Chapter 6.9: Water Resources

A. INTRODUCTION

This chapter describes the existing groundwater, floodplain, and surface water resources within the study areas for the Cross Harbor Freight Program (CHFP) alternatives and assesses the potential effects to these resources from the operation and construction of the project alternatives. The effects of the alternatives on wetlands and aquatic biota are discussed in Chapter 6.8, "Natural Resources."

B. REGULATORY CONTEXT

This section provides a description of the federal and state laws and associated regulatory programs that may apply to the project alternatives with respect to water resources, including regulations for floodplains, dredging or placement of fill in surface waters, and discharges to surface waters (e.g., stormwater runoff and groundwater recovered during dewatering).

FEDERAL

THE CLEAN WATER ACT

The objective of the Clean Water Act of 1987 is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. It regulates point sources of water pollution, such as discharges of municipal sewage, industrial wastewater, and stormwater runoff; the discharge of dredged or fill material into navigable waters and other waters (Section 404 of the Act); and non-point source pollution (e.g., runoff from streets, construction sites, etc.) that enter water bodies from sources other than the end of a pipe. Applicants for discharges to navigable waters in New York must obtain a Water Quality Certificate from the New York State Department of Environmental Conservation (NYSDEC). Under Section 401 of the Clean Water Act, any applicant for a Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, must obtain a certification from the State in which the discharge originates or will originate (i.e., NYSDEC and New Jersey Department of Environmental Protection [NJDEP]), or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable waters at the point where the discharge originates or will originate, that the discharge will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the Clean Water Act (i.e., effluent limits and standards and water quality standards and implementation plans).

RIVERS AND HARBORS ACT OF 1899

For the purpose of protecting navigation and navigable channels, Section 10 of the Rivers and Harbor Act of 1899 requires authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any navigable water of the United States, the excavation from or deposition of material in these waters, or any obstruction or alteration in navigable water of the United States. Any structures

placed in navigable waters such as pilings, piers, or bridge abutments up to the mean high water line would be regulated pursuant to this Act. USACE must evaluate the probable impacts, including cumulative impacts of the proposed activity, on the public interest.

NATIONAL FLOOD INSURANCE ACT OF 1968, 44 CFR § 59, AND FLOODPLAIN MANAGEMENT EXECUTIVE ORDER 11988, 42 FR 26951

Development in floodplains defined by Federal Emergency Management Agency (FEMA) mapping is regulated at the federal level by the Floodplain Management Executive Order 11988 and National Flood Insurance Act of 1968 (44 CFR § 59). Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

THE SAFE DRINKING WATER ACT, SECTION 1424(E)

Section 1424(e) of the Safe Drinking Water Act of 1974 [P.L. 93-523] authorizes the Administrator of the U.S. Environmental Protection Agency (USEPA) to designate an aquifer for special protection if it is the sole or principal drinking water resource for an area (i.e., supplies 50 percent or more of the drinking water in a particular area), and if its contamination would create a significant hazard to public health. No commitment for federal financial assistance may be entered into for any project that the Administrator determines may contaminate such a designated aquifer so as to create a significant hazard to public health.

NEW YORK

PROTECTION OF WATERS, ARTICLE 15, TITLE 5, ECL, IMPLEMENTING REGULATIONS 6 NYCRR PART 608

NYSDEC is responsible for administering the Protection of Waters Act and regulations to govern activities on surface waters (rivers, streams, lakes, and ponds). The Protection of Waters Permit Program regulates five different categories of activities: disturbance of stream beds or banks of a protected stream or other watercourse; construction, reconstruction, or repair of dams and other impoundment structures; construction, reconstruction, or expansion of docking and mooring facilities; excavation or placement of fill in navigable waters and their adjacent and contiguous wetlands; and Water Quality Certification for placing fill or other activities that result in a discharge to waters of the United States in accordance with Section 401 of the Clean Water Act.

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM (SPDES), ARTICLE 17, TITLE 8, ECL, IMPLEMENTING REGULATIONS 6 NYCRR PARTS 750–757.

The State Pollutant Discharge Elimination System (SPDES) was created to regulate discharges to the state's waters to protect and maintain surface and ground water resources. The following activities require SPDES permits: constructing or using an outlet or discharge pipe (point source) that discharges wastewater into surface or groundwaters of the State; constructing or operating a disposal system (sewage treatment plant); or discharge of stormwater. Construction activities that disturb five acres or more or any industrial activity must obtain an SPDES permit.

LONG ISLAND WELLS, ARTICLE 15, TITLE 15, SECTION 1527, ECL, IMPLEMENTING REGULATIONS 6 NYCRR PART 602

Installation or operation of any new or additional wells in the counties of Kings, Queens, Nassau, or Suffolk to withdraw water from underground sources for any purpose (including construction dewatering) requires a Long Island Well permit if the installed pumping capacity is greater than 45 gallons per minutes (gpm).

NEW JERSEY

WATER POLLUTION CONTROL ACT, NJSA 13:19, AND RULES AT NJAC 7:14A, NJAC 7:8, NJAC 7:9B, AND NJAC 7:9C

The Water Pollution Control Act sets forth the State's policy to restore, enhance, and maintain the chemical, physical, and biological integrity of the State's waters; to protect public health; to safeguard fish and aquatic life and scenic and ecological values; and to enhance the domestic, municipal, recreational, industrial, and other uses of the State's waters. This Act includes responsibilities for administering the New Jersey Pollutant Discharge Elimination System (NJPDES). NJPDES applies to any discharge of a pollutant into the waters of the state or onto land or into wells from which it might flow or drain into state waters, as well as the discharge of stormwater. Under this Act, all projects requiring a federal permit for the discharge of dredged or fill material into State waters and/or adjacent wetlands requires a state Water Quality Certification (pursuant to Section 401 of the Federal Clean Water Act) that ensures consistency with the New Jersey State Water Quality Standards (NJAC7:9B). In addition, compliance with New Jersey State Ground Water Quality Standards (NJAC 7:9C) is required when discharges to groundwater subsequently discharge into surface waters and compliance with New Jersey's Stormwater Management Regulations (NJAC 7:8) is required for those projects involving greater than 1/4 acre of impervious surface coverage or greater than 1 acre of land disturbance.

