freight movements, data will be collected regarding commodity and vehicle flows. Several sources of data will be used for this effort, including existing regional models, TRANSEARCH data, Rail Waybill data, as well as truck and rail surveys at key facilities. Detailed methodologies for this data collection effort are included in Appendix B.

FREIGHT MARKET RESEARCH

The second task for the market analysis is to clearly understand and describe the factors used by decision-makers to select a particular mode of transportation. Market research will be undertaken, through one-on-one interviews and focus groups. Specifically, the objectives of this research are to:

- Understand how Cross Harbor shippers make decisions regarding freight transportation, including mode and carrier choices, through a coordinated program of one-on-one interviews and focus groups.

- Understand the role of supply chain logistics on these decisions through a coordinated program of one-on-one interviews and focus groups.

- Obtain detailed information on actual recent shipments in the market demand and forecasting study area via revealed-preference surveys conducted via telephone.

- Obtain detailed information on the extent to which shipping decision-makers would change their choices under different hypothetical transportation scenarios, via stated-preference choice exercises.

Detailed methodologies for the specific efforts associated with the market research, including surveys, focus groups, and interviews, are included in Appendix B.

LEVEL OF SERVICE PARAMETERS

The last task for the market analysis is to specify key attributes or level of service parameters for each proposed alternative. These attributes will be used to test each alternative in the freight flow forecasting effort. These attributes include:

- **Reliability** – Ability to provide predictable delivery of goods within expected time windows.

- **Cost –** The end-to-end price paid by the shipper or receiver, reflecting labor costs, fuel costs, equipment costs, and the time lost to congestion or to the breakdown of efficient supply chains.

- **Speed** – Total end-to-end travel time for delivery of goods.

- **Safety/security/loss/breakage –** Safe and secure operation of freight vehicles and facilities to minimize loss and damage.

- **In-transit visibility** – Ability to track and locate goods throughout shipping process.

Table 1: Screening Criteria

Goals and Objectives	Broad Screening Criteria
Goal 1: Reduce the contribution of Cross Harbor trucks trips to congestion along the region's major freight corridors.	
Reduce the vehicle miles traveled by freight trucks which cross the Hudson River.	Likely change in regional truck vehicle miles of travel (VMT).
Reduced travel-time and delay on regional highway network.	Not evaluated for screening analysis.
Maximize efficient use of available capacity on existing transportation infrastructure.	Qualitative comparison of alternative concepts plans.
Maintain or improve regional rail network performance.	Likely change in regional rail system demand.
Goal 2: Provide Cross-Harbor freight shippers, receivers, and carriers with additional, attractive modal options to existing interstate trucking services.	
Increase the number of modal options available for Cross Harbor freight transportation.	Qualitative comparison of alternative concepts plans
Provide modal options and choices that offer attractive and competitive performance, consistent with business requirements.	Comparison of market demand as measured by the Mode Choice Model
Goal 3: Expand facilities for Cross Harbor goods movement to enhance system resiliency, safety and security, and infrastructure protection.	
Provide Cross Harbor freight facilities and services that improve system redundancy and resilience in event of a major interruption of service on existing interstate highway corridors serving the region.	Provision of new freight capacity other than existing interstate highway corridors.
Support contingency planning for emergency alternative Cross Harbor goods movement operations	Provision of new freight capacity other than existing interstate highway corridors.
Reduce the number of freight vehicle related accidents.	Likely change in regional truck VMT.
Develop effective alternative options for transporting overweight/non-standard cargo to support infrastructure protection for regional bridges and highway network.	Qualitative comparison of alternative concepts plans
Goal 4: Support development of integrated freight transportation/land use strategies.	
Maximize underutilized freight transportation infrastructure and related land uses.	Qualitative comparison of alternative concepts plans
Support services to existing freight distribution centers in the region.	Qualitative comparison of alternative concepts plans
Integrate rail freight services with local land use and transportation planning objectives.	Not evaluated for screening analysis.
Integrate rail freight development with statewide freight and passenger rail plans.	Not evaluated for screening analysis.

- **Equipment availability** – Equipment required for the shipment and storage of goods is available at the appropriate location.

Information regarding these parameters will be obtained from the market research surveys. These parameters vary for a broad range of commodities and origin destinations. Any alternative that can be defined in terms of its level of service can be tested for its estimated potential demand in the mode choice model.

FREIGHT SHIPMENT MODE CHOICE MODEL

The data and information collected from the market analysis will be used to develop a model that predicts how shippers will react to corridor transportation improvements and alternatives. The mode choice model will relate the choice of shipment mode (truck, rail, waterborne) to specific characteristics of the shippers/receiver, the shipments made, and the level of service attributes of each mode. The detailed methodology for developing the mode choice model is included in Appendix B.

For each alternative, the mode choice model will calculate the diversion of freight flows to rail or waterborne modes, as compared to the base traffic moving by truck. This comparative process allows for a range of alternatives to be tested against a broader range of commodities and origin destinations. As a result of the model, the mode diversion of freight and the geographic distribution of freight will be identified for each alternative.

CRITERIA FOR ALTERNATIVES SCREENING

The output of the mode choice model will be freight flow by mode—how much freight will move by rail or waterborne as compared to trucks on the highway system. If similar alternatives result in comparable results, the alternative with the best results will be carried forward and the other similar alternatives with less favorable outcomes will be eliminated.

Alternatives will also be evaluated for consistency with the objectives associated with the project goals. This evaluation will be based on broad qualitative measures for each objective. For some objectives, such an evaluation may not be possible at the screening level since the alternatives and their potential effects have not been defined in enough detail. The proposed screening criteria are shown in Table 1. In this case, criteria will be developed in Step 4—the detailed evaluation. The following describes the broad screening criteria for each of the project goals and objectives.

4. DETAILED EVALUATION

The outcome of the screening analysis will be a limited list of alternatives. The next step in the process is the detailed evaluation that will consider both quantitative and qualitative performance measures and provide a comparative analysis to weight the relative benefits and detriments of each alternative and determine which alternative(s) best meets the project's goals and objectives. One purpose of the detailed evaluation is to analyze potential regional and localized effects based on more quantified measures. The results of the detailed evaluation will also identify the alternatives that will be carried forward in the Tier I EIS. For this step in the process, alternatives will be evaluated to determine their potential effects on:

- Transportation networks – regional rail and highway networks.

- Operational and engineering requirements – right-of-way, yard, facility, and infrastructure requirements.

- Environment – range of social and environmental conditions.

- Economic and financial conditions – cost and benefits, financial value to the railroads, various revenue streams, and funding needs.

For each alternative, the results of the analyses will be evaluated based on performance measures associated with the project goals and objectives. These performance measures will primarily be quantitative; however, some analysis areas will consider potential benefits or detriments that cannot be easily measured but must be characterized qualitatively, such as effects on surrounding land and consistency with local plans. Based on the results of the detailed evaluation, alternatives could be eliminated and therefore not carried forward for the Tier I Draft EIS. The full extent of the technical methodologies that will be used for the detailed evaluation can be found in Appendix C.

REGIONAL TRANSPORTATION EFFECTS

As described above, the screening analysis in Step 4 will result in a comparison of the amount of freight that will be diverted from trucks in the No Action Alternative to alternative modes. The transportation network will be further analyzed in Step 5, by determining how the resulting future freight flows would affect the regional rail and highway networks. The purpose of the transportation evaluation is to understand the impact of potential Cross Harbor improvements on specific rail lines, river crossings, and highway freight corridor segments.

RAIL OPERATIONS ANALYSIS

Cross Harbor rail infrastructure enhancements from the alternatives could lead to substantial changes in rail operations. At the same time, rail traffic growth over the regional rail freight network, absent the improvements, must be accommodated as well. Therefore, a rail operations analysis will be performed by developing high-level rail traffic density projections and evaluating the broad implications in terms of rail network capacity.

Current rail traffic flows will be used to initially set up and develop a regional rail network model. Future baseline growth will then be estimated and applied to the model. The effects from the alternatives—in terms of changes in volumes over existing infrastructure—will then be modeled. The modeling will address float and tunnel services and the lines serving them. Each section of rail line will be evaluated in terms of capacity, based on its physical characteristics, impact on existing operations, traffic mixes, service schedules, signaling, dispatching procedures, time-of-day peaking factors, and other similar attributes.

HIGHWAY NETWORK ANALYSIS

To assess the effects of the alternatives on the regional highway system, regional travel demand models will be used to assess the expected changes in truck trip volumes and origin-destination patterns. Regional model outputs, with and without the proposed alternatives, will be compared to estimate the net benefits to the regional highway system. It is expected that for most alternatives, truck trips over the Hudson River crossings and major corridors accessing these crossings would be somewhat reduced. However, local traffic at certain points, particularly truck to rail transfer facilities, could increase. The regional models provide a framework to evaluate these effects on a regional basis. They can not be used to evaluate the localized increases in trips. This needs to be done on a more micro-scale. The analysis will use a combination of two regional model systems— North Jersey Transportation Planning Authority's (NJTPA) North Jersey Regional Transportation

Model Enhanced (NJRTME) and New York Metropolitan Transportation Council's (NYMTC) Best Practices Model (BPM).

The results of the mode choice model—reductions in truck traffic on key corridors, as well as potential increased concentrations at local facilities—will be exported into the BPM and NJRTME models. Each alternative will be analyzed for its potential to divert truck traffic, as quantitatively measured by decreases in:

- Vehicle miles of travel (VMT)
- Vehicle hours of travel time (VHT)
- Vehicles hour of delay (VHD)
- Change in travel time
- Peak period traffic and truck volumes

OPERATIONAL AND ENGINEERING REQUIREMENTS

An operational analysis, based on conceptual engineering, will be undertaken during this step to determine operational needs, particularly as it relates to the existing rail network and costs associated with the proposed alternatives. For yards and facilities associated with the alternatives, the conceptual engineering will identify the location of yards and facilities, minimum sizes, and any infrastructure needs. The conceptual engineering will also identify any associated right-of-way requirements. Order of magnitude cost estimates for the construction, operation, and maintenance of the alternatives will also be developed.

ENVIRONMENTAL EFFECTS

Environmental analyses of alternatives will also be undertaken in this step. These analyses will consider both direct and indirect effects as well as cumulative effects for a range of social and environmental conditions and evaluate the potential for local environmental effects. The conceptual engineering and operational information described above will be used to consider potential environmental consequences for each alternative. The analyses will be a mix of both quantitative and qualitative, depending on the specific analysis and available information, and the detailed methodology for each of these analyses is included in Appendix C. Environmental analyses will be undertaken in the following areas:

- **Land use, zoning, and public policy** – compatibility with land use, neighborhood character, and development goals and regional public policy.
- **Cultural and historic resources** – direct effects on archaeological and historic resources and parkland.
- **Air quality** – regional (mesoscale) effects and potential local effects on ambient air quality.
- **Energy and greenhouse gases** – change in energy consumption and greenhouse gas emissions in the 54-county Cross Harbor modeling study area.
- **Noise and vibration** – effects from increased rail activity along rail freight routes, activity at rail yards.

- **Natural resources** – direct effects on aquatic biota, terrestrial biota, threatened or endangered species (and their associated habitats, such as wetlands), as well as other resources of special concern, such as essential fish habitat.

- **Contaminated and hazardous materials** – potential to encounter contaminated soil and groundwater during construction, especially those elements that would require excavation, storage, transport, or disposal of contaminated soil.

- **Environmental justice** – potential for disproportionate adverse effects on minority and low-income populations.

ECONOMIC AND FINANCIAL EFFECTS

The detailed evaluation will consider a series of economic and financial effects to address issues associated with the public and private benefits of the alternatives. The analyses will focus on evaluating the effects on economic activity in the 54-county Cross Harbor modeling area. The economic effects will be presented in terms of direct, indirect, and induced economic impacts. Alternatives may also attract local economic development along the alignments and in the vicinity of project elements, such as yards and float facilities. Localized adverse economic impacts may also occur from displacement and relocation of businesses.

As part the screening analysis in Step 4, alternatives are evaluated to estimate their market demand, relative utilization, and modal diversion potential. The alternatives will be further refined based on engineering, operational, environmental, and other considerations in Step 5 (as described above). These revised alternatives will be re-tested with respect to market demand, relative utilization, and modal diversion potential using the mode choice models.

The economic analyses include:

- **Economic impact analysis** – examine the broader implications of the alternatives on freight stakeholders, surrounding communities, and the larger statewide and national implications.

- **Benefit-cost analysis** – estimate benefits from a local, regional, and national perspective based on transportation efficiencies and social and environmental benefits.

- **Market feasibility analysis** – evaluate the acceptance and sustainability of alternatives within the private market world of transportation service providers and customers.

- **Railroad financial analysis** – estimate the potential operational value of alternatives to railroads.

- **Revenue stream and funding needs analysis** – estimate potential revenue streams to the public sector and identify overall funding needs, including needs unmet by revenue streams.

- **Displacement analysis** – identify potential direct displacement of residents and/or businesses.

CRITERIA FOR EVALUATION

For each alternative, the results of the analyses will be evaluated based on performance measures associated with the project goals and objectives. Although these performance measures have not

Table 2: Detailed Evaluation Analysis

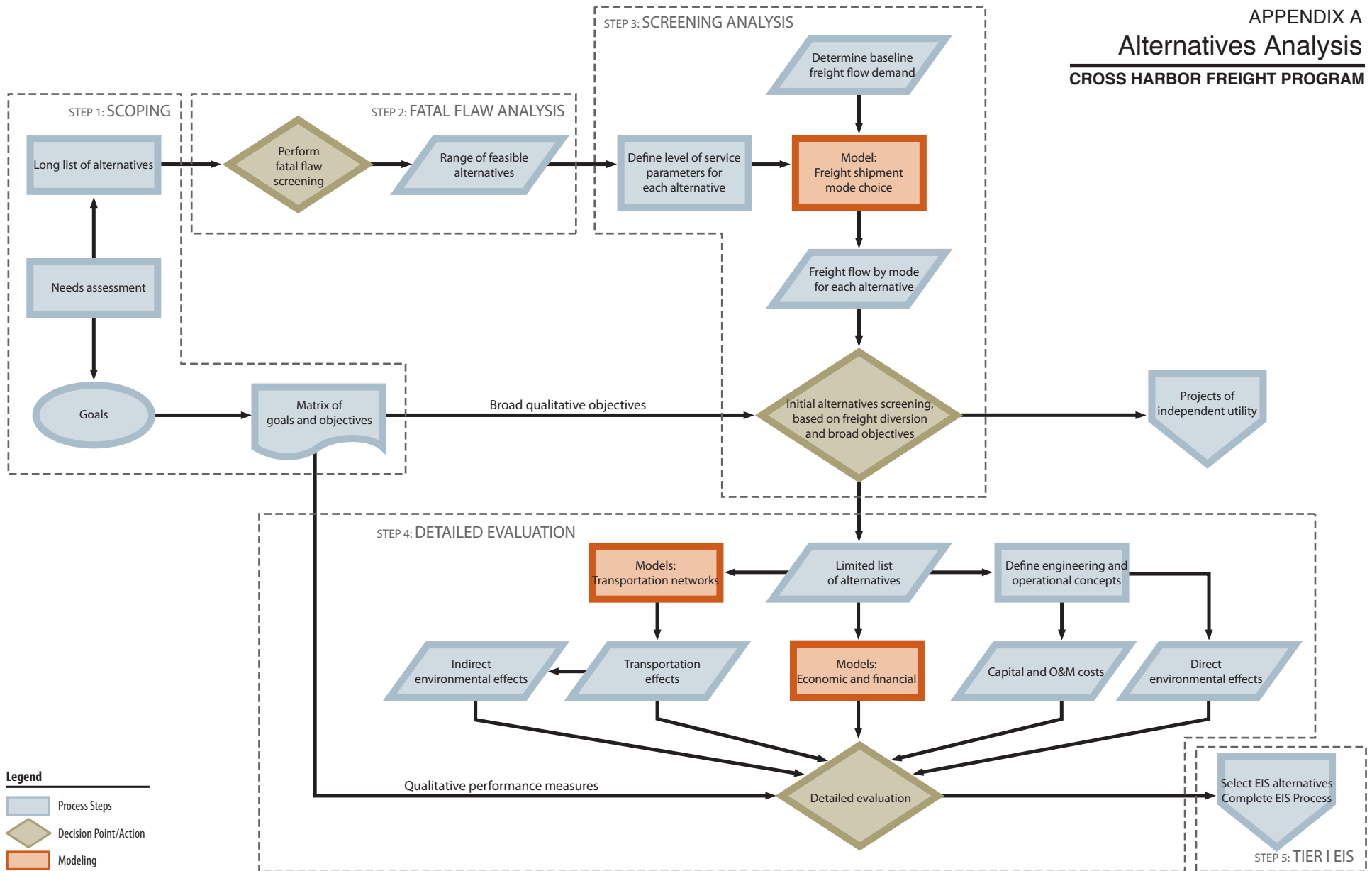| Goals and Objectives	Detailed Evaluation Analysis
Goal 1: Reduce the contribution of Cross Harbor trucks trips to congestion along the region's major freight corridors.	
Reduce the vehicle miles traveled by freight trucks which cross the Hudson River.	Transportation
Reduced travel-time and delay on regional highway network.	Transportation
Maximize efficient use of available capacity on existing transportation infrastructure.	Engineering and operational
Maintain or improve regional rail network performance.	Engineering and operational
Goal 2: Provide Cross-Harbor freight shippers, receivers, and carriers with additional, attractive modal options to existing interstate trucking services.	
Increase the number of modal options available for Cross Harbor freight transportation.	Economic and financial
Provide modal options and choices that offer attractive and competitive performance, consistent with business requirements.	Economic and financial
Goal 3: Expand facilities for Cross Harbor goods movement to enhance system resiliency, safety and security, and infrastructure protection.	
Provide Cross Harbor freight facilities and services that improve system redundancy and resilience in event of a major interruption of service on existing interstate highway corridors serving the region.	Transportation
Support contingency planning for emergency alternative Cross Harbor goods movement operations	Engineering and operational
Reduce the number of freight vehicle related accidents.	Transportation
Develop effective alternative options for transporting overweight/non-standard cargo to support infrastructure protection for regional bridges and highway network.	Engineering and operational
Goal 4: Support development of integrated freight transportation/land use strategies.	
Maximize underutilized freight transportation infrastructure and related land uses.	Transportation Environmental
Support services to existing freight distribution centers in the region.	Transportation
Integrate rail freight services with local land use and transportation planning objectives.	Environmental
Integrate rail freight development with statewide freight and passenger rail plans.	Environmental

