DRAFT

Draft Integrated Hurricane Sandy General Reevaluation Report & Environmental Assessment

Passaic River Tidal Protection Area, New Jersey Coastal Storm Risk Management Feasibility Study

September 2017

New Jersey Department of Environmental Protection

U.S. Army Corps of Engineers New York District

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Executive summary

The U.S. Army Corps of Engineers (USACE) - New York District prepared this Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment (HSGRR/EA) for the Passaic River Tidal Protection Area, New Jersey, Coastal Storm Risk Management General Reevaluation Study (Passaic Tidal). The Passaic Tidal study area is a component of the Passaic River Main Stem Flood Risk Management Project, authorized in 1990 (Figure 1). Spanning 17 miles from Newark Bay to the Dundee Dam, the Passaic Tidal study area includes the City of Newark in Essex County and the Townships of Kearny and Harrison in Hudson County.

The waterfront areas of Newark, Kearny, and Harrison were severely impacted by Hurricane Sandy (October 28-30, 2012). The storm surge inundated an extensive area of highly developed industrial, commercial, and residential neighborhoods. In Newark, 266 homes and 10,522 businesses were damaged; Harrison had 100 homes and 536 businesses damaged; and Kearny had 96 homes and 1,484 businesses damaged (www.njspotlight.com). The highly utilized urban transit systems of the PATH, NJ Transit, and Amtrak were also severely impacted and operate through this area and the transportation infrastructure was extensively damaged from the storm surge. There was two documented fatalities in the study area due to the storm surge.

In the Passaic River Main Stem project, the Passaic Tidal component is referred to as the Tidal Protection Area, which provided “protection in the Lower Passaic Valley included 5.5 miles of levees and 5.0 miles of floodwalls lying downstream of Interstate 280 to Newark Bay which provide 500 year (0.2-percent flood) protection against hurricane and tidal surges." Had the authorized Tidal Project Area project been constructed, flood damages to Newark, Kearny, and Harrison would have been reduced during Hurricane Sandy. This reach is considered to be a separable element from the Passaic River Main Steam project because it is hydraulically separated from the rest of the basin (it is located below Dundee Dam) and is incrementally justified. Accordingly, as part of the response to the Disaster Relief Appropriation Act of 2013 (Public Law 113-2, Public Law 113-2), Passaic Tidal was separated from Passaic River Main Stem to be evaluated under a separate Interim General Reevaluation Study (Figure 1).

The purpose of the Passaic River HSGRR/EA is to document the development of the updated cost estimates, plan formulation, and environmental impacts and to determine if the Passaic Tidal project remains economically justifiable, technically feasible, and environmentally acceptable. This draft report presents the Tentatively Selected Plan (TSP) for concurrent public and agency review.

Draft Finding of No Significant Impact (FONSI)

I. DESCRIPTION OF ACTION

The proposed action includes seven separate floodwall segments, total length of 2,730' at +12 to +14 ft. NAVD88 with five road closure structures, five railroad closures structures (nine tracks), a tide gate and interior drainage system along low lying areas with flanking potential near existing elevated features such as railroad and roadway embankments that provide flood protection. This plan reduces the risk of coastal storm damage for a large portion of Newark's Ironbound residential area. The project features would reduce damages from hurricanes and storms to an approximate stillwater elevation of 14 feet (ft.) North American Vertical Datum of 1988 (NAVD88). The proposed action is authorized by the Disaster Relieve Appropriation Act of 2013 (P.L. 113-2).

II. ALTERNATIVES

In addition to the proposed action described in section I. of the FONSI, the following alternatives were evaluated in the *Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment (HSGRR/EA) for the Passaic River Tidal Protection Area, New Jersey, Coastal Storm Risk Management General Reevaluation Study (Passaic Tidal)*: a). No Action; b) Alternative #1: Levees and floodwalls at +14 feet NAVD88, 14.8 miles long; c) Alternative #2: Levees and floodwalls at +16 feet NAVD88, 15 miles long; d) Alternative #3: Levees and floodwalls at +18 feet NAVD88, 15.6 miles long.

III. ANTICIPATED ENVIRONMENTAL CONSEQUENCES

A full assessment of impacts associated with the No Action Alternative and Proposed Action were evaluated in the attached *Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment (HSGRR/EA) for the Passaic River Tidal Protection Area, New Jersey, Coastal Storm Risk Management General Reevaluation Study (Passaic Tidal).* A summary of anticipated environmental consequences is as follows:

- The project will not negatively impact public health or safety.
- The project will not negatively impact the quality of the human environment.
- The project will not negatively impact on endangered, threatened, or special concern State and Federal species.
- Standard erosion control techniques and best management plans will minimize excess sedimentation to Jasper's Creek during construction.
- Approximately 0.38 acres of wetlands and watercourses will be permanently impacted. Compensatory mitigation would be conducted to offset minor adverse impacts to wetlands and watercourses. The project would also result in the permanent loss of approximately 0.09 acres of mowed lawn, 0.01 acres of maintained roadside, and 0.02 acres of urban vacant lot habitat.
- The project may have minor permanent impact to birds, mammals, reptiles, amphibians, and benthic resources will the loss of the above described habitat

- The project has the potential to adversely affect the National Register of Historic Places (NRHP) listed Newark Penn Station. Below ground properties that may be effected are the NRHP-eligible Newark City Sewers, Morris Canal Historic District and Site 28-Ex-129 (Balbach & Sons Smelting and Refining Works) as well as historic railroad features and, potentially, Peddie's Ditch. Archaeological remains of the Robinson & Roders Company factory may also be encountered. A Programmatic Agreement has been prepared in coordination with the New Jersey State Historic Preservation Office, the Advisory Council on Historic Preservation and other interested parties to ensure that adverse effects are managed in accordance with Section 106 of the National Historic Preservation Act as the project moves forward. Avoidance, minimization, and mitigation measures will be employed as appropriate to reduce or eliminate adverse impacts to historic properties.
- The anticipated emission levels for NOx emissions from construction equipment are below the *de minimis* levels established for General Conformity and have been documented with a Record of Non-Applicability.
- No adverse cumulative impacts are associated with project implementation. When assessed in conjunction with other past, present or future flood risk management initiatives within the Passaic River Basin, positive cumulative impacts include a regional long term risk reduction to loss of life and property/infrastructure damages resulting from flood events.

IV. COORDINATION

The New York District has coordinated this project with Federal and State resource agencies and the interested public and issued a Notice of Availability of the draft Environmental Assessment (EA) in order to:

a. Inform agencies and stakeholders of the proposed work and the environmental evaluation contained in the draft EA, and
b. Provide an opportunity for comments on that evaluation and findings.

V. CONCLUSION

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the proposed action to provide coastal storm risk management for the City of Newark, Essex County, New Jersey is not a major federal action significantly affecting the quality of the human environment. Therefore, I have determined that this project is exempt from the requirement to prepare an Environmental Impact Statement.

Date:_____

_____
Thomas D. Asbery
Colonel, U.S. Army
Commander

Pertinent Data

Tentatively Selected Plan Features*

The Newark Flanking Plan (TSP) includes seven separate floodwall segments, total length of 2,730' at +12 to +14 feet (ft) NAVD88 with five road closure structures, five railroad closures structures (nine tracks), a tide gate and interior drainage system along low lying areas with flanking potential near existing elevated features such as railroad and roadway embankments that provide flood protection. This plan reduces the risk of coastal storm damage for a large portion of Newark's Ironbound residential area. The project features would reduce damages from hurricanes and storms to an approximate stillwater elevation of 14 ft North American Vertical Datum of 1988 (NAVD88). The Proposed Action consists of seven separate floodwall segments.

Project first cost of $45,666,000
Average annual cost of $2,261,000
Average annual benefits of $10,538,000
Average annual net benefits of $8,277,000
BCR of 4.7

Construction Method:
The project assumes a start date of May 2018 with an overall duration of 38 months with a completion date in July 2021. Construction years are assumed for the economics evaluation in this study, but are subject to report approval, acquisition of necessary real estate, project approval and funding requirements, including Federal and non-Federal funds.

Real Estate Requirements: USACE projects require the non-Federal sponsor, The New Jersey Department of Environmental Protection (NJDEP), to provide lands, easements, rights-of-way and relocations, and disposal/borrow areas (LERRDs) for a project. Currently, the TSP will require the non-Federal sponsor to acquire temporary and permanent easements.

Project Cost

The project cost estimate is broken out by cost component in Table 1. This includes planning, engineering and design, construction management, interest during construction and operation and maintenance (contingencies are included).

Project First Cost is the constant dollar cost of the TSP at current price level and is the cost used in the authorizing document for a project. Total Project Cost is the constant dollar cost fully funded with escalation to the estimated midpoint of construction. This is the "cost of money" because costs are expected to escalate over time due to various factors. Total Project Cost is the cost estimate used in Project Partnership Agreements for implementation of design and construction of a project. Total Project Cost is the cost estimate provided to non-Federal sponsor, NJDEP, for their use in financial planning as it provides information regarding the overall non-Federal cost sharing obligation.

Table 1: TSP Refined Cost Estimate

Description	Total
Lands and Damages	$578,000
Relocations	$609,000
Fish and Wildlife	$603,000
Levees and Floodwalls	$11,483,000
Pumping Plant	$5,713,000
Floodway Control & Diversion	$17,261,000
Cultural Resources	$1,826,000
Engineering & Design	$5,278,000
Construction Management	$2,314,000
TOTAL	$45,666,000

*Note: These costs will be revised by further project evaluation, agency reviews, and optimization as the study progresses.

Economic Analysis

The Costs and Benefits of the TSP are provided in Table 2. Projects costs are annualized over a 50-year period of analysis at the Fiscal Year 2017 (FY17) Federal interest rate for evaluation water resource projects (2.875%). Dividing the annual benefit of the project by the annual cost estimate results in an estimated Benefit-Cost Ratio of 4.7.

Table 2: Refined TSP, Annual Benefit and Cost Summary

(Price Level: February 2015 (Benefits), 2016 (Costs), FY16 3.125% discount rate)

Project First Costs	$45,666,000
Interest During Construction	$599,000
Total Investment Costs	$46,265,000
Annualized Investment Costs	$1,707,000
Annual Operations and Maintenance Costs	$554,000
Total Average Annual Costs	$2,261,000
Annual Without Project Damages	$73,110,000
Annual With-Project Damages	$62,847,000
Annual Benefits	$10,538,000
Net Benefits	$8,277,000
Benefit Cost Ratio	4.7

*Note: The Benefit-Cost Ratio will be revised by further project evaluation, agency reviews, and optimization as the study progresses.

Federal and Non-Federal Project Cost Sharing

In accordance with the cost share provisions in Section 103 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C. 2213), project design and implementation are cost shared 65% Federal and 35% non-Federal.

Table 3: First Cost Apportionment

	Federal	Non-Federal	Total
Initial Project Cost	$29,683,000	$15,983,000	$45,666,000
Real Estate Credit		$1,243,000	$1,243,000
Cash Contribution	$29,683,000	$14,740,000	$44,423,000
Total	$29,683,000	$15,983,000	$45,666,000

The non-Federal sponsor is responsible for providing all lands, easements and rights-of-way as part of their portion of the cost-share, in this case estimated at $1,243,000. This can be seen in Table 3 and in combination with the $14,740,000, make up the non-Federal portion of a total of $15,983,100. Further information on real estate can be found in Appendix I – Real Estate Plan.

Passaic Tidal, New Jersey
Coastal Storm Risk Management Feasibility Study

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List of Acronyms

Acronym	Title
AADT	Average Annual Daily Traffic
APE	Area of Potential Effect
ARA	Abbreviated Risk Analysis
BCR	Benefit Cost Ratio
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CSO	Combined Sewer Overflows
CSRM	Coastal Storm Risk Management
CWCCIS	Civil Works Construction Cost Index System
CZM	Coastal Zone Management
dBA	A-weighted decibels
District	United States Army Corps of Engineers, New York District
EFH	Essential Fish Habitat
EGM	Economic Guidance Memorandum
ER	Engineering Regulation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FY	Fiscal Year
GDM	General Design Memorandum
HD	Historic District
HSGRR/EA	Hurricane Sandy General Reevaluation Report and Environmental Assessment
HTRW	Hazardous, Toxic and Radioactive Waste
HUD	Housing and Urban Development
IPaC	Information for Planning and Conservation
KCS	Known Contaminated Site
LERRD	Lands, Easements, Rights of Way, Relocations and Disposal/Borrow Areas
LIDAR	Light Detection and Ranging
LVRR	Lehigh Valley Railroad
MAFMC	Mid-Atlantic Fishery Management Council
MHW	Mean High Water
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NACCS	North Atlantic Coast Comprehensive Study
NAE	No Adverse Effect
NAVD	North Atlantic Vertical Datum (1988)
NE	No Effect
NED	National Economic Development

NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum (1929)
NHPA	National Historic Preservation Act of 1966, as amended
N.J.A.C	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJHPO	New Jersey Historic Preservation Office
N.J.S.A.	New Jersey Statute Annotated
NJTR	New Jersey Transit Rail Operations
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OMRR&R	Operation, Maintenance, Repair, Replacement and Rehabilitation
OSE	Other Social Effects
PA	Programmatic Agreement
PATH	Port Authority Trans-Hudson
PED	Preconstruction Engineering and Design
PL	Price Level
PPA	Project Partnership Agreement
PRR	Pennsylvania Railroad
PVSC	Passaic Valley Sewerage Commission
PVSCNBOSW	Passaic Valley Sewerage Commission Newark Bay Outfall Sewerage Works
RED	Regional Economic Development
SAFMC	South Atlantic Fishery Management Council
SLC	Sea Level Change
SWO	Stormwater Overflows
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WRDA	Water Resources Development Act

Chapter 1: Introduction

1.1 Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment

The U.S. Army Corps of Engineers (USACE), New York District (District), and the non-Federal sponsor, the NJDEP, prepared this Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment (HSGRR/EA) for the Passaic River Tidal Protection Area, New Jersey, Coastal Storm Risk Management Feasibility Study. The purpose of the Passaic River HSGRR/EA is to document the development of the updated cost estimates, plan formulation, and environmental impacts and to determine if the Passaic Tidal project remains economically justifiable, technically feasible, and environmentally acceptable. This report presents the Tentatively Selected Plan (TSP) for managing coastal storm risk within the tidal portion of the Passaic River. Passaic River Tidal Protection Area is located in Newark, Harrison, and Kearny counties. Over the course of the review process, the report will be updated to include input from the NJDEP, as well as local governments, resource agencies, and the public.

The Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with managing and reducing risk to the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements (Principles and Guidelines, 1983).

Water and related land resources projects are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. Pursuant to this, the draft report (1) summarizes the problems, needs, and opportunities for coastal storm risk management in the Passaic River Tidal Protection Area; (2) presents and discusses the results of the plan formulation for coastal storm risk management; (3) identifies specific details of the Tentatively Selected Plan, including inherent risks; (4) and will be used to assist in determining the extent of the Federal interest and local support for the plan.

This draft report is being released for concurrent public and agency technical review and Independent External Peer Review. USACE has evaluated an array of structural and nonstructural alternatives including levees, floodwalls, surge barriers, ringwalls, structure elevation, and flood proofing for the identification of the TSP. The TSP will be refined based on comments from public and agency review. It will contain additional feasibility level optimization for the Final Integrated Feasibility Report and environmental analysis conducted for and presented in the Environmental Assessment.

1.2 National Environmental Policy Act Requirements

This Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment (HSGRR/EA) was prepared pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's (CEQ) Guidance Regarding NEPA Regulations, and the USACE's Procedures for Implementing NEPA (Engineering Regulation [ER]-200-2-2).

NEPA requires the USACE to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. Federal regulations to implement NEPA are found in Title 40 Code of Federal Regulations (CFR) Parts 1500-1508. The intent of NEPA is to ensure that information is made available to public officials and citizens about major actions taken by Federal agencies, and to identify and consider public concerns and issues. "Any environmental document in compliance with NEPA may be combined with any other agency document to reduce duplication and paperwork" (40 CFR §1506.4). This draft report integrates discussions into the feasibility report that normally would appear in a Final Environmental Impact Assessment in the feasibility report. The purpose of an EIS is to aid a Federal agency's compliance with NEPA.

This Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment must discuss:

- the need for the proposed action;
- the proposed action and alternatives;
- the probable environmental impacts of the proposed action and alternatives;
- and the agencies and persons consulted during preparation of the HSGRR/EA.

This integrated report is consistent with NEPA statutory requirements. The report reflects an integrated planning process, which avoids, minimizes, and mitigates adverse project effects associated with coastal storm risk management actions. The probable environmental impacts of the alternatives considered are presented in the NEPA documents associated with the 1987 and 1995 GDMs. Sections of text marked with an asterisk are applicable to the satisfaction of National Environmental Policy Act (NEPA) requirements.

1.3 Study Purpose and Scope*

The purpose of the study is to determine if the Passaic Tidal project remains economically justifiable, technically feasible, and environmentally acceptable. A 1987 General Design Memorandum (GDM) and 1995 GDM for the Passaic River Main Stem project presented preliminary designs. In the 20 years since the 1995 GDM was drafted, study area conditions have changed, and engineering standards and criteria have been updated based on lessons learned from major storm events. Changes in study area conditions, post-hurricane resilience work, updated economic forecasting, and new engineering analyses have informed this study.

The draft interim HSGRR/EA will be an interim response to the study authority, as the Passaic River Main Stem General Reevaluation Study is ongoing. This draft report presents the Tentatively Selected Plan (TSP) for concurrent public and agency review. After reviews and comments, the TSP will be refined and optimized, resulting in the Recommended Plan for the final report.

1.4 Need for Action*

In response to the destruction laid forth by Hurricane Sandy, the U.S. Congress passed and the President signed into law P.L. 113-2, Hurricane Sandy Disaster Relief Appropriations Act. The legislation provides supplemental appropriations to address damages caused by Hurricane Sandy and to manage future flood risk in ways that will support the long-term sustainability and resilience of the coastal ecosystem and communities, and reduce the economic costs, and to risks associated with large-scale flood and storm events.

The study will be consistent with and use the technical analysis done under the purview of the North Atlantic Coast Comprehensive Study (NACCS) (USACE 2015).