FLOOD HAZARD AREA CONTROL ACT, NJSA 58:16A, AND RULES AT NJAC 7:13

The Flood Hazard Area Control Act protects rivers, lakes and streams including their floodplains and riparian zones, and is regulated by the NJDEP Division of Land Use Regulation. The regulated floodplain is the area that would be covered by water during the 100-year storm event, a storm that has a 1 in 100 chance of occurring in any given year. Most activities regulated under this program include the placement of structures or fill in a floodplain that could block or displace floodwaters. Activities within the riparian zone of regulated watercourses are also covered under this program. Riparian buffers typically extend 50 feet from the top of bank (or mean high water line in the case of a tidal waterbody). For Category 1 waters, the riparian zone extends 300 feet and for trout waters, threatened & endangered species habitats and areas involving acid-producing soils, the riparian zone extends 150 feet from top of bank or mean high water line.

WATERFRONT DEVELOPMENT ACT, NJSA 12:5-3, AND RULES AT NJAC 7:7 AND 7:7E

The Waterfront Development Act regulates activities on lands in or near tidal waters (see Chapter 6.12, "Coastal Zone Management"). Activities regulated under this program include placement of structures, fill, or dredging within or over a tidal waterway, and development adjacent to a tidal waterway. A Waterfront Development Permit authorized by the NJDEP Division of Land Use Regulation is needed for projects that develop waterfront near or upon any tidal or navigable waterway. Waterfront development can include docks, wharfs, piers, bulkheads, bridges, pipelines, cables, pilings, filling, dredging or removing of sand or other

materials from lands under all tidal waters, and limited upland construction within 500 feet of tidal waters.

TIDELANDS ACT, NJSA 12:3-1

The Tidelands Act protects all lands owned by the State of New Jersey that are now or formerly flowed by the tides. Projects that include building in or near tidal waters may need a grant, lease, or license from the State for portions of the project occurring on State-owned lands. The NJDEP Bureau of Tidelands Management manages this program.

C. METHODOLOGY

Floodplains, groundwater, and surface water resources are described for the study areas associated with the alternatives described in Chapter 4, "Alternatives." The study area for surface waters included the Upper New York Harbor, with the Kill van Kull, Newark Bay, and Newtown Creek/Maspeth Creek, and the East River and the areas within 1,000 feet of a potential freight facility. The potential freight facilities considered are: Oak Island Yard, Greenville Yard, Port Newark/Port Elizabeth, 65th Street Yard, 51st Street Yard, South Brooklyn Marine Terminal (SBMT), Red Hook, East New York, Fresh Pond Yard, Maspeth Yard, Oak Point Yard, Hunts Point Site, and potential Long Island facilities.

Descriptions of existing conditions from the 2004 DEIS served as the basis for this section and were expanded and updated as needed to incorporate recent information, including FEMA's updated floodplain maps. This section describes the methodology used to assess the potential effects of the project alternatives on floodplains, groundwater and surface water.

FLOODPLAINS

Existing information on floodplains within the study areas was obtained from FEMA preliminary Flood Insurance Rate Maps (FIRMs) or FEMA preliminary work maps. Preliminary work maps are an interim product created in the process of developing preliminary FIRMs. On December 5, 2013, FEMA released preliminary FIRMs for each county in New York City and certain coastal counties of New Jersey which precede the future publication of new, duly adopted, final FIRMs. Preliminary FIRMs for Essex County have yet to be released; therefore, the information below reflects the preliminary work maps for Essex County, NJ (originally released on July 18, 2013). The preliminary FIRMs and work maps represent the Best Available Flood Hazard Data at this time. FEMA encourages communities to use the preliminary maps when making decisions about floodplain management and post-Superstorm Sandy recovery efforts.

Potential effects due to the Build Alternatives were assessed on the basis of the existing floodplains, the type of flooding affecting a study area, and the activities that would result from the project alternatives. All of the study areas subject to flooding are subject to coastal flooding and are not subject to riverine flooding. New York Metropolitan Area is generally affected by local (e.g., flooding of inland areas from short-term, high-intensity rain events in areas with poor drainage), fluvial (e.g., rivers and streams overflowing their banks), and coastal flooding (e.g., long and short wave surges that affect the shores of the Atlantic Ocean, bays such as Upper New York Bay and Newark Bay, and tidally influenced rivers such as the Hudson River and East River, streams, and inlets [FEMA 2007]). Because the surface waters in the vicinity of the study areas are all tidal waters, flooding of study areas adjacent to these waters is controlled by the tidal conditions within the New York Bay and the Atlantic Ocean and is not influenced by freshwater flow from upriver. Within the New York Metropolitan Area, tidal flooding is the

primary cause of flood damage. The floodplain within and adjacent to the study areas adjacent to Newark Bay, Upper New York Bay and the East River is affected by coastal flooding and would not be affected by construction or regrading/filling of the floodplain as would occur within a riverine floodplain.[1] Coastal floodplains are influenced by astronomic tide and meteorological forces (e.g., northeasters and hurricanes [FEMA 2007]) and not by fluvial flooding.

GROUNDWATER

The major potential groundwater quality issues associated with the Build Alternatives are: (1) the possibility of construction requiring dewatering or other activities (such as excavation) below the water table that would result in the recovery of groundwater or change its flow patterns, and (2) the possibility that construction or operation of the alternatives would result in the release of below ground contaminants that could affect groundwater quality. The method used to assess the potential effects on groundwater quality consisted of the following:

- Describe the existing groundwater regime and quality within the study area;
- Assess the potential impacts from the Build Alternatives on groundwater resources on the basis of activities that would occur as a result of the construction and operation of the alternatives; and
- Develop appropriate procedures or potential mitigation measures to reduce the potential impacts on groundwater quality from the project alternatives.

SURFACE WATER

The major potential water quality issues associated with the Build Alternatives are maintaining the water quality improvements that have occurred in the New York Harbor, minimizing direct runoff to the New York Harbor, minimizing the resuspension of contaminated sediments into the water column, and preventing the relocation of these sediments up or down the estuary.

The method used to assess the potential impacts on water quality included the following:

- Describe the existing surface water quality and sediment conditions within the study areas, as appropriate;
- Assess the potential effects on water quality from the project alternatives on the basis of in-water and upland activities that would occur within the study areas; and
- Develop potential mitigation measures to reduce the potential impacts on water quality and sediment quality from the project alternatives.

D. EXISTING CONDITIONS

This section describes the floodplain, groundwater and surface water resources for the study areas within 1,000 feet of the potential termini and supporting freight facilities. The current and past uses of the study areas are described in detail in Chapter 6.10, "Hazardous Materials," and the natural resources (e.g., vegetation, wildlife, and wetlands) are described in Chapter 6.8.