Cross Harbor Freight Program

yet been defined, Table 2 identifies how each of the project goals and objectives will be evaluated by the analyses described above.

5. TIER I DEIS

The final step in the process is the preparation of the Tier I DEIS. The results of all the previously described steps and assessments will be summarized in the Tier I DEIS. The environmental analyses undertaken for the detailed evaluation will be presented in the Tier I DEIS. Some of the environmental analyses may be further refined for the EIS. In addition, the Tier I DEIS will include analyses of visual resources, water resources, coastal zone management, and indirect and cumulative effects, as well as a Section 4(f) evaluation and Section 106 considerations, as appropriate.

The format and content of the Tier I EIS, as well as the review process is described in the Scoping Document. As the EIS process continues, alternatives may be revised, discarded, or added. The preparation of the EIS will ultimately select a Preferred Alternative or Alternatives in the Tier I EIS Record of Decision.

9.14.10

APPENDIX A
Alternatives Analysis
CROSS HARBOR FREIGHT PROGRAM

STEP 3: SCREENING ANALYSIS

STEP 1: SCOPING

STEP 2: FATAL FLAW ANALYSIS

Long list of alternatives

Perform fatal flaw screening

Range of feasible alternatives

Define level of service parameters for each alternative

Determine baseline freight flow demand

Model: Freight shipment mode choice

Needs assessment

Freight flow by mode for each alternative

Goals

Matrix of goals and objectives

Broad qualitative objectives

Initial alternatives screening, based on freight diversion and broad objectives

Projects of independent utility

STEP 4: DETAILED EVALUATION

Models: Transportation networks

Limited list of alternatives

Define engineering and operational concepts

Indirect environmental effects

Transportation effects

Models: Economic and financial

Capital and O&M costs

Direct environmental effects

Qualitative performance measures

Detailed evaluation

Select EIS alternatives Complete EIS Process

STEP 5: TIER I EIS

Legend

Process Steps

Decision Point/Action

Modeling

Appendix B: Technical Methodology – Screening Analysis

A. INTRODUCTION

As described in the Environmental Impact Statement (EIS) Methodology Report, as a result of the fatal flaw analysis, a range of potentially feasible project alternatives will be identified and then carried forward to Step 3—the alternatives screening process. The screening process begins with a market analysis to collect detailed information about existing freight logistics and demand. This information is then used to develop the mode choice model. The mode choice model will provide estimates of future freight flows by mode for each alternative. The following details the full extent of the technical methodologies that will be used to evaluate logistics and market demand for the screening analysis.

B. EXISTING FREIGHT FLOW RESEARCH

As described in the EIS Methodology Report, the market analysis begins by identifying the logistics patterns that are most likely to benefit from Cross Harbor freight enhancements.

OVERVIEW

This information will be gained from past studies, freight movement databases, industry interviews, and current industry trends. The EIS Methodology Report describes in detail the four types of freight movements that may be well served by Cross Harbor freight improvements.

ANALYSIS METHODOLOGY

Once the key logistics patterns are identified, the next step is the collection of best available data on commodity and vehicle flows relevant to these patterns. The goal is not to describe the universe of freight activity; rather, it is to develop a clear, focused, and easily communicated picture of the freight flows that are most critical for enhanced Cross Harbor rail infrastructure. The following sources will be utilized:

- *Existing regional models* (New York Metropolitan Transportation Council [NYMTC], North Jersey Transportation Planning Authority [NJTPA], New Jersey Department of Transportation [NJDOT], which contain truck movement information.

- *TRANSEARCH data* (acquired by the Port Authority of New York and New Jersey [PANYNJ])

- *Rail Waybill data* for key states

- *Truck origin-destination surveys at key facilities*: major truck crossings and regional intermodal rail yards. (Useful origin-destination data are already available for the region's marine terminals.) TRANSEARCH is useful for describing truck origin-destination pairs and commodity mixes, but less useful for estimating route-by-route truck volumes. Empirical data from on-the-ground surveys is therefore helpful to validate and, if necessary, adjust the TRANSEARCH data. This validation

step should significantly increase confidence in the underlying estimates of freight flows, and in the resulting estimates of potential utilization of enhanced Cross Harbor rail infrastructure. This information will provide best-practice estimates of full truck loads for the east-of-Hudson region.

- *Rail terminal and warehouse/distribution facility surveys* and observations aimed at developing defensible estimates of the volumes, types, and percentages of rail traffic that could proceed as full moves to the east-of-Hudson region, as opposed to rail traffic requiring handling in the west-of-Hudson region. Initially gate surveys will be used, performed by the railroads, which are on file with the Surface Transportation Board (STB), and then the need for any additional empirical information will be determined. If this information proves insufficient, the possibility of conducting gate surveys at the North Jersey intermodal terminals will be explored. From prior experience, the questionnaires must be short and answerable in a minute or less. This requirement will limit questions to a critical few, including origin and destination, load/empty, commodity, and equipment type. Approval to conduct the surveys would have to be obtained from the terminal operators, whose cooperation will likely vary depending on their perception of the potential benefits that they may accrue. Similarly, if the STB information proves insufficient, the possibility of collecting similar data at a cross-section of distribution/warehousing facilities in the region to supplement rail facility information will be explored.

- *One-on-one interviews* with knowledgeable individuals in the freight industry. A target list of potential interviewees and an interview guide will be developed. It is anticipated that approximately 20 interviews will be performed. These interviews will be performed with representatives of carriers, shippers, third-party logistics providers, and public agency stakeholders. The findings from the interviews will be used to help describe existing freight movements and to focus further analyses on the most important aspects of shipping decisions. In the process of selecting interviewees, individuals with a mix of responsibilities will be identified to ensure that the broad range of issues and perspectives is fully understood. For example, personnel at each of the railroads serving the region are expected to be interviewed. For the Class I carriers, interviews will be conducted with operations staff that is intimately familiar with how their railroad runs trains and terminals in the region, marketing officials that are selling transportation services, and strategic planners who are looking toward the future and their railroad's position in it.

- *Economic forecasts.* The TRANSEARCH Insight 30-year forecast links economic and demographic projections to increases in demand for specific commodity groups, and provides a baseline estimate of increases in freight movement by mode and origin-destination that would result from such increases. It is important to note that the TRANSEARCH forecasts assume no changes in the underlying mode shares. Therefore, a commodity in a given trade lane that is 10 percent by rail today, is assumed to be 10 percent by rail in the future. This represents a base case scenario, against which the effects of Cross Harbor freight improvements can be evaluated

- *International trade forecasts.* TRANSEARCH forecasts are driven primarily by demographic and economic trends. Those forecasts can be adjusted to reflect anticipated or potential changes in international trade, if desired, based on PANYNJ projections.

C. MARKET RESEARCH

OVERVIEW

To clearly understand and describe the factors used by decision-makers to select a particular mode of transportation, surveys of and qualitative research with freight shippers and receivers in the corridor will be developed, fielded, and analyzed. The objectives of this research are:

- Understand how Cross Harbor shippers make decisions regarding freight transportation, including mode and carrier choices, through a coordinated program of one-on-one interviews and focus groups.

- Understand the role of supply chain logistics on these decisions through a coordinated program of one-on-one interviews and focus groups.

- Obtain detailed information on representative actual recent shipments via revealed-preference surveys conducted via telephone.

- Obtain detailed information on the extent to which shipping decision-makers would change their choices under different hypothetical transportation scenarios, via stated-preference choice exercises.

- Construct a set of Mode Choice Models reflecting the critical logistics patterns, commodities and rail equipment, and trade lanes. The models are populated with best-practice data on current and future baseline forecast activity; modeling equations are constructed based on the preference surveys; and different level of service values are specified. As the level of service for rail is improved compared to trucking—in terms of cost, speed, and reliability—its attractiveness and its market share can be seen to increase, and the increase is quantified by the models. The forecasting tool will allow for various logistics adjustments as well. For example, the minimum shipment size required to "trigger" the availability of rail service can be adjusted to reflect likely rail marketing practices, which have increasingly targeted larger shippers and "mixing centers" in recent years. This tool allows a wide range of rail enhancement strategies to be tested, including simple or complex float networks, single-track or double-track tunnels, rail AGV services, "open technology" rail versus conventional technology, and other options. Essentially, any rail service that can be defined in terms of a particular cost, speed, and reliability can be tested and its potential demand estimated.

Overview of Proposed Logistics and Market Demand Methodology

The market research effort involves seven tasks:
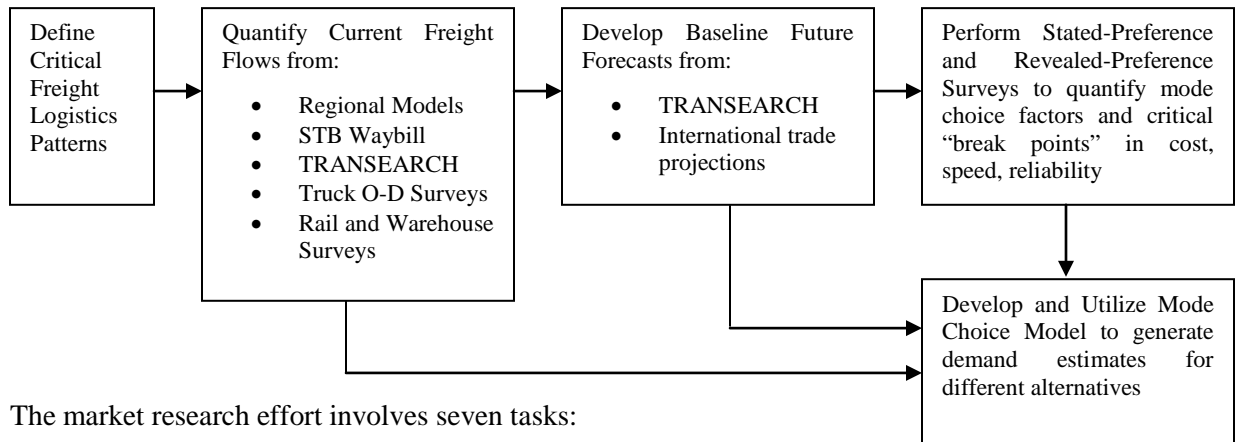
1. Initial Survey Design
2. Focus Groups and Interviews
3. Sample Identification
4. Recruiting Interviews and Revealed-Preference Surveys
5. Stated-Preference Surveys
6. Freight Shipment Mode Choice Model Construction
7. Documentation

ANALYSIS METHODOLOGY

INITIAL SURVEY DESIGN

The design of the survey will be driven by the modeling needs and practical data collection considerations. A survey of shipping decision-makers is being proposed in which information will be gathered on actual and hypothetical shipping choices. The primary outputs of the initial survey design will include findings from the focus group sessions, finalized scripts of the telephone-based revealed-preference surveys, and a standard template for the follow-up Internet or faxed-based stated-preference surveys.

The survey plan will consist of four key elements:

- Defining Universe/Sampling Units – The survey results will be used to represent the total commodity flows of freight movements in each of the relevant logistics market areas. The total freight flows for each market area developed from the TRANSEARCH commodity flow database and other available commodity flow data sources will be used to define the shipment population of interest and to determine the expansion factors.

- Sampling Frame – The sampling unit will be the decision-maker of individual shippers/receivers and carriers. Sampling by individual company will allow each survey to be weighted based on relative contribution to total commodity flows. Therefore, the ideal sampling frame will be a comprehensive list of all businesses that make shipments within the logistics market areas in the New York/New Jersey region.

- Sampling Approach – The sample for this study will be stratified by logistics market area, commodity type, and trip distance. These variables are relevant with respect to mode choice characteristics of freight. The Standard Industry Classification code or the North American Industry Classification System code from the sampling database will be used to identify company business sectors that are most closely related to the STCC classifications within the TRANSEARCH database. If the shipper/receiver or carrier drawn from the sample has qualifying shipments, then it will be included. A shipping/receiving decision-maker at the selected sample establishment will be contacted during recruitment to determine if they should be included in the sample. This procedure will be followed until the desired number of surveys are collected for each logistics market area. For sampling purposes, approximate ranges for each stratum will be identified, to enable a reasonable distribution of business sectors and commodity shipment types to be captured in the surveys. The final sampling plan will be based on a review of the sampling frame and the variables that will be identified from the commodity flow data.

- Defining Survey Methods – A two-stage survey is anticipated, involving an initial telephone interview focusing on respondent revealed-preferences, followed by a mail/fax/Internet survey that will include stated-preference tradeoff exercises.

The revealed-preference survey will be designed to obtain more specific information about shipments within, into, or out of the region that can be used as bases for the stated-preference choice exercises, including: commodity details, including shipment size, shipment value, and special transportation considerations (hazardous materials, etc.); transportation mode level-of-service information, including travel time, freight shipping cost, delivery windows and requirements, origin and destination facility types, and reliability estimates; and respondents' assessments of the availability and levels-of-service of alternative freight modes. The revealed-preference survey will be administered by telephone, as discussed below.

The stated-preference technique is typically used to forecast consumer response to products and services that do not presently exist. Typical applications include a new public transportation service, such as a rapid transit system in a region with only bus service today; or innovative consumer products, such as new types of cellular telephones and paging devices. 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 that can predict choices under a specific set of service attributes.

For the stated-preference surveys, the proposed design approach is to offer fully customized choice tradeoff exercises based on actual reported shipments for each participating respondent. In the choice exercises, the values of each of these attributes for each potential mode will be systematically varied according to a pre-established experimental design. Shipping decision-makers will be asked to choose alternatives under varying levels of service. Since the exercises are based on actual shipments, and the attribute levels (cost, speed, frequency, reliability, mode, etc.) are based on reasonable variations in the potential service levels, respondents are able to make realistic choices (see Table 1 for a sample trade-off exercise). By basing the hypothetical choices on reasonable variations of actual service conditions and actual potential improvements, responses will be obtained that are as realistic and relevant to each individual as possible. Furthermore, basing the choice exercises on actual recent shipments enhances the ability to combine the revealed and stated-preference data, improving the quality of the results.