1.5 Study Authority

The Passaic Tidal area is part of the larger Passaic River Main Stem project, which was authorized for construction by Section 101(a)(18) of the Water Resources Development Act (WRDA) of 1990, as amended by Section 101(a)(18)(ii) of WRDA 1992, Section 102(p) of WRDA 1992, and Section 327(i) of WRDA 2000:

> *In general. --The project for flood control, Passaic River Main Stem, New Jersey and New York: Report of the Chief of Engineers, dated February 3, 1989, except that the main diversion tunnel shall be extended to include the outlet to Newark Bay, New Jersey, at a total cost of $1,200,000,000, with an estimated first Federal cost of $890,000,000 and an estimated first non–Federal cost of $310,000,000.*

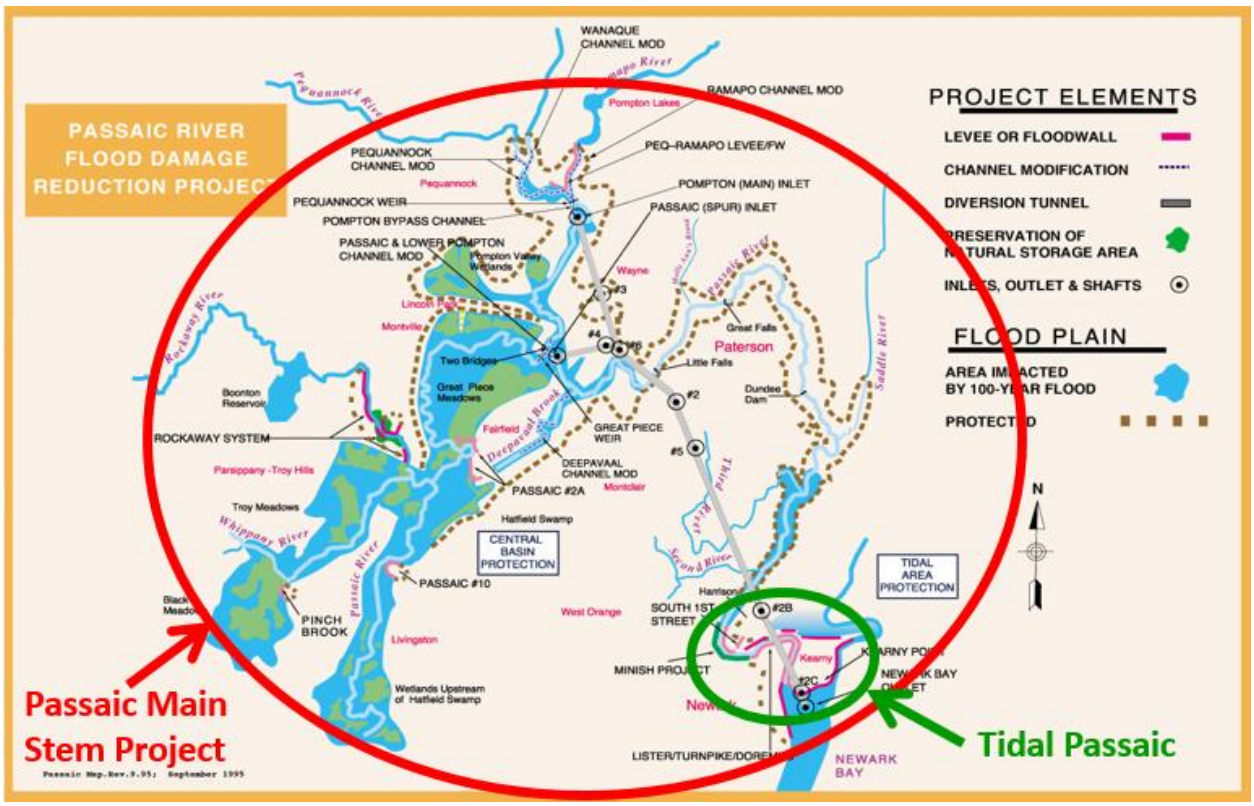

Figure 1: Passaic Main Stem Authorized Project (1995)

Pre-engineering design work was underway until the sponsor withdrew support for the overall project in 1995 due to objections over the tunnel feature. Work was halted until March 2011, when the non-Federal sponsor, the New Jersey Department of Environmental Protection (NJDEP), requested a reevaluation of the Passaic River Main Stem project; a Feasibility Cost Sharing Agreement was executed in June 2012 between USACE and NJDEP for the Passaic Tidal Main Stem study.

The reevaluation study was underway when Hurricane Sandy severely impacted the study area in October 2012. The storm surge from Hurricane Sandy impacted the southern portion of the Main Stem project area. The Tidal Protection Area was included in the Second Interim Report to Congress in response to P.L. 113-2, listing it as eligible to be managed as its own separate project. The reevaluation study is 100% federally funded for completion via P.L. 113-2.

1.6 Non-Federal Sponsor

The New Jersey Department of Environmental Protection (NJDEP) is the non-Federal cost-sharing partner. This reevaluation study is 100% federally funded under P.L. 113-2. A Feasibility Cost Sharing Agreement for Passaic Tidal was executed between USACE and NJDEP on October 28, 2014.

1.7 Prior Studies, Reports, and Existing Water Projects

A study of water resource problems in the Passaic River watershed was first authorized by the Flood Control Act of 1936. Reports recommending plans of action were issued in 1939, 1948, 1962, 1969, 1972, and 1973. In October 1976, Congress authorized the Passaic River Basin Study in WRDA 1976. After a series of investigations, a GDM was finalized in 1987. It recommended a plan that included a tunnel diversion, channel modification of the Passaic River, and tidal levees/floodwalls in Newark, Kearny, and Harrison, New Jersey (Figure 1).

Construction for the Passaic Main Stem Project was authorized by WRDA 1990. A 1995 GDM recommended modifications to the authorized project due to a change in study area conditions. Revisions for the Tidal Area Protection included an increase in the total length at Kearney Point to 37,679 feet that includes 33,771 feet of floodwall and 3,908 feet of levee. On South First Street in Harrison, the project was lengthened to 7,450 feet to include 1,750 feet of levee and 5,700 feet of floodwall. At Lister/Turnpike/Doremus in Newark, three original separate systems, totaling 14,470 feet of levees and floodwalls were modified and combined into one continuous system 23,256 feet long; the system includes 5,599 feet of levee and 17,657 feet of floodwall. The alignments of these three reaches are presented as colored lines in Figure 2. Soon after the completion of the 1995 GDM, the State of New Jersey withdrew support for the overall project due to objections over the tunnel feature.

Following the execution of the Feasibility Cost Sharing Agreement for the Passaic River Main Stem Reevaluation Study in 2012, USACE produced a Preliminary Alternative Reevaluation Report (2013), upon which the current draft Interim HSGRR/EA draws upon for characterization of existing conditions and preliminary alternatives evaluation.

Prior USACE Reports

- Flood Frequency Studies, 1939, 1948, 1962, 1972, 1973, 1983
- General Design Memorandum Phase I, dated December 1987
  - Environmental Impact Statement
- General Design Memorandum Phase II, dated September 1995
  - Environmental Impact Statement
- South First Street Wall Survey Control Report, dated August 2005
- Lower Passaic Hudson Raritan Estuary Study, February 2017
- Draft Passaic Main Stem Phase I Preliminary Reevaluation Report, 2013

Figure 2: Authorized project alignment in Passaic Tidal portion of the Main Stem Project with reaches identified in the 1995 GDM

Existing Water Resource Projects

- U.S. Army Corps of Engineers, New York District (District) Joseph G. Minish Passaic River Waterfront Park and Historic Area, Phase I Project
  The project will reduce erosion and provide environmental restoration, recreation, and economic development benefits.
- Constructed streambank stabilization and bulkheads
- Proposed (P.L. 113-2) streambank stabilization and bulkheads
- Lincoln Park, Section 1135
  The restoration project would provide the necessary tidal exchange between the project area and the Hackensack River.
- Long Hill Township 205
  The flood damage reduction project proposes a levee, floodwall, and limited road raising in the Township 76 miles upstream of the mouth of the Passaic River.

1.8 Study Area

The study area is the area within which significant project impacts may occur. The study area includes the tidally-influenced and surge-prone areas in the lower Passaic and Hackensack Rivers, and Newark Bay, New Jersey that were included in the authorized Passaic Main Stem project (Figure 3). It includes portions of the city of Newark (Essex County), and its suburbs of Harrison and Kearny (Hudson County).

The study area encompasses 5.0 square miles (3,200 acres) in the city of Newark, 0.65 square miles (400 acres) in the Town of Harrison, and 2.73 square miles (1,880 acres) in the Town of Kearny. The Passaic and Hackensack Rivers intersect the study area.

The study area is a mixed use area of industrial, commercial, and residential development. The waterfront is mostly developed for industrial uses including manufacturing, shipping (oil and gas, containers/consumer goods) and wastewater treatment. Related rail, barge, truck, and storage infrastructure line the waterfront. There are public parks and a sports arena along the waterfront as well.

Most industrial development is found: 1) on the east bank of the Passaic River south of US-280 in Harrison and on Kearny Point, the peninsula located between the Passaic and Hackensack Rivers, and 2) on the west bank east of NJ-25/US-1/Lincoln Highway in Newark. Most residential communities are west of NJ-25/US-1/Lincoln Highway in Newark, and the northern portion of Harrison.

Most residential communities are west of NJ-25/US-1/Lincoln Highway in Newark, and the northern portion of Harrison. The rest of the study area is developed for industrial uses, including manufacturing, shipping, rail transport, oil and gas storage, and container storage. Most residents and businesses have returned after the devastation caused by Hurricane Sandy in 2012, and continue their recovery.

Figure 3: Passaic Tidal Study Area

Seven reaches were used for formulation and analysis. The reaches were determined using current land use, hydrology, and topography (Figure 4). The reaches are Harrison Section 1, Harrison Section 2, Kearny Section, Newark Section, Minish Park Section, Newark Flanking Section, and Newark Gap.

1) Harrison 1 – The area of Harrison included in the 1995 alignment.
2) Harrison 2 – Additional protection in Harrison which includes Red Bull Arena and the PATH Service Station. NOTE: This reach was eventually screened out as not economically viable and not included in the final plan.
3) Kearny – Also referred to as Kearny Point, this includes all of Kearny Point peninsula to the northern rail yard.
4) Newark – This area includes the areas of Newark subject to flooding from the east and was part of the 1995 alignment.
5) Minish – This component includes a line of protection along Minish Park, providing flood risk management for 'inland' Newark.
6) Newark Flanking – This component includes floodwalls and closure gates to prevent flooding of the South Ironbound area of Newark from flood water flanking the line of protection north of Newark Liberty Airport.
7) Newark Gap – Area of no proposed floodwall because the ground elevation is at or greater than 18 feet NAVD88.

Figure 4: Passaic Tidal Planning Reaches

1.9 Project Area

The Project Area is that in which measures will likely be built, and consists of the alignment of the structural features associated with the proposed plan as well as any temporary construction easements or working areas. The Project Area is shown within the broader Study Area in Figure 3 above.

Chapter 2: Existing Conditions

Existing conditions serve as the basis for the characterization of problem identification and projection of future without project conditions. Existing conditions are described in this Chapter (setting, significant storms, and assets at risk) and in Chapter 3 (environmental resources).

2.1 Describing Storms and Flood Levels

Floods are often defined according to their likelihood of occurring in any given year at a specific location. The most commonly used definition is the "100-year flood." This refers to a flood level or peak that has a 1 in 100, or 1-percent chance of being equaled or exceeded in any year (i.e., 1-percent "annual exceedance probability"). Therefore, the 100-year flood is also referred to as the "1-percent flood," or as having a "recurrence interval" or "return period" of 100 years.

A common misinterpretation is that a 100-year flood is likely to occur only once in a 100-year period. In fact, a second 100-year flood could occur a year or even a week after the first one. The term only means that that the average interval between floods greater than the 100-year flood over a very long period (say 1,000 years) will be 100 years. However, the actual interval between floods greater than this magnitude will vary considerably.

In addition, the probability of a certain flood occurring will increase for a longer period of time. For example, over the life of an average 30-year mortgage, a home located within the 100-year flood zone has a 26-percent chance of being flooded at least once. Even more significantly, a house in a 10- year flood zone is almost certain to be flooded at least once (96-percent chance) in the same 30-year mortgage cycle. The probability (P) that one or more of a certain-size flood occurring during any period will exceed a given flood threshold can be estimated as

$$P = 1 - \left[1 - \frac{1}{T}\right]^n$$

where *T* is the return period of a given flood (e.g., 100 years, 50 years, 25 years) and n is the number of years in the period. The probability of flooding by various return period floods in any given year and over the life of a 30-year mortgage is summarized in Table 4.

Table 4: Examples of Flooding by Various Return Periods

Return Period (years)	Chance of flooding in any given year	Percent chance of flooding during 30-year mortgage
10	10 in 100 (10%)	96%
50	2 in 100 (2%)	46%
100	1 in 100 (1%)	26%
500	0.2 in 100 (0.2%)	6%

Because of the potential confusion, recent USACE guidance documents and policy letters recommend use of the annual exceedance probability terminology instead of the recurrence interval or return period terminology. For example, one would discuss the "1-percent-annual-exceedance-probability flood" or "1-percent-chance-exceedance flood," which may be shortened to "1-percent flood" as opposed to the "100-year flood." This report uses the short form "1-percent flood."

The study area was identified as a Significantly Impacted Area in the NACCS January 2015 report. Flooding in the study area occurs when surge and waves from coastal storms such as nor'easters, tropical storms and hurricanes travel north through Newark Bay into the Passaic and Hackensack Rivers, inundating the area. Hurricane Sandy resulted in an approximate 1-percent flood for this area. Hurricane Sandy inundated the study area with water up to 8 feet deep; this equates to a still water elevation of about 11.82 feet NAVD88 (Figure 5).

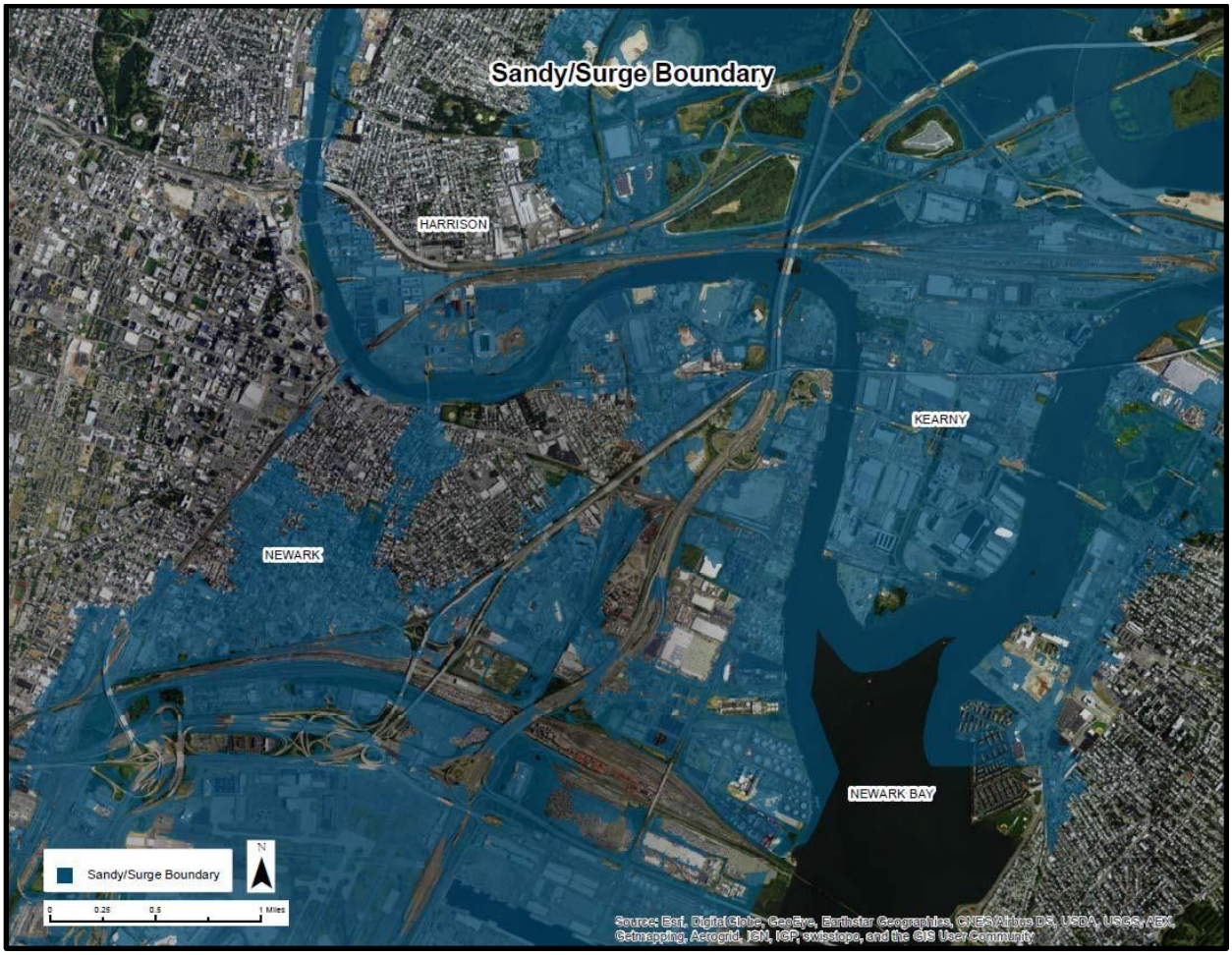

Figure 5: Extent of Hurricane Sandy Flooding (USGS, accessed April 2016).

2.2 Water Surface Elevation

Stage-frequency curves for existing conditions were acquired from NACCS and the Federal Emergency Management Agency (FEMA) for the study area. Stage-frequency relationships for the study area were based on NACCS data for all reaches directly fronting the Passaic River. For the Newark Flanking Section, since the principal source of flooding is anticipated to be overland flow from the south rather than directly from the Passaic River, the most recent FEMA stage-frequency data was assigned to this reach. Stage and wave frequency curves for a range of frequencies, from the 100-percent flood to the 0.1-percent flood, are presented in Table 5.

Table 5: Water Surface Elevations (still water) west of Kearny Point

Average Frequency	NAVD88 (feet)
100%	4.96
50%	5.82
20%	7.00
10%	7.92
5%	8.90
2%	10.44
1%	11.82
0.5%	13.20
0.2%	14.84
0.1%	16.02

2.3 Land Use and Development

Current Land use in the study area is a combination of urban, industrial, and limited suburban developments. The following sections describe the land use in each component municipality of the study area in more detail (see section 3.5).

Table 6: Number of structures in the study area, by type and floodplain.

Damage Category	10% floodplain	1% floodplain	0.2% floodplain	0.2% floodplain + 2 ft
Apartment	134	583	783	899
Commercial	212	686	878	997
Industrial	550	986	1,123	1,166
Municipal	36	78	85	95
Residential	462	2,251	3,188	3,886
Total	1,394	4,585	6,058	7,044

Table 7: Value of structures in the study area, by type and floodplain.

Damage Category	10% floodplain	1% floodplain	0.2% floodplain	0.2% floodplain + 2 ft
Apartment	$235,543,000	$1,075,956,000	$1,441,161,000	$1,657,919,000
Commercial	$437,357,000	$1,654,450,000	$1,923,864,000	$2,351,241,000
Industrial	$1,772,715,000	$2,608,912,000	$3,059,963,000	$3,115,181,000
Municipal	$102,837,000	$666,327,000	$698,420,000	$748,230,000
Residential	$163,113,000	$774,031,000	$1,063,711,000	$1,288,920,000
Total	$2,711,565,000	$6,779,676,000	$8,187,119,000	$9,161,491,000

2.4 Economy

The City of Newark acts as one of the major hubs for air, shipping and rail transportation; including Port Newark, Newark Liberty International Airport, and several universities. Historically, the City of Newark has had a strong industrial and commercial economic base. It is home to four universities; New Jersey Medical School, New Jersey Institute of Technology, Rutgers University – Newark, and Essex County College.