This section also provides a general overview of existing water quality conditions, current NJDEP and NYSDEC use classifications and associated water quality standards for the primary

1 Filling of a riverine floodplain obstructs flood flows, which can result in flooding upstream and on adjacent properties. It also reduces the ability of the floodplain to store excess water which results in more water being sent downstream and increases the elevation of the floodwater.

surface waters, and evaluates whether the primary waterbodies currently meet the set standards. The surface water resources considered include Newark Bay, Upper New York Harbor, East River, Newtown Creek, and Maspeth Creek. The sediment quality for the Upper New York Harbor is also described, as this surface water would potentially be affected by sediment disturbance due to in-water construction activities associated with the project alternatives.

New York City, New York State, New Jersey, federal agencies such as USACE, multi-jurisdictional agencies such as the Port Authority of New York/New Jersey (PANYNJ), and cooperative efforts such as the New York-New Jersey Harbor Estuary Program (HEP) have implemented programs to monitor and improve water quality in Upper New York Harbor. These programs have, over time, resulted in water quality improvements documented by monitoring programs such as the Harbor-Wide Water Quality Monitoring Report for the New-York-New Jersey Harbor Estuary and the New York City Department of Environmental Protection (NYCDEP) New York Harbor Water Quality Report. The City of New York has monitored New York Harbor water quality with an annual survey (New York Harbor Water Quality Report) for over 90 years. NYCDEP conducts the survey by collecting water samples at 47 stations in four regions: Inner Harbor Area, Upper East River-Western Long Island Sound, Lower New York Bay-Raritan Bay, and Jamaica Bay (NYCDEP 2008). Two of these regions, the Inner Harbor Area and the Upper East River-Western Long Island Sound, comprise the bulk of the major surface waters in the east-of-Hudson study areas.

INNER HARBOR AREA

The Inner Harbor Area is defined as the area including: the Hudson River from Westchester County to the Verrazano-Narrows Bridge; the lower East River from the Harlem River (including Newtown Creek and Maspeth Creek) to the Battery; and the Arthur Kill-Kill Van Kull straits. Newtown Creek and its tributary Maspeth Creek are located within the Inner Harbor Area. There are thirteen monitoring stations for the Inner Harbor Survey.

Water Quality

With the exception of the Kill Van Kull, Arthur Kill, and Newtown Creek/Maspeth Creek, the waters making up the Inner Harbor Area are NYSDEC Class I saline surface waters. The best usages of Class I waters are secondary contact recreation and fishing. The water quality should be suitable for fish propagation and survival. Newtown Creek and Maspeth Creek are Class SD saline surface waters. The best usage of Class SD waters is fishing, and the water quality of these waters should be suitable for fish survival. This classification may be given to waters that cannot meet the requirements for primary and secondary contact recreation and fish propagation.

As part of the Inner Harbor Survey, NYCDEP collects samples to evaluate water quality, sediment characteristics, hydrology, phytoplankton, and macroinvertebrates two to four times in the summer months and once each in October, February, March, and April. The results of the annual Inner Harbor Survey are used by NYSDEC to determine use classifications for waterbodies within the survey. Every year, NYCDEP produces a report summarizing the results of the current survey and providing a synopsis of recent trends in coliform counts, chlorophyll-*a*, DO, and Secchi disk depth. There are no New York State standards for chlorophyll-*a* or water clarity, but there are standards for DO and coliforms. Implementation of water pollution control programs over the past 20 to 25 years have led to a marked improvement of the water quality in New York Harbor. Indicators of improved water quality include decreases in fecal coliform bacteria and increases in DO (NYCDEP 2008).

The presence of fecal coliform bacteria in surface waters indicates potential health impacts from human or animal waste, and elevated levels of coliform can result in the closing of bathing beaches and shellfish beds. According to the New York Harbor Water Quality Regional Summaries, the waters of the Inner Harbor Area meet the fecal coliform standard for Use Class I waters at most sampling locations. Temporary increases in fecal coliform concentrations may occur during wet weather due to increased fecal coliform loadings following a rain event. In 2012, the year of the most recent report, fecal coliform levels dropped to 81.3 cells/100 mL (NYCDEP 2012), which meets state standards for Class I waters.

DO in the water column is necessary for respiration by all aerobic forms of life, including fish, invertebrates such as crabs and clams, and zooplankton. The bacterial breakdown of high organic loads from various sources can deplete DO to low levels. Persistently low DO can degrade habitat and cause a variety of sublethal or, in extreme cases, lethal effects. Consequently, DO is one of the most universal indicators of overall water quality in aquatic systems. DO summer concentrations in the Inner Harbor Area have increased over the past 30 years from an average of bottom water that was below 3 mg/L in 1970 to above 6 mg/L in 2007, a value fully supportive of ecological productivity (NYCDEP 2008). In 2012, the year of the most recent report, DO decreased slightly to 6.0 mg/L but met the state standard for bathing and continued an overall long-term positive trend (NYCDEP 2012).

High levels of nutrients can lead to excessive plant growth (a sign of eutrophication) and depletion of DO. Concentrations of the plant pigment chlorophyll-*a* in water can be used to estimate productivity and the abundance of phytoplankton. Although there is no state standard for Class I waters, chlorophyll-*a* concentrations greater than 20 micrograms per liter (µg/L) can be considered suggestive of eutrophic conditions. In 2012, chlorophyll-*a* concentrations in the Inner Harbor Area averaged 4.8 µg/L, the lowest since 1990 (NYCDEP 2012).

Secchi transparency is a measure of the clarity of surface waters. Transparency greater than 5 feet indicates relatively clear water in turbid estuaries. Decreased clarity can be caused by high suspended solid concentrations or blooms of plankton. Secchi transparencies less than 3 feet (0.9 meters) may be considered indicative of poor water quality conditions. Average Secchi readings in the Inner Harbor area have remained relatively consistent since measurement of this parameter began in 1986, ranging between approximately 3.5 feet and 5.5 feet (1.1 and 1.8 meters). In 2012, the average secchi reading was approximately 3.3 feet (NYCDEP 2012).

UPPER EAST RIVER AREA

The Upper East River Area is defined as the area including: the East River from Hell Gate to the western Long Island Sound, and the Harlem River. There are eight monitoring stations for the New York Harbor Water Quality Report in this area. This area includes the waters near the Oak Point Yard.

The waters making up the Upper East River Area are NYSDEC Class I saline surface waters. The best usages of Class I waters are secondary contact recreation and fishing. The water quality should be suitable for fish propagation and survival (NYCDEP 2008).