To accomplish this customization, it is essential that each survey respondent participate at two stages of the process: the revealed-preference stage (at which information on actual reported shipments is obtained), and at the stated-preference stage (at which respondents are given custom-tailored choices reflecting a range of freight shipment options). Each stated-preference questionnaire will have four to eight different trade-off exercises.

Table 1
Stated Preference Survey—Sample Trade-Off Exercise

Choice Exercise 1				
	Suppose the following transportation options were available for shipping Non-Perishable Food Products from Thunder Bay to Quebec City			
	If these were your only options, which would you choose?			
	(Please Circle the letter of your preferred shipping option)			
	A	B	C	D
Shipment Option	Truckload Shipment	Intermodal Rail Shipment	Maritime Shipment	Railcar Shipment
Description	SAME AS NOW For-Hire Trucking Company picks up shipment at Thunder Bay and delivers it to the Quebec City destination	For-Hire Trucking Company picks up shipment in a container at a shipper, delivers it to a rail facility in Thunder Bay, where it is shipped by rail to Quebec City, and driven by truck to its destination	For-Hire Trucking Company picks up shipment in Thunder Bay, delivers it to the port facility, where it is shipped by Great Lakes/Saint Lawrence Seaway to Quebec, and driven by truck to its destination	Railroad picks up shipment in a railcar at Thunder Bay and delivers the railcar to the Quebec City destination
Standard Shipment Size	22 tons	22 tons	22 tons	70 tons
Shipping Cost	$1,850 CAD/truckload (22 ton) ($84 CAD/ton)	$1,650 CAD/truckload (22 ton) ($70 CAD/ton)	$650 CAD/truckload (22 ton) ($29 CAD/ton)	$2,940 CAD/truckload (70 ton) ($42 CAD/ton)
Shipping Time	34 hours	50 hours	190 hours	110 hours
Frequency of Available Service	Every Hour	Every Hour	Every 24 hours	Every 4 Hours
Rate of Turn-downs / lack of availability	1.0%	2.0%	0.6%	0.5%
Delivery Window	4 Hours	2 Hours	12 Hours	2 Hours
On-Time Delivery Reliability	88%	80%	95%	66%
Loss and Damage Rate	2%	1%	1%	2%

As an initial target, it is anticipated that a total of 400 completed stated-preference questionnaires will be collected. A survey response will be deemed useable if <u>both the revealed-preference telephone survey and the stated-preference tradeoff survey are completed</u>. The ultimate sample size may differ depending on the initial survey design and the survey costs as determined by the pre-test.

A cash incentive for completing both portions of the survey will be used as part of the data collection strategy to: increase the cooperation rate of potential respondents (reducing the cost of recruiting respondents); reduce biases associated with data collection by attracting a larger proportion of the total sample; and speed up the data collection effort.

FOCUS GROUPS AND INTERVIEWS

Three Focus Group sessions with shippers and other logistics professionals will be held to help develop and "pre-test" both the revealed-preference and stated-preference surveys. A cash incentive may be offered to secure appropriate numbers and types of participants.

The location for these sessions will be based on proximity to relevant business locations. Approximately 8 to 12 logistics managers will be invited to attend each session, with the expectation that each session will include 6 to 8 participants. Information about the needs and behaviors of shippers and receivers making freight shipments within the logistics market areas will be gathered. Question lists and discussion materials will be developed for the sessions.

The first two focus groups will take place prior to the detailed survey questionnaire design steps. The third group will be used as a means to test the validity of the survey and adjust the survey materials once the questionnaires are in place. As part of the third focus group, the revealed and stated-preference surveys will be presented to the participants, allowing further probing and understanding of their decision-making process, and to determine if refinements are needed to the survey design.

In addition to the qualitative focus group sessions, interviews with knowledgeable individuals in the freight industry will also be performed to supplement and enhance the information collected through the focus group process. These interviews will include carriers, shippers, and public agency stakeholders. Findings from these interviews may be used to refine the survey questionnaires.

SAMPLE IDENTIFICATION

A pool of regional shipping interests will be identified for purposes of conducting revealed-preference surveys (primarily conducted by telephone) and stated-preference surveys (primarily conducted via Internet or fax). The anticipated protocol, similar to previous efforts, is to:

- Assemble establishment data for the relevant geography from which a sample of businesses can be drawn.
- Draw a sample of establishments, stratified by geography and primary business definition (NAICS code).
- Send selected establishments pre-notification letters.
- Contact sampled establishments by telephone, and identify one or more shipping decision-makers (either within or external to the establishments, themselves).

The business establishment information for sample identification will be developed from a commercial business database, such as Global Insight's Freight Locator (recently acquired by PANYNJ), the Dun & Bradstreet Selectory database, the InfoUSA database, or SSI database. Using the establishment contact information in these or a similar database, a stratified random sample of establishments will be constructed, stratified by geographic grouping and primary industry grouping. Establishments in industry categories that are not likely to generate or attract divertible Cross Hudson freight shipments will be excluded from the survey population.

Note that the establishment is the sampling unit. As a result, the shipment commodity types and logistics market areas will only be obliquely controlled, through the oversampling of certain NAICS codes and through non-random selection of specific shipments to be included in the stated-preference surveys. While the expectation is to target a wide variation in specific commodity shipments, no formal quotas at the commodity level will be established.

RECRUITING INTERVIEWS AND REVEALED-PREFERENCE SURVEYS

Working from the sample identification data, interviewers will contact the key transportation managers of the businesses by telephone, ascertain whether they are shipping or receiving qualifying shipments, and seek their permission to be surveyed. The interviewers may need to make several calls before identifying the correct person within an organization, and this person may actually end up working for a different or related company. Therefore, these surveys often take more time and effort than more traditional telephone interviews.

The telephone survey is expected to last between 15 and 20 minutes, and will be designed to:

1. Screen out establishments that do not qualify for the survey (i.e., they do not make relevant Cross Hudson freight shipments).

2. Identify the appropriate freight shipment decision-maker either at the establishment, at another company location, or at another company.

3. Administer the revealed-preference survey and collect basic data (about the origins, destinations, quantities, and types of shipments to or from the establishment).

4. Collect more detailed data (about specific relevant shipments to or from the establishment) in order to construct choice experiments for the stated-preference survey.

5. Solicit the respondent's agreement to follow up with the stated-preference survey.

6. Obtain the respondent's email address, so he or she can receive the link to the Internet survey, or obtain the respondent's fax number.

State-of-the-art Computer-Assisted Telephone Interview processes will be employed to conduct the revealed-preference surveys. The survey script will be programmed and will be conducted by trained personnel to achieve higher response rates and good quality data. This process will enable compilation of revealed-preference data in a consistent manner that is easily readable and formatted for analyses. The process will also enable smooth transmission of the collected revealed-preference data, allowing the customization of stated-preference trade-off exercises to begin.

The telephone survey will include the collection of several data elements related to the overall shipping activity of the respondents' establishments, including: number of inbound and

outbound shipments by commodity type; origins and destinations of the inbound and outbound shipments; and logistics arrangements and transportation modes used for the shipments.

In addition, the survey will obtain more specific information about shipments that can be used as bases for the stated-preference choice exercises, including: commodity details, including shipment size, shipment value, and special transportation considerations (hazardous materials, etc.); transportation mode level-of-service information, including travel time, freight shipping cost, delivery windows and requirements, origin and destination facility types, and reliability estimates; and respondents' assessments of the availability and levels-of-service of alternative freight modes.

Prior to implementing the full revealed-preference survey, a two-stage pre-test will be conducted. As previously noted, in the first stage, focus group participants will review and respond to the survey questions. The second stage will be a full dress rehearsal of the survey, in which the survey procedures will be applied to a smaller sample (20 interviews) of the survey population. This will provide any information necessary to fine tune the Computer-Assisted Telephone Interview process and the revealed-preference survey itself.

STATED-PREFERENCE SURVEYS

Next, qualifying regional shipping decision-makers identified through the recruiting interview and revealed-preference survey process will be contacted to complete stated-preference surveys.

The main exercises in these surveys will describe alternative shipping options, including possible new services and improved service alternatives. In these choice exercises, different shipping alternatives will be defined in terms of their key attributes, such as mode, travel time, cost, reliability, frequency of service, delivery window, origin and destination facility types, and transportation access.

Initially, the telephone survey responses will be reviewed for each individual to be surveyed and develop customized stated-preference surveys reflecting a realistic range of choices. These stated-preference questionnaires will then be mailed or faxed or made available to respondents on the Internet. Finally, interviewers will then re-contact the participants by phone to collect the stated choice data or to clarify responses.

As with the Revealed-preference survey, there will be a two-stage pre-test. In the first stage, focus group participants will be asked to complete stated-preference trade-off exercises. Based on the results, and on results from fielding the revealed-preference survey, the stated-preference trade-off exercises will be customized for a small test sample of 20 participants. These trade-off exercises will be formatted and mailed or faxed to participants. The time elapsed between the retrieval of the revealed survey data and the commencement of the stated-preference surveys will be minimized to minimize attrition.

Once the survey procedures and content are finalized based on the pre-test results, the full surveys will be completed.

FREIGHT SHIPMENT MODE CHOICE MODEL CONSTRUCTION

The collected revealed-preference/stated-preference survey data will allow for the development of discrete choice (multinomial and nested logit) models that can be used to predict how shippers will react to corridor transportation improvements and alternatives.

The mode choice model development effort will involve the estimation and validation of a group of market-specific models. The key methodological issue for the mode choice models relates to the use of the available freight shipment data. For this modeling effort, the revealed-preference data will be relied on to the extent possible to estimate mode choice behavior for the base year. The data collected through the stated-preference surveys will be used to guide the assessment of the attractiveness of new and improved Cross Harbor rail and float services that might be available in the future-year horizon. The mode choice models will relate the choice of shipment mode to specific characteristics of the shippers/receivers, the shipments being made, and the level-of-service attributes of each mode.

For this program, a form of logit mode choice model will be estimated and applied. In the logit model, it is assumed that each available freight shipment alternative provides the shipper with a utility, and the decision-maker is modeled as selecting the alternative with the highest utility. However, the model recognizes these utilities as random variables, so rather than estimating a specific choice, it estimates the probability of a specific choice, under the given conditions. This probability is defined as the likelihood that an alternative has the highest utility among available alternatives.

In the logit model, the utility is usually specified as a linear combination of the different observed independent variables available from the survey, multiplied by unknown parameters. The process of model estimation involves finding the values of the parameters that result in the highest probabilities being assigned to actual observed choices from the revealed-preference surveys. Once the parameters are estimated, the model is used to estimate the choice probabilities of different alternatives with different characteristics.

The basic decisions in developing the mode choice models will include: (a) selection of the variables to be included in the utility function for each mode along with the mathematical forms of each variable; and (b) selection of the appropriate model structure (multinomial logit or nested logit) as allowed by the data and the nature of the choice behavior under study. The model estimation effort will be an iterative process. Different model specifications, with various combinations of variables and levels of complexity, will be tested until a set of final models is developed.

The percentage of total freight that would move by a particular mode (e.g., by truck or by rail) will not be estimated. The development of such a model would be impractical, given the size of the sample that would be required. Instead, the results of the logit choice model will be applied in a comparative process, to calculate how the relative utility of a change in rail service would compare to the relative utility of the base traffic moving by truck. This incremental approach, which "pivots" from the existing tons and shipments moved by truck to calculate the amount that might divert based on changes in the utility of competing modes, particularly rail service, allows for a more robust range of alternatives to be tested against a broader range of commodities and origin destinations, by maximizing the information from the stated-preference surveys.

The logistics of special handling, value of shipment, and size of shipment will be explicitly considered through the development of filters and equations for specific commodities. Previous studies found that while small amounts of annual diversion of freight might be consistent with the mode choice equation, such traffic rarely materializes in practice because rail is an inefficient handler of small quantities of traffic. Previous studies also found that the validation of freight mode choice was improved if utility equations were developed for classes of commodities with similar values per ton or similar handling requirements.

Once the best model specifications are identified, validation will be performed by applying the models to present conditions and comparing the results to available commodity flow data. Mode choice models will be re-calibrated as applicable. Validation will consist of the following steps: reasonableness checks; disaggregate validation; and aggregate validation.

- <u>Reasonableness checks</u> of model parameters and results to known or expected values, based on revealed-preference surveys and other data. This form of model validation is conducted throughout the model estimation process on each interim model result.

- <u>Disaggregate validation</u>, in which the model is applied to see whether the results match observed or expected values. The preferred approach is to apply each model to a disaggregate data set other than the one from which the model was estimated. We will investigate whether other disaggregate intercity freight data sets could be used for this purpose.

- <u>Aggregate validation</u> comparing model results to known aggregate data not used in model estimation, such as commodity flow data sets.

Appendix C: Technical Methodology – Detailed Evaluation

A. INTRODUCTION

As described in the Environmental Impact Statement (EIS) Methodology Report, the alternatives screening analysis will result in a limited list of alternatives to be carried forward to Step 4—the detailed evaluation. Since the Tier I process will focus on selecting the mode(s), alignment(s), and logical termini for those alternatives that best meet the project's stated goals and objective, the data that will be collected and analyzed for the detailed evaluation (Step 4) and the Tier I EIS, will be largely tailored to support corridor-level decision-making. At the same time, an understanding and assessment of the local effects of the proposed alternatives is necessary, since a complete description of any proposed alternative requires a discussion of specific project elements—e.g., rail yards, track and structural improvements, marine infrastructure, ventilation systems, roadway improvements—that may result in adverse social and environmental effects on local communities. These adverse effects and the ability to avoid, minimize or mitigate them could influence the ultimate selection of a preferred alternative(s).

One consideration in the development of the detailed evaluation framework is that various transportation network and environmental concerns, issues, and resources require varying spatial and temporal scales of analysis. Some effects of the proposed project may be regional, while others would only affect a particular community or neighborhood. Many potential impacts effects may only occur in areas of direct construction or on properties adjacent to project elements. The framework must also consider the temporal basis for any impact assessment. Typically, the analysis would include short-term effects, such as those that would occur during construction of the project. Potential impacts would also be assessed both at the initiation of project operation (i.e., at the year of the estimated time of completion [ETC]) and at a future analysis year (typically 20 to 30 years after the project ETC). This is intended to capture the project's effects, both beneficial and adverse, over the long-term, particularly since population and employment growth may change those adverse and beneficial effects in the future. Because the alternatives may have differing years of completion—some may be complete in 2012, others in 2020—the year 2015 has been chosen as a compromise between the earlier and later years of completion to represent the project ETC. This ETC also reflects the fact that 2035 is being used as the future analysis year to forecast freight conditions in the region, as described below.

STUDY AREA

To fully understand the origin and content of freight entering the New York/New Jersey region, and to forecast future conditions, the alternatives analysis and Tier I EIS will model goods movement in a 54-county multi-state area, comprising portions of southern New York, northern and central New Jersey, western and southern Connecticut, and a portion of eastern Pennsylvania (see Figure 1). The counties selected for this modeling study area reflect the following:

- The Port Authority of New York and New Jersey (PANYNJ) core planning region, which includes the five boroughs of New York City (Bronx, Kings, New York, Queens, Richmond Counties), Long Island (Nassau and Suffolk Counties), lower Hudson Valley (Westchester and Rockland Counties), and northern New Jersey (Passaic, Bergen, Morris, Essex, Hudson, Union, Somerset, and Middlesex Counties).

- Surrounding counties that are also part of the New York Metropolitan Transportation Council (NYMTC) and the North Jersey Transportation Planning Authority (NJTPA) planning regions.

- Counties that accommodate truck/rail terminals and freight corridors that are important in serving the region.

- Additional counties that accommodate important Hudson River crossings that are, or may be, used to bypass infrastructure in the core planning region.

A model of goods movement in this area will provide a clear and focused picture of the freight flows between the west-of-Hudson and east-of-Hudson regions, including an understanding of ways that shippers choose to use a particular mode of transportation. This insight will allow the alternatives analysis and Tier I EIS to evaluate the economic costs and benefits of a new harbor crossing and to study the potential for diversion of freight. A full description of the methodology used to conduct the travel demand analyses and forecasts is included in this document.