Although Harrison is within Hudson County and is influenced by other Hudson County municipalities, Harrison is also influenced by the adjacent City of Newark due to its close proximity. In the past the Town of Harrison was heavily involved in industry and manufacturing, which began to move out in the late 1960s. Due to the Waterfront Redevelopment Plan of 2012, there has been an influx in residential and mixed-use development along the Passaic River and a decline in the manufacturing industrial sector. The Town of Harrison includes the Red Bull Arena, which is located near the Passaic River and was opened in 2010.

The Town of Kearny is located roughly six miles west of Manhattan. Much of the section of Kearny within the study area hosts commercial and industrial areas. From the late 1800s Kearny was an industrial area and was known as a factory town until the late 20th century. It was also the location of a ship yard for the construction of cargo ships and home of the 'Kearny Standard' for the manufacturing of tools and equipment. The Town of Kearny includes an extensive residential area in the north of the Town limits, which is located outside the boundary of this study.

The median household income for the study area is $78,466, or 10.2-percent greater than the State median household income of $71,180. However, the mean household income for the State of New Jersey of $95,812 is significantly higher than the study area figure of $80,688.

2.5 Transportation and Infrastructure

The study area contains important infrastructure that includes methods residents may use to evacuate the area during a storm event. Wastewater treatment services, energy infrastructure, railroads, and other valuable infrastructure are present in the study area (Figure 6):

- Passaic Valley Sewerage Commission Wastewater Treatment Plant
- Energy Infrastructure
    - Essex County Power Generation Plant
    - Kearny Power Generation Plan
- Newark Airport
- Rail Infrastructure
    - Newark Pennsylvania Station
    - Amtrak Kearny Sub Station
    - NJ Transit Train Yards
- Highways
    - I-95
    - I-280
- Port Newark

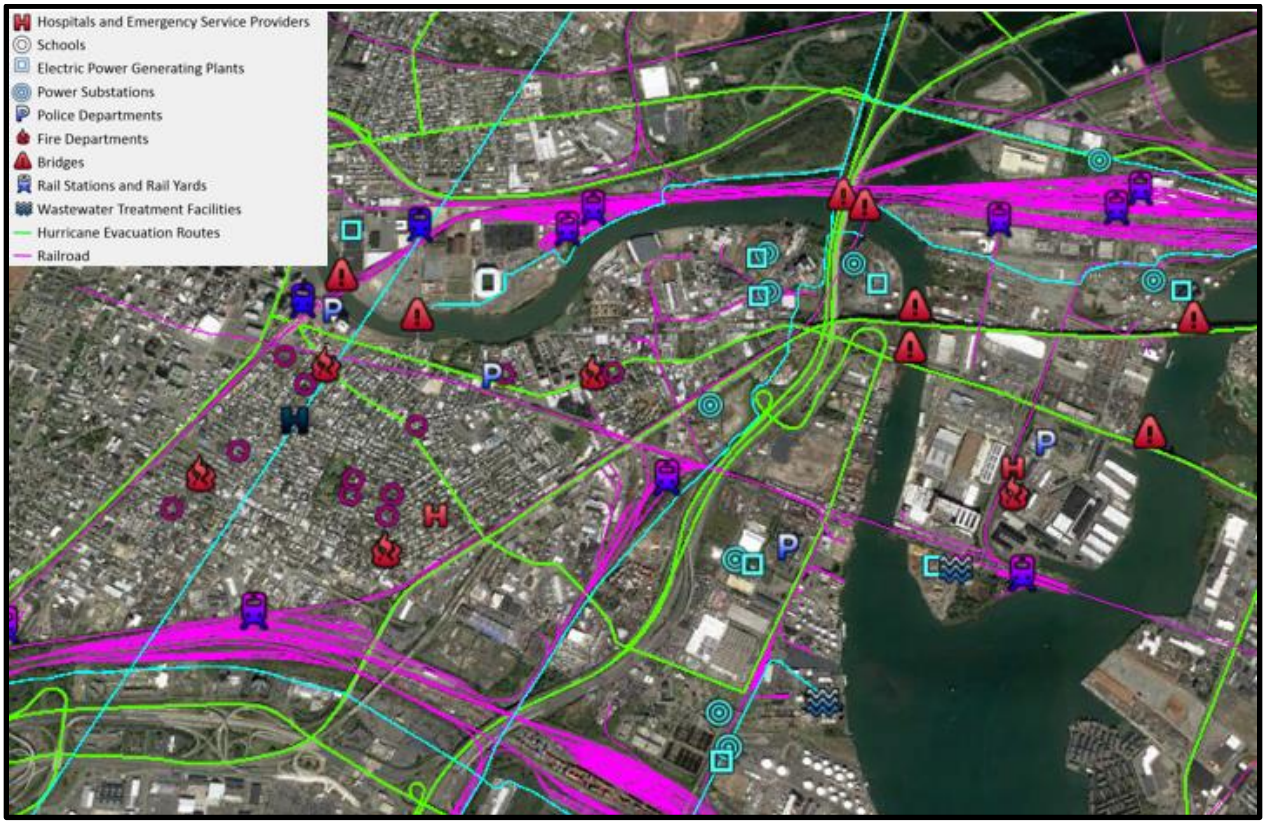

Figure 6: Infrastructure in the Study Area

2.6 Environmental Conditions

The existing environmental conditions are identified in Section 3 below. An assessment of potential environmental impacts is provided in Section 6.

Chapter 3: Affected/Existing Environment*

3.1 Physical Setting

3.1.1 Geology and Physiography

The Study Area is located along the southeastern edge of the Piedmont Physiographic Province, which encompasses Essex County and Hudson County. The Piedmont Province is characterized by rolling hill lowlands divided by broad, winding river valleys with well-developed floodplains. The province slopes from the foot of the Highlands Province toward its southeastern boundary toward the Inner-Coastal Plain Province.

The Study Area consists of an underlying slightly folded and faulted sedimentary rocks of Triassic and Holocene Age (240 to 140 million years old). The Triassic Age sedimentary rock is primarily comprised of siltstone, shale, sandstone, and conglomerate; the Holocene Age material is comprised of estuarine deposits and beach (NJDEP 1999).

3.1.2 Topography

In general, topography within the Piedmont Province is relatively flat with low rolling hills. Elevations in the Passaic River watershed range from approximately 400 ft above sea level in upstream portions, north and west of the Study Area to 0 ft (sea level) in lower portions. The Study Area lies within the Lower Valley portion of the Passaic River Basin, which is low lying and relatively flat, with elevations that range from sea level to approximately 30 ft above sea level. In this dense urban area, much of the topography has been altered by human activity through filling and construction of structures and infrastructure. The banks along the rivers and bay within the Study Area are mostly relatively steep and consist primarily of hardened shorelines consisting of bulkheads and other structures in an urban setting.

Most of the study area within the 1-percent floodplain (Figure 7). The ground elevation is generally +4 to +8 feet NAVD88 in the study area. The base flood elevation of areas shown in blue on Figure 7 is +10 NAVD88 to +12 feet NAVD88. Though rain sometimes inundates the area, most major flooding comes from the Passaic and Hackensack Rivers during coastal storms.

FEMA Preliminary Flood Insurance Rate Maps (FIRMs), released on 12/20/2013 for Hudson County and 05/30/2014 for Essex County, were used within the municipalities of Kearny, Harrison, and Newark, to delineate floodplains and identify structures subject to inundation during, flood events, notably the 1-percent flood (sometimes referred to as the “100-year”) event and the 0.2-percent flood (“500-year”) event. A floodplain corresponding to the 0.2-percent annual chance exceedance plus two feet was also developed to define the maximum extent of the structure inventory. Building footprint data for the approximately 7,000 structures covered by the study was obtained from the City of Newark, the New Jersey Meadowlands Commission, and the New Jersey Department of Environmental Protection.

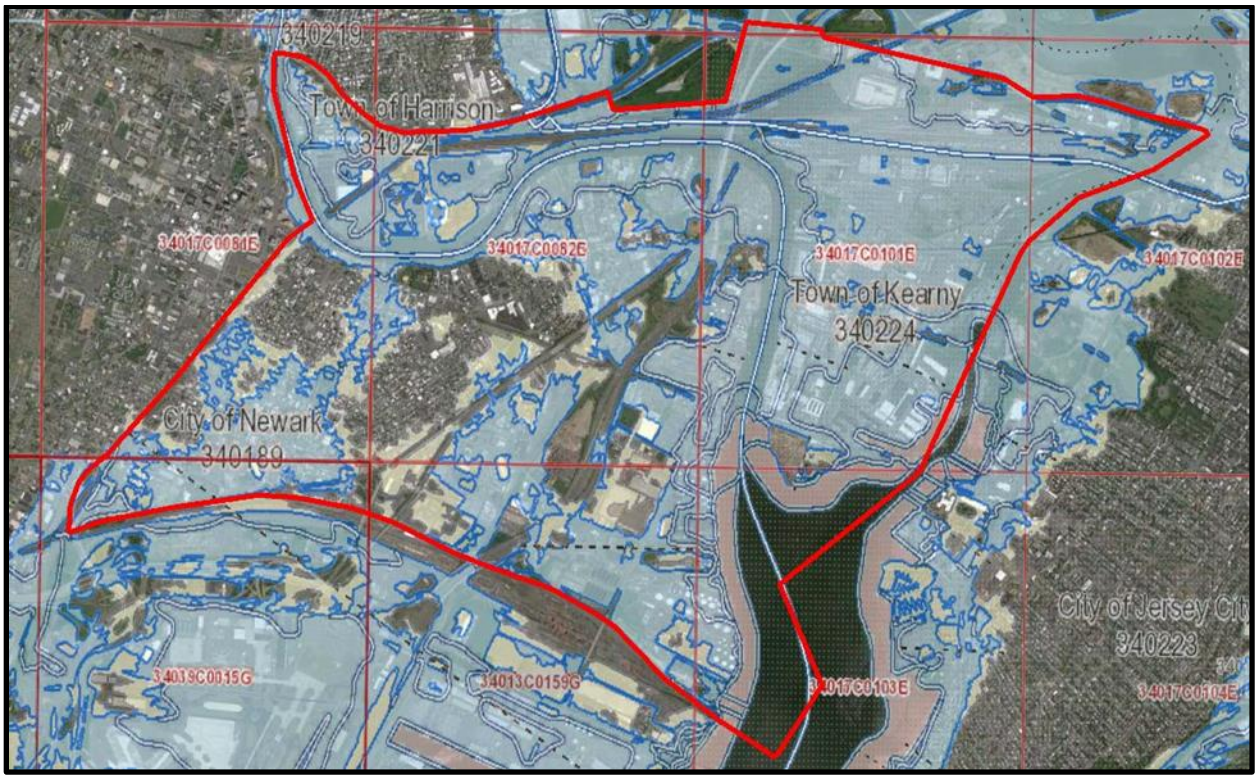

Figure 7: Preliminary FIRM showing the 1% (blue) and 0.2% (yellow) floodplains (FEMA, January 2015).

3.1.3 Soils

Soils in the Study Area include predominately non-hydric/upland soils. There is a small percentage of hydric/wetland soils located along the banks of the Passaic River, Hackensack River, and Newark Bay. According to the U.S. Department of Agriculture National Cooperative Soil Survey (Soil Survey Staff 2016), a large majority of the Study Area consist of Urban land, Dunellen substratum (0-8 percent slopes); Urban Land, wet substratum (0-8 percent slopes); Urban land, Bigapple substratum (0-8 percent slopes). Hydric soils tend to be concentrated in lower elevations along the Hackensack River and Passaic River. These soils typically have grayish and/or black subsoil and occur on tidal areas. Soils throughout the Study Area have been heavily disturbed as a result of urban development and industrial activities. Many of the soils consist of a mixture of construction debris and filled dredge materials. The majority of the natural soils are formed in stratified materials, from crystalline rocks, overlain by impervious surfaces of pavement, concrete, buildings, or other structures.

The primary soil types along the project alignment or Project Area are similar. These soils consist of Urban land, Dunellen substratum (0-8 percent slopes); Urban Land, wet substratum (0-8 percent slopes); Urban land, Bigapple substratum (0-8 percent slopes); Secaucus artifactual fine sandy loam (0-3 percent slopes).

The natural soils throughout the alignment of the floodwall/levee system are overlain by a layer of highly variable fill materials up to approximately 20 ft in thickness (USACE-NYD 2016). These materials are predominantly granular soils intermixed with silt, clay, and decaying organic soil

that have been placed incident to development over the past 200 years or more and include wood, metal, and general building demolition rubble (USACE-NYD, 2016).

3.2 Climate and Weather

Essex County and Hudson County experience significant seasonal and daily temperature fluctuations. Winters are generally cool with moderate snowfall and summers are moderate with hot mid-summer weather and frequent thunderstorms. Average temperatures range from 27 degrees Fahrenheit (°F) in January to a high of 84 °F in July. The monthly precipitation average ranges from 3.2 inches in February to 4.6 inches in July (National Weather Service, 2016). The growing season lasts approximately 180 days beginning in late April and ending in middle to late October. Changes in climate, with increases in frequency and intensity of coastal storms along with sea level rise from 0.71 to 3.50 ft (USACE-NYD, 2016), is expected in the Project Area over the next 50 years.

3.3 Floodplains and Coastal Processes

The following includes a description of the floodplains and coastal processes in the Study Area.

3.3.1 Floodplains

Over half of the Study Area lies within the FEMA designated 1-percent floodplain, based on the FIRMs. The 1-percent flood elevation is 11.82 ft NAVD88 in the Study Area. The 0.2-percent annual chance of exceedance is 14.84 ft NAVD88 in the Study Area. The portions of the Study Area within the 1-percent and 0.2-percent floodplain are illustrated in Figure 8.

3.3.2 Coastal Processes

Coastal processes include erosion and accretion which together result in shaping the shoreline. Erosion is the removal of sediment or material from a particular location by the action of wind or water. Accretion is the deposition of sediment or material in a particular location. The shoreline along the water bodies in the Study Area is subject to river currents and tidal fluctuation but is not influenced by larger waves and ocean currents such as longshore drift that are present in coastal environments that are exposed to the open ocean. Wind driven waves can erode the shoreline of the water bodies in the Study Area. Fetch is the distance that wind travels over open water and is a variable in determining the maximum wind driven wave height at a particular location. The Passaic

River and Hackensack River are both relatively narrow with a short fetch thus limiting the development of larger wind driven waves. Upper Newark Bay in the Study Area is less than 1 mile wide with a limited fetch from east wind driven waves. The portion of the Study Area that is exposed to wind driven waves with the longest fetch is Kearny Point with of a fetch of approximately 6 miles for northeast winds. Potential wave heights in Newark Bay can be over 6 ft for the most severe storms but are typically less than 4 ft (Shrestha et. al., 2014). Vessel-generated wakes associated with larger boats such as tugs, barges other deep-draft vessels are another source of wave action that has the potential to erode the shoreline in the Study Area.

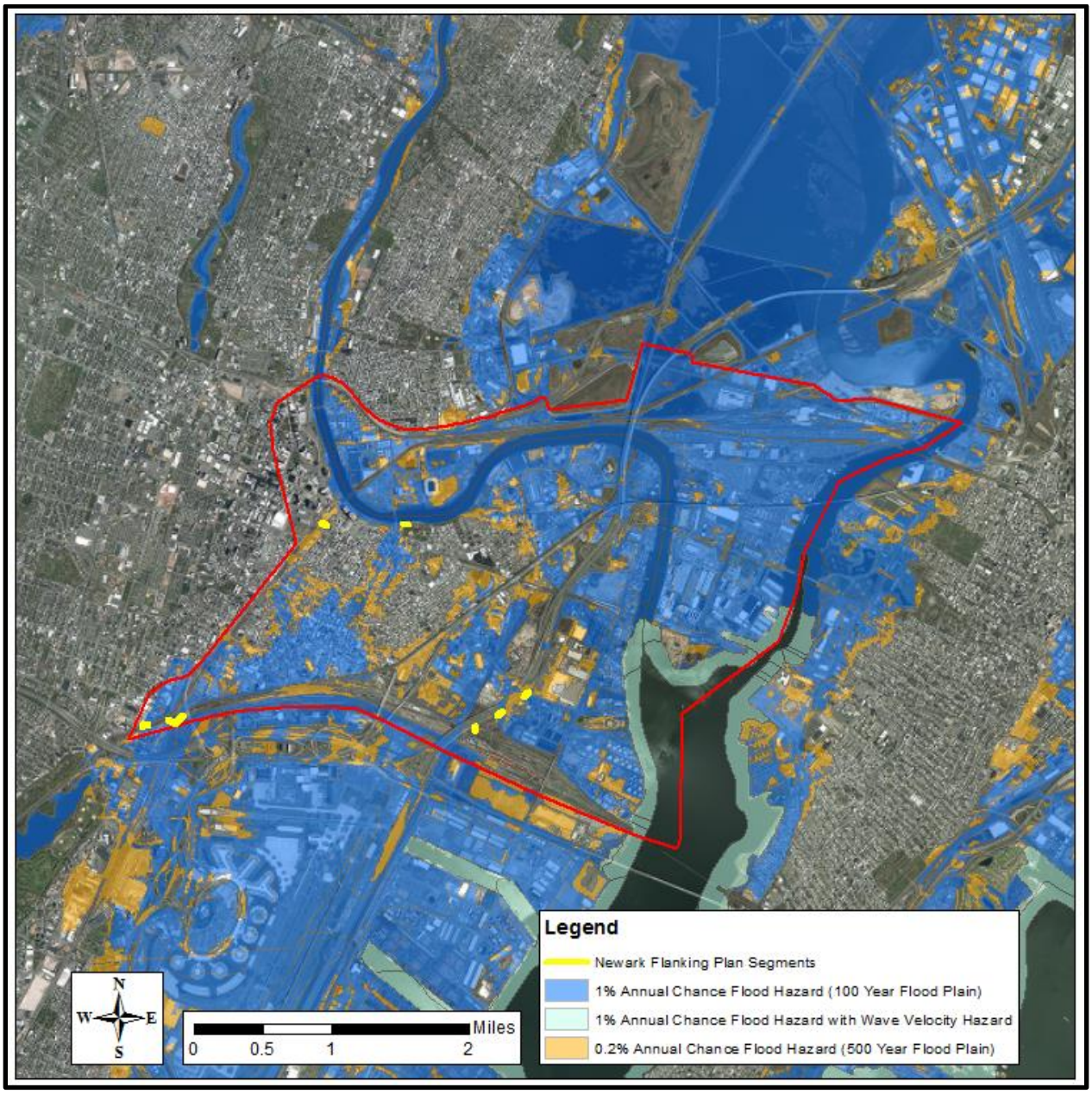

Figure 8: Floodplain within the Study Area

Like waves, currents can also erode the shoreline. Tidal currents in Newark Bay as well as in the Passaic River and Hackensack River are moderate with maximum speeds of 0.5 meters/second (approximately 1 knot) (HydroQual Inc., 2008). Localized higher velocity currents with the greater potential to erode the shoreline are present in constricted areas along the Passaic River and Hackensack River such as around bridges. Although these coastal processes exist, much of the shoreline in the Study Area is hardened, consisting of steel, timber or concrete bulkheading or walls or riprap for protection from erosion and to support the landward industrial development.