In 2009, results of the Harbor Survey indicated that water quality within this region continued to be superior. Fecal coliform concentrations for most of the monitoring sites were in compliance with the Class I standard. All monitoring sites met with the *Enterococcus* Bathing Standard of 35 cells/100 mL.

Results of the Harbor Surveys indicate that the Upper East River periodically exhibits anoxic and hypoxic dissolved oxygen conditions (DO less than 3.0 mg/L) in both surface and bottom waters, even though average dissolved oxygen concentrations are above 4.0 mg/L (NYCDEP 2007). In 2009, average summer DO values for most of the monitoring stations met and exceeded 5.0 mg/L. Hypoxia (DO concentrations less than 3.0 mg/L) at three of the stations, with minimum levels recorded in August. Trends analysis has shown surface and bottom water DO concentrations to be increasing (NYCDEP 2010). In 2009, chlorophyll-*a* concentration averaged below 20 µg/L and average Secchi transparency was 3.9 feet (NYCDEP 2010).

WEST-OF-HUDSON FREIGHT FACILITIES

OAK ISLAND YARD, GREENVILLE YARD, PORT NEWARK/PORT ELIZABETH

Floodplains

Based on the FEMA preliminary work maps, the majority of Oak Island Yard and Port Newark/Port Elizabeth is within the 100-year floodplain (Zone AE), with flood elevations of 11 to 12 feet (NAVD88). The easternmost portion of the Oak Island Yard, near the edge of Newark Bay, is within a designated Coastal High Hazard Area (Zone VE), with flood elevations of 13 to 14 feet (NAVD88). The potential location of the west-of-Hudson terminus for the Truck Ferry Alternative, Truck Float Alternative, Lift On-Lift Off (LOLO) Container Barge Alternative, and Roll On-Roll Off (RORO) Container Barge Alternative at Port Newark/Port Elizabeth is also within the limits of moderate wave action.

Based on the FEMA preliminary FIRMs for Hudson County, released December 20, 2013, the eastern half of the Greenville Yard lies within the 100-year floodplain (Zone AE) associated with Upper New York Bay. The 100-year flood elevations range 12 to 13 feet (NAVD88). The extreme shoreline edge is mapped as Zone VE, with a 100-year flood elevation of 17 feet (NAVD88).

Groundwater

The principal aquifers of New Jersey are classified into two groups—Coastal Plain aquifers south of the Fall Line and non-Coastal Plain aquifers north of the Fall Line that encompass the local study areas in New Jersey. North of the Fall Line, the principal aquifers consist of glacial valley-fill deposits, fractured shales, limestones, sandstones, conglomerate, and crystalline rocks. These aquifers include the glacial valley-fill aquifers, the Newark Group aquifers, the carbonate aquifers within the valley and ridge sedimentary units, and the igneous and metamorphic crystalline rocks of the Highlands crystalline units. The Newark Group aquifers are located below the local study areas in New Jersey.

Aquifers in the Newark Group consist of shale and sandstone. Water generally is present in weathered joint and fracture systems in the upper 200 or 300 feet (ft) (Barksdale et al. 1958). Below a depth of 500 feet, fractures are fewer and smaller, and water availability is reduced, depending on rock type. In coarse-grained sandstones, groundwater also is present in intergranular pore spaces. In several counties, the shale and sandstone of the Newark Group are the most productive aquifers and can yield as much as 1,500 gallons of water per minute (Carswell and Rooney 1976).

The NJDEP regulates groundwater by preventing pollution, managing and restoring degraded groundwater and protecting groundwater resources. Groundwater levels and flow in the project vicinity vary widely, largely due to urban development. The U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) Soil Survey of Essex and Hudson Counties, New

Jersey, indicates that groundwater levels vary throughout New Jersey. According to the United States Geological Survey, the majority of the west-of-Hudson study areas have a depth to high water table that is 10 feet or greater in Essex and Hudson Counties. Water wells in Essex County are limited to Millburn Township, which is located well outside the west-of-Hudson study areas. No water wells are located in Hudson County. There are no sole source aquifers located within the vicinity of the west-of-Hudson study areas.

Groundwater quality likely varies widely throughout the west-of-Hudson study area with generally greater contamination in current/former industrial/manufacturing area. Some areas are known to have been affected by historical uses (see Chapter 6.10, "Hazardous Materials"), other areas may have been tested and have no significant contamination and some areas may not have been tested sufficiently to determine whether or not significant contamination is present. There are no groundwater resources within the study areas for the west-of-Hudson freight facilities.

Surface Waters

Surface waters in the project study areas west-of-Hudson, within New Jersey, include Newark Bay adjacent to the Oak Island Yard, and Upper New York Harbor adjacent to Greenville Yard. These waters are monitored as part of the New York Harbor Water Quality Report in the Inner Harbor Area. Through HEP, data are collected from NYCDEP and the New Jersey Harbor Dischargers Group to develop water quality trend assessments for the New York-New Jersey Harbor Estuary. The data for the Harbor-Wide Water Quality Monitoring Report for the New York-New Jersey Harbor Estuary are collected from sixty-eight sampling sites throughout the harbor region (HEP 2011).

Newark Bay

Newark Bay is a tidal bay within the New York/New Jersey Harbor Estuary formed by the confluence of the Passaic and Hackensack Rivers. This rectangular bay is approximately 5.5 miles long, and between 0.6 to 1.2 miles wide. It is enclosed on the west by the cities of Newark and Elizabeth, and Jersey City and Bayonne are located along the western and eastern portions of the bay, respectively. Newark Bay is classified by NJDEP as a Class SE3 (fishing/fish migration) saline/estuarine surface water. The Upper New York Harbor is classified as a NJDEP Class SE2 (fishing/fish propagation) saline/estuarine surface water. The recommended best usage for Class SE3 waters is secondary contact recreation. The water quality should be sufficient for maintenance and migration of fish populations; migration of diadromous fish; maintenance of wildlife; and any other reasonable uses. The recommended best uses of Class SE2 waters are secondary contact recreation and fishing. The water quality should be sufficient for maintenance, migration and propagation of the natural and established biota; migration of diadromous fish; maintenance of wildlife; and any other reasonable uses.