Framed by this understanding of freight flows into, out of, within, and through the larger 54-county area, the alternatives analysis and Tier I EIS analyses will focus on the project's potential regional impacts in the greater New York/New Jersey region. This regional study area will comprise a combination of counties served by NYMTC, which encompasses New York City, Long Island and the lower Hudson Valley, and NJTPA, which serves 13 counties in northern New Jersey and the cities of Newark and Jersey City (see Table 1). The extent of the regional study area may be refined as project elements are defined and freight demand modeling is conducted and will be confirmed as appropriate for each analysis.

The regional study area will include: major interstate highways leading to the existing cross-harbor connections (I-278, I-495, I-95); a number of highways serving northern New Jersey (such as New Jersey Turnpike/I-95, I-78, I-80, and I-287); and many state and local routes that are important for local freight movement. The alternatives analysis and Tier I EIS will also investigate major freight rail lines and facilities west of the Hudson River (such as lines within the Conrail Shared Assets Area, the CSX River Line, the Norfolk Southern Lehigh Line, Chemical Coast Line and important rail yards at Croxton, Kearny, Oak Island, Greenville, Port Newark/Elizabeth in New Jersey) and strategic rail assets east of the Hudson River, which may be affected by the proposed alternatives (such as the 65th Street Yard, the Bay Ridge Branch, Montauk Branch, the Oak Point and Harlem River yards, and railcar float facilities at 51st and 65th Streets in Brooklyn). Conditions at area marine terminals and airports will also be included in the regional study area.

While much of the alternatives analysis and Tier I EIS will focus on broad, corridor-level impacts, some analyses will probably require an evaluation of local impacts from proposed or altered rail yards, rail lines, and/or intermodal facilities. The study areas for the evaluation of local impacts will depend greatly on the elements of each specific alternative and, to a lesser extent, on the environmental analysis in question. Therefore, for Tier I of the EIS, local study areas will be determined as appropriate before each analysis, for each potential project site, and will probably vary among alternatives.
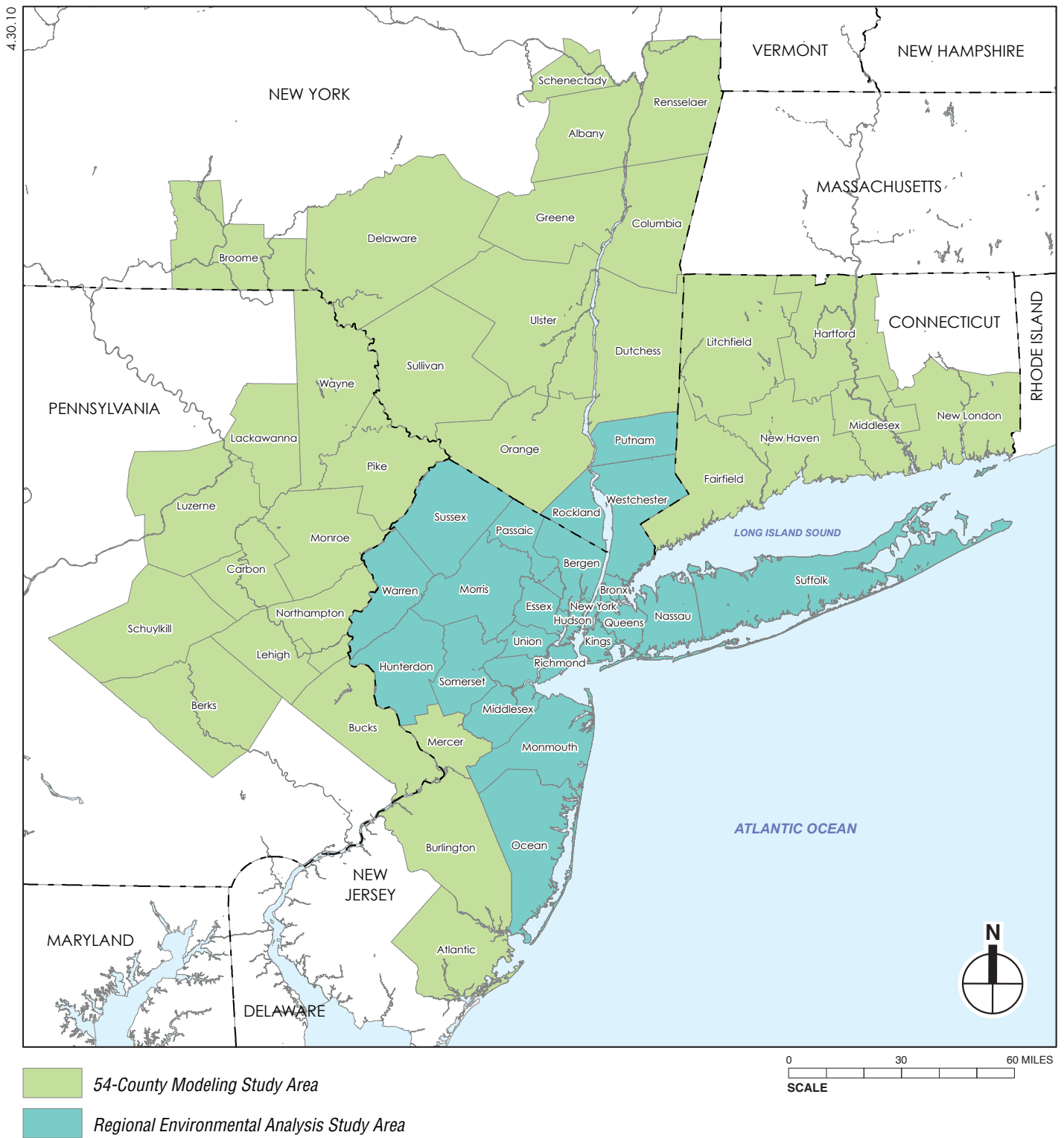
VERMONT

NEW HAMPSHIRE

NEW YORK

MASSACHUSETTS

Schenectady

Rensselaer

Albany

Greene

Columbia

CONNECTICUT

RHODE ISLAND

Delaware

Broome

Ulster

Dutchess

Litchfield

Hartford

Sullivan

Wayne

PENNSYLVANIA

Orange

Putnam

New Haven

Middlesex

New London

Lackawanna

Pike

Westchester

Fairfield

LONG ISLAND SOUND

Luzerne

Sussex

Rockland

Monroe

Passaic

Bergen

Suffolk

Carbon

Warren

Morris

Bronx

Northampton

Essex

New York

Hudson

Queens

Nassau

Schuylkill

Lehigh

Union

Kings

Hunterdon

Richmond

Somerset

Berks

Middlesex

Bucks

Mercer

Monmouth

ATLANTIC OCEAN

Burlington

Ocean

NEW
JERSEY

MARYLAND

N

DELAWARE

Atlantic

0   30   60 MILES

SCALE

54-County Modeling Study Area

Regional Environmental Analysis Study Area

4.30.10

FIGURE 1

Study Areas

CROSS HARBOR FREIGHT PROGRAM

Table 1
Study Area Counties

State	Counties	54-county Modeling Area	Regional Study Area	
			NYMTC	NJTPA
NY	Albany	✔		
NY	Bronx	✔	✔	
NY	Broome	✔		
NY	Columbia	✔		
NY	Delaware	✔		
NY	Dutchess	✔		
NY	Greene	✔		
NY	Kings	✔	✔	
NY	Nassau	✔	✔	
NY	New York	✔	✔	
NY	Orange	✔		
NY	Putnam	✔	✔	
NY	Queens	✔	✔	
NY	Rensselaer	✔		
NY	Richmond	✔	✔	
NY	Rockland	✔	✔	
NY	Schenectady	✔		
NY	Suffolk	✔	✔	
NY	Sullivan	✔		
NY	Ulster	✔		
NY	Westchester	✔	✔	
CT	Fairfield	✔		
CT	Hartford	✔		
CT	Litchfield	✔		
CT	Middlesex	✔		
CT	New Haven	✔		
CT	New London	✔		
NJ	Atlantic	✔		
NJ	Bergen	✔		✔
NJ	Burlington	✔		
NJ	Essex	✔		✔
NJ	Hudson	✔		✔
NJ	Hunterdon	✔		✔
NJ	Mercer	✔		
NJ	Middlesex	✔		✔
NJ	Monmouth	✔		✔
NJ	Morris	✔		✔
NJ	Ocean	✔		✔
NJ	Passaic	✔		✔
NJ	Somerset	✔		✔
NJ	Sussex	✔		✔
NJ	Union	✔		✔
NJ	Warren	✔		✔
PA	Berks	✔		
PA	Bucks	✔		
PA	Carbon	✔		
PA	Lackawanna	✔		
PA	Lehigh	✔		
PA	Luzerne	✔		
PA	Monroe	✔		
PA	Northhampton	✔		
PA	Pike	✔		
PA	Schuylkill	✔		
PA	Wayne	✔		

Notes: NJTPA study area also focuses specifically on the cities of Newark (within Essex County) and Jersey City (within Hudson County)
Sources: http://www.nymtc.org/, http://www.njtpa.org/Plan/Subregion/Default.aspx

B. RAIL OPERATIONS ANALYSIS

Rail infrastructure enhancements within the study area, required for some of the project alternatives, would lead to potentially significant changes in rail operations. At the same time, expected rail traffic growth over the regional rail freight network, absent the enhancements, must be accommodated as well.

OVERVIEW

A rigorous methodology will be deployed to perform this assessment, using a train scheduling and line capacity simulation tool. Although the set-up will take considerable effort, evaluation of different scenarios can then be quickly accomplished. The minimum required work plan for the rail operations tool is focused on developing a high-level traffic density projection, and evaluating the broad implications in terms of rail network capacity.

- To start, a model representation of the rail network will be developed in the 54-county Cross Harbor market demand and forecasting study area, plus extensions over key corridors where changes in traffic density arising from the program might be reasonably expected to have an impact on traffic densities.

- A current year traffic database, utilizing the Surface Transportation Board's Full Waybill Sample, and "flow" this traffic over the network to develop estimates of current rail traffic densities by line will be developed. Simple methods will be used to translate these densities into estimated peak train densities.

- Future-year baseline growth will be estimated using the TRANSEARCH Insight growth forecasts, and traffic over the network will be re-estimated.

- Next, the effects of changes in rail infrastructure and services—in terms of changes in volumes over existing infrastructure, as well as volumes over new infrastructure—will be modeled. Model alternatives will address float and tunnel services and the lines serving them.

- Each section of rail line will be graded in terms of current capacity, based on its physical characteristics, traffic mix, service schedules, signaling, dispatching procedures, time-of-day peaking factors, and other similar attributes. Current and projected line densities will then be used to identify where line capacity issues may arise in the future, and where possible, will reflect the extent to which these issues arise from general economic growth versus the impacts of the specific project under study.

- Current and projected intermodal unit origination/termination counts will also be estimated for key facilities in the terminal area. This information may also be estimated for other selected railcar types, such as multilevel automobile carriers.

ANALYSIS METHODOLOGY

1. Develop updated data on rail network volumes to understand the impact of potential rail infrastructure improvements on specific rail lines and highway segments. As a starting point, an understanding of current rail system volumes will be developed.

    a. Obtain the STB's Full Waybill Sample. The Full Waybill Sample contains a 2.5 to 3.0 percent sampling rate of all carloads and intermodal containers/trailers moved in the entire country, with specialized alternative sampling rates for unit trains. While it does have some shortcomings, it provides a single source for

traffic moving on all of the carriers in the area of interest, and has a long history of being a defensible source for rail-related statistical analysis. Two major caveats apply to the sample. First, the sample only contains loaded movements, and requires that the empty movements be estimated. Second, some small short-lines may be missing or under-represented in the sample. In the past, a third issue also applied, which was that carloads terminating in Canada or Mexico were not reported (carloads originating in Canada/Mexico and terminating in the U.S. are fully included in the sample); however, this issue has been corrected, starting with the 2002 sample. For this study, an adjusted carload sample for the most recent year available at the time the project is undertaken (most likely 2006) will be used, where the primary adjustments and new traffic additions will be provided by other team members. Year 2006 was a peak year, with 2007 and 2008 generally representing contractions in volumes. Recent shifts in fuel prices and the value of the U.S. dollar have also impacted the patterns of rail shipments, particularly intermodal, which may require some adjustments to the traffic. The Full Waybill Sample can only be obtained under certain circumstances. Individual states may obtain a subset of the sample without a full review and approval process for "any waybill record pertaining to traffic that was originated, terminated, interchanged in, or that passed through" the state. Requests outside the scope of the above guidelines must go through a formal publication, comment, and approval process, which increases the time and expense for obtaining the sample, and introduces the possibility that the request will be denied. For this reason, it is recommended that the request focus on traffic originating, terminating or interchanged in New Jersey or New York. Once obtained, certain restrictions apply to the use of the data. To meet these restrictions, it is assumed that no individual O-D level traffic data will be publicly disseminated as part of this study. Instead, the results will be presented as aggregate line densities, perhaps broken out by major traffic types (international intermodal, domestic intermodal, carload/merchandise, and unit/bulk).

b. Validate and/or adjust the STB Full Waybill line density assignments, based on discussions with the region's freight railroads and comparison with other recent regional studies (NJTPA Freight System Performance Assessment Study, etc.) and multi-state studies (Mid-Atlantic Rail Operations Study, etc.).

c. Obtain current data on passenger train volumes over the regional freight network from NJ TRANSIT, Amtrak, Long Island Rail Road, and Metro-North Railroad.

2. <u>Perform rail system capacity analysis for local rail freight corridors based on prior studies and available information</u> to assemble, synthesize, and update, as appropriate, existing knowledge related to rail network capacity potentially impacted by Cross Harbor alternatives.

a. Update previous studies of rail network capacity. Previous studies included analysis of the major freight rail network elements in evaluating capacity and traffic (freight and passenger) demands that may impact Cross Harbor freight mobility. The analysis included the CSX Corporation, Norfolk Southern, Conrail Shared Assets, NJ TRANSIT, New York & Atlantic, and Long Island

Rail Road operations. Specific attention was paid to the capacity of the Lehigh Valley Main Line, Chemical Coast Secondary, River Line, National Docks Secondary and Greenville Running Track in New Jersey, and the Hudson Line in New York. A service plan was specifically developed to incorporate future traffic levels. This plan was then subjected to a manual simulation of these lines to identify and assess the infrastructure improvements that may be necessary to assure the reliable flow of freight and passenger train movements throughout the study area, which was defined as North Bergen to the north, Port Reading Junction to the south, LIRR Fresh Pond Yard to the East, and Oak Island Yard to the west. The specific study data was then integrated with available data on rail freight operations from Harrisburg, Selkirk, and Boston. Key factors considered included long-distance freight traffic, local freight operations in New Jersey and Long Island, successful integration with NJ TRANSIT Raritan Valley trains, operations at major freight yards (Oak Island, Fresh Pond, North Bergen, Croxton, Meadows, the New York Cross Harbor Railroad, and Greenville) and Amtrak service on the Northeast Corridor. These analyses will be reviewed and updated to reflect the most current available information.

b. Incorporate findings and data from other recent studies as applicable. Relevant capacity studies include: (1) analyses of the Brooklyn waterfront (New York Cross Harbor), Bushwick Terminal (NY & Atlantic) and Oak Point (CSX and Conrail Shared Assets) yard facilities for feasibility of constructing waste transfer facilities; (2) analyses of New Jersey rail network capacity developed for NJTPA; (3) analyses of multi-state rail network capacity developed for the I-95 Corridor Coalition as part of the Mid-Atlantic Rail Operations Study; and (4) information from the New York State Department of Transportation's (NYSDOT) Hudson Line Joint Users Study, which included a full network simulation between the Capital District and New York City; (5) Ulster County's study of River Line grade crossing blockages; and (6) other information from regional freight and passenger railroads;

3. <u>Perform rail network capacity and demand analysis and modeling, addressing the larger regional and national freight system</u> to expand the analysis geography beyond the boundaries of local conditions. This will capture critical interchange points between the regional and national networks, helping us understand how national flows feed to and from the project, and to identify any critical issues or impediments beyond the immediate project boundaries. The product is a comprehensive analysis tool for assigning and documenting rail network flows.