3.4 Water Resources

The following profile of water resources in the Study Area focuses on tidal surface waters, fresh surface waters, and regional hydrogeology and groundwater. Potential environmental impacts to each of these resources resulting from the No Action Alternative as well as construction and maintenance of the Proposed Action follow the existing conditions descriptions.

3.4.1 Surface Waters

The main surface water bodies in the Study Area include the Passaic River, Hackensack River, and upper Newark Bay. The Study Area includes the lower ±5 miles of the lower Passaic River above Newark Bay. The Passaic River flows south into the Study Area through the City of Newark and Town of Harrison. After entering the Study Area the river turns east then south again before flowing into upper Newark Bay. The area of the Passaic River watershed is approximately 935 square miles. There are also several small, tributaries to the Passaic River in the Study Area. An unnamed stream that drains the Kearny Marsh is located west of I-95 and enters the north bank of the Passaic River approximately 0.75 mile west of I-95. A smaller tributary (Lawyers Creek) is located just to the north of the Pulaski Skyway and flows east for approximately 0.25 mile to the west bank of the Passaic River. Additional sources of freshwater to the Passaic River include combined sewer overflows (CSOs) and stormwater overflows (SWOs). Density stratification is present in the Passaic River causing a reversal of residual current layers between the top and bottom layers of the water column with the shipping channel acting as a conveyance for the denser salt water (HydroQual Inc., 2008).

The lower ±2.75 miles of the Hackensack River flows south into the Study Area through the Town of Kearney and Jersey City before flowing into upper Newark Bay. The area of the Hackensack River watershed is approximately 202 square miles. There are no tributaries to the Hackensack River within the Study Area. The lower Hackensack River receives freshwater input from CSOs and SWOs.

The western portion of upper Newark Bay is within the Study Area. The Passaic River and Hackensack River are the principal sources of freshwater to Newark Bay with mean daily discharges of 1500 ft3/sec and 218 ft3/sec, respectively (Shrestha et. al., 2014). Other much smaller tributaries to upper Newark Bay include Jasper Creek located in the far south end of the Study Area and a small, short section of an unnamed, channelized stream that discharges to Newark Bay just south of the Passaic Valley Sewerage Commission (PVSC) wastewater treatment facility. Newark Bay also receives freshwater input from CSOs, SWOs and wastewater treatment plant outfalls. In the absence of strong winds the navigational channel in Newark Bay displays a two-layer circulation with a seaward surface flow of freshwater and a landward bottom flow of salt water similar in what is found in many estuaries (Shrestha, et. al., 2014). Tidal currents in Newark Bay, as well as in the Passaic River and Hackensack River, are moderate with maximum speeds of 0.5 meters/second (approximately 1 knot) (HydroQual Inc., 2008).

3.4.2 Water Quality

Surface waters in the Study Area are saline/estuarine waters, with tidal influences resulting in brackish water throughout the Study Area. The portion of the Passaic River and its two tributaries in the Study Area are classified in accordance with the NJDEP Surface Water Quality Standards (New Jersey Administrative Code (N.J.A.C.) 7:9B) as SE3 (SE means a general surface water classification applied to saline waters and estuaries with the number following the classification referring to the designated best use of the water body) (NJDEP 2011). The Hackensack River is

classified as SE3 from the Route 1 and 9 crossing downstream to Newark Bay. Upstream of the Route 1 and 9 crossing the Hackensack River is classified as SE2. Newark Bay and the two small tributaries are classified as SE3. SE3 waters are saline waters with designated uses of secondary contact recreation, maintenance and migration of fish populations, migration of diadromous fish, maintenance of wildlife, and any other reasonable uses. SE2 waters are saline waters with designated uses of maintenance, migration and propagation of the natural and established biota, migration of diadromous fish, maintenance of wildlife, secondary contact recreation, and any other reasonable uses.

Recreational activities in the Passaic River, Hackensack River, and Newark Bay are generally limited to boating. Uses of these waters for recreational fishing is limited or prohibited due to NJDEP established Fish Consumption Advisories; both statewide and in the Newark Bay Complex and the tidal portion of the Passaic River where specific advisories apply to the Study Area (NJDEP, 2013). The lower eight miles of the Passaic River, including the portion in the Study Area has been designated a Superfund site by the US Environmental Protection Agency due to contaminated sediments. Additional detail on this designation is provided in Section 3.16 Hazardous, Toxic, and Radioactive Waste.

3.4.3 Regional Hydrogeology and Groundwater

The Study Area is located in the Newark Group of aquifers that consist of shale and sandstone. Groundwater generally is present in weathered joint and fracture systems in the upper 200 to 300 ft with groundwater availability below 500 ft being less due to fractures being fewer and smaller (United States Geological Survey [USGS], 2016). Surface water reservoirs in northern New Jersey serve as the drinking water supply for communities in the Study Area. Groundwater is not a source of potable water in the Study Area.

3.4.4 Tidal Influences

The Passaic River, Hackensack River, and Newark Bay are all entirely tidal within the Study Area. These water bodies experience semi-diurnal tidal fluctuations but are sheltered from direct ocean waves. Brackish water extends throughout the Study Area. Two National Oceanic and Atmospheric Administration (NOAA) subordinate tidal stations are located in the Study Area. The Point No Point tidal station is located in the Passaic River under the US Route 1/9 truck bridge. The Kearny Point tidal station is located in the Hackensack River also below the US Route 1/9 truck bridge. The mean tidal range at both of these stations is 5.21 ft (NOAA, 2016).

3.5 Land Use and Zoning

The Study Area is currently dominated by industrial and urban land uses and also includes some residential areas and limited suburban developments.

Current land use in the Project Area is a combination of: (1) urban land uses (2) industrial land uses, and (3) transportation corridors.

3.5.1 City of Newark

The City of Newark has a total area of 26.1 square miles, including 24.2 square miles of land and 1.9 square mile of water (US Census, 2010). According to the US Census, Newark has the third

smallest land area among the 100 most populous cities in the United States. The densest areas of Newark are located further inland in proximity to public transportation.

The city of Newark is divided into five wards: East, South, Central, West, and North. The East Ward is zoned primarily as heavy industrial and port use. The South Ward encompasses Newark Liberty International Airport and associated airport support development. The Central Ward is a mix of light industrial use, institutional, neighborhood commercial and low-rise multifamily residential development. The West and North Wards consist of mostly residential use with a mix of single family residential, one-to-three family and townhouse residential, and parks with open space (DMJM Harris et. al., 2008).

The future development potential of the City of Newark is based on the development of approved projects not yet built and future development plans. There have been several proposals focusing on underutilized existing sites as potential redevelopment areas.

3.5.2 Town of Harrison

The Town of Harrison, located on the western edge of Hudson County along the eastern banks of the Passaic River, has a total area of 1.3 square mile, including 1.2 square mile of land and 0.12 square mile of water (US Census, 2010). Elevation is approximately 20 ft above sea level. Historically, the Town of Harrison has been occupied by industrial activities. Recently, the Town of Harrison developed a Waterfront Redevelopment Plan to capitalize on the Harrison Port Authority Trans-Hudson (PATH) Station, in order to provide a variety of mixed-use, transit-oriented, and pedestrian scale development (Heyer Gruel & Associates, 2012).

The Town of Harrison primarily consists of industrial and commercial land uses. The entire southern portion, south of Interstate-280, is occupied by railroad/utility, industrial, and undeveloped land uses. The area to the north of Interstate-280 features a mix of commercial mixed use buildings, industrial use, and single-family residential and multifamily residential units, with limited park/recreation use (Heyer Gruel & Associates, 2012).

The future development potential of the Town of Harrison is based on the development of approved projects not yet built and future development plans. Recently, the Town of Harrison prepared a Waterfront Redevelopment Plan in order to capitalize on the Harrison PATH Station and to provide a variety of potential mixed-use, transit-oriented, and pedestrian scale development (Heyer Gruel & Associates, 2012). Underutilized existing, primarily nonresidential sites are identified in the Waterfront Redevelopment Plan as potential redevelopment areas.

3.5.3 Town of Kearny

The Town of Kearny has a total area of 10.2 square miles, including 8.8 square miles of land and 1.4 square miles of water. The Town of Kearny is divided into three sections: the Kearny Uplands, the Kearny Meadows, and Kearny Point, also referred to as the South Kearny Peninsula. The Kearny Uplands consists of residential communities, while Kearny Point is an industrial district. Kearny Meadows consist of wetlands and tributaries, interspersed with residential and industrial communities (Department of Community Affairs, 2013). The Project Area includes Kearny Point, a heavily used industrial area.

The future development potential of the Town of Kearny is based on the development of approved projects not yet built and future development plans. The town planning board does not propose any substantially different land use concepts that would dramatically change the character of the

community (NY, NJ, CT Regional Plan Association, et. al., 2009). The Town of Kearny plans to focus on the 'Transit-Oriented Development Vision Plan,' using underutilized sites for potential redevelopment areas (NY, NJ, CT Regional Plan Association, et. al., 2009).

3.6 Socio-Economics

The Study Area falls within Essex and Hudson counties, specifically the City of Newark, Town of Harrison, and Town of Kearny. The communities in Newark, Harrison, and Kearny are relatively vulnerable to disasters such as nor'easters, tropical storms, and hurricanes. Vulnerability is defined by the diminished capacity of an individual or group to anticipate, cope with, resist and recover from the impact of a natural or man-made hazard. As compared to New Jersey and National population statistics, the communities are relatively young, minority, foreign-born, and poor.

Residents generally have problems evacuating prior to storms. This is due largely to a lack of automobiles available to many households. According to the 2010 U.S. Census, Newark has the second highest percentage (44.17%) in the Nation of households that do not own or otherwise have access to an automobile. (New York City, which has extensive public transportation networks, was the first-ranked city at 56% of households.) Cultural norms, lack of emergency money, and language barriers also significantly contribute to the problem.

In general, the Study Area contains predominantly industrial facilities with a mix of residential development. Profiles of the three communities within the Study Area are presented below.

3.6.1 The City of Newark

The City of Newark, located in Essex County, is the largest city in the state of New Jersey. It is situated on the western side of the Passaic River and Newark Bay, serving as a major international hub for air, shipping, and rail transportation in the metropolitan region. Port Newark, Newark Penn Station, and Newark Liberty International Airport are located in Newark. Historically, Newark has had a strong industrial and commercial economic base.

Newark is a dense urban area surrounded by residential communities. It is home to four universities: New Jersey Medical School, New Jersey Institute of Technology, Rutgers University – Newark, and Essex County College. Cultural amenities within the city include the Prudential Center sports arena and the New Jersey Performing Arts Center, as well as numerous museums, art galleries and cultural centers.

Newark is the second most racially diverse city in New Jersey, with a 52-percent African American population, followed by 26-percent White, and a 33-percent Hispanic population. Newark's population primarily consists of children under the age of 18, young adults and middle aged persons with an average age of 32 years. As of the last census data for the city, 25.6-percent of the population were under the age of 18, 11.9-percent were from 18 to 24, 31.9-percent were from 25 to 44, 22.1-percent were from 45 to 64, and 8.6-percent were 65 years of age or older (US Census, 2010).

Table 8 presents the populations, Table 9 presents the medium household incomes and Table 10 presents the employment by sector for the three municipalities in the Study Area.

Table 8: Population of Study Area Jurisdictions

	1980	1990	2000	2010	2014
City of Newark	329,248	275,221	273,546	277,140	280,579
Town of Harrison	12,242	13,425	14,424	13,620	15,376
Town of Kearny	35,735	34,874	40,513	40,684	41,837
Sources: U.S. Bureau of the Census: 1980, 1990, 2000, 2010, 2014					

Table 9: Median Household Income of Study Area Jurisdictions

	2000	2010	2014
New Jersey (State of)	55,146	69,811	72,062
City of Newark	29,913	35,659	34,012
Town of Harrison	41,350	51,193	53,772
Town of Kearny	47,757	58,698	63,093
Sources: U.S. Bureau of the Census, American Community Survey 5-Year Estimates 2000, 2010, 2014			

Table 10: Employment by Sector (2010) of Study Area Jurisdictions

Civilian employed population 16 years and over	Kearny		Harrison		Newark	
	Total	**%**	**Total**	**%**	**Total**	**%**
Industry:	19,543	100	6,828	100	111,834	100
Agriculture/Forestry/Fisheries/Mining	15	0.1	0	0	167	0.1
Construction	1,710	8.7	827	12.1	11,014	9.8
Manufacturing	1,923	9.8	741	10.9	9,327	8.3
Wholesale Trade	1,025	5.2	360	5.3	3,120	2.8
Retail Trade	1,538	7.9	797	11.7	10,525	9.4
Transportation/Utilities	2,327	11.9	655	9.6	10,652	9.5
Information	438	2.2	163	2.4	2,036	1.8
Finance/Insurance/Real Estate	1,330	6.8	411	6.0	6,618	5.9
Professional/Management	2,098	10.7	851	12.5	10,835	9.7
Educational/ Health care	3,855	19.7	1,068	15.6	25,771	23.0
Arts/Entertainment/Hospitality/Food	1,337	6.8	345	5.1	8,874	7.9
Public Administration	605	3.1	137	2.0	5,788	5.2
Other	1,342	6.9	473	6.9	7,107	6.4
Sources: U.S. Bureau of the Census: 1970, 1980, 1990, 2000, 2010,2014						

3.6.2 Town of Harrison

The Town of Harrison is located in Hudson County on the Passaic River adjacent to the City of Newark. In the past, the Town of Harrison was heavily influenced by industry and manufacturing; however, these business sectors began to decline in importance in the late 1960s. The town's Waterfront Redevelopment Plan of 2012 has resulted in an influx of residential and mixed-use development along the Passaic River and a further decline in the industrial and manufacturing sectors. The Town of Harrison includes Red Bull Arena, which is located along the Passaic River.

In the Town of Harrison, 20.8-percent of the population were under the age of 18, 10.9-percent were from 18 to 24 years of age, 35-percent were from 25 to 44 years of age, 24-percent were from 45 to 64 years of age, and 9.3-percent were 65 years of age or older (US Census, 2010). The Town of Harrison is racially made up of 61.7-percent White, 2.8-percent African American, 17-percent Asian, and 21.7-percent other race (US Census, 2010).

3.6.3 Town of Kearny

The Town of Kearny, located in Hudson County, is situated between the Passaic River and Hackensack River. A large majority of Kearny contains commercial and industrial uses, and there

are several residential communities in the eastern and northwestern portions of the town (Town of Kearny, 2016). The South Kearny peninsula, which is the portion of the town within the Study Area, is primarily industrial. Since the late 1800s, Kearny has been an industrial region and has served as a ship yard for the construction of cargo ships and home of the 'Kearny Standard' for the manufacturing of tools and equipment. The Kearny Works of Western Electric, which employed as many as 24,000 people in the production of hardware and supplies for the Bell System between 1926 and 1986, was formerly located in Kearny. The Kearny Works was sold by AT&T in 1984, at which time it employed 4,000 people.

In the Town of Kearny, 20.7-percent of the population were under the age of 18, 11.0-percent were from 18 to 24, 31.2-percent were from 25 to 44, 26.4-percent were from 45 to 64, and 10.7-percent were 65 years of age or older. The Town of Kearny is racially made up of 48.7-percent White, 39.9-percent Hispanic or Latino, 4.4-percent Asian, 5.4-percent African American (US Census, 2010).

3.6.4 Environmental Justice Summary

In accordance with Executive Order 12898 (dated February 11, 1994), federal agencies are required to identify and address the potential of disproportionately high and adverse human health on environmental effects of its programs, policies, and activities on minority populations and low-income populations.

According to the US Census, approximately 29.9-percent of the population of the City of Newark, 16.9-percent of the population of the Town of Harrison, and 10.8-percent of the population of the Town of Kearny had income below the poverty level in 2014.

Low income and minority populations are present in the Study Area and reside in the City of Newark, Harrison, and Kearny. Demographics and household income levels for each municipality is provided in Tables 11 and 12, respectively. Although the Proposed Action is intended to protect the Study Area from coastal storm damages and, therefore, would provide a public safety benefit to these populations, consideration must also be given to the potential for adverse impacts to these communities. Coordination and consultation with the municipal officials and community groups has been conducted and will continue throughout the project planning and design phases. Access to the waterfront and parklands has been identified by these entities as a key consideration. In addition, the Study Area is a non-attainment zone for air quality; therefore, construction related impacts to the local air quality are also evaluated from an environmental justice perspective.

The Newark Municipal Council passed the Environmental Justice and Cumulative Impacts Ordinance to address cumulative impacts that lead to disproportionate risks on low-income and residents of color. The ordinance requires industrial and commercial development proposals to include information on cumulative environmental impacts that will allow for informed decisions regarding development and the city's sustainability goals. The ordinance goal is to protect the health of all Newark residents from adverse health effects, including cumulative impacts, from development and to avoid or minimize any net new pollution to the environment or adversely impact public health.

Table 11: Demographics in the Three Project Area Municipalities, as of the 2010 U.S. Census

Distribution of Race/Ethnicity								
	Kearny		Harrison		Newark		New Jersey (State of)	
	Total	%	Total	%	Total	%	Total	%
	40,684	100	13,620	100	277,140	100	8,791,894	100
White alone	29,933	73.6	7,91	58.3	72,914	26.3	5,214,878	59.3
Black alone	2,186	5.4	297	2.2	145,085	52.4	1,204,826	13.7
American Indian alone	163	0.4	76	0.6	1,697	0.6	29,026	0.3
Asian/Pacific Islander alone	1,825	4.5	2,219	16.3	4,603	1.7	725,726	8.3
Other race alone	5,099	12.5	2,517	18.5	42,181	15.2	559,722	6.4
Two or More Races	1,478	3.6	570	4.2	10,660	3.8	240,303	2.7
Hispanic Origin	16,253	39.9	6,017	44.2	93,746	33.8	819,975	9.3
Source: U.S. Bureau of Census: 2010								

Table 12: Household Income Levels in the Three Project Area Municipalities

Household by Income - 2010								
Household Income Base	Kearny		Harrison		Newark		New Jersey (State of)	
	Total	%	Total	%	Total	%	Total	%
	13,518	100	4,582	100	92,618	100	3,172,421	100
<10,000	604	4.5	335	7.3	14,538	15.7	174,342	5.5
$10,000-14,999	526	3.9	272	5.9	7,385	8.0	130,977	4.1
$15,000-24,999	1,247	9.2	385	8.4	12,166	13.1	270,609	8.5
$25,000-34,999	1,261	9.3	305	6.7	11,503	12.4	256,073	8.1
$35,000-49,000	2,178	16.1	921	20.1	13,464	14.5	353,152	11.2
$50,000-74,999	2,642	19.5	1,099	24.0	15,053	16.3	541,530	17.1
$75,000-99,999	1,812	13.4	533	11.6	8,628	9.3	414,452	13.1
$100,000-149,999	2,239	16.6	505	11.0	7,259	7.8	526,854	16.6
$150,000-199,999	718	5.3	175	3.8	1,608	1.7	264,604	8.3
>$200,000	291	2.2	52	1.1	1,014	1.1	257,828	8.1
Source: U.S. Bureau of Census: 2010								

3.7 Coastal Zone Management

Pursuant to the Coastal Zone Management (CZM) Act of 1972 and the Coastal Zone Reauthorization Act Amendments of 1990, New Jersey has defined its coastal zone boundaries and developed legislation and policies to regulate resource protection and land use within the designated coastal zone. The NJDEP regulates the use and development of coastal resources under the Coastal Area Facility Review Act (N.J.S.A. 13:19-1 et seq.), the Wetlands Act of 1970 (N.J.S.A. 13:19-1 et seq.), and the Waterfront Development Law (N.J.S.A. 12:5-1 et seq.). Implementing policies and permit requirements for these coastal areas are presented in the CZM Rules at N.J.A.C. 7:7 (last amended on July 6, 2015). Each of these acts provides a slightly different definition of the coastal zone; therefore, the designated coastal zone consists of the cumulative total of these three definitions.