The most recent Harbor-Wide Water Quality Monitoring Report for the New York-New Jersey Estuary (from 2011) provides general water quality conditions for New Jersey waters without specifying areas of concern for these three waterbodies. The report indicates, however, that fecal coliform and *Enterococci* levels in the New Jersey portion of the Inner Harbor waters are generally higher than the New York portions of the Inner Harbor waters, notably in the tributaries (HEP 2011). Water quality in Newark Bay is showing a trend toward improvement with respect to surface and bottom dissolved oxygen concentrations and bacterial counts. Dissolved oxygen (DO) and bacterial counts in the New Jersey waters of the Upper New York Bay have shown a steady trend of improvement over the past 30 or so years, with the average DO concentration and bacterial counts generally meeting the appropriate standard (HEP 2011).

Upper New York Harbor

Upper New York Harbor comprises a portion of the New York/New Jersey Harbor Estuary (Harbor Estuary) located between the Bayonne/Jersey City area of New Jersey to the west, Brooklyn, New York to the east, the Battery Park portion of Manhattan, New York to the north, and the Verrazano-Narrows Bridge to the south. The Harbor Estuary is a complicated hydrologic and hydraulic system that is influenced by:

- Connection to Long Island Sound through the East River in Upper New York Harbor and through the Harlem River that connects the Lower Hudson River to the East River;
- Connection to the Atlantic Ocean in the Lower New York Harbor;
- Discharges from the Lower Hudson River;
- Discharges from other rivers, sewage treatment plants, and Combined Sewer Overflows (CSOs); and
- The westward flowing Kill Van Kull that branches north to Newark Bay and south toward the Arthur Kill.

The shoreline of the Upper Harbor within the study area is almost entirely developed with bulkheading, piers (usable and dilapidated), pile fields, commercial and industrial waterfront facilities, and military installations. There are some small wetland areas on the west side of Liberty Island, in various interpier areas (between the Global Marine Terminal/Auto Marine Terminal Pier and the Military Ocean Terminal in Bayonne [MOTBY], between MOTBY and Constable Hook, and in a small area north of Caven Point). Mudflats occur along the New Jersey shoreline of Upper New York Harbor, with a large mudflat area between MOTBY and Constable Hook (USACE 1999).

EAST-OF-HUDSON FREIGHT FACILITIES

SBMT, 51ST STREET YARD, 65TH STREET YARD, RED HOOK, EAST NEW YORK

Floodplains

The waterfront portion of the study area is within the 100-year floodplain boundary (Zone AE) on the preliminary FIRM and has a flood elevation ranging from 11 to 13 feet (NAVD88). The offshore areas are mapped as Zone VE with an elevation of 17 feet (NAVD88). There are no floodplain resources within the East New York portion of the study area.

Groundwater

Groundwater in the east-of-Hudson study area is primarily associated with surficial aquifers located in glacial till. The Upper Glacial Aquifer is an unconfined aquifer directly underlying the ground surface that was formed during the last ice age. In Brooklyn and southern Queens, the Upper Glacial Aquifer is underlain by the Pleistocene Gardiners Clay (serving as a confining layer) and the Jameco Gravel Aquifer. The study areas are within the area designated for the Brooklyn-Queens Sole Source Aquifer. However, groundwater is not routinely used as a potable water supply for this portion of New York City. In part this is due to known contamination (especially in current/former industrial/manufacturing section of Brooklyn and Queens), but also due to the availability of reliable supplies from the upstate reservoir systems.

Surface Waters

The study areas for these freight facilities are within Upper New York Harbor, described in the west-of-Hudson Freight Facilities section.

FRESH POND YARD, MASPETH YARD

Floodplains

There are no floodplains within 1,000 feet of Fresh Pond Yard. The southern half of the Maspeth Yard is within the 100-year floodplain (Zone AE) associated with Newtown Creek and Maspeth Creek. The preliminary FIRM shows the 100-year flood elevation in this area to be 10 feet (NAVD88).

Groundwater

The study areas for Fresh Pond and Maspeth are within the area designated for the Brooklyn-Queens Sole Source Aquifer. As discussed, groundwater is not routinely used as a potable water supply for this portion of New York City. The portion of the study area comprising the former Phelps Dodge site in Maspeth was used primarily for copper smelting and refining from the late 1800s until 1983. The NYSDEC and the Phelps Dodge Refining Corporation entered into consent Orders in 1987 and 1999. Contaminated soil has been documented and removed from the site, and groundwater contamination (with dissolved metals) was found present and determined to have the potential to adversely impact Newtown Creek. NYSDEC issued a Record of Decision (ROD) in January 2003, identifying the preferred remediation alternative of hot spot removal and off-site disposal for soils contaminated with PCBs and petroleum; physical containment and selective capping of the site; groundwater containment, extraction, and treatment system; and long-term monitoring and institutional controls. Remediation has been completed and groundwater monitoring and treatment are ongoing.

Surface Waters

There are no surface waters within 1,000 feet of Fresh Pond Yard. Newtown Creek and Maspeth Creek are within the study area for Maspeth Yard. Newtown Creek is a federal navigation channel, approximately three miles long from its mouth at the East River to English Kills. Maspeth Creek, also a federal navigation channel, is 2,000 feet long. The authorized depth for Newtown Creek is 23 feet up to Maspeth Avenue where the authorized depth for English Kills is 20 feet. The authorized depth for the federal channel in English Kills decreases to 12 feet at Metropolitan Avenue. Maspeth Creek is eight feet deep at the mouth, and approximately two inches deep at mean low water, 200 feet upstream from the mouth. At 600 feet upstream from the mouth, the sediment is more than 1 foot higher than the mean low water line. Land uses along Newtown and Maspeth Creeks are primarily industrial.

OAK POINT, HUNTS POINT

Floodplains

Most of the study area for Oak Point and Hunts Point is within the 100-year floodplain (Zone AE) associated with the East River. The 100-year flood elevation on the preliminary FIRM is for this zone ranges from 11 to 14 feet (NAVD88). The shoreline portion of the Oak Point and Hunts Point study areas are within an area that is subject to Moderate Wave Action.

Groundwater

No water wells are located in the study areas for the potential termini or supporting freight facilities in the Bronx.[1]

[1] NYSDEC http://www.dec.ny.gov/cfmx/extapps/WaterWell/index.cfm

Surface Waters

East River is the only surface water within the study area for Oak Point and Hunts Point. The East River is a tidal strait that connects the Upper New York Harbor with the western end of Long Island Sound. The East River's circulation and salinity structure are largely determined by conditions in the Upper Harbor and the Sound. The river is approximately 17 miles long and generally ranges from 600 to 4,000 feet wide. Water depth in the federal navigation channel is maintained to 40 feet from the Battery to the former Brooklyn Navy Yard, and 35 feet from that point to the Throgs Neck Bridge. In reality, the channel is much deeper in places than the maintained depth, reaching up to 100 feet deep in areas just north of Hell Gate. The Upper East River is generally wider and shallower than the Lower East River, with an irregular shoreline that encloses embayments. The Lower East River is narrow and deep with straight engineered shorelines (New York City Department of Environmental Protection [NYCDEP] 2007).