a. Develop network representation of relevant rail infrastructure. Using proprietary Traffic Flow Analyzer software, a network representation of relevant existing rail infrastructure will be developed. This network will be highly detailed in the areas near and potentially feeding into rail infrastructure improvements, and become more aggregate in nature as the distance from the project area increases. Thus, rail lines of any relevance will be represented in the northern New Jersey area and southern New York area. As the distance from the study area increases, only the main lines will be represented, and the various branch lines will be largely omitted. The network will include the key data needed to properly assign the waybill sample to the network. This data will include line ownership and trackage rights by carrier, station names, Freight Station Accounting Codes

(FSACs), and Standard Point Location Codes (SPLCs). While the base network will initially contain information for the rail lines spanning the entire Eastern U.S., this network will be reduced to focus on only those elements that are relevant to the program. This work will be largely driven by the extent to which projected related volume changes impact the line densities of more distant parts of the rail network. The greater the distance from the study area, the smaller the impact of the project in terms of the percentage of traffic it represents traversing a particular line. We are suggesting a minimum study area to include: Framingham, MA; New Haven, CT; the New York/Montreal border; Buffalo, NY; Allentown and Harrisburg, PA; Hagerstown, MD; and Wilmington, DE to the south. This network could include rail traffic that does not "touch" New Jersey or New York, and would have to be omitted or information obtained through other means.

b. Geo-code waybill data and calibrate rail network flows. Once the network design is complete, the next step will be to "geo-code" the waybill data, and "flow" the traffic over the network. This process consists of the following steps: determining the exact location on the network where the traffic movement begins; assigning the origin of the traffic to that network location; repeating this process for the traffic destination; determining how the traffic will be routed over the network from origin to destination; assigning the traffic to the various network links that are traversed; and deriving the resulting line densities. This process will be done using the advanced traffic routing (flowing) capabilities in the Traffic Flow Analyzer computer model. The calibration process is designed to address limitations inherent in the source data. One limitation is that waybill origins and destinations are often not the "true" origins or destinations of the traffic. Key commodity groups will be directly researched, particularly in the Northern New Jersey area, and assignment adjustment rules will be developed where needed. Another limitation is that intermodal traffic is most reliably reported in terms of containers and trailers; these need to be converted into railcar movements, considering the types of rail equipment used. Another issue is the need to consider which rail carrier handled a given traffic movement, and the operational practices of that carrier. The Traffic Flow Analyzer supports the specification of the carriers that handle each leg of a rail car's route, and it will "flow" the traffic in a manner that respects the operating territories of each carrier. In addition, the Traffic Flow Analyzer supports the specification of routing preferences for traffic at both a general level, and at a very specific level. For example, the route determination process can take into account which lines are preferred for various types of movements (e.g., intermodal versus general merchandise), and also supports the specification of operating rules to further refine the car routings. These additional operating rules can take the form of either specifying that particular traffic movements must traverse specific lines or pass through specific facilities. In the most advanced approach, we can take into account the "switching" rules that dictate how cars are grouped together and routed for train movement (this last approach would likely be beyond the scope of this study). These techniques will be used as time, budget, and supporting information to achieve a reasonably accurate picture of how the various traffic movements will be routed.

c. Develop supplemental rail network traffic estimates on movements not covered by the Waybill. The waybill contains only loaded movements, and thus requires the estimation of empty movements. Also, if only New Jersey and New York "participatory" waybill traffic is used, it may be necessary to "bulk up" the line densities on lines in Pennsylvania or other states. The normal practice for empty movements is to obtain statistical "empty/load ratios" for the industry or specific carriers, and apply these on a "reverse route" basis. For example, one might know there are 0.9 empty miles generated for every loaded mile of a box car on a particular carrier. One would then take each loaded O-D boxcar pair, and generate a new movement in the opposite direction with a car volume of 0.9 times the loaded movement's volume. These "e/l" ratios are available from a variety of sources, including the Association of American Railroads, and statistical reports filed by the individual carriers known as "R-1s." This information can be used, but judgment must be applied, particularly with respect to whether the number of loaded plus empty terminating cars is approximately equal to the number of loaded plus empty originating cars. Where significant balance issues exist, we may adjust the empty movements to more accurately reflect local conditions. To correct for waybill limitation on traffic outside of New Jersey and New York, publicly available sources will be used, and any materials directly supplied by the carriers to determine the current densities on each relevant line. These base volumes will then be added to the general traffic database, and thus will be available for "scaling" as part of any forward projections.

d. Perform high-level rail network density/capacity analysis for the existing system and for future baseline conditions. Once the traffic densities have been developed, these densities will be converted into estimated peak train densities. Estimated capacities will also be developed for each line. The peak train densities will be computed by converting the average carloads per day into estimates of the number of trains per day by type. Densities for five different train types will be determined: container-on-flatcar/container-on-flatcar, double-stack trains, merchandise trains, bulk/unit trains, and local service trains. Automotive trains could also be considered separately. The first four types of trains will be estimated based on the traffic mix over the line, the operating practices of the carrier involved, and estimates of the average length of trains operated by that carrier. This information will come from a combination of general industry knowledge, publicly available information, and any information directly obtained from the carriers. To reflect peak situations, the annual carload volumes will be divided by a value that is lower than 365, perhaps as low as 200 or 250. If information is available to support estimating the distribution of trains by time of day, it will be performed. For example, it would be useful to estimate the number of trains by type on the "River Line" (Northern New Jersey – Albany) for the time periods 4 PM to midnight, midnight to 8 AM, and 8 AM to 4 PM. This single-track line tends to have heavy northbound intermodal flows in the late evening and morning periods, southbound in the late afternoon and early morning, and very little mixed freight. Because the Cross Harbor freight movement program may have specific impacts on intermodal operations, estimating the peak train operations by eight-hour periods would provide more insight into the potential for line capacity issues. Such a breakout would be

based on general industry knowledge and current carrier timetables to the extent they are available. Each major line segment will be characterized by its current configuration and estimated capacity. This information will include the number of tracks, the length and spacing of passing sidings, the signaling or control system, track quality, and typical operating speeds. Based on information obtained from the carriers and public data sets, each line will be graded as to its approximate capacity in terms of trains per hour or day. The actual capacity is affected by the mix of trains operated, the directionality of the operations, and the peaking factors. These capacity rankings will then be used to determine where capacity issues currently exist or may arise in the various alternative scenarios. In addition, the number of originating and terminating intermodal units will be computed for each major facility in the study area. This information will be used to create a baseline for identifying possible rail intermodal expansion requirements. Finally, estimated future volumes (based on growth factors developed in the demand analysis and projections obtained from passenger railroads) will be flowed over the network to identify changes in routings and system performance in the absence of Cross Harbor alternatives.

    e.   Prepare the model for high-level rail network density/capacity analysis of future system and demand assumptions, based on Cross Harbor alternatives.

4.   <u>Develop highway system capacity and demand analysis tools</u> to develop a comprehensive understanding of capacity and demand over the regional highway network related to freight movement, as a basis for evaluating the impacts of Cross Harbor strategies.

    a.   Consult with the PANYNJ and other study partners to determine the preferred highway network model(s). Obtain the most current versions of model control files, networks, and trip tables.

    b.   Review and evaluate models for strengths, weaknesses, known deficiencies, and inconsistencies. If necessary or warranted, combine elements of different models to maximize their strengths within an integrated tool.

    c.   Use the preferred highway network model(s) to develop baseline estimates of truck traffic under current conditions and future no-build conditions. Review with PANYNJ and other study partners to identify an agreed-upon starting point for the analysis of changes in truck traffic related to Cross Harbor improvements.

C. HIGHWAY NETWORK ANALYSIS

To assess the effects of potential freight improvements on the regional highway system, the expected changes in truck trip volumes and origin-destination patterns using regional travel demand models will be tested. Regional model outputs, with and without freight improvements, will be compared to measure the net benefits of the improvements to the highway system.

OVERVIEW

For most improvements, truck trips over the Hudson River crossings, and major corridors accessing these crossings, would be reduced, but at the same time, local truck activity at certain points—particularly truck to rail transfer facilities served by the improvements—could be increased. The regional models provide a framework to evaluate these effects.

The highway network analyses will consist of initial validation and adjustment of truck travel components of the available regional travel demand models, and then application of the model systems to reflect potential truck shipment demand changes that the various improvement plans might cause. These activities are discussed below.

ANALYSIS METHODOLOGY

Two regional model systems cover portions of the study area: NJTPA's North Jersey Regional Transportation Model Enhanced (NJRTME); and NYMTC's Best Practices Model (BPM).

Both model systems include truck travel as special modules within their modeling processes, but neither delineates commodity truck trips from other types of truck trips that would not be captured in commodity flow analyses, such as the TRANSEARCH database. While the two models forecast trucks differently, both approaches appear to represent good quality state-of-the-practice modeling.

Both of the model systems include their core Metropolitan Planning Organization (MPO) region, as well as several adjacent counties. By including these adjacent counties, the models are better able to provide forecasts within their core regions. The model coverage areas of these model systems are shown in Figures 2 and 3 following.

Although the model study areas are largely overlapping, the models do not maintain the same level of zone detail for non-core areas as they do for their core counties. In particular, the NJTPA model has very little detail about the east-of-Hudson region, except for in Manhattan. Because of these zonal differences, the current plan for the modeling for the Cross Harbor analyses is to rely on a combination of the two model systems:

- Truck trips with both trip ends west-of-Hudson (except Staten Island) will be analyzed with the North Jersey Regional Transportation Model-Enhanced (NJRTM-E); and

- Truck trips with both trip ends east-of-Hudson or in Staten Island and truck trips that cross the Hudson will be analyzed with the BPM.

Figure 2. NJTPA NJRTME Model Area
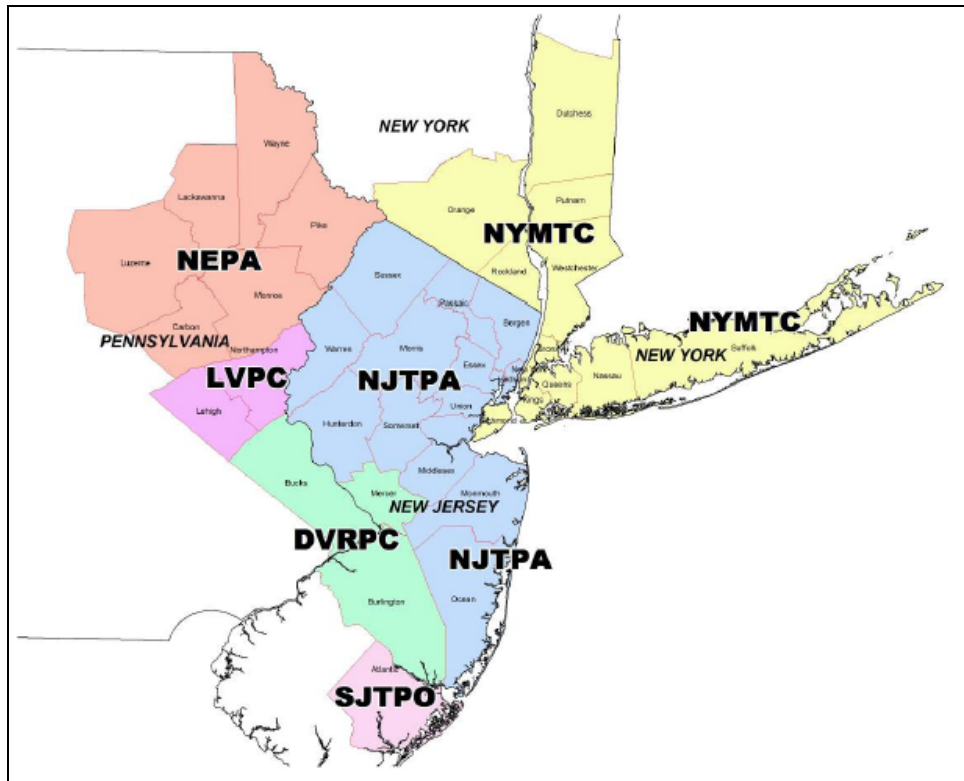
Source: NJRTME Model Development Report, November 2008.

Figure 3. NYMTC BPM Model Area
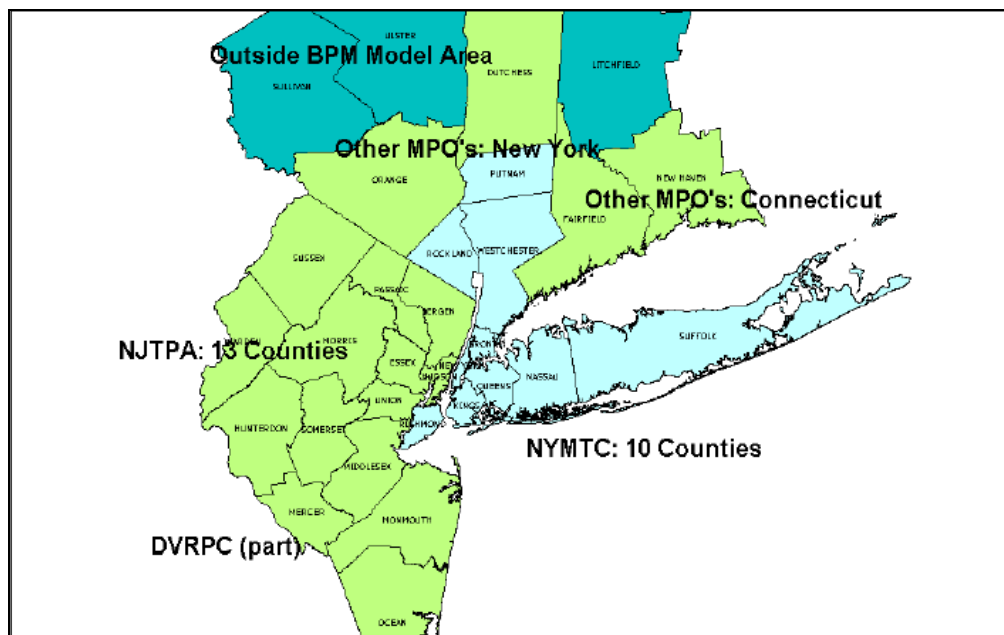
Source: NYMTC 2005 Update and Recalibration of the BPM, December 2008.

The models have been initially reviewed and evaluated for strengths, weaknesses, known deficiencies, and inconsistencies (with respect to network attributes, base year demand, future forecast demand, level of detail to which truck flows are addressed, etc.). This process will be continued, the model systems' base year truck trip estimates will be compared to PANYNJ truck toll figures and other truck count data, and the models will be re-calibrated as necessary.

Initial work suggests that in terms of total traffic, the BPM matches PANYNJ river crossing data quite well. However, the truck trip percentage estimates for these facilities are not consistent. The truck trip models will be adjusted to improve the fit with these important counts. The models' county-to-county, internal-external, and external-external truck trip tables will be compared to the TRANSEARCH data to ensure important commodity flows are captured with the regional model truck estimates. Commodity truck trips are generally only a percentage of shorter truck trips, because there are many trips by service trucks (waste haulers, construction trucks, etc.) which are not engaged in goods movement. Some adjustment of longer-distance truck trip tables may be necessary to ensure consistency with the TRANSEARCH data. As the PANYNJ truck origin-destination data become available, and as intermodal facility origin-destination data is obtained, the baseline model trip table estimates will be updated.

Once the baseline estimates of truck traffic under current conditions and future No Build conditions have been developed, the proposed changes will be reviewed with NYMTC and NJTPA to identify an agreed-upon starting point for the analysis of changes in truck traffic related to Cross Harbor improvements.

Lastly, the potential regional impacts from operation of the alternatives will be assessed. Each alternative's potential to divert truck traffic to rail, as measured by a decrease in overall vehicle miles and hours of travel, and changes in traffic volume on the major highways leading to the cross harbor crossings and associated operational changes on these crossings will be analyzed.

D. OPERATIONAL AND ENGINEERING REQUIREMENTS

For yards and facilities associated with the alternatives, the conceptual engineering in this task of the detailed evaluation will identify the location of yards and facilities, minimum sizes, and any infrastructure needs. The conceptual engineering will also identify any associated right-of-way requirements. Order of magnitude cost estimates for the construction, operation, and maintenance of the alternatives will also be developed.