Portions of the Study Area are within the Waterfront Development Law regulated area, including upland and in-water Waterfront Coastal areas. There are no areas regulated under the Wetlands Act of 1970 or Coastal Area Facility Review Act in the Study Area. Although tidally influenced wetlands are present, these areas are not regulated pursuant to the Wetlands Act, which only pertains to wetlands mapped by the NJDEP in response to enactment of the Wetlands Act. Tidal wetland mapping by the NJDEP does not extend north of the south bank of the Raritan River, which is south of the Study Area.

Coastal areas defined in and regulated by the Waterfront Development Law includes tidal waters up to the mean high water (MHW) line and lands adjacent to tidal waters, extending from the MHW line to the first paved public road, railroad, or surveyable property line, to a maximum distance of 500 ft.

3.8 Vegetation

The Study Area is largely developed with commercial, industrial, and residential land uses where vegetation is limited to disturbance tolerant species that are typical of an urban/industrial setting. Vegetated areas are limited to maintained transportation corridors, lawns, and parks. These vegetative communities have been degraded as a result of centuries of anthropogenic disturbance. The wetland and upland habitats that comprise these communities are described below.

3.8.1 Upland Habitat

The upland communities within the Study Area are generally located in vegetated vacant lots, vegetated railroad corridors, and maintained lawns and parkland. Disturbed successional fields with early successional and invasive species dominate the undeveloped portions of the Study Area. Vegetation in these lots consists of mugwort (*Artemisia vulgaris*), English plantain (*Plantago lanceolata*), goldenrod (*Solidago* spp.), eastern cottonwood (*Populus deltoides*), tree of heaven (*Ailanthus altissima*), crown vetch (*Securigera varia*), garlic mustard (*Alliaria petiolata*), common mullein (*Verbascum thapsus*), downy brome grass (*Bromus tectorum*), and bedstraw (*Galium spp.*). Wooded uplands occur along riverbanks, including the southern shore of the Passaic River, the Turnpike Crossing along Raymond Boulevard, and on the northwestern shoreline of Kearny

Point. Open spaces serving as parkland contain large areas of mowed lawn and ornamental shrubs, often with trees along the perimeter.

The NJDEP regulated riparian zone extends 50 ft from each riverbank and streambank within the Study Area. Vegetated areas within the riparian zone would require mitigation for permanent and temporary impacts resulting from clearing. Mitigation will be conducted in accordance with applicable rules and permit conditions and in cooperation with the appropriate agencies.

3.8.2 Wetlands Habitat

Human-induced alterations, including dredging and filling, have modified most of the wetlands within the Study Area. Extensive residential, commercial, and industrial development is built upon wetlands that were filled prior to the enactment of the Clean Water Act. Development encroaches into the edges of wetlands currently present in the Study Area. These alterations have created areas of hydrologic obstruction and the segregation of historically contiguous wetlands.

A desktop assessment of wetlands within the Project Area was completed using wetland data available from NJDEP and the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (Figure 9). These map products are developed through interpretation of aerial photographs and presence of hydric soils and are not field verified, but they provide the general location of wetlands. The NJDEP and NWI maps indicate that wetlands may be present within the footprint of Segments 2 and 3, which are located at the southern portion of the Study Area. The maps classify the wetlands along Segment 2 as palustrine emergent wetlands that may have been disturbed and are dominated by common reed (*Phragmites australis*). The wetlands at Segment 3 are identified as palustrine emergent wetlands by NJDEP and estuarine and marine deepwater in the NWI. NWI and NJDEP wetlands and their classifications are outlined in Table 13.

All wetlands in the Study Area are regulated by NJDEP under the New Jersey Freshwater Wetlands Protection Act. In addition, the tidal wetlands are under the jurisdiction of the USACE under Section 404 of the Clean Water Act. The USACE may also assert jurisdiction over non-tidal wetlands within 1,000 ft of MHW, as well as wetlands further landward impacted by the Proposed Project. Impacts to regulated wetlands would require compensatory mitigation. Mitigation will be conducted in accordance with applicable rules and permit conditions and in cooperation with the appropriate agencies.

3.9 Fish and Wildlife Resources

3.9.1 Shellfish

Historic overharvesting, loss of habitat and pollution have had substantial impacts on shellfish populations within Newark Bay and its tributaries. Historically, the Passaic River has had shellfish populations that included Eastern oysters (*Crassostrea virginica*), various clam and mussel species, shrimp and crabs (Iannuzzi and Ludwig 2004). Today, there are no commercial shellfish

populations located in the Passaic River. Soft-shell clams (*Mya arenaria*) and blue mussels (*Mytilus edulis*) were reported in small numbers during a USACE benthic community survey that took place in Newark Bay in 2005 and 2013 (USACE 2014). Few blue crabs were also collected during USACE fish surveys in nearby Newark Bay near the confluence of the Passaic River (USACE, 2011, 2015). Little information is available on Hackensack River shellfish, however, due to the close proximity and similar conditions to Newark Bay and the Lower Passaic River, a similar community would be found.

Table 13: NJDEP and NWI Wetlands Mapped within the Project Area

Segment	NJDEP Wetland Classification	NWI Wetlands Classification
2	PEM1E: Palustrine, Emergent, Persistent, Seasonally flooded/saturated	PEM5Fh: Palustrine, Emergent, *Phragmites australis*, Semi-permanently flooded, Diked/impounded
3	PEM1B: Palustrine, Emergent, Persistent, Saturated	E1UBLx: Estuarine, Subtidal, Unconsolidated bottom, Subtidal, Excavated

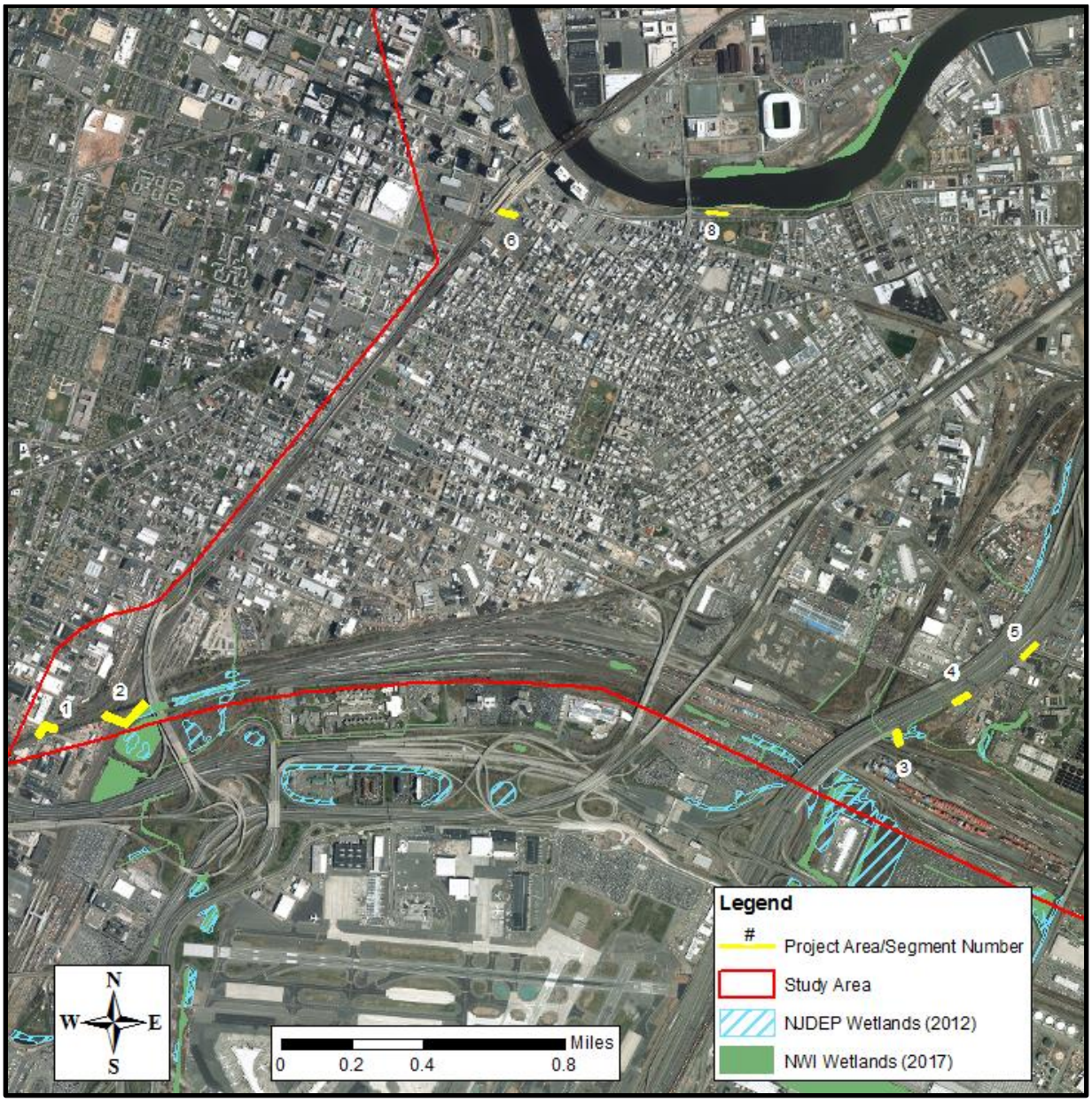

Figure 9: Mapped NJDEP and NWI Wetlands within the Study Area

3.9.2 Finfish

Aquatic habitats such as tidal rivers, creeks, and marshes with intertidal mudflats and subtidal shallows occurring in the Study Area represent those typically encountered in mid-Atlantic estuaries. Typically these habitats serve as a nursery area for early life stages of both resident and transient estuarine/marine species, and provide spawning habitat for freshwater and anadromous fish populations. The Study Area is a high density urban and industrial estuary with hardened shorelines that limit natural shallow and vegetated estuarine habitats that serve early life stages of fish populations.

Characteristic finfish found in the Passaic River include the American shad (*Alosa sapidissima*), gizzard shad (*Dorosoma cepedianum*), Atlantic menhaden (*Brevoortia tyrannus*), mummichog

(*Fundulus heteroclitus*), yellow perch (*Perca flavescens*), white perch (*Morone americana*), brown bullhead (*Ameiurus nebulosus*), striped bass (*Morone saxatilis*), and silversides (*Menidia* spp.), as well as alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), collectively referred to as river herring, and bluefish (*Pomatomus saltatrix*) and winter founder (*Pseudopleuronectes americanus*) which are managed fish species. Diversity and abundance of fish in the lower Passaic River is low relative to species reported in other New York/New Jersey estuaries (Iannuzzi and Ludwig 2004).

A number of aquatic species surveys have been completed in the Passaic and Hackensack Rivers and Newark Bay. A survey of aquatic species within the lower Passaic River was conducted during 1999 and 2000. A total of 22 fish species and blue crab were collected during the survey. Six species made up 98% of the total catch with mummichog comprising more than 75% of the total catch (Iannuzzi and Ludwig, 2004). In a comparative study that took place in 1987-1988 and 2001-2003, the New Jersey Meadowlands Commission in association with the Meadowlands Environmental Research Institute (MERI) documented the finfish population of the Hackensack River. White perch, mummichog, and Atlantic silverside (*Menidia menidia*) made up more than 80% of the total catch during the 2001-2003 study, compared to mummichog alone comprising approximately 85% of the catch in 1987-1988.

USACE also conducted a number of fish surveys in Newark Bay. A bottom trawl survey of aquatic species within Newark Bay was conducted from 1998 through 2010 (USACE 2011). A total of 53 fish species and blue crab were captured during the survey. Five species made up 94% of the total catch. These species included white perch, bay anchovy (*Anchoa mitchilli*), Atlantic herring, striped bass, and spotted hake (*Urophycis regia*). A mid-water trawl survey of aquatic species within Newark Bay was conducted in 2006 and 2011 (USACE 2015). A total of 41 fish species and blue crab were captured during the survey. Five species made up 96% of the collections with bay anchovy (*Anchoa mitchilli*) making up 81% of the total catch. Other abundant species include alewife, blueback herring, and gizzard shad. The ten most abundant species captured during these surveys are outlined in Table 14.

Table 14: Ten Most Abundant Species Captured during Surveys in or Near the Study Area

Common Name	Scientific Name	Lower Passaic River	Newark Bay – Bottom Trawls	Newark Bay – Midwater Trawls	Hackensack River
Alewife	*Alosa pseudoharengus*		X	X	
American eel	*Anguilla rostrata*	X			
Atlantic herring	*Clupea harengus*		X	X	
Atlantic menhaden	*Brevoortia tyrannus*	X		X	X
Atlantic silverside	*Menidia menidia*				X
Atlantic tomcod	*Microgadus tomcod*		X		
Bay anchovy	*Anchoa mitchilli*		X	X	
Blueback herring	*Alosa aestivalis*	X	X	X	X
Bluefish	*Pomatomus saltatrix*	X		X	
Brown bullhead	*Ameiurus nebulosus*				X
Butterfish	*Peprilus triacanthus*			X	
Common carp	*Cyprinus carpio*	X			
Gizzard shad	*Dorosoma cepedianum*	X		X	X
Inland silverside	*Menidia beryllina*	X			X
Mummichog	*Fundulus heteroclitus*	X			X
Red hake	*Urophycis chuss*		X		
Spotted hake	*Urophycis regia*		X		
Striped anchovy	*Anchoa hepsetus*			X	
Striped bass	*Morone saxatilis*	X	X		X
Striped killifish	*Fundulus majalis*				X
Weakfish	*Cynoscion regalis*			X	
White perch	*Morone americana*	X	X		X
Winter flounder	*Pseudopleuronectes americanus*		X		

Managed fish species are protected under the Magnuson-Stevens Fishery Management and Conservation Act (1996, as amended). In accordance with this Act, the New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), and the National Marine Fisheries Service (NMFS) have compiled and assigned Essential Fish Habitat (EFH) designations for species and life stages of fish, shellfish, and mollusks in the Passaic River/Newark Bay area. Consultation with NMFS is currently ongoing. An EFH Assessment Worksheet has been completed and is provided in Appendix C.

3.9.3 Benthic Resources

Benthic invertebrate taxa abundance and richness within the Study Area appears to be relatively low in comparison to other New York/New Jersey Harbor areas (e.g., Arthur Kill, Kill van Kull, Ambrose Channel) based on surveys conducted during 2005 and 2013 in Newark Bay (USACE 2014). Benthic macroinvertebrates found in the Passaic River, Hackensack River and the unnamed tributary to Jasper Creek where Segment 3 is located, would be expected to include various pollution-tolerant species of annelids, arthropods, and mollusks. Lower abundance and overall taxa richness would likely be due to a number of factors which include sediment type (silt and fine sand), low dissolved oxygen levels, and high ammonia/sulfide levels, lack of hard substrates and submerged aquatic vegetation, as well as high contamination levels within the substrates (mercury, poly-chloral benzoate [PCBs], dioxins) found in Newark Bay and the Passaic River.

3.9.4 Reptiles and Amphibians

Reptiles and amphibians occupy a wide diversity of habitats during their lifecycle, including vegetated uplands, permanently and seasonally flooded vegetated wetlands, and open water. A total of 71 species of reptiles and amphibians may occur in New Jersey (NJDEP 2016). A study was completed in the nearby Newark Bay area located to the south of the Study Area, identifying the presence of 17 species of reptiles and amphibians (USACE 1997). Based on existing conditions, available habitat and previous studies conducted in the vicinity, it is estimated that 6 reptile species may occur within the Study Area. A list of species expected within the Study Area is provided in Table 15.

The species identified may utilize vegetated habitat found along the banks of the Passaic River or brackish waters found in the Study Area. These species are common and tolerant of disturbance. The diamondback terrapin is typically found in brackish waters and is listed in the State of New Jersey as a species of special concern. Although not identified within the vicinity of the Project Area under the NJDEP Landscape Project, this species is known to inhabit the Hackensack Meadowlands and the lower Hackensack River (Bragin and Wood undated) and may migrate to portions of the Project Area which contain saline tidal wetlands.

3.9.1 Birds

Seasonal bird surveys conducted on the lower Passaic River in 1999 and 2000 reported 48 species of birds (Table 16), 19 of which are strictly terrestrial (Iannuzzi and Ludwig 2004).

Gulls are the most abundant species, followed by common ducks and swallows (Iannuzzi and Ludwig 2004). Other aquatic birds that may forage along the shorelines of the rivers or on mudflats

in the Study Area include the double-crested cormorant, herons, and egrets (Iannuzzi and Ludwig 2004).

Table 15: Reptiles and Amphibians found in Newark Bay

Common Name	Scientific Name
Amphibians	
Red-backed salamander	*Plethodon cinereus*
American toad	*Anaxyrus americanus*
Reptiles	
Northern brown snake	*Storeria dekayi*
Eastern black racer	*Coluber constrictor*
Common garter snake	*Thamnophis sirtalis*
Snapping turtle	*Chelydra serpentina*
Painted turtle	*Chrysemys picta*
Diamondback terrapin	*Malaclemys terrapin*
Eastern fence lizard	*Sceloporus undulatus*

Table 16: Birds Occurring Along the Lower Passaic River

Common Name	Scientific Name	Common Name	Scientific Name
Double-crested cormorant	*Phalacrocorax auritus*	Canada goose	*Branta canadensis*
Great egret	*Ardea alba*	Common merganser	*Mergus merganser*
Snowy egret	*Egretta thula*	American black duck	*Anas rubripes*
Black-crowned night-heron	*Nycticorax nycticorax*	Wood duck	*Aix sponsa*
Great blue heron	*Ardea herodias*	Mallard	*Anas platyrhynchos*
Green heron	*Butorides virescens*	Black scoter	*Melanitta nigra*
Little blue heron	*Egretta caerulea*	Osprey	*Pandion haliaetus*
White-winged scoter	*Melanitta fusca*	Belted kingfisher	*Ceryle alcyon*
Peregrine falcon	*Falco peregrinus*	Eastern kingbird	*Tyrannus*
Red-tailed hawk	*Buteo jamaicensis*	Blue Jay	*Cyanocitta cristata*
Killdeer	*Charadrius vociferus*	American crow	*Corvus brachyrhynchos*
Least sandpiper	*Calidris minutilla*	Fish crow	*Corvus ossifragus*
Spotted sandpiper	*Actitis macularia*	Barn swallow	*Hirundo rustica*
Greater yellowlegs	*Tringa melanoleuca*	Northern rough-winged swallow	*Stelgidopteryx serripennis*
Lesser yellowlegs	*Tringa flavipes*	Gray catbird	*Dumetella carolinensis*
Great black-backed Gull	*Larus marinus*	Northern mockingbird	*Mimus polyglottos*
Herring Gull	*Larus argentatus*	European starling	*Sturnus vulgaris*
Laughing gull	*Larus atricilla*	Northern cardinal	*Cardinalis cardinalis*
Ring-billed gull	*Larus delawarensis*	American tree sparrow	*Spizella arborea*
Budgerigar	*Melopsittacus undulatus*	Song sparrow	*Melospiza melodia*
Mourning dove	*Zenaida macroura*	White-throated sparrow	*Zonotrichia albicollis*
Rock dove	*Columba livia*	Red-winged blackbird	*Angelaius phoeniceus*
Common grackle	*Quiscalus quiscula*	House sparrow	*Passer montanus*
American goldfinch	*Carduelis tristis*	House finch	*Carpodacus mexicanus*
Note: Findings based on surveys conducted in 1999 and 2000 (Iannuzzi and Ludwig 2004)			

3.9.1 Mammals

Based on the availability and types of habitats present, and previous research completed in the Hackensack Meadowlands located to the north of the Study Area (Kiviat and MacDonald 2002), approximately 14 species of terrestrial mammals potentially occur within the Study Area (Table 17). Most of these are common species adapted to living in proximity to human communities, such as the eastern cottontail rabbit (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus)*, eastern gray squirrel (*Sciurus carolinensis)*, raccoon (*Procyon lotor*), and Virginia opossum (*Didelphis virginiana*).