Sources of freshwater flow to the East River include the Bronx River, Westchester Creek, Hudson River, CSOs, and wastewater point sources (e.g., Newtown Creek and Red Hook wastewater treatment facilities). Regional surface water runoff also contributes to freshwater input.

LONG ISLAND FREIGHT FACILITIES

As described in Chapter 4, for the purposes of this Tier I EIS, the Pilgrim Intermodal Terminal, proposed by the New York State Department of Transportation (NYSDOT), and the existing Brookhaven Rail Terminal serve as illustrative examples for the determination of potential environmental effects resulting from the CHFP operation in Nassau/Suffolk. These two sites are generally representative of potential environmental effects of the operation of the Build Alternatives on Long Island.

The Pilgrim Intermodal Terminal study area consists of approximately 105 acres of land on property previously occupied by the Pilgrim Psychiatric Hospital. Structures within the study area include a former incinerator building and an abandoned wastewater chlorination building. Northeast of the study area is the former Pilgrim Psychiatric Hospital power plant, and associated coal storage yard, coal ash disposal area, and petroleum bulk storage.

The Brookhaven Rail Terminal study area consists of an approved rail yard site that has not been developed for that function as such. It consists of vacant land and is surrounded mostly by vacant land and some industrial uses to the south.

Floodplains

There are no floodplain resources within the Pilgrim Intermodal Terminal or Brookhaven Rail Terminal study areas.

Groundwater

The three most important Long Island aquifers are the Upper Glacial Aquifer, the Magothy Aquifer, and the Lloyd Aquifer. Of note, the Harbor Hill Moraine and Ronkonkoma Moraine represent two different glacial advances and run roughly east to west for the length of Long Island. These moraines comprise poorly sorted glacial till (sand, pebbles, rock, boulders) deposited at the glacier's leading edge. Found between these moraines and to the south, are outwash plains of well sorted sand and gravel.

In Nassau and Suffolk Counties, groundwater supplies all of the drinking water. As such, its quality is more closely monitored and where contamination is present, it is either not used for

drinking water supply or only used after appropriate treatment. These counties are within the area designated for the Nassau-Suffolk Sole Source Aquifer.

Surface Waters

There are no surface waters on either of the Long Island study areas other than a stormwater retention basin on the Pilgrim Intermodal Terminal study area and a drainage basin for the Long Island Expressway on the Brookhaven Rail Terminal study area.

E. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

OPERATIONAL IMPACTS

NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed project would not be implemented. However, improvements to rail yards and other properties on which one or more of the proposed project alternatives may rely are anticipated in the future without the project. As described in Chapter 4, under the No Action Alternative, rail, highway, and port infrastructure projects currently planned by the various regional and local transportation agencies would occur. For rail, it includes projects being advanced by PANYNJ, and other remaining improvements on PANYNJ east-of-Hudson and west-of-Hudson rail program lists that have not been constructed. The No Action Alternative includes upgrades to the existing railcar float service between Greenville Yard and 65th Street Yard, including the construction of up to two modern float bridges and new track work in Greenville Yard, improvements to the existing 65th Street Yard in Brooklyn, and service to and from the 65th Street float bridge.

As part of the proposed near-term activities at Greenville Yard mentioned above, the eastern portion of the site that would be used for NYNJR operations would be raised to an elevation of 9 feet above sea level (NAVD 1988) from its current elevation of 5 feet above mean sea level (NAVD 1988) to increase flood resiliency and ease the transition through the "A" Yard portion of Greenville Yard (which is located at a much higher elevation than the rest of the yard). While this earthwork will not raise the level of the entire yard out of the preliminary work map 100-year flood elevation, it would help reduce future flooding. Using lessons learned from Superstorm Sandy, the design of the replacement hydraulic bridges will incorporate measures to prevent future damage to bridge structures and controls.

Based on recent climate change projections, by the 2050s, the floodplain elevation could be expected to shift by more than 2.5 feet.[1] PANYNJ has considered both the current and future flooding risks. It would not be practical or safe to increase the elevation of the yard and the associated tracks beyond what is proposed. The float bridges and railcar floats would be designed to reduce the risk of damage during storms and flood events. The elevation of the first floor slab of the control tower would be more than 17 feet above sea level (NAVD 1988), and would therefore be resilient to the type of storm surge that occurred with Superstorm Sandy, even under projected sea level rise due to climate change through 2050s. PANYNJ would also establish plans for moving locomotives and stored freight out of the way when adverse weather conditions are expected.

1 PlaNYC, "A Stronger, More Resilient New York: Climate Analysis," June 2013. While the information was developed specifically for New York, the projections are applicable through the wider New York Harbor area, including Greenville Yard.

WATERBORNE ALTERNATIVES

Enhanced Railcar Float Alternative

Floodplains

Operation of the Enhanced Railcar Float Alternative within the floodplain would not adversely affect floodplain resources. Because the surface waters in the regional study area are tidal waters, flooding of lands adjacent to these waters is controlled by the tidal conditions within Newark Bay, New York Bay, and the Atlantic Ocean and is not influenced by freshwater flow from upriver. Therefore, operation of waterfront facilities within the floodplain would not have the potential to adversely affect floodplain resources.

Groundwater

Operation of the Enhanced Railcar Float Alternative could involve the storage of petroleum or other chemicals at the facility as well as inside railcars and trucks. Both of these kinds of storage are strictly regulated in terms of types of chemicals that can be stored as well as requirements for labeling, handling (e.g., secondary containment and leak detection systems) and contingency procedures in the event of a release. As such, while releases are unlikely and existing reporting requirements and procedures would be followed to ensure that releases were addressed before they could adversely affect groundwater.

Surface Waters

Operation of waterfront termini would be in accordance with state and federal regulations governing the storage and use of petroleum or other chemicals. Implementation of these requirements would minimize the potential for discharges due to operation of the yard to adversely affect water quality of Newark Bay, the Upper New York Harbor, or the East River. In addition, surface runoff would be managed in accordance with stormwater pollution prevention plans (SWPPPs) developed for projects, as necessary, and the post-construction requirements of NJPDES and SPDES general permit for stormwater discharges from construction activity or for industrial discharges.