A set of engineering guidelines will be compiled into a design handbook for the project to provide a uniform basis for preliminary design and will undergo continuous refinement and expansion during the preliminary engineering process and final design. The design handbook will:

- Identify and define relevant project criteria.
- Identify regulations, standards and guidelines applicable to the design process.
- Provide a means and mechanism to identify, assess and resolve project technical issues.
- Provide a mechanism for systematically developing and recording the appropriate design criteria for the project.
- Provide documentation of the development and evolution of the project design criteria.
- Clarify and aid in the development of the project technical memos and design reports.

An operational analysis, based on conceptual engineering, will be undertaken during this step to determine operational needs of each alternative, particularly as it relates to the existing rail network and costs associated with each alternative.

E. ENVIRONMENTAL EFFECTS

Environmental analyses of alternatives will consider both direct and indirect effects, as well as cumulative effects, for a range of social and environmental conditions. The potential for local environmental effects and the relationship between local, short term impacts and the maintenance and enhancement of long-term regional productivity will also be evaluated, to the extent possible in a Tier I EIS. The conceptual engineering and operational information described above will be used to consider potential environmental consequences for each alternative.

OVERVIEW

Because Tier I will focus on potential regional and corridor-level impacts, it will be a mix of both quantitative and qualitative environmental analyses, depending on the specific analysis and available information; however, some discussion of local impacts around project elements will also be included, as far as the design development of alternatives will allow. Each area of analysis will also identify data needs for Tier II, when site-specific analyses will be performed.

The environmental methodology is divided as follows:

- Land Use, Zoning, and Public Policy
- Cultural and Historic Resources
- Air Quality
- Energy and Greenhouse Gases
- Noise and Vibration
- Natural Resources
- Water Quality
- Contaminated and Hazardous Materials
- Environmental Justice

Each section below will discuss issues of each particular subject area, the extent of the regional and local study areas, and the methodology for conducting an analysis for the detailed evaluation and subsequently for the Tier I EIS.

ANALYSIS METHODOLOGY

LAND USE, ZONING, AND PUBLIC POLICY

This analysis will include both a regional and a local examination of issues. On a regional basis, Tier I of the EIS will discuss regional land use development trends and various regional government plans and policies. Where appropriate, the analysis will identify regional concentrations of industrial and commercial activity, since these areas may create additional demand for improved freight movement. The analysis will also include a general description of land use, zoning, and demographic characteristics in local study areas, where specific project elements may be located. The consistency of the alternatives with local land use will be

evaluated. Potential impacts from the construction (short-term) and operation (long-term) of project elements on community facilities and neighborhood and community cohesion will be described.

1. Confirm the extent of the regional study area. The regional study area for land use will comprise the 10 counties served by NYMTC and the 13 counties served by NJTPA.

2. Define the extent of the local study areas. The study areas for the evaluation of local impacts will depend greatly on the alignment, extent, and termini of each project alternative. Screening for local impacts will be conducted around specific project elements where construction or operational activities may occur. The potential for noise impacts around project elements will be used as a worst-case scenario for environmental impacts to determine the extent of the local study areas. Therefore, the Federal Transportation Administration (FTA) guidance manual, Transit Noise and Vibration Impact Assessment (May 2006) will be used as guide where practical.

   a. **Rail yards** – land use and zoning will be described within 1000 feet from the boundaries of existing and proposed sites

   b. **Intermodal yards** – land use and zoning will be described within 1000 feet from the boundaries of the proposed yard sites, and within 400 feet from any truck routes connected to the regional highway network.

   c. **Float facilities (rail or truck)** – land use and zoning will be described within 1000 feet from the boundaries of existing or proposed sites.

   d. **Rail lines** – land use and zoning will be generally identified within 400 feet of each line. The longer rail line study areas may be divided into segments to aid in the analysis.

   e. **Tunnel alignments** – for the bored portions of the tunnel alignments, land use and zoning will be described within 400 feet of the proposed alignment. Since the physical effects of cut-and-cover and open-cut construction are more extensive, a local study area of 1000 feet will be used for those sections.

   f. **Road segments** – land use and zoning will be described within 400 feet of road segments where roadways improvements are proposed.

   g. **Tunnel entrances** – land use and zoning will be described within 1000 feet from the boundaries of proposed sites.

Local study areas will be refined after considering the potential for other impacts in the vicinity of the project elements, such as traffic or noise, and will be expanded as appropriate.

3. Describe existing regional public policy goals and development plans. Documents compiled by the Regional Plan Association (RPA), NYMTC, and NJTPA will be used to describe public policy goals for the greater New York/New Jersey region, and to identify areas in the region that are targeted for growth and development. Identify land use where appropriate. Secondary sources, such as geographic information systems (GIS), will also be utilized to identify areas within the region where industrial and manufacturing activity is concentrated. These areas may ship and/or receive freight, and may generate demand for the proposed project.

4. Discuss existing conditions around project elements, within the study areas identified above. The discussion of existing conditions will identify land use and neighborhood character around project elements, existing zoning, and will include a limited discussion of community facilities (e.g., libraries, schools, hospitals, places of worship) and open spaces (e.g. parks and other recreational areas) that may be affected by the proposed project. The existing demographic characteristics within the local study areas will also be described to identify low-income and minority communities. The description of local existing conditions will be based on information available from local government agencies (such as the New York City Department of City Planning); county planning agencies (such as the Hudson County Division of Planning), the 2000 Census of Population and Housing (updated as appropriate using available data); field surveys; and secondary sources.

5. Discuss future trends and growth expected by 2035 for the regional study area, independent of the project. The analysis will identify future large development projects (committed to or proposed) and public policy changes proposed in the region. Projections prepared by RPA, NYMTC, and NJTPA, and well as county and city master plans, will be used to prepare this section.

6. Discuss future trends and growth expected within local study areas, independent of the proposed project. The analysis will identify land use and/or zoning changes that are committed to or proposed within the local study areas. Information available from county and local planning agencies, as well as secondary sources, will be used to prepare this section.

7. Assess potential regional impacts from the operation of the project alternatives. On the regional level, the discussion of impacts will be centered on the project's compatibility with land use and development goals and regional public policy.

8. Assess potential local impacts from construction and operation of the project alternatives. The analysis will begin by discussing the compatibility of project elements with existing land use, zoning, and neighborhood character and whether project elements would significantly alter the character of local study areas or block access to area amenities. The analysis will discuss whether acquisition of property would be required for new or expanded project elements (such as rail yards), the potential for direct or indirect displacement of residents and businesses, and whether any required displacement would disproportionately benefit or harm certain populations. The need for relocation, where appropriate, will be discussed generally, since it will be addressed more specifically in Tier II of the EIS.

9. Identify the range of mitigation measures that would be available for potential project impacts.

CULTURAL AND HISTORIC RESOURCES

The archaeological and historic resources analysis will be conducted in accordance with Section 106 of the National Historic Preservation Act (NHPA), National Environmental Policy Act (NEPA), Section 4(f) of the United States Department of Transportation Act (DOTA), the New York State Historic Preservation Act of 1980 (SHPA), and the New Jersey Register of Historic Places Act of 1970 (NJSA).

1. Delineate areas of potential effect (APEs) for the project alternatives. APEs will be delineated in consultation with the New York State Historic Preservation Office (NYSHPO) and the New Jersey Historic Preservation Office (NJHPO). Where appropriate, APEs delineated as part of the Cross Harbor Freight Movement Project Draft Environmental Impact Statement, published in April 2004 (2004 DEIS) will be used for this analysis. Where project elements have been added, new APEs will be delineated using methodology consistent with that of the 2004 DEIS. It is expected that different APEs will be established for archaeological and historic resources, with the archaeological APE focusing on areas of physical disturbance and the historic resources APE including areas where visual and secondary impacts may occur.

2. Compile inventory of archeological and historic resources in the project APEs. The inventory compiled to assess the potential effects of the project alternatives will include:

    a. **Resources identified as part of the 2004 DEIS –** Resources inventoried as part of the 2004 DEIS included National Historic Landmarks (NHLs), properties listed on or determined eligible for listing on the State and National Registers of Historic Places (S/NR), designated New York City Landmarks (NYCLs) or properties considered for NYCL designation, properties designated by the Newark Landmark and Historic Preservation Commission or the Jersey City Historic Preservation Commission ("known historic resources"), as well as previously identified, but unevaluated, archaeological resources. Archaeological resources were surveyed for the 2004 DEIS through completion of a series of archaeological documentary studies (Phase 1A Studies). A Phase 1A Study uses documentary sources such as local histories, historic maps, census and property records, archaeological site files and other documents to present a detailed history of the project site, assess modern ground disturbance, and evaluate the potential for archaeological resources to exist in locations that could be affected by the proposed project. A field survey of the project APEs was also conducted by an architectural historian as part of the 2004 DEIS process; those properties that appeared to meet the criteria for S/NR listing and/or NYCL designation were flagged. New York State and/or New Jersey historic resource inventory forms were completed for each of these potential historic resources, and were submitted to NYSHPO, NJHPO, and the New York City Landmarks Preservation Commission (LPC), as appropriate, for determinations of eligibility.

    b. **Resources located within APEs not included in the 2004 DEIS –** A list of known archaeological and historic resources in Tier I EIS APEs that were not included in the 2004 DEIS will be compiled, and the resources described and mapped. In addition to identifying known resources, a reconnaissance-level walkover survey of the APEs not previously included in the 2004 DEIS will be conducted by an archaeologist and architectural historian. Properties that appear to meet the criteria for listing on the S/NR, or for designation as NYCLs or Newark or Jersey City local landmarks, will be flagged as potential historic resources. Areas of archaeological potential will also be flagged. Historic structure inventory forms or additional Phase 1A studies will not be prepared as part of the Tier I EIS process; this work would be completed as part of the future Tier II EIS process.

3. Assess the potential for the project alternatives to impact inventoried archeological and historic resources within the delineated APEs, including potential visual impacts. Both construction and operational impacts will be assessed.

4. Identify the range of mitigation measures that would be available for potential project impacts.

AIR QUALITY

This analysis will assess potential regional (mesoscale) effects and potential local effects from the proposed project on ambient air quality. The proposed project is expected to provide significant regional air quality benefits by shifting freight movement from truck to the more efficient and underutilized rail, thereby reducing future truck vehicle miles traveled (VMT), and easing congestion on study area roadways. The various project alternatives will generate emissions primarily from non-road sources, such as freight locomotives, ferries, and/or new or expanded intermodal facility activities. Some local increases in emissions from trucks on roadways in the vicinity of proposed bulk or intermodal yards may also occur.

1. Confirm the extent of the regional study area. The regional study area will comprise the 10 counties served by NYMTC and the 13 counties served by NJTPA.

2. Define the extent of the local study areas. Local study areas will be defined in terms of the presence of potential receptors in the vicinity of project elements.

3. Identify pollutants of concern. Potential pollutants of concern may include:

   a. **Carbon monoxide (CO)**. CO is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. Elevated concentrations are usually limited to locations near crowded intersections, along heavily traveled and congested roadways, or at parking lots or garages, but may also be associated with diesel engines such as ferries and locomotives.

   b. **Nitrogen dioxide and ozone precursors.** 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. Effects of NO_x and VOC emissions from mobile sources are generally examined on a regional basis, together with emissions of these pollutants from stationary sources. NO_2 is also a criteria pollutant. These pollutants are emitted from both on-road and non-road sources such as ferries and locomotives as well as stationary sources.

   c. **Particulate Matter (PM).** 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). PM emissions are associated with diesel-powered vehicles, such as heavy trucks and buses, locomotives, and ferries as well as stationary sources.

4. Determine the project's conformity with the New York and New Jersey State Implementation Plans (SIPs). The Clean Air Act requires a conformity determination for federal actions, directing that "no department, agency or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an implementation plan after it has been approved or promulgated…" (42 U.S.C. §7506.(c).1).

Transportation conformity determinations are required for the approval, funding, or implementation of any Federal Highway Administration (FHWA) project. The Cross Harbor Freight Movement Program's current status, relative to the Transportation Improvement Programs (TIPs) and Regional Transportation Programs (RTPs) in New York and New Jersey, will also be documented. The need for a Transportation Conformity Hot-Spot $PM_{2.5}$ analysis, using criteria in Transportation Conformity Guidance for Qualitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas, issued March 2006 by FHWA and United States Environmental Protection Agency (USEPA), or later guidance if available, will be evaluated. If an analysis is required, guidance from this document would be followed.

5. Assess the potential regional (mesoscale) air quality effects from the proposed project. Potential regional (mesoscale) effects on air quality will be assessed to determine the proposed project's effect on air quality in each non-attainment area. This effort would consider the proposed project within the framework of region-wide emissions and efforts to attain the National Ambient Air Quality Standards (NAAQS), such as NYSDEC and New Jersey Department of Environmental Protection (NJDEP) SIPs and NYMTC and NJTPA TIPs and RTPs. The change in VMT and in rail/ferry operations would be analyzed (on a daily and annual basis) to calculate the net change in emissions from the build alternatives.

6. Mobile Source Air Toxics (MSATs) will be assessed, using criteria in Interim Guidance on Air Toxic Analysis in NEPA Documents, issued February 2006 by FHWA and the September 2009 update. This assessment would include region-wide (mesoscale) emissions and potential local increases near intermodal yards or other hotspots. If detailed analysis is required, guidance from this document would be followed.

7. Assess the potential for local air quality impacts from operation of project alternatives:

    a. **Rail traffic associated with the proposed project.** Potential impacts will be estimated based on the number of locomotives passing sensitive receptors. The latest emission factors available from USEPA will be utilized.

    b. **Intermodal facilities and bulk yards.** Potential impacts will be estimated based on the size of yards and their location near sensitive receptors.

    c. **Truck traffic associated with project elements.** A screening of impacts for the rail yards, located in the east-of-Hudson region, will be conducted utilizing procedures outlined in the New York State Department of Transportation (NYSDOT) Environmental Procedures Manual (EPM).

8. Identify the range of mitigation measures that would be available for potential project impacts.

ENERGY AND GREENHOUSE GASES

This analysis will look at potential impacts from the construction and operation of the project alternatives on greenhouse gas emissions and energy consumption in the regional study area. The proposed project aims to enhance the movement of freight through the region and, as a result, may shift some freight movement from trucks to rail, a more energy-efficient mode of transportation. This shift would reduce roadway congestion, resulting in a reduction in associated greenhouse gas emissions. The analysis will be performed based on the draft Energy

and Greenhouse Gas Analysis Guidelines for Project-Level Analysis (NYSDOT, February 2003) and will utilize NYSDOT's MOVES Roadway and Rail Energy and Greenhouse Gas Analysis Extension (MOVES-RREGGAE, NYSDOT 2009). MOVES-RREGGAE is a tool that combines the use of EPA's MOVES model for calculating on-road emissions and the procedures specified in NYSDOT's draft guidelines for modeling emissions from construction and rail components of a project or plan. The analysis will also follow the general guidelines in the Guide for Assessing Energy Use and Greenhouse Gas Emissions in an Environmental Impact Statement (New York State Department of Environmental Conservation (NYSDEC), July 2009) for determining the boundaries of analysis and the examination of GHG mitigation options.

1. Identify the state and federal energy policies and greenhouse gas emission reduction goals relevant to the project. Examples of relevant policies are:

   - New York State Climate Action Plan (expected publication late 2010)
   - 2009 New York State Energy Plan
   - New York State Governor Executive Order No. 24
   - New Jersey Global Warming Response Act, 2007 (and Draft Recommendation Report 2008)
   - The Energy Independence and Security Act of 2007
   - USEPA Renewable Fuel Standard Program
   - The proposed American Clean Energy and Security Act

2. Assess the potential for greenhouse gas emissions from operation of project alternatives. The analysis will identify whether each alternative is expected to create a change in freight movement (a reduction in truck traffic or an increase in rail or ferry movement), the expected change in fuel consumption, and the associated change in greenhouse gas emissions. The change in emissions due to operation of project alternatives will be discussed in comparison to the No Action Alternative. The analysis will utilize the MOVES–RREGGAE tool based on current project data and information from analyses previously conducted for the 2004 DEIS. If additional information or analysis is required, data sources may include information published by the US Department of Energy (USDOE), Energy Information Administration (USDOE-EIA), FHWA, USEPA, Federal Railroad Administration (FRA), NYSDOT, and similar sources.