Table 17: Common Mammals Found in the Project Area

Common Name	Scientific Name
Eastern cottontail rabbit	*Sylvilagus floridanus*
Eastern chipmunk	*Tamias striatus*
Eastern gray squirrel	*Sciurus carolinensis*
Raccoon	*Procyon lotor*
Virginia opossum	*Didelphis virginiana*
Striped skunk	*Mephitis mephitis*
Norway Rat	*Rattus norvegicus*
House mouse	*Mus musculus*
White-footed mouse	*Peromyscus leucopus*
Meadow vole	*Microtus pennsylvanicus*
Groundhog	*Marmota monax*
Muskrat	*Ondatra zibethicus*
Masked shrew	*Sorex cinereus*
Eastern mole	*Scalopus aquaticus*

3.10 Threatened and Endangered Species

The presence of Federally or State-listed threatened, endangered and special concern species were evaluated within the Study Area using the USFWS Information for Planning and Conservation (IPaC) system and the NJDEP Division of Fish and Wildlife Landscape Project (Version 3.1). The findings of this evaluation are provided below. Consultations with USFWS and the New Jersey Natural Heritage Program have been initiated to confirm the presence or absence of the species identified within the Study Area. Agency consultations are provided in Appendix D.

3.10.1 Federal Species of Concern

Under Section 7(a)(2) of the Federal Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) all Federally-listed rare, threatened, and endangered species are legally protected

(USFWS, 1999). Based on IPaC review, no Federally-listed endangered or threatened wildlife species have been identified within the boundaries of the Study Area (USFWS 2016). Additionally, no Federally-listed threatened or endangered species are documented as occurring within the Study Area, per the NJDEP's Landscape Project.

3.10.2 State Species of Concern

State-listed threatened, endangered, and special concern species were evaluated within the Study Area using NJDEP's Landscape Project (Version 3.1). Based on this evaluation, five threatened, endangered, or special concern species were identified, as listed in Table 18.

Four of the five species listed are wading birds that forage in tidal shallows and ponds. The peregrine falcon (*Falco peregrinus*) nests in urban structures and may forage within the Study Area.

Table 18: State Listed Species Identified within the Study Area

Common Name	Scientific Name	State Status
Glossy ibis	*Plegadis falcinellus*	Species of Special Concern
Snowy egret	*Egretta thula*	Species of Special Concern
Little blue heron	*Egretta caerulea*	Species of Special Concern
Black crowned night-heron	*Nycticorax nycticorax*	Threatened
Peregrine falcon	*Falco peregrinus*	Endangered

3.10.3 Designated Critical Habitat

Based upon the IPaC record search, there is no designated critical wildlife habitat present within the Study Area.

3.11 Cultural Resources

As a federal agency the USACE has certain responsibilities for the identification, protection and preservation of cultural resources that may be located within the Area of Potential Effect (APE) associated with the proposed Passaic Tidal Protection Area (Passaic Tidal or the Undertaking). Present statutes and regulations governing the identification, protection and preservation of these resources include the National Historic Preservation Act of 1966 (NHPA), as amended; the National Environmental Policy Act of 1969; Executive Order 11593; the regulations implementing Section 106 of the NHPA (36 CFR Part 800, Protection of Historic Properties, August 2004); and the U.S. Army Corps of Engineers Identification and Administration of Cultural Resources (33 CFR 305). Significant cultural resources include any material remains of human activity eligible for inclusion on the National Register of Historic Places (NRHP). This work is done in coordination with the New Jersey Historic Preservation Office (NJHPO).

As established by 36 CFR Part 60, an historical property (generally a property over 50 years of age) is eligible for listing in the National Register if it possesses "integrity of location, design, setting, materials, workmanship, feeling, and association," and it meets at least one of four criteria:

A. It is associated with events that have made a significant contribution to the broad patterns of our history; or
B. It is associated with the lives of persons significant in our past; or
C. It embodies the distinctive characteristics of a type, period, or method of construction, or it represents the work of a master, or it possesses high artistic values, or it represents a significant and distinguishable entity whose components may lack distinction; or
D. It has yielded, or may be likely to yield information important in prehistory or history.

Cultural resource work is coordinated with the NJHPO. The Advisory Council on Historic Preservation, Federally-recognized Tribes, other interested parties and the public are given opportunities to participate in the process.

3.11.1 Study Method and Area of Potential Effect

The cultural resources investigation for Passaic Tidal has been limited to documentary research, a review of field conditions using on-line imagery and a limited pedestrian survey. Documentary research consisted of gathering existing data from previous cultural resource studies and an examination of existing digital databases held by the NJHPO on NJgeoweb. Limited research into primary materials such as historic maps was undertaken although few published works on county and local histories were consulted at this time. Historical files on historic resources, such as Peddie's Ditch, were examined at the City of Newark Archives. The current study area has considerable overlap with other studies and relevant results from previous work have been integrated into the analyses and conclusions for this report. An initial site assessment and limited windshield survey where properties were visible from public roadways was conducted on 20 May 2016 and 12 July 2017. Google Earth satellite imagery was also used to assess site conditions.

3.11.2 Previous Work

Reports resulting from cultural resources investigations were consulted for information relevant to the current study area. One extensive study that encompassed much of the Passaic Tidal APE was conducted for the City of Newark as part of Combined Sewer Overflow Abatement Project (Richard Grubb & Associates 2000). While covering a very large area this survey was, however, very limited in terms of resources surveyed as it looked primarily at the extant historic sewer system. This work determined that the extant historic sewer systems constitutes an NRHP-eligible property. The researchers documented that the sewers were built almost exclusively of brick but were constructed in different dimensions and configurations including "circular, arch-shaped, U-shaped, horseshoe-shaped, box-shaped, egg-shaped and eye-shaped" (Modica 2007). The predominant shape is egg-shaped. Interestingly, some of the earliest sewer lines were built in the then outskirts of the city where there was no development as real estate interests hoped to encourage settlement by having this infrastructure in place. Mitigation undertaken by the City of Newark for impacts from their project on the sewer system included the public distribution of a publication on the historic sewer system (Modica 2007).

3.11.3 Historic Properties

Above-Ground

Several NRHP-listed or eligible historic districts and individual properties are located within the study area. These consist of: Lehigh Valley Railroad Historic District (LVRR HD) and contributing elements, Pennsylvania Railroad (PRR) New York to Philadelphia HD (now Amtrak's Northeast Corridor), PRR New York Bay Branch HD; LVRR Oak Island Yard HD; Newark Penn Station; Jackson Street Bridge; Riverbank Park and Fieldhouse; Passaic Valley Sewerage Commission Newark Bay Outfall Sewerage Works; Second Reformed Dutch Church and Rectory and the Ironbound Trust Company.

Below Ground

In addition to the NRHP-eligible Newark City Sewer System, other sub-surface resources include the Morris Canal HD, and associated archaeological resources, and the Balbach & Sons Smelting and Refining Works archaeological site (28-Ex-129).

Potential archaeological resources that may be encountered include sections of the Morris Canal, railroad features such as embankments, Peddie's Ditch, remains of the 19th-century Robinson & Roders Company factory, and the Balbach & Sons Smelting and Refining Works archaeological site.

3.12 Air Quality

Emissions from the project are associated with non-road construction equipment working on the site and on-road trucks moving on public roads to and from the Project site. Emissions from these two source categories, primarily generated from their diesel engines, include NOx, VOCs, SO2, CO, and PM2.5. Emissions from Federal Actions, such as the proposed project, are regulated under 40 CFR §93 Subpart B General Conformity, which aims to ensure that emissions from Federal Actions to not impede a State's progress toward achieving or maintaining compliance with National Ambient Air Quality Standards (NAAQS) under their applicable State Implementation Plan. Fugitive dust on the worksite can potentially be generated due to trucks and equipment moving on unpaved surfaces, but can be significantly reduced through the use of best management practices relating to site work dust mitigation.

The City of Newark, particularly the Ironbound neighborhood, has been impacted by polluting facilities and air pollutants from one of the country's largest seaports, an international airport, and a numerous heavily used commercial and passenger rail lines. Newark is also home to the largest trash incinerator in the northeast, which also contributes to the area pollution. It has been estimated that approximately 7,000 trucks make about 10,000 trips per day. As a result, Newark residents suffer from cancer risk due to diesel emissions and asthma. With a rate of 25%, Newark school children have double the New Jersey State and the nation average rates. The US EPA has been working with the city to monitor and track air quality environmental impacts on the community.

3.12.1 Green House Gases and Climate Change

In addition to the applicable regulated pollutants, each Federal Agency project's NEPA assessments will consider and evaluate greenhouse gases consistent with the final guidance on the consideration of greenhouse gas emissions and the effects of climate change issued by the former

administration's Council on Environmental Quality (CEQ). It is noted that this final guidance is no longer available on the current "whitehouse.gov" website (nor is anything related to the CEQ), but is posted on an archive website as footnoted below. The extent to which this guidance will be adopted by the current administration, if at all, is not known at this time.

3.13 Noise

The adjusted noise metric that most closely duplicates human perception of noise is known as the A-weighted decibel (dBA). Community noise levels in urban areas usually range between 45 dBA and 85 dBA with 45 dBA being the approximate daytime noise level in a typical quiet living room and 85 dBA being the approximate daytime noise level near a sidewalk adjacent to heavy traffic. The segments of the Proposed Action are adjacent to commercial, industrial, and transportation/utility land uses, with public open space found at Riverfront Park along Segment 8.

The primary source of noise in the Study Area is from vehicular traffic on state and local roadways and the New Jersey Turnpike; New Jersey Transit passenger rail traffic; CSX Intermodal Terminals and freight rail traffic; and commercial aircraft accessing Newark International Airport. Based on the land uses and identified noise sources typical noise levels in this area can be expected to be in the range of 60 to 80 dBA (United States Environmental Protection Agency [USEPA] 1978). However, noise levels greater than 80 dBA are also likely to occur given the presence of passenger rail and freight traffic near the Project Area, and aircraft associated with the airport.

The New Jersey statewide noise control code (N.J.A.C. 7:29) does not regulate noise from construction activities, however, the regulation contains a provision allowing for local municipalities to adopt their own noise control ordinance, provided it's consistent with, or more stringent than, N.J.A.C. 7:29.

The Project Area is located in the City of Newark and therefore is subject to comply with the city's local ordinances. Title 20:3-13(g) of the Newark Ordinance prohibits the operation of tools or equipment used in construction, drilling, demolition or similar work between the hours of 8:00 p.m. and 7:00 a.m. on weekdays or Saturday, and at any time on Sunday or legal holidays except for emergency work, or by special variance issued pursuant to the Newark Ordinance, or when the resulting sound level does not exceed the maximum permissible sound levels outlined in Table 19. Table 19 outlines the noise thresholds for the City of Newark as detected at receiving properties generated at adjacent or surrounding residential, commercial, and industrial properties. Because no construction would occur within the Kearny or Jersey City portions of the Study Area under the Proposed Action, the noise ordinances of those municipalities are not presented herein.

Table 19: Maximum Permissible Sound Levels by Receiving Property

	Receiving Property Category			
Sound Source Property Category	**Residential (7:00 a.m. to 10:00 p.m.)**	**Residential (10:00 p.m. to 7:00 a.m.)**	**Commercial (All Times)**	**Industrial (All Times)**
Residential	55 dBA	50 dBA	65 dBA	75 dBA
Commercial	65 dBA	50 dBA	65 dBA	75 dBA
Industrial	65 dBA	50 dBA	65 dBA	75 dBA

3.14 Recreation

The City of Newark and the Towns of Kearny and Harrison maintain open spaces, town parks, and recreational areas in the Study Area. The locations of these public spaces are shown on Figure 10 and are described below. There also numerous private playgrounds, baseball fields, basketball courts and pools within the Study Area. In addition, there are also public access points for small recreational vessels, for boating and fishing, rowing, canoeing, and kayaking. Recreational activities in the Study Area include field sports, biking, birding, and wildlife observation.

Joseph G. Minish Passaic River Waterfront Park and Historic Area (Minish Park) is located in Newark along the Passaic River from Bridge Street to Brill Street. Following Hurricane Sandy, the USACE, New York District, partnered with the NJDEP and the City of Newark to construct the Minish Park Project. This project has reduced riverbank erosion and created waterfront park development and returned public access to the Passaic River. Phase I has been completed and includes 6,000 ft of new bulkhead, 3,200 ft of restored riverbank and creation of wetlands. Overall, the project has reduced erosion, provided environmental restoration, recreation, and economic development benefits (USACE 2016). As of February 2016, project partners are working towards a project agreement for Phase II/III design and construction. Phases I and II would complement the existing park space by providing stream bank stabilization to the park and furnishing railings along all of the bulkheads. Phase II would add a 9,200-ft waterfront walkway and Phase III would consist of park facilities, plazas, and landscaping, and enables the development of complementary facilities by others, i.e. links to the New Jersey Performing Arts Center and Riverbank Park.

Washington Park is located on Washington Avenue and Washington Place in Newark. This small, triangular park is across the street from the Newark Main Library and a short distance from One Washington Place (where the Rutgers Business School and the Audible Headquarters are housed). The Newark Light Rail also stops here.

Riverfront Park is located along the west ascending bank of the Passaic River at river mile 5.9 in the City of Newark. This 12-acre park in Newark was completed in 2013 with Green Acres and *Hazardous Discharge Site Remediation Fund* funding, and has transformed a former brownfield site/industrial site, into public open space (Trust for Public Land, 2016).The park consists of forested open space plus amenities including a baseball field, two playgrounds, tennis and

basketball courts, an open grassy area and a turf soccer field, as well as walking paths and river views (Essex County 2016).

Riverbank Park is located in what is commonly known as the "Ironbound" section of the City of Newark, and also part of Kearny. It sits along the Passaic River and is host to many recreational uses. Riverbank Park is located off Raymond Boulevard, Market, Van Buren, and Somme Streets, within the east side section of Newark. A portion of the park across Raymond Boulevard has 1,000 ft of waterfront access on the Passaic River, and includes land which once held the old Morris Canal. At 11 acres, it is the smallest park in Essex County (Essex County 2016). Riverbank Park was designed by the Olmsted brothers and is listed on both the New Jersey and the National Registers of Historic Places, and a multi-million dollar restoration and upgrade of the park was completed in 2003.

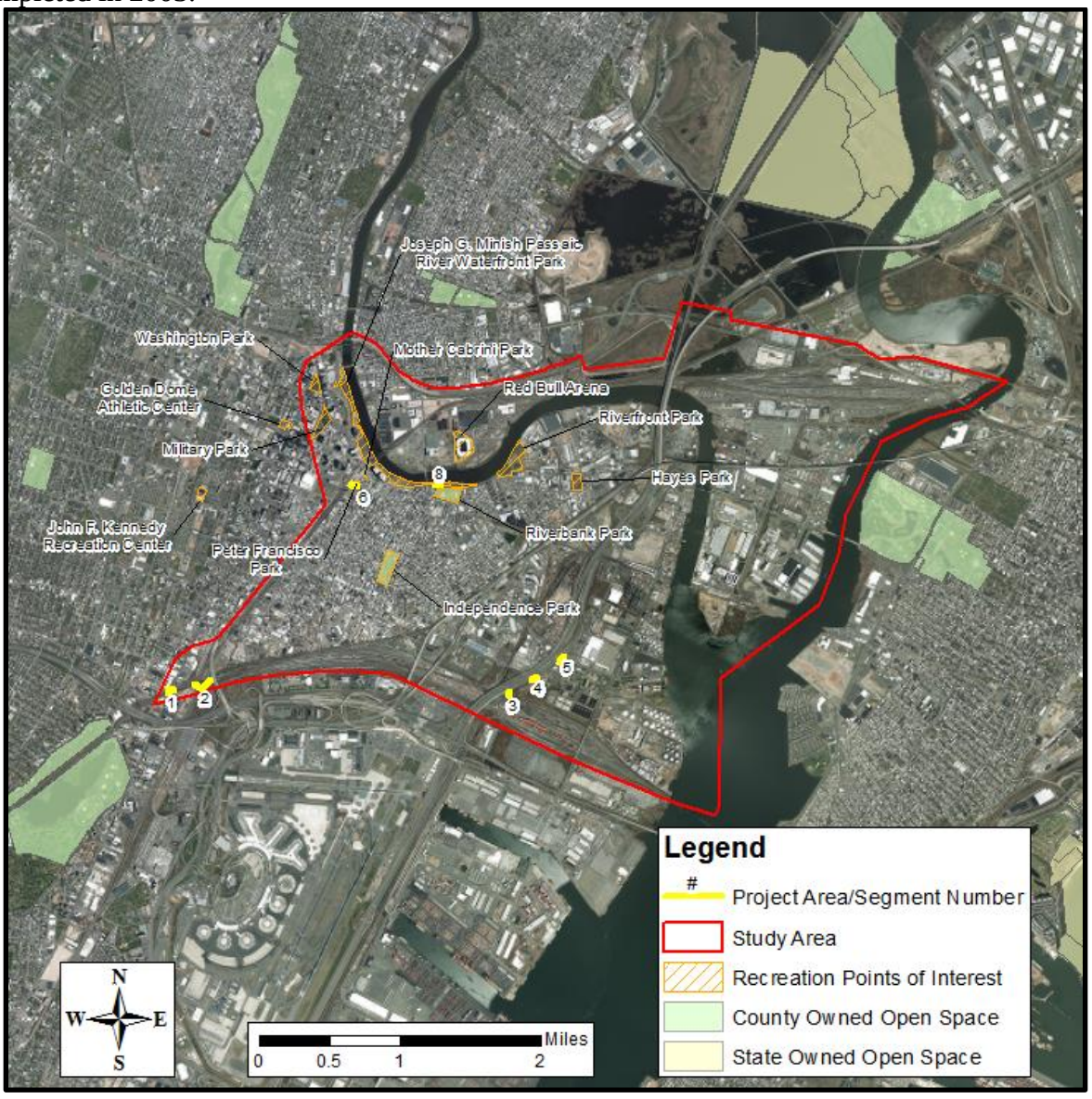

Figure 10: Recreation Facilities Located within the Study Area

Independence Park is located in the Ironbound or "Down Neck" section of Newark. It is bordered by Walnut Street on the north, Oliver Street on the south, and Adams and Van Buren Streets west and east. This 13-acre park was designed by the Olmsted brothers and serves the neighborhood with athletic fields, basketball courts, a playground, and walking paths (Essex County 2016).