The increased use of waterfront facilities and increases in marine traffic would not result in adverse water quality effects to the Upper New York Harbor. The waterfront locations where facilities associated with the Enhanced Railcar Float Alternative may be constructed have been used in the past for these activities; have engineered shorelines that would not be affected by erosion due to increased use of a waterfront facility, and have water depth sufficient for operation of the floats.

Truck Ferry Alternative

Like the Enhanced Railcar Float Alternative, the Truck Ferry Alternative would not have an effect on floodplains. Harbor crossing termini would be operated in accordance with regulations and would not adversely affect groundwater and surface water.

Truck Float Alternative

Like the Enhanced Railcar Float Alternative, the Truck Float Alternative would not have an effect on floodplains. Harbor crossing termini would be operated in accordance with regulations and would not adversely affect groundwater and surface water.

Lift On-Lift Off (LOLO) Container Barge Alternative

Like the Enhanced Railcar Float Alternative, the LOLO Container Barge Alternative would not have an effect on floodplains. Harbor crossing termini would be operated in accordance with regulations and would not adversely affect groundwater and surface water.

Roll On-Roll Off (RORO) Container Barge Alternative

Like the Enhanced Railcar Float Alternative, the RORO Container Barge Alternative would not have an effect on floodplains. Harbor crossing termini would be operated in accordance with regulations and would not adversely affect groundwater and surface water.

RAIL TUNNEL ALTERNATIVES

Rail Tunnel Alternative

The operation of the Rail Tunnel Alternative would utilize many of the facility locations as described above under the Waterborne Alternatives, with the additional operation of a tunnel under the New York Harbor and associated facilities. The operation of the facilities required to support the Rail Tunnel Alternative would not result in operational effects to floodplains, groundwater, or surface waters for the reasons described above under the Waterborne Alternatives.

Rail Tunnel with Shuttle ("Open Technology") Service Alternative

Like the Rail Tunnel Alternative, the operation of the Rail Tunnel with Shuttle Service Alternative would not have an effect on floodplains, groundwater, or surface water.

Rail Tunnel with Chunnel Service Alternative

Like the Rail Tunnel Alternative, the operation of the Rail Tunnel with Chunnel Service Alternative would not have an effect on floodplains, groundwater, or surface water.

Rail Tunnel with Automated Guided Vehicle (AGV) Technology Alternative

Like the Rail Tunnel Alternative, the operation of the Rail Tunnel with AGV Technology Alternative would not have an effect on floodplains, groundwater, or surface water.

Rail Tunnel with Truck Access Alternative

Like the Rail Tunnel Alternative, the operation of the Rail Tunnel with Truck Access Alternative would not have an effect on floodplains, groundwater, or surface water.

CONSTRUCTION IMPACTS

NO ACTION

Construction activities associated with the No Action Alternative would be expected to be conducted in accordance with state and federal regulations with respect to excavation and other construction within sites identified as having contaminated soils or groundwater, and in accordance with erosion and sediment control measures identified in a SWPPP prepared in accordance with NJPDES or SPDES requirements. With the implementation of these measures, construction activities would not adversely affect groundwater or surface water resources. Construction activities within the floodplain would not adversely affect floodplain resources for the same reasons discussed for the No Action Alternative under Operational Impacts.

WATERBORNE ALTERNATIVES

Enhanced Railcar Float Alternative

Floodplains

Construction activities associated with the Enhanced Railcar Float Alternative would not adversely affect floodplain resources for the same reasons discussed under Operational Impacts.

Groundwater

As discussed in Chapter 6.10, "Hazardous Materials," most of the locations associated with the Enhanced Railcar Float Alternative are within existing industrial areas and, therefore, have the potential for on-site contamination. Expansion of some of these facilities would require additional environmental due diligence to assess the potential for additional contamination sources (e.g., soils and groundwater) and identify the potential for adverse impacts on groundwater quality due to construction activities. Construction of new or upgraded facilities could entail excavation below the water table and/or dewatering to temporarily lower the water table. Prior to any such construction, groundwater testing would be conducted to determine the quality of the groundwater that would be encountered. This would be used to determine safety procedures for the workers (and surrounding communities), disposal options (e.g., sewer or surface water under applicable permit requirements). In some cases (e.g., were petroleum to be found on the water table) cleanup (treatment) would be required prior to and/or during construction to ensure no adverse effects.

Surface Waters

Construction activities associated with the Enhanced Railcar Float Alternative would be expected to be conducted in accordance with state and federal regulations with respect to excavation and other construction within sites identified as having contaminated soils or groundwater, and in accordance with erosion and sediment control measures identified in a SWPPP prepared in accordance with NJPDES or SPDES requirements. With the implementation of these measures, construction activities would not adversely affect surface water resources of Newark Bay, Upper New York Harbor, or the East River.

Truck Ferry Alternative

Like the construction of the Enhanced Railcar Float Alternative, the construction of the termini for the Truck Ferry Alternative would not affect floodplains. Additional environmental due diligence would be needed to assess the potential for additional contamination sources (e.g., soils and groundwater) and identify the potential for adverse impacts on groundwater quality due to construction activities. Construction activities would be conducted in accordance with state and federal regulations within sites identified as having contaminated soils or groundwater to avoid adverse effects on surface water resources of Newark Bay, Upper New York Harbor, or the East River.

Truck Float Alternative

Like the construction of the Enhanced Railcar Float Alternative, the construction of the termini for the Truck Float Alternative would not affect floodplains. Additional environmental due diligence would be needed to assess the potential for adverse impacts on groundwater quality due to construction activities. Construction activities would be conducted in accordance with state and federal regulations to avoid adverse effects on surface water resources.

Lift On-Lift Off (LOLO) Container Barge Alternative

Like the construction of the Enhanced Railcar Float Alternative, the construction of the termini for the LOLO Container Barge Alternative would not affect floodplains. Additional environmental due diligence would be needed to assess the potential for adverse impacts on groundwater quality due to construction activities. Construction activities would be conducted in accordance with state and federal regulations to avoid adverse effects on surface water resources.

Roll On-Roll Off (RORO) Container Barge Alternative

Like the construction of the Enhanced Railcar Float Alternative, the construction of the termini for the RORO Container Barge Alternative would not affect floodplains. Additional environmental due diligence would be needed to assess the potential for adverse impacts on groundwater quality due to construction activities. Construction activities would be conducted in accordance with state and federal regulations to avoid adverse effects on surface water resources.