3. Evaluate the consistency of the proposed project with relevant state and federal policies and goals, as identified above.

4. Identify the range of mitigation measures that would be available for reducing energy consumption and greenhouse gas emissions. This section will include a discussion of potential mitigation measures that could be taken during construction and operations to further reduce greenhouse gas emissions and energy consumption. Potential measures will be divided into those already included in project design, measures that should be under consideration, and those that would be impracticable to implement for the proposed project. Where practicable, the benefits of such measures will be quantified.

NOISE AND VIBRATION

This analysis will look at the project's potential to generate noise and vibration impacts due to increased rail activity along rail freight routes, activity at rail yards (such as loading and classification of freight, truck activity, equipment operation, and truck and employee vehicular

trips on local streets), tunnel ventilation equipment, and construction activities. The Noise and Vibration analysis will consist of a screening-level assessment for potential impacts in the vicinity of project elements.

1. Define the extent of the local study areas. The analysis will follow the FTA guidance manual, Transit Noise and Vibration Impact Assessment (May 2006), and where applicable will include the CREATE Railroad Noise Model and the FRA Train Horn Noise Model, to assess noise and vibration impacts in the vicinity of project elements. Potential impacts would be described within 1000 feet of intermodal yards, float facilities, and tunnel entrances and within 400 feet from rail lines and tunnel alignments.

2. Describe existing noise levels in the vicinity of the project elements. Measurements conducted for the 2004 DEIS will be used to generally describe existing conditions in the vicinity of project elements, updated to reflect land use that has changed in the interim.

3. Assess potential impacts from freight rail sources. A Screening and General (where necessary) Noise Assessment will be performed using FTA/CREATE/FRA Train Horn Noise Model guidance. Some rail freight routes that would be included as project elements are in active operation, while some experience little activity. Noise and vibration from new or expanded rail service operations would be, therefore, more perceptible at locations that currently experience little activity. Potential noise impacts may also occur from rail activity at these rail yards located near residential or other sensitive uses.

4. Assess potential impacts from vehicular sources. Noise from vehicular sources would be limited to those project elements that would experience increased truck traffic. Noise would be generated by truck activity in the rail yards, and by truck and employee vehicles traveling to/from the rail yards along local streets. A screening analysis using proportional modeling would be used to identify those locations that the more detailed Tier II studies should examine further. The cumulative effects of rail and vehicular noise at the rail yards will also be studied.

5. Assess adverse vibration and ground-borne noise impacts. The analysis will be conducted in accordance with methods presented in FTA guidance. A Screening Assessment would be performed for operational activities along rail lines and rail yards. Residential, commercial, institutional and other uses in the areas above the proposed tunnel, along rail lines, and adjacent to rail yards could be potentially impacted by vibration and ground-borne noise.

6. Assess potential impacts from construction of the project elements, qualitatively. Construction noise and vibration would be discussed.

7. Identify the range of mitigation measures that would be available for potential project impacts.

NATURAL RESOURCES

Natural resource issues associated with project alternatives would be limited to local effects on terrestrial resources from construction and operation of the project alternatives. Existing natural resources within each local study area may include terrestrial biota, threatened or endangered species (and their associated habitats, such as wetlands), as well as other resources of special

concern, such as essential fish habitat (EFH). The analysis will determine potential short- and long-term impacts to these resources, with emphasis on potential impacts to sensitive resources or other resources of special concern. Aquatic resources, such as surface waterbodies and navigable waters will be discussed in this section, however potential impacts from the construction and operation of the project alternatives on water quality and sediments will be analyzed in the Water Quality section, as described below.

1. Confirm the extent of the regional study area for terrestrial natural resources. The regional study area for this analysis will center on Upper New York Harbor. Identification of the regional study area will take into consideration the land cover and coastal resources in the vicinity of project elements, specifically whether these resources are also regional in nature and are connected to the Upper New York Harbor habitat. Major waterbodies in the regional study area will be described.

2. Define the extent of the local study areas. Natural resources will be described within 400 feet of the project elements. Where appropriate, local study areas may be expanded to account for sensitive habitats and potential project impacts.

3. Describe existing conditions for natural resources in the regional study area. This section will present a regional overview of habitats and associated wildlife present in the vicinity of New York Harbor.

4. Describe existing natural resources in the vicinity of project elements. Aquatic and terrestrial resources will be described by identifying habitat types (e.g. state freshwater and tidal wetlands, federal jurisdictional wetlands) and plant and animal communities known to occur in these areas. Description of existing conditions from the 2004 DEIS will serve as the basis for this section, expanded and updated as necessary with a review of literature and available electronic data. Potential sources of available documents and data will include:

   a. State GIS portals, such as NYSDEC Environmental Resource Mapper and NJDEP I-Map. Each portal contains a variety of data layers pertaining to environmental resources.

   b. Literature prepared by New York City Department of Parks and Recreation (NYCDPR), NYSDEC, NJDEP, New York City Department of Environmental Protection (NYCDEP), US Fish and Wildlife Service (USFWS), U.S. Army Corp of Engineers (USACE), and the National Marine Fisheries Service (NMFS), among others.

   Potential areas of concern that could include endangered or threatened species will be generally identified, and used to assess potential impacts from the project alternatives. Federal, state and local resource and regulatory agencies may be contacted to discuss any resources of concern in the vicinity of specific project elements; however, most coordination regarding specific habitats will occur in Tier II of the EIS.

5. Discuss future conditions and trends for natural resources in the vicinity of the project elements by 2035, independent of the proposed project. Programmed and proposed habitat restoration activities in the vicinity of project elements will be described. Large development projects that may disturb sensitive habitats in the vicinity of proposed project elements will also be discussed.

6. Assess potential local study area impacts from the construction and operation of the proposed alternatives. The assessment of impacts will be divided into temporary impacts, which may occur during construction, and permanent impacts, which may occur from the operation of the project alternatives.

   To evaluate the project alternatives' potential impacts on terrestrial resources, the analysis will consider:

   a. Temporary impacts to habitats adjacent to areas of disturbance associated with land clearing, grading, and other upland activities associated with construction.

   b. Long-term impacts associated with permanent loss or modification of habitats, including wetlands, due to construction of project elements, such as roads, tracks, rail yards, and tunnel sections.

   c. Potential shoreline erosion and loss of shoreline habitat from the expansion of the existing float bridges and construction of new float bridges, and construction of tunnel sections.

   d. Potential indirect effects to terrestrial resources, such as the disturbance of normal feeding or nesting patterns near tunnel alignments or rail lines, due to increased human presence, increased rail traffic, nighttime lighting, and noise associated with the rail operation, float bridges and tunnel vents.

   These potential impacts will be identified generally, with an expanded, site-specific analysis to be completed in Tier II of the EIS.

7. Identify the range of mitigation measures that would be available for potential project impacts.

WATER QUALITY

This analysis will consider the potential effects to water quality from dredging and other in-water construction activities that may be required for the construction of the tunnel and float alternatives. The section will focus on Upper New York Harbor as the study area for the description of existing conditions and the analysis of potential impacts from project alternatives.

1. Describe the existing water quality and sediment characteristics within the Upper New York Harbor. Materials compiled by the New York-New Jersey Harbor Estuary Program, including a database of existing information on water, sediment quality, and biota within the estuary system, will be utilized for this section. Water quality data collected by NYSDEC, NJDEP, and USACE and PANYNJ (as part of dredging and channel maintenance efforts) will also be used to describe existing water quality and sediment quality conditions.

2. Discuss future conditions of the water quality and sediments in the harbor by 2035, independent of the proposed project. On-going improvements and activities impacting water quality and sediments proposed by other agencies, such as navigational channels and dredging activities, will be identified in the study area.

   Assess potential impacts from the project alternatives on water and sediment quality. The analysis will assess potential impacts from dredging and other in-water construction activities that may be required for the construction of the tunnel or float alternatives. For alternatives that require in-water construction, the analysis will consider:

    a. Temporary adverse impacts to aquatic organisms during sediment-disturbing construction, such as dredging, pile driving, or installation of shoreline stabilization features, or other bottom-disturbing activities required for construction of a tunnel, float facility or other waterfront or in-water structures. In-water construction of these project elements have the potential to result in:

        i. Temporary increases in suspended sediment and release of contaminants during sediment disturbance—potential risks to aquatic biota from the resuspension of bottom sediments and redeposition of contaminants during construction and operation will be qualitatively assessed on the basis of the existing sediment conditions

        ii. Temporary loss of fish breeding or nursery habitat, or EFH identified by NMFS from temporary water quality changes and impacts associated with pile driving, dredging, tunneling, or other in-water construction activities

        iii. Temporary impacts to aquatic resources from the discharge of stormwater during construction of upland components of the project alternatives.

    b. Potential shading impacts to aquatic organisms caused by new or modified over-water structures, such as additional float bridges or tunnel vents

    c. Potential shoreline erosion and increased suspended sediment from the operation of project elements along the waterfront, such as float facilities.

The analysis will also assess potential operational impacts from the proposed alternatives such as impacts associated with the operation of the railcar float system (fuel spills from barges or accidental discharges of material from barges), or water quality impacts from stormwater runoff derived from rail yards, tunnel sections, rail lines, or float facilities. The analysis will also discuss future conditions within the study areas associated with global climate change and the potential for sea level rise and flooding. The latest data available from the New York State Sea Level Task Force and from the New York City Climate Change Task Force will be examined to determine expected future conditions in the vicinity of project elements.

3. Identify the range of mitigation measures that would be available for potential significant project impacts.

CONTAMINATED AND HAZARDOUS MATERIALS

This analysis will discuss the potential to encounter contaminated soil and groundwater during construction of project elements, especially those elements that would require excavation, storage, transport, or disposal of contaminated soil. The project alternatives will be designed to utilize areas with previous maritime, industrial, or transportation uses, such as existing railroad tracks, which may have been contaminated by past or current uses. The analysis will be limited to the local study areas in the vicinity of project elements.

1. Identify contaminants of concern. Some of the potential contaminants of concern may include:

a. **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.

b. **Heavy metals, including lead, cadmium, chromium, and mercury.** These contaminants have been widely used in many industries, including printing, 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 and/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.

c. **Volatile Organic Compounds (VOCs).** These contaminants 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.

d. **Semivolatile Organic Compounds (SVOCs).** These contaminants 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.

e. **Pesticides and Herbicides**. These contaminants are commonly used to control rodents and/or insects, and vegetation in rail yards and along rail lines, particularly between the tracks.

f. **Fuel Oil and Gasoline Storage Tanks.** Many of the rail yards, businesses, and industries once located in the vicinity of potential project elements contained aboveground storage tanks (ASTs) or underground storage tanks (USTs) for fuels. Soils and groundwater near 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 within the local study areas, contaminating soil and groundwater on-site.

g. **Asbestos.** Potentially asbestos-containing materials may be located within buildings or on underground steam pipes, within or on existing float lifts where box cars are transferred from rail to barge, or at illegal dump sites within the rail yards and rail lines.

2. Define the extent of the local study areas. The local study areas will include land within the boundaries of each project element where construction activities that may include subsurface disturbance would occur.

3. Describe existing conditions within the boundaries of each local study area. Preliminary site assessments performed for the 2004 DEIS and other relevant studies will be updated as necessary and will form the basis of this analysis. Each assessment will include a past and current land use review; a contaminated materials database search and records research; a site inspection; and a review of previous investigations. For project elements

not previously identified in the 2004 DEIS, existing conditions will be described though a past and current land use review, with more extensive investigations to be performed, as necessary, during Tier II of the EIS.

4. Describe future conditions in the local study areas, independent of the proposed project. This section will identify any remediation activities planned for any contaminated areas identified above.

5. Determine the potential impacts from the construction and operation of the project alternatives. Potential impacts on contaminated or hazardous materials from construction activities will be based on general construction extent and methods. The analysis will also describe the potential for operational impacts from each alternative, such as the accidental release of contaminated or hazardous materials during freight transport.

6. Identify the range of mitigation measures that would be available for potential project impacts. The mitigation measures will be refined during Tier II of the EIS when site-specific impacts are identified.

ENVIRONMENTAL JUSTICE

As required by Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," this analysis will identify any disproportionate adverse impacts on minority and low-income populations in the vicinity of project elements. This analysis will be conducted in accordance with the Executive Order, FHWA Actions to Address Environmental Justice in Minority Populations and Low Income Populations (December 2, 1998), and any relevant guidance from the states of New York and New Jersey. The local study areas for this analysis will follow those of the Land Use analysis.

1. Identify the thresholds for determining the presence of minority or low-income populations. Where several analysis thresholds may apply, the most stringent definitions will be used.

2. Identify minority and low-income populations within the local study areas, based on the demographic information presented in the Land Use, Zoning, and Public Policy section.

3. Identify potential project impacts on minority and low-income populations in the vicinity of project elements, based on the screening conducted on the various technical sections. The impacts described may be direct—such as acquisition or displacement of residences—or indirect, such as increased air pollution from diesel truck traffic destined to rail facilities. Once impacts are identified, determine whether they would disproportionately affect low-income and minority populations.

4. Identify the range of mitigation measures that would be available for potential project impacts.

F. ECONOMIC AND FINANCIAL ANALYSIS

The detailed evaluation will consider a series of economic and financial effects to address issues associated with the public and private benefits of the alternatives. The analyses will focus on evaluating the effects on economic activity in the regional study area. The economic effects will be presented in terms of direct, indirect, and induced economic impacts. Alternatives may also attract local economic development along the alignments and in the vicinity of project elements,

such as yards and float facilities. Localized adverse economic impacts may also occur from displacement and relocation of businesses.

OVERVIEW

Data will be collected and analytical tools will be developed to conduct the following series of analyses:

- Economic impact analysis will examine the broader implications of the cross harbor investment on freight stakeholders, surrounding communities and the larger statewide and national implications.

- Benefit-Cost analysis will estimate project benefits from a local, regional and national perspective based on transportation efficiencies and social and environmental benefits.

- Market feasibility analysis will evaluate the acceptance and sustainability of project alternatives within the private market world of transportation service providers and customers.

- Railroad financial analysis will estimate the potential operational value of project alternatives to railroads.

- Revenue stream and funding needs analysis will estimate potential revenue streams to the public sector and identify overall funding needs, including needs unmet by revenue streams.

- Displacement analysis will identify potential direct displacement of residents and/or businesses.

ANALYSIS METHODOLOGY

ECONOMIC IMPACT ANALYSIS

Economic impact refers to effects on the economic activity in a given region, as reflected by a change in the flow of money (output, GDP or the income generated in the region).

Economic impact analysis quantifies the monetized dollar value of transportation system benefits and the direct, indirect, and induced monetized benefits of program-related increases in economic activity. Key factors to be quantified and translated into monetary terms for the economic benefits analysis include transportation-related benefits, shipper cost savings, and business attraction and retention. The monetized benefits will be run through an economic simulation model to generate the multiplier benefits of the program. The travel efficiency and shipper cost savings will also be used as a foundation for the Benefit-Cost Analysis. Estimating the economic effects of the Cross Harbor project require an understanding of who is being affected and the manner in which they are affected.

In general, freight projects can affect four types of stakeholders:

- Asset Providers, which develop, lease, maintain, or finance freight investments (both fixed and mobile). Asset Providers may be in the private or public sectors.

- Service Providers, which provide transportation or logistics services for freight shipments such as railroads and trucking companies.

- End Users, which include both shippers/consignees, as well as end customers for finished goods.

- Other Impacted Parties, which include neighborhood/community interests, non-freight users of the infrastructure; environmental/land use interests, business interests, and others.

It is important to describe the interest points and perspectives of different stakeholder types—essentially, what "stake" these stakeholders have in the success of a freight improvement project. Understanding the perspectives of different stakeholders—and how they can change depending on the type of project and/or role the stakeholder is playing in the project development—is important in developing an understanding of which benefits matter most, and how best to measure them. Four types of stakeholder interest/perspectives have been identified for the Cross Harbor project:

- Parties with a Direct Financial Stake in the development and performance of a freight investment. These are primarily asset providers (both development and ongoing maintenance/operation) with a vested financial interest in a freight improvement project. These stakeholders are providing capital (public funding, in the case of a state or local DOT; private capital in the case of a concessionaire or developer) in the hope of attaining particular goals, missions, or mandates.