Hayes Park on Raymond Boulevard in Newark is a common space in a former industrial neighborhood. It currently consists of open/grass weedy areas with trees around the perimeter. Plans are being developed to improve the park for community use (Heritage Architecture 2016).

Military Park is a historic park that serves as the central downtown gathering space for the Newark community. After many years as an underutilized space, Military Park is now part of Newark's revitalized town square. The park is privately operated and managed by a nonprofit corporation, the Military Park Partnership. Fitness programs, arts and culture programs, and children's programs are offered at the park, on a weekly basis (Military Park Partnership 2016).

Among the many smaller public parks within the Study Area are: **Lombardy Park**, a very small triangular lot located off of McCarter Highway; **Peter Francisco Park**, located just outside of Penn Station on Ferry Street in Newark. The park was built in 1966 by the Municipal Council of Newark and contains a 12-ft monument in honor of Peter Francisco, funded by the Portuguese American Community, and **Mother Cabrini Park**, also a small, triangular park located outside of Penn Station Newark, on Commerce Street, named after Saint Francesca Xavier Cabrini.

There are also numerous recreation centers, including **John F. Kennedy Recreation Center**, located on Kinney Street in Newark, and the **Golden Dome Athletic Center**, a stadium located in Rutgers University Newark campus on Warren Street, among other recreation centers and aquatic complexes. Harrison is home to **Red Bull Arena**, a soccer-specific stadium, home of the New York Red Bulls of Major League Soccer and New York Red Bulls II of the United Soccer Leagues.

3.15 Aesthetics and Scenic Resources

The lower Passaic River and Hackensack River are bounded primarily by private property and areas where public access is limited. Land uses immediately surrounding the waterfront are predominantly developed for industrial uses, including shipping and wastewater treatment. Rail, barge, truck, and storage infrastructure also line the waterfront. As such, the majority of the Study Area currently offers limited aesthetic and scenic resources due to its developed commercial and industrial character. Riverfront and Minish parks are the only public spaces that offer open water views of the lower Passaic River in the Study Area.

Views from the Passaic River offered to recreational boaters in the Study Area are primarily industrial development. This is particularly true along the east bank of the Passaic River on Kearny Point between the Passaic and Hackensack rivers, and on the west bank of the Passaic River east of NJ-25/US-1/Lincoln Highway in Newark, where industrial development is heaviest. Riverfront and Minish parks located along the waterfront of the Passaic River in the Study Area offer views of public open space. Existing industrial complexes, commercial buildings, residences, and other structures serve as sources of light and glare, which are generated from interior and exterior lighting, traffic headlights, street lighting, and reflective surfaces.

There are no designated State Scenic Byways located in the Project Area and the proposed project would not be located near any such State Scenic Byway. In addition, the Passaic and Hackensack Rivers hold no designations as National Wild and Scenic Rivers or American Heritage Rivers.

3.16 Hazardous, Toxic, and Radioactive Waste

Much of the City of Newark, particularly along the Passaic River and along the railroad and highway corridors, has been occupied by industrial sites for nearly 150 years. These sites ranged from heavy industrial uses, including chemical and paint manufacturing, power generating stations and oil refining and storage, to light manufacturing, and truck/vehicle maintenance areas and transportation hubs. A number of hazardous sites have been identified along the Passaic River and include Superfund sites such as Diamond Shamrock, the Lower Passaic River, and Riverside Trucking. Many of these sites are active and have been identified for chemical, volatile organics, PCBs and fuel with soil and/or groundwater contamination. A number of sites have plans for or are in various stages of remediation and cleanup.

The Known Contaminated Sites list, maintained by the NJDEP, list 650 active sites for the City of Newark. These sites include current and former gasoline stations, dry cleaners, machine shops, salvage yards, former manufacturing sites and portions of the railroad. Much of the city, particularly just inland of the river, was former wetlands that were filled in the late 19th and early 20th century to create additional land for the expansion of Newark's industrial base. A National Priority List site, Pierson's Creek, is located in south east Newark. The site is associated with the Troy Chemical Corporation. The company allegedly dumped untreated wastewater in the creek from 1956 through 1965, contaminating the sediment with high levels of mercury.

3.17 Transportation and Other Infrastructure

The Study Area is located within the New York metropolitan region with direct access to road, rail, and air networks, and is bounded by Newark Turnpike and Essex Freeway to the north, Interstate 78 to the south, Hackensack River to the east, and McCarter Highway to the west. The majority of roads in the Study Area are classified as local streets, which primarily function to provide access to abutting residential, industrial, and commercial properties; however, there is nearby access to major highways, such as U.S. Route 1/9 (US-1/9, NJDOT 2013 Average Annual Daily Traffic (AADT) 77,000), the Essex Freeway (I-280, NJDOT 2015 AADT 74,000), and Interstate 95 (I-95, CBRE Traffic Counts 2011 AADT 177,000). Nine bridges span the Passaic River and five bridges span the Hackensack River within the Study Area which is served by several transit providers for service throughout much of the state and connection to New York City, including New Jersey Transit Rail Operations (NJTR), New Jersey Transit Bus Operations, Amtrak Northeast Corridor, and Port Authority Trans-Hudson (PATH). The Newark Pennsylvania Station is a major transit hub located in the vicinity of the Study Area.

The Study Area also contains a network of active and inactive commercial freight rail tracks. NJTR owns several lines used for freight, and the main storage and maintenance facility is the Meadows Maintenance Complex in Kearny. CSX owns several rail lines for freight within the Study Area, and owns the CSX South Kearny Yard in Kearny.

Most of the lower Passaic River within the Study Area has been deepened as a result of various navigation projects for the purpose of commerce and industry (USACE 2010). The navigation channels of the Passaic River and the Hackensack Rivers connect communities, supporting both commercial and recreational boating.

A wastewater treatment plant, operated by PVSC, is located on the west side of the lower Passaic River at its confluence with Newark Bay. Two power generation plants: Essex Generating Station in Newark and Kearny Generating Station in South Kearny serve the Study Area. The City of Newark, which makes up 5.0 miles of the project alignment, is served by a century-old combined sewer system with CSO events (Amar et al. 2014).

Chapter 4: Plan Formulation

4.1 Problem Identification

Problem definition is the detailed description of a problem. It begins with a problem statement, a simple assertion of what the basic problem is.

Problem Statement: The study area experiences damages from flooding due to storm surge caused by coastal storms such as nor'easters, tropical storms, and hurricanes.

Structures and infrastructure in the study area are repeatedly flooded by coastal storms. Major damage is caused by inundation from storm surge and waves. The areas that incur the most repeated damages are within the 1-percent floodplain.

Hurricane Sandy was devastating to the area. In Newark, 266 homes and 10,522 businesses were damaged; Harrison had 100 homes and 536 businesses damaged; and Kearny had 96 homes and 1,484 businesses damaged (www.njspotlight.com). The average damage to homes was $10,600 in Newark, $6,000 in Kearny, and $12,200 in Harrison. There were two Hurricane Sandy-related deaths in the study area; a 47 year old died from drowning and a 65 year old died from acute asthma exacerbation.

Since the inception of the National Flood Insurance Program (NFIP), over $52,000,000 in insurance claims has been distributed (Table 20). Most of these claims were due to damage incurred by coastal storms.

Table 20: NFIP Claims, 1978 - 2015

Municipality	Total Payments
Newark	$17,408,228
Kearny	$29,389,876
Harrison	$5,334,049
Total	$52,132,153

FEMA distributed over $5,400,000 in Newark, $850,000 in Kearny, $300,000 Harrison to local governments for Hurricane Sandy emergency response (debris removal and emergency protective measures).

The following sections describe how we estimate the amount of damage to structures and vehicles in the study area.

Structure Inventory

A structure inventory was completed in February 2015 for use in computing flood inundation damages in the study area using standard planning methods and models. In addition to theoretical flood damages, the team is collecting historic damage figures from local and state government, and businesses.

FEMA Preliminary Flood Insurance Rate Maps (pFIRM), released on 12/20/2013 for Hudson County and 05/30/2014 for Essex County, were used within the municipalities of Kearny, Harrison, and Newark, to delineate floodplains and identify structures subject to inundation during, flood events, notably the 1-percent flood event and the 0.2-percent flood event. A floodplain corresponding to two feet above the 0.2-percent flood was also developed to define the maximum extent of the structure inventory. Building footprint data for the approximately 7,000 structures covered by the study was obtained from the City of Newark, the New Jersey Meadowlands Commission, and the New Jersey Department of Environmental Protection.

Due to time and budgetary constraints, a field survey to collect data for all 7,000 or so structures in the area could not be conducted. Instead, a sample of 520 structures was selected for detailed survey in the field, and their typical characteristics were extrapolated to the remaining structures to populate the full inventory database.

Inventory Sample Design

The study area was delineated into five areas for structure sampling (Figure 11). In the Newark, Kearny, and Harrison areas, a focus was placed on the largest structures within the 1-percent floodplain, because these structures are expected to be the largest source of flood damage in the study area. In the Newark Additional area, 100 structures were sampled randomly in clusters of ten. In the Additional Harrison area, all of the structures in the 1-percent and 0.2-percent floodplains were sampled, as well as the three largest structures in the 0.2-percent + 2 foot floodplain. Table 21 provides a summary of the structure inventory sample. Structures outside of the 0.2-percent +2 foot floodplain were not included in the survey.

Field Survey Methodology

A "windshield survey" of the sample structures was conducted using topographic mapping with a 2-foot contour interval during January and February 2015. For each building, data was gathered in the field pertaining to its damage potential including ground and main floor elevations, lowest opening, construction material, and basement. The full list of information recorded via the windshield survey is below:

- Type/Damage Category
- Usage
- Size
- Basement
- Foundation Type
- Number of Stories
- Construction Material
- Quality of Construction
- Condition
- Ground Elevation
- First Floor Elevation Above Grade
- Low Opening Relative to First Floor

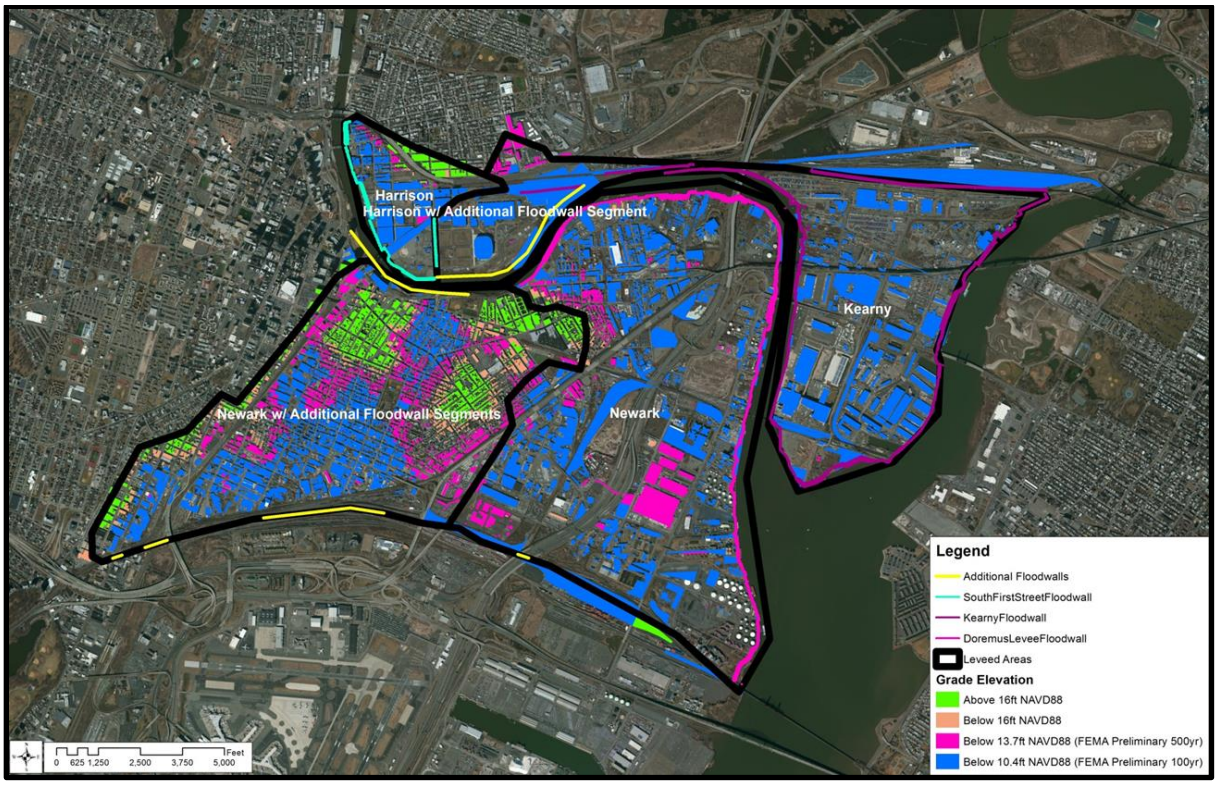

Figure 11: Delineation of the Five Areas Sampled

Table 21: Summary of structure inventory sample

Area	Sample	Total	%	Selection Criteria
Newark	400	6,190	6%	The 300 largest structures in the 1% floodplain plus 100 additional structures in 10 randomly-selected clusters in the 100-year floodplain.
Kearny	100	261	38%	The 100 largest structures in the 1% floodplain.
Harrison	80	323	25%	The 50 largest structures in the 1% floodplain plus 30 structures in the 0.2% floodplain in the Harrison Section 2 area.
Total	**520**	**6,774**	**8%**	

To supplement and confirm structure inventory collected via the field survey, tax parcel data was obtained from the MOD-IV tax list search database (http://oprs.co.monmouth.nj.us/oprs/External.aspx?iId=12). The MOD-IV property tax system is the mandatory method of tax record keeping in the state of New Jersey. It provides for the uniform preparation, maintenance, presentation, and storage of detailed property tax information. This information includes property address, block/lot, owner, property class (use), land value, and improvement (building or structure) value.

Estimation of Structure Value

One of the key components of the data required by Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA) is the depreciated structure replacement value for each structure. The area of each structure footprint was measured using GIS, and values were estimated using square foot costs and location adjustment factors published by RS Means in January 2015.

For approximately 500 structures, physical characteristics were compiled from the observations made in the windshield survey in the field. Attributes for the remaining structures in the study area were extrapolated from publicly available data and from the average characteristics and average square foot costs of the surveyed structures. The extrapolation was further refined based upon adjacent parcel information and reference to the Mod-IV data.

Tables 22 and 23 provide a breakdown of the full inventory going forward into the computation of flood damages by damage category and floodplain.

Table 22: Number of structures in the study area, by type and floodplain

Damage Category	10% floodplain	1% floodplain	0.2% floodplain	0.2% floodplain + 2ft
Apartment	46	449	695	859
Commercial	89	556	784	926
Industrial	402	900	1,058	1,128
Municipal	29	66	78	87
Residential	131	1,620	2,886	3,774
Total	697	3,591	5,501	6,774

Table 23: Value of Structures, by Type and Floodplain

Damage Category	10% floodplain	1% floodplain	0.2% floodplain	0.2% floodplain + 2ft
Apartment	$88,338,000	$810,947,000	$1,283,273,000	$1,589,009,000
Commercial	$205,895,000	$1,286,217,000	$1,528,332,000	$2,001,076,000
Industrial	$1,549,053,000	$2,709,911,000	$3,213,129,000	$3,300,636,000
Municipal	$76,654,000	$521,379,000	$636,153,000	$714,652,000
Residential	$31,937,000	$528,880,000	$950,739,000	$1,250,029,000
Total	$1,951,877,000	$5,857,334,000	$7,611,626,000	$8,855,403,000

Additional Key Analytical Data

In addition to structure physical characteristics and values, critical data for each structure such as ground elevations and stream stationing were assigned using LiDAR and cross-sections developed by USACE.

The analysis also required the assignment of the most appropriate depth-damage relationships to all structures in the inventory. While several sets of damage functions have been developed by USACE for use in studies such as this one, the functions selected for this study were drawn from two sources:

- The most recent standard depth damage curves for residential structures issued by the District, which are the Generic Depth-Damage Relationships for Residential Structures without Basements (Economic Guidance Memorandum [EGM] 01-03, 4 December 2000) and the Generic Depth-Damage Relationships for Residential Structures with Basements (EGM 04-01, 10 October 2003). These functions have become the standard flood depth-damage functions for use in Corps studies in both coastal and riverine areas for single-family residential and similar structures since their release.
- The Passaic River Basin (PRB) functions for residential and non-residential structures, which were developed specifically for use in the Passaic River Basin in the years 1980-1982, and which were based on approximately 3,500 interviews with property owners in the floodplain. Several recent studies have been accepted using the EGM 01-03 and EGM 04-01 functions for most residential structures and the PRB functions for non- residential and larger residential structures.

Hence the study used a combination of PRB and EGM 01-03 and EGM 04-01 functions as described above, but with the existing "other" damage component of the PRB functions (originally intended to cover damage to motor vehicles, landscaping and outbuildings, as well as non-physical costs associated with evacuation and re-occupation, debris removal, and temporary housing) discarded in favor of the following additional modeled damage categories:

- Motor vehicles (in accordance with EGM 09-04: see below for a more detailed description)
- Emergency costs and debris removal (based on tools developed as part of the recent North Atlantic Coast Comprehensive Study (NACCS, USACE 2015))

The flood damages associated with motor vehicles was computed in accordance with the Corps guidance found in EGM 09-04, "Generic Depth-Damage Relationships for Vehicles", 22 June 2009. For each residential structure in the inventory, an additional 'structure' was added to the inventory to represent those vehicles.

Each additional vehicle structure was assumed to have the same ground elevation as the parent structure and was assigned a value based on assumptions regarding the average number of households per residential structure, the number of vehicles per household, the average value of pre-owned vehicles, and the probability that owners would remove vehicles to safety prior to a flooding event. The sources for these assumptions were the US Census Bureau, Internet research,

and tables provided in EGM 09-04. The resulting value of vehicles assumed to be at risk in the study area is presented in Table 24.