RAIL TUNNEL ALTERNATIVES

Rail Tunnel Alternative

For reasons discussed above under the Waterborne Alternatives, construction at potential facility locations to support the Rail Tunnel Alternative would not result in adverse effects to floodplains, groundwater, or surface waters.

Similarly, the construction of the tunnel would not be expected to adversely affect floodplains or groundwater resources. Sediment disturbance associated with in-water construction activities that would occur during construction of the tunnel would have the potential to result in adverse effects to water quality of the Upper New York Harbor, as described below.

Surface Waters

The rail tunnel would be constructed by either boring the entire length of the tunnel alignment underneath the floor of the Upper New York Harbor, or boring for part of the way and then trenching and immersing the remaining segment (immersed tube tunnel [ITT]). Boring the entire distance would not result in bottom disturbing activities that would result in resuspension of sediment of the Upper New York Harbor and adversely affect surface water quality.

The immersed tube tunnel option would require dredging approximately 2 million cubic yards of bottom sediment within the Upper New York Harbor to create a trench in which to lay the tunnel tube segments. Dredging and the placement of the tunnel tube segments have the potential to result in the temporary resuspension of bottom sediment and the release of sediment contaminants to the water column, and possible decreases in dissolved oxygen. Bottom sediment throughout the New York/New Jersey Harbor Estuary contains contaminants such as pesticides, metals such as mercury, cadmium, lead, and copper, PCBs and various polycyclic aromatic hydrocarbons. Other water quality impacts that may be associated with these sediment disturbing activities included decreases in dissolved oxygen.

Potential impacts on water quality due to construction of the tunnel was evaluated in detail for the 2004 DEIS on the basis of existing sediment data, sediment sampling conducted for the project, and modeling of potential water quality impacts due to dredging. Contaminants found within sediments collected along the proposed tunnel alignment evaluated in the 2004 DEIS were typical for the Harbor Estuary, with exeedances of metals near the shorelines and lower levels of contamination for deeper samples in the center of the Harbor. Generally, sediment samples from the shoreline areas were more contaminated than those from the middle of the

Harbor, and core samples from 8 to 10 foot depths usually had higher levels of contamination than shallower (0 to 2 feet) or deeper (18 to 20 feet and 35 to 37 feet).

Given the potential for the resuspension of bottom sediment during in-water construction activities associated with the Rail Tunnel Alternative, and the release of sediment contaminants to the waters of the Upper New York, Tier II documentation would include a detailed assessment of the potential adverse effects to surface water quality of the Upper New York Harbor using the information presented in the 2004 DEIS, updated as necessary to incorporate changes in the tunnel alignment, and sediment quality conditions, and in-water construction techniques.

Rail Tunnel with Shuttle ("Open Technology") Service Alternative

Like the Rail Tunnel Alternative, construction of the freight facilities for the Rail Tunnel with Shuttle Service Alternative would not result in adverse effects to floodplains, groundwater, or surface waters. The construction of the tunnel would not be expected to adversely affect floodplains or groundwater resources. Sediment disturbance associated with in-water construction activities that would occur during construction of the tunnel would have the potential to result in adverse effects to water quality of the Upper New York Harbor and Tier II documentation would include a detailed assessment of the potential adverse effect.

Rail Tunnel with Chunnel Service Alternative

Like the Rail Tunnel Alternative, construction of the freight facilities for the Rail Tunnel with Chunnel Service Alternative would not result in adverse effects to floodplains, groundwater, or surface waters. The construction of the tunnel would not be expected to adversely affect floodplains or groundwater resources. Sediment disturbance associated with in-water construction activities that would occur during construction of the tunnel would have the potential to result in adverse effects to water quality of the Upper New York Harbor and Tier II documentation would include a detailed assessment of the potential adverse effect.

Rail Tunnel with Automated Guided Vehicle (AGV) Technology Alternative

Like the Rail Tunnel Alternative, construction of the freight facilities for the Rail Tunnel with AGV Technology would not result in adverse effects to floodplains, groundwater, or surface waters. The construction of the tunnel would not be expected to adversely affect floodplains or groundwater resources. Sediment disturbance associated with in-water construction activities that would occur during construction of the tunnel would have the potential to result in adverse effects to water quality of the Upper New York Harbor and Tier II documentation would include a detailed assessment of the potential adverse effect.

Rail Tunnel with Truck Access Alternative

Like the Rail Tunnel Alternative, construction of the freight facilities for the Rail Tunnel with Truck Access Alternative would not result in adverse effects to floodplains, groundwater, or surface waters. The construction of the tunnel would not be expected to adversely affect floodplains or groundwater resources. Sediment disturbance associated with in-water construction activities that would occur during construction of the tunnel would have the potential to result in adverse effects to water quality of the Upper New York Harbor. Tier II documentation would include a detailed assessment of the potential adverse effect.

F. TIER II ANALYSIS AND POTENTIAL MITIGATION MEASURES

As discussed above for the four alternatives, and in Chapter 6.10, "Hazardous Materials," the Tier I analysis assumes that additional environmental studies be conducted at the local study

areas to assess the potential for additional contamination sources (e.g., soils and groundwater) and identify the potential for adverse impacts on groundwater quality due to construction activities.

Construction of new or upgraded facilities required for both the waterborne and Rail Tunnel Alternatives could entail excavation below the water table and/or dewatering to temporarily lower the water table. Prior to any such construction, groundwater testing would be conducted to determine the quality of the groundwater that would be encountered and the necessary treatment identified to meet NJPDES and SPDES requirements for discharge to surface waters to minimize the potential for adverse impacts on surface water quality.

Dredging and the placement of the tunnel tube segments for the Rail Tunnel Alternatives have the potential to result in the temporary resuspension of bottom sediment and the release of sediment contaminants to the water column, and possible decreases in dissolved oxygen, adversely affecting water quality of the Upper New York Harbor. Given the potential for adverse impacts on surface water quality during construction of the Rail Tunnel Alternatives, any Tier II documentation would include a detailed assessment of the potential for these alternatives to adversely affect surface water quality of the Upper New York Harbor using the information presented in the 2004 DEIS, updated as necessary to incorporate changes in the tunnel alignment, and sediment quality conditions, and in-water construction techniques.

Measures to avoid or minimize adverse impacts on water quality due to construction of the Rail Tunnel Alternatives, including evaluation of alternative dredging techniques to reduce sediment resuspension, the feasibility of using turbidity curtains, and alternative tunnel construction techniques, would be evaluated in the Tier II and mitigation measures developed as necessary.

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