- Parties that have an Indirect Financial Stake in the result of a freight investment. These stakeholders typically consist of service providers that operate transportation services on freight infrastructure, as well as shippers who are the true "users" of freight infrastructure capacity and services. In practice, these two groups are connected because service carriers pass on a significant share of their net costs to shippers. Together, these parties have a financial interest in the project outcome, but no direct investment stake in the project itself. However, the interests of these parties are an important consideration for investment decisions, because impacts and benefits to these stakeholders can influence the net benefit-cost calculation made by those with direct financial stakes.

- Parties that have a Major Nonfinancial Stake in the result of a freight investment. These parties typically include nearby land owners and occupants affected by access, noise, safety, or livability impacts; or community organizations or resource agencies concerned about broader environmental impacts related to the construction or operation of facilities. Their concerns need to be considered as factors in the economic analysis, both quantitatively and qualitatively.

- Parties that have a Tangential Stake in the result of a freight infrastructure project, either financial or nonfinancial. These stakeholders may include private companies (or a consortium of companies) affected by indirect and induced economic growth impacts; or local or regional taxpayers affected by project financing strategies. Many of their interests are likely to be in the form of concerns (that can potentially be addressed) and more general policy interests, rather than measurable direct effects of an individual project. Therefore, the impacts will be discussed qualitatively, as opposed to being part of the quantitative analysis.

Using the definition of the four stakeholder types developed for this project, we will identify benefits of concern to the broader set of freight stakeholders, including infrastructure developers, industrial site developers, supply chain professionals, and others. In general, the types of benefits that are meaningful to these freight stakeholders can be summarized in two categories: cost factors, and benefit and other impact factors.

Cost factors include:

- Facility Capital Costs – up-front costs to acquire property, improve sites, develop infrastructure, and purchase equipment.

- <u>Facility Maintenance Costs</u> – ongoing costs of maintaining a facility to ensure safe operations and upkeep.

- <u>Operating Costs</u> – labor costs, fuel costs, equipment costs, and the time lost to congestion or to the breakdown of efficient supply chains.

Benefit and other impact factors include:

- <u>Capacity</u> – alleviating the impact of highway and rail system bottlenecks, as well as the throughput attainable on any transportation infrastructure or facility access point.

- <u>Productivity</u> – ability to operate a supply chain from start to finish with maximum efficiency.

- <u>Loss and Damage</u> – maximizing the safety and security of freight operations and movements to minimize loss to the shipper, carrier, or community.

- <u>Scheduling/Reliability</u> – ability to have predictable and timely delivery of goods allows for streamlined inventories, less disruption in the manufacturing or supply process, and a more efficient supply chain.

- <u>Tax Revenue</u> – taxes paid from expanded or new freight-related business activity.

- <u>Wider Economic Development</u> – increased jobs resulting from increased freight activity, as well as the multiplier effects to the regional economy.

- <u>Safety</u> – minimizing of impacts of freight land uses on neighboring communities, and the safe operation of freight vehicles and facilities.

- <u>Environmental Quality</u> – mitigation of air or water quality impacts, reduction of truck VMT, reduction of noise or vibration or other impacts.

These benefits will be grouped into four primary categories of benefits or impacts: (1) Transportation-related benefits; (2) Shipper costs savings; (3) Business attraction and retention benefits; and (4) Multiplier benefits. Approaches for estimating the benefits within each of these categories are described below.

Transportation-Related Benefits

The diversion of freight traffic from truck to rail may lead to significant congestion relief and other benefits on specific segments of the region's transportation system. The region's travel demand model will be used to project changes in highway system performance arising from this diversion. Outputs from the regional highway network model can be translated into monetized metrics—user costs, accident costs, emissions costs, maintenance costs, and new highway capacity costs—using tools originally developed by Consultant Team members. These tools include the HERS (Highway Economic Requirements System), IDAS (ITS Deployment Analysis System), and STEAM (Surface Transportation Efficiency Analysis Model), each originally developed under contract to the U.S. Department of Transportation (USDOT).

Shipper Cost Savings

Rail service, when available, is often less expensive than trucking. Reduced transportation costs translate directly into higher profits, competitive advantage, and other similar benefits. Transportation rates are changing rapidly, particularly in light of ongoing fuel price fluctuations, and our team will survey public rate sources, as well as private industry contacts, to develop best available estimates of typical rates for major commodities and trade lanes, for truck versus rail.

A detailed mode choice model will be developed for this project. Cost factors are one of the inputs to the model, which then estimates diversion and demand among different transportation choices that offer different ranges of cost, speed, reliability, and frequency.

Sometimes cost is the deciding factor; other times, speed or frequency or reliability are the deciding factors. The model outputs provide important information on shippers' willingness to pay, and the degree to which cost savings are a factor in their decisions. The accurate estimation of shipment costs is therefore essential. Some of the tools available for this analysis include the following:

- The Intermodal Transportation and Inventory Cost (ITIC) Model is a freight mode choice model from FHWA's Office of Freight Management and the FRA. It attempts to calculate the logistics cost and decision tradeoffs seen by shipper logistics managers, and then assigns the truck/rail diversion to alternatives that minimize total logistics cost. It is based on an earlier model developed for FRA in 1995.

- The MIT Spreadsheet Logistics Model estimates the truck/rail mode choice for 48 typical types of customers, based on customer characteristics (use rate and trip length); commodity characteristics (value/pound) and mode characteristics (e.g., price, trip time, and reliability) for rail, truck, and intermodal options.

- The Uniform Rail Costing System (URCS) Model (Surface Transportation Board) can estimate the changes in shipper productivity associated with rail system performance changes. The URCS model uses data on average carrier cost and performance measures to estimate the cost of providing service, and can estimate how a change in facility capacity or speed (affecting rail cars per day) would translate into average shipper dollar savings per ton-mile.

Industry and stakeholder interviews will also be critical in accurately estimating current and representative price structures.

Business Attraction and Retention

Cross Harbor rail improvements can be expected to generate certain types of new jobs in the east-of-Hudson region—not only temporary construction jobs, but also permanent jobs in the transportation carriage, warehouse/distribution, manufacturing, and other industry sectors. A critical element of this study is the evaluation of regional economic development strengths, weaknesses and opportunities for the Cross Harbor investment to impact economic prosperity over the next three decades.

The core analysis requires a comprehensive "economic development assessment" process rather than reliance on any single economic model. Core issues for each of the economic regions are: (1) economic performance, (2) competitiveness factors that explain performance results, and (3) relative roles of transportation in changing future competitiveness and performance. The economic development assessment process is the most appropriate way to address these issues. Traditional economic forecasting and impact models focus mostly on industry trends and cost factors, while this assessment will expand to assess workforce issues, supply chain infrastructure, multimodal connectivity, market access, and related factors that also affect economic growth opportunities.

Multiplier Benefits

The Regional Economic Models, Inc. (REMI) economic simulation model will be used to estimate multiplier benefits. The REMI analysis utilizes as inputs the estimates of transportation-related benefits, shipper cost savings, and business attraction and retention (see Figure 4).

Figure 4. Framework for Evaluating Multiplier Benefits
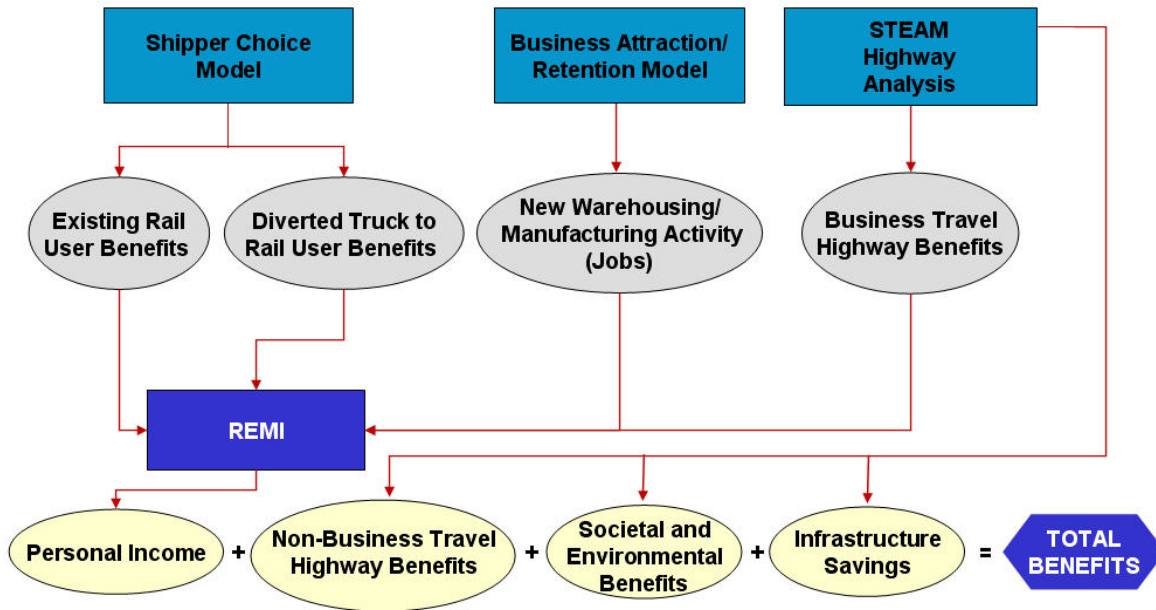
BENEFIT-COST ANALYSIS

Benefit-cost analysis addresses two main categories of benefit: (1) the economic value of a program or a project's net benefits; and (2) the effect of a transportation program or project on the economic growth of a region, which is usually referred to as the economic development impact. Benefit-cost analysis usually includes certain categories of impacts that are not addressed by economic impact analysis, and excludes others, as shown in Table 2 following.

Table 2

Difference in the Coverage of Impacts Between Benefit-Cost Analysis and Economic Impact Analysis

Form of Impact	Benefit-Cost Analysis	Economic Impact Analysis
Business cost savings	Yes	Yes
Business-related time savings that generate cost savings	Yes	Yes
Personal and household cost savings	Yes	Yes
Personal time savings (not affecting money flows)	Yes	--
Environmental impacts (not affecting money flows)	Yes	--
Attractions (relocations) of business activity into area	--	Yes
Income generated by business suppliers and vendors	--	Yes

Benefits may be presented in terms of "traveler benefits" (also referred to as "transportation system user benefits") or in terms of wider "societal benefits" (also referred to as "social benefit"). Either way, some benefits reflect real money cost or income changes, while others have a value to people, although no actual transfer of money may take place. Major benefit categories for which the monetary transfers take place include travel time benefits, safety benefits, environmental quality benefits, and increases in choices of destinations or of travel modes or of the times at which travel can occur. Travel time benefits themselves can occur due to normal everyday reductions in travel times, and due to reductions in the uncertainty of travel times (reliability benefits). In some instances, travel time reliability benefits can be of higher value than the value of regular travel time benefits.

Typically, benefit-cost analysis is broken down into several basic categories of the benefits that are calculated for the economic impact analysis discussed above. Benefits included in BCA usually include:

- <u>Direct user benefits</u> – travel time savings, vehicle operating cost and other out-of-pocket cost savings
- <u>Indirect user benefits</u> – benefits to the users of the rest of the highway or transit systems from reduced congestion and delay throughout the system
- <u>Safety improvements</u> – mainly fatality and other accident reductions
- <u>External or environmental benefits</u> – emissions reductions, noise reductions, etc.

Because the project will potentially have significant impacts on freight movements, travel time benefits could be expanded to incorporate reliability benefits as estimated under shipper cost savings. In addition, given the emerging priority on reducing greenhouse gas (GHG) reductions, the economic analysis of air quality benefits or other types of benefits and measures of value could be expanded to include not only the local value of emissions reductions, but also the broader benefit with respect to global climate change.

Benefits are usually estimated for the entire project study period and discounted to obtain the net present value (NPV). Costs are usually supplied by engineering and operational investigations, and discounted and reported as net present value.

MARKET FEASIBILITY ANALYSIS

Market feasibility analysis considers whether a particular Cross Harbor rail enhancement makes sense from the standpoint of a railroad. It should be assumed that railroads will not want to use rail infrastructure unless it provides revenues sufficiently in excess of their costs to operate. The degree to which a facility fits into a carrier's operations, marketing, and financial models will affect the level of "buy-in" by potential users, as well as their level of commitment to successfully marketing the services. The importance of this issue is illustrated clearly by the contraction of the U.S. railroad system since the early 1900s—the number of rail system miles has declined, as railroads have shed less profitable routes and services. Our team will provide insights into the likely market feasibility of various alternatives through an understanding of carrier economics and market strategy. The economics can be evaluated by estimating the profitability for the different traffic segments using available carrier cost data. Market strategy is driven by a variety of factors, and is not wholly limited to quantifiable financial measures. These

factors will be addressed through interviews with motor and rail carrier managers, and practical railroad industry knowledge among the project team members.

RAILROAD FINANCIAL ANALYSIS

Railroads do not typically share confidential financial information as part of public infrastructure studies, and in cases where they may be asked to contribute to the capital or operating costs of a project, their ability and willingness to pay is usually closely guarded, since it bears directly on their negotiating leverage. Nevertheless, it is possible to "reverse engineer" a reasonable approximation of a railroad's potential willingness to pay. Some of our team members recently employed such a methodology in analyzing the Norfolk Southern "Crescent Corridor" project paralleling I-81 between Harrisburg and the Southeastern U.S. The key elements are: determining average gross revenue per rail unit (distinguishing intermodal and non-intermodal traffic); determining the percent of gross revenue typically devoted to infrastructure investment; determining the share of infrastructure investment typically devoted to new capacity projects, rather than maintaining existing infrastructure; and estimating the amount of new railroad business over an analysis period that would directly result from the proposed improvement. This analysis yields the dollars per rail unit that should typically be available for investment in new infrastructure. Multiplying this number by the number of units of new rail business associated with different Cross Harbor rail enhancements, as determined from the Mode Choice Model, provides estimates of potential railroad contributions over the analysis period.

REVENUE STREAM AND FUNDING NEEDS ANALYSIS

Revenue stream analysis considers a different type of economic benefit: direct revenues that might be realized from Cross Harbor rail infrastructure improvements, in the form of user tolls on traffic, access fees charged to railroads, etc. Two important questions must be answered. First, what level of annual revenues, on a per unit basis, would be needed to fully fund each of the Cross Harbor alternatives? Second, what level of revenues on a per unit basis might be reasonably expected, based on railroad "willingness to pay" and the potential imposition of traffic surcharges or tolls on freight using the Cross Harbor improvements? The potential effect of tolls and surcharges on traffic forecasts can be tested by re-running the Mode Choice Model for a given alternative, with incrementally higher shipper costs assumed.

Funding needs analysis weighs project costs against revenue streams that might be reasonably anticipated. It identifies funding gaps, if any, that would appear to require other sources. We recognize that the PANYNJ has extensive financial analysis capabilities and resources, and is not proposing to conduct bonding analyses as part of this program. However, if desired, these services could be provided.

DISPLACEMENT ANALYSIS

Localized adverse economic impacts may also occur from displacement and relocation of businesses from construction or expansion of project elements. The analysis will be performed in conjunction with the land use, zoning, and public policy analyses.

1. Define the extent of the local study areas. The study areas for the evaluation of local impacts will depend greatly on the alignment, extent, and termini of each project alternative. Screening for local impacts will be conducted around specific project elements where construction or operational activities may occur.

2. Describe existing economic characteristics of local study areas. GIS and other secondary sources will be used to identify key businesses in the local study areas that may be affected by construction and operation of the proposed alternatives. Discuss major future development projects within the local study areas, independent of the proposed project. This section will identify development projects in the vicinity of proposed project elements that may affect economic conditions in the local study areas by encouraging the retention of existing businesses or attracting additional businesses. The inventory of future projects developed for the Land Use, Zoning, and Public Policy analysis will be used.

3. Assess potential local impacts from construction and operation of the project alternatives. The analysis will also discuss the economic impacts from potential direct or indirect displacement of residents and/or businesses as a result of construction and operation of project elements.

4. Identify the range of mitigation measures that would be available for potential project impacts.

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