Table 24: Value of vehicles by location and floodplain

Damage Category	10% floodplain	1% floodplain	0.2% floodplain	0.2% floodplain + 2 ft
Newark Section	$514,000	$1,760,000	$3,551,000	$4,565,000
Kearny Section	$0	$0	$0	$0
Harrison Section 1	$981,000	$3,468,000	$3,658,000	$3,750,000
Harrison Section 2	$0	$0	$0	$0
Minish Park Section	$576,000	$8,512,000	$13,224,000	$16,396,000
Newark Flanking Section	$337,000	$8,859,000	$15,315,000	$19,614,000
Newark Gap	$0	$1,036,000	$3,205,000	$6,008,000
Total	$2,409,000	$23,635,000	$38,953,000	$50,332,000

Following the computation of structure values and extrapolation of average/typical parameters to the non-surveyed structures, further research using publicly available sources (such as company websites) was undertaken for the larger commercial structures to refine structure and content values and the assignment of damage functions.

4.2 Future Without Project Conditions

Under future without-project conditions, the study area will continue to be subject to flooding due to storm surge from coastal storms. Inundation due to storm surge is expected to increase gradually over time in direct relation to sea level change resulting in the future (Table 25).

Sea level is predicted to continue to rise in the study area. Figure 12 shows predicted sea level change based on long term trends measured in the area over the period of analysis (2020 – 2070) at the Sandy Hook NOAA gage, as calculated using procedures in ER 1100-2-8162. The "low" (historic) scenario = 0.64 feet, "intermediate" scenario = 1.11 feet, "high" scenario = 2.61 feet.

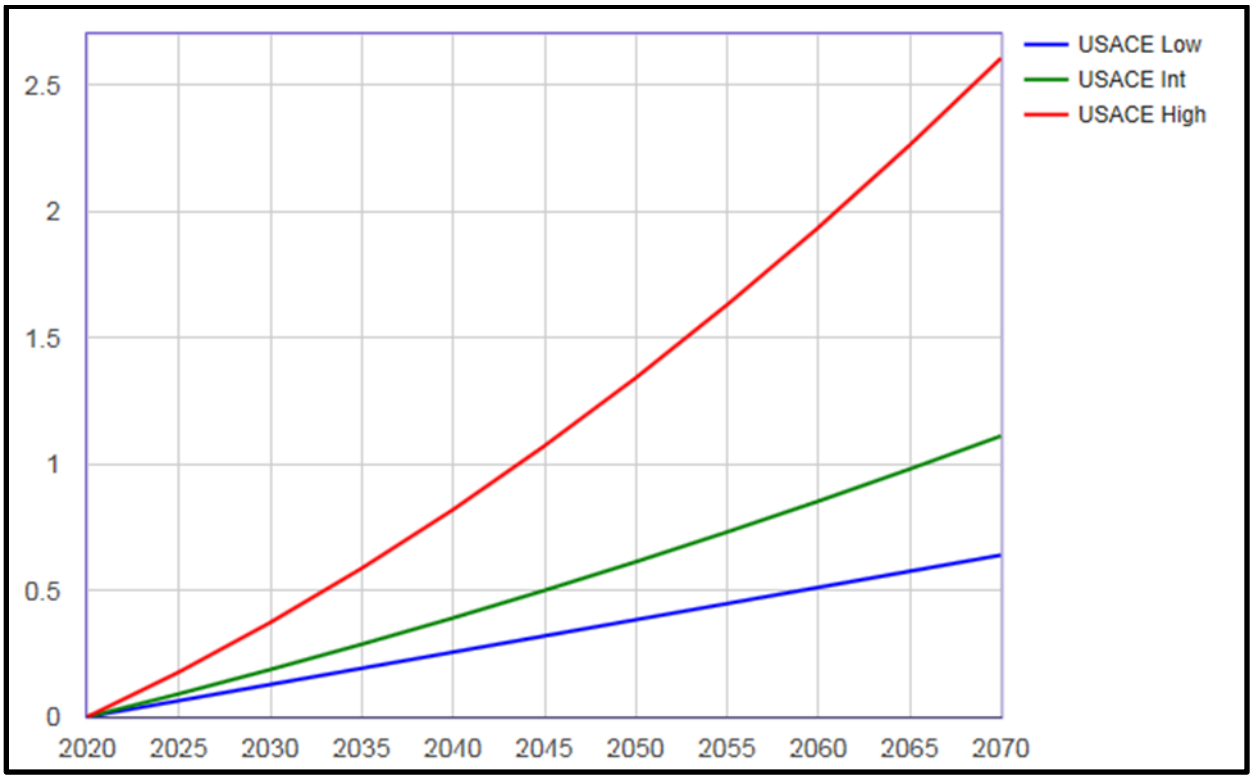

Figure 12: Sea level change 2020 – 2070 (Sandy Hook NOAA gage).

Table 25: Effects of Projected RSLC Rates on Stage-Frequency Data (Kearny Point)

		Projections per ER 1100-2-8162		
Average Frequency	NAVD88 (feet)	Low	Intermediate	High
1	4.96	5.6	5.96	7.53
2	5.82	6.46	6.82	8.39
5	7.00	7.64	8	9.57
10	7.92	8.56	8.92	10.49
20	8.90	9.54	9.9	11.47
50	10.44	11.08	11.44	13.01
100	11.82	12.46	12.82	14.39
200	13.20	13.84	14.2	15.77
500	14.84	15.48	15.84	17.41
1,000	16.02	16.66	17.02	18.59

It is expected that structures will be damaged more frequently and severely in the future due to increased water levels from predicted sea level rise in the study area. The team has completed a structure inventory, data from which will be used with the HEC-FDA economic model and appropriate depth-damage curves to estimate economic damages. All flood damage analysis damage computations were completed using Version 1.4 of HEC-FDA, certified for nationwide use as a planning model for flood risk management studies by the National Flood Risk Management Planning Center of Expertise in December 2014. HEC-FDA incorporates risk and uncertainty associated with critical parameters in the computation of flood damages in accordance with current Corps policies. Equivalent annual damages over the 50-year period of analysis are presented in a similar format in Table 26. The equivalent annual damage due to flood inundation of structures and motor vehicles in the study area is approximately $70 million (Oct. 2015 price levels). The computation of damages associated with emergency costs and debris removal is ongoing.

Table 26: Summary of Without-Project Damages

Equivalent Annual Damage								
Economic Reach	**Damage Categories**							**Total**
	Apartment	**Commercial**	**Industrial**	**Municipal**	**Residential**	**Vehicles**	**Debris**	
Harrison Section 1	$174,100	$2,111,600	$3,370,100	$43,500	$921,800	$116,800	$68,500	$6,806,400
Harrison Section 2	$0	$542,400	$800,800	$0	$0	$0	$15,200	$1,358,400
Kearny Section	$0	$4,370,100	$19,253,900	$4,158,000	$0	$0	$340,200	$28,122,200
Newark Section	$281,600	$6,616,100	$11,776,200	$2,751,400	$882,600	$98,400	$251,600	$22,657,900
Minish Park Section	$384,000	$1,653,100	$235,300	$254,300	$1,461,900	$121,700	$13,000	$4,123,300
Newark Flanking Section	$454,700	$3,759,600	$1,814,400	$574,000	$1,938,100	$130,600	$49,400	$8,720,800
Newark Gap	$35,100	$734,000	$106,700	$3,500	$419,800	$17,700	$3,900	$1,320,700
Totals	$1,329,500	$19,786,900	$37,357,400	$7,784,700	$5,624,200	$485,200	$741,800	$73,109,700

Price Level: February 2015, Interest Rate 3.125%

4.3 Opportunities

Opportunities to solve problems in the study area have been identified by the study team. There is an opportunity in the study area to reduce the risk of coastal storm flooding to residents, property, and infrastructure.

Other opportunities include:

- Improve interior drainage (though not a primary project purpose, interior drainage will be managed by proposed project elements such as pump stations)
- Increase or improve recreation and waterfront access

4.4 Planning Goal & Objectives

A study goal based on problems and opportunities was developed to help create and evaluate alternative plans. It is the overarching intent of the project. The period of analysis for this study is 2020 to 2070.

Project Goal: Reduce the risk of storm surge flooding and associated damages in the study area.

Study Goal: Reevaluate authorized project to determine technical feasibility, environmental acceptability and that the plan is economically justifiable.

Plans are formulated to achieve planning objectives. Planning objectives and constraints are inexorably linked to problems and opportunities. A planning objective states the intended purposes of the planning process. It is a statement of what solutions should try to achieve.

Objectives provide a clear statement of the study purpose. In support of the goal, the planning objectives are to:

1. Reduce the risk of damages due to storm surge in the study area through the period of analysis.
2. Support community resilience and cohesion in the study area through the period of analysis.

4.5 Planning Constraints and Considerations

Constraints are restrictions that limit the extent of the planning process. They can be divided into universal constraints and study-specific constraints. Universal planning constraints are the legal and policy constraints to be included in every planning study. Study-specific planning constraints are statements of things unique to a specific planning study that alternative plans should avoid. Only study-specific constraints are included below. Constraints are designed to avoid undesirable changes between without- and with-project conditions.

Study-specific constraints include:

- Maintain current and planned waterfront uses: The waterfront is entirely developed, mostly with industrial infrastructure related to manufacturing and shipping (barges, rail infrastructure, trucks, etc.). In addition, there are public resources such as parks that are of great value to residents in the area. The largest, Riverfront Park, is currently being expanded. The project cannot greatly impact this existing and planned waterfront infrastructure, which is the only open space, recreational facility in downtown Newark.
- Minimize impacts to resilience projects: Federal, state, and local governments, as well as businesses and homeowners, have heavily invested in post-storm recovery projects in the study area. The project should not compromise the function of existing, or planned and funded resilience projects.
- Minimize impacts to current and planned development: The study area is a densely-developed urban environment. The City of Newark is the second largest city in the New York Metropolitan Area. The project team will consider current and planned development, specifically when investigating potential alternations to the authorized alignment.

Planning Considerations

- Location and extent of contaminated sites: There are many contaminated sites of concern that have been identified by the USEPA and NJDEP. These include sites containing elevated levels of mercury, dioxins, lead, and other industrial contaminants. The District is in the process of working with the USEPA, NJDEP, and others to identify the location, extent, and status of remediation for all sites that may be remediated under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund"), Resource Conservation and Recovery Act, and other laws.
- Consideration of current and planned development: The U.S. Federal Emergency Management Agency, U.S. Department of Housing and Urban Development and other Federal agencies are investing hundreds of millions of dollars to increase storm resilience in the study area. In addition, major public and private developments are currently being planned and constructed. The study team will continue to coordinate with Federal, state, and local agencies and stakeholders about the scope of their plans.
- Potential impact of CSOs on interior drainage. There are many combined sewer overflows (CSOs) in the study area. The study team is working with local and state agencies to identify the location and capacity of CSOs, and how they affect local drainage patterns. This information will be considered when considering potential ponding areas, pump station locations, and other interior drainage features.

4.6 Management Measures

General Reevaluation Reports reanalyze the proposed plans of previous reports; in this case, the 1995 GDM. Because tidal storm surge is the major driver of flooding, and the Passaic Tidal reach is characterized by a relatively large hydraulic channel capacity for flood flows due to its enlargement for navigation, only two measures were considered in the 1995 GDM to be effective within the Passaic Tidal area – levees and floodwalls, and a tidal barrier. All other measures (with the exception of basin-wide locally-implementable nonstructural measures such as evacuation plans and zoning) were decided to not be effective in reducing coastal storm risk in the tidally-influenced sub-reach, and were dropped from further consideration. The measures considered during the previous study, as identified in NACCS, are as follows:

- Acquisition and relocation
- Building retrofit
- Enhanced flood warning and evacuation planning
- Land use management/ conservation and preservation of undeveloped land, zoning, and flood insurance
- Deployable floodwalls
- Floodwalls and levees
- Shoreline stabilization
- Storm surge barriers
- Barrier island preservation and beach restoration
- Beach restoration and breakwaters
- Beach restoration and groins
- Drainage improvements
- Living shorelines
- Overwash fans
- Reefs
- Submerged aquatic vegetation
- Wetlands

Levees and floodwalls were considered a stand-alone plan (Plan 11 from USACE 1987), and included in a number of multi-feature plans. The tidal barrier was combined with limited, downriver levees and floodwalls as Plan 27.

Levees and floodwalls were carried forward for consideration. The Tidal barrier was dropped from consideration during the initial screening of alternatives because it was found to be not economically justified. This HSGRR/EA performs a cursory reanalysis on the levees and floodwall option and the tidal barrier option identified by the 1995 GDM.

1. Levees and Floodwalls (measures included in many plans). Levees and floodwalls were included in many plans and their iterations considered during formulation of the Passaic River Main Stem Study. Three plans were carried forward for consideration after final

screening: Plan 30E (Pompton River/Passaic River Dual Inlet Tunnel Diversion Plan)[1], Plan 30A (Single Inlet Tunnel Plan)[2], and Plan 16A (No Tunnel Plan)[3].

Each of these three plans included the same extent of levees and floodwalls within the Passaic Tidal area. All plans included 5.5 miles of levees and 5.0 miles of floodwalls that would provide protection against a storm with a 0.2-percent annual chance of occurrence[4] in the Passaic Tidal sub-basin. The levees and floodwalls were ultimately included in the recommended plan (Plan 30E, the Pompton River/Passaic River Dual Inlet Tunnel Diversion).

2. Tidal Barrier[5] (Plan 27). The purpose of the tidal barrier is to prevent unusually high tides caused by storm surge from entering the lower Passaic River Basin. The tidal barrier analyzed during the Passaic River Basin Study included two sector gates that would remain open under normal conditions (<5.0 feet National Geodetic Vertical Datum (NGVD) tides); a short non-overflow concrete dam; a 50-foot wide spillway gate; a pumping plant to prevent ponding; and 100 feet of levee and 12,600 feet of floodwall downstream of the barrier.

   The proposed barrier is located near the mouth of the Passaic River in the vicinity of an abandoned Central Railroad of New Jersey river crossing within the 30-foot navigation channel (Figure 13). The channel width is 700 feet at this location. The height of barrier would be +15 feet NGVD. It would be expected to defend against a storm that is five feet higher than the 1-percent annual chance of occurrence6, under expected 2040 conditions. The pumping station capacity would be 20,000 cfs during a storm with a 1-percent annual chance of occurrence7.

   The total project cost of the tidal barrier plan was estimated to be $152,000,000 (October 1985 PL). The total annual cost was estimated to be $18,600,000 (October 1985 PL)[8]. This plan was dropped from further consideration during the initial screening of alternatives because, based on preliminary analysis, it was not cost effective.

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[1] Information from 1987 GDM Appendix C – page C-453, and Table C-80 "Plan 30E – Dual Inlet Tunnel Plan – Levee/Floodwall Physical Features" on page C-457.
[2] Information from 1987 GDM Appendix C – page C-461, and Table C-82 "Plan 30A – Single Inlet Tunnel Plan – Levee/Floodwall Physical Characteristics" on page C-464.
[3] Information from 1987 GDM Appendix C – page C-466, and Table C-84 "Plan 16A – Levee/Floodwall Physical Features" on page C-470.
[4] As calculated in the 1980s and presented in the 1987 GDM. Based on current H&H modeling, this return period is actually higher (i.e., more frequent).
[5] Information from 1987 GDM Appendix C – page C-315, and Figure C-53 "Tidal Barrier Building Block 27" on page C-318.
[6] As calculated in the 1980s and presented in the 1987 GDM. Based on current H&H modeling, this return period is actually higher (i.e., more frequent).
[7] As calculated in the 1980s and presented in the 1987 GDM. Based on current H&H modeling, this return period is actually higher (i.e., more frequent).
[8] Information from 1987 GDM Appendix C – page C-317.

4.6.1 Cursory Re-Analysis of Passaic Tidal Sub-Reach

Cost estimates presented in this section are based on using the location and specifications of the previously-described tidal barrier and levee/floodwall alternatives included in the 1987 GDM. Estimates were completed using a price level (PL) update, and cost estimates for barriers, levees, and floodwalls detailed in the January 2015 North Atlantic Comprehensive Study report.

Levee and Floodwall Plan

Price Level Update: A price level update of the Kearny Point, Doremus Avenue, Turnpike, Lister Avenue, and South First Street segment costs was performed using Civil Works Construction Cost Index System (CWCCIS). These segments in the 1987 GDM are estimated to cost $56,891,000 (October 1986 PL). At the current price level, the total project cost of the tidal segments was estimated to be $129,440,274 (October 2015 PL).

NACCS Cost Estimate: An estimate of the tidal segments was calculated by using the NACCS estimate of $28,170,599 per mile of floodwall and $8,333,329 per mile of levee. The 5.5 miles of levee and 5 miles of floodwall is estimated to cost $186,656,000 (October 2013 PL). A price level update was performed using CWCCIS. At the current price level, the project cost of the tidal segments was estimated to be $191,326,000 (October 2015 PL).

Barrier Plan

Price Level Update: A price level update of the 1987 Plan 27 costs was performed in November 2015 using Civil Works Construction Cost Index System (CWCCIS). At the current price level, the total project cost of the tidal barrier was estimated to be $345,001,000 (October 2015 PL).

NACCS Cost Estimate: An estimate of the tidal barrier was calculated by using the estimated average value of $1,391 per cubic foot for the cost of a storm surge barrier, as calculated using actual costs of barriers from around the world[9]. Assuming a 700-foot barrier structure at a height of 15 feet and 15-foot head, the estimated cost is $219,083,000 (October 2013 PL). A price level update was performed in November 2015 using CWCCIS. At the current price level, the project cost of a tidal barrier was estimated to be $227,741,000 (October 2015 PL).

The cost of the associated 100 feet of levee and 12,600 feet of floodwall downstream of the barrier were calculated using the NACCS estimate of $28,170,599 per mile of floodwall and $8,333,329 per mile of levee. The estimate came to $67,383,000 (October 2013 PL). Using CWCCIS, the project cost of the tidal barrier associated levees and floodwalls is estimated to be $69,058,000 (October 2015 PL). The combined estimated cost of the tidal barrier plan is $296,798,000. For comparison, please see Table 27.

[9] Information from 1987 GDM Appendix C – Table VIII-11 "Dimensions and costs for storm surge barriers around the world" on page 138.

Table 27: Cursory Re-analysis of Costs

	Levee and Floodwall Plan	Barrier Plan
1987 GDM	$56,891,000	$152,000,000
Price Level Update	$129,440,000	$345,001,000
NACCS Cost Estimate	$191,326,000	$296,798,000

The cursory reanalysis shows the levee and floodwall plan is more cost effective than the barrier plan. Levees and floodwalls are further evaluated in this document in the following chapters.

4.7 Key Uncertainties

Extent of and remediation schedules for contaminated sites: There are many contaminated sites of concern that have been identified by the USEPA and NJDEP. These include sites containing elevated levels of mercury, dioxins, lead, and other industrial contaminants. Based on coordination to date, there are no upland sites with known or likely contamination that are scheduled for remediation. One site has been remediated with the removal and capping of a less than a foot of soil. No other work is planned. USACE is in the process of working with USEPA, NJDEP, and others to identify the extent and status of remediation for all known contaminated sites (KCS) that may be remediated under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund"), Resource Conservation and Recovery Act, and other laws.

Current and projected land use changes, resilience projects, and other development: The U.S. Federal Emergency Management Agency, U.S. Department of Housing and Urban Development and other Federal agencies are investing hundreds of millions of dollars to increase storm resilience in the study area. In addition, major public and private developments are currently being planned and constructed. The study team will continue to coordinate with Federal, state, and local agencies and stakeholders about the scope of their plans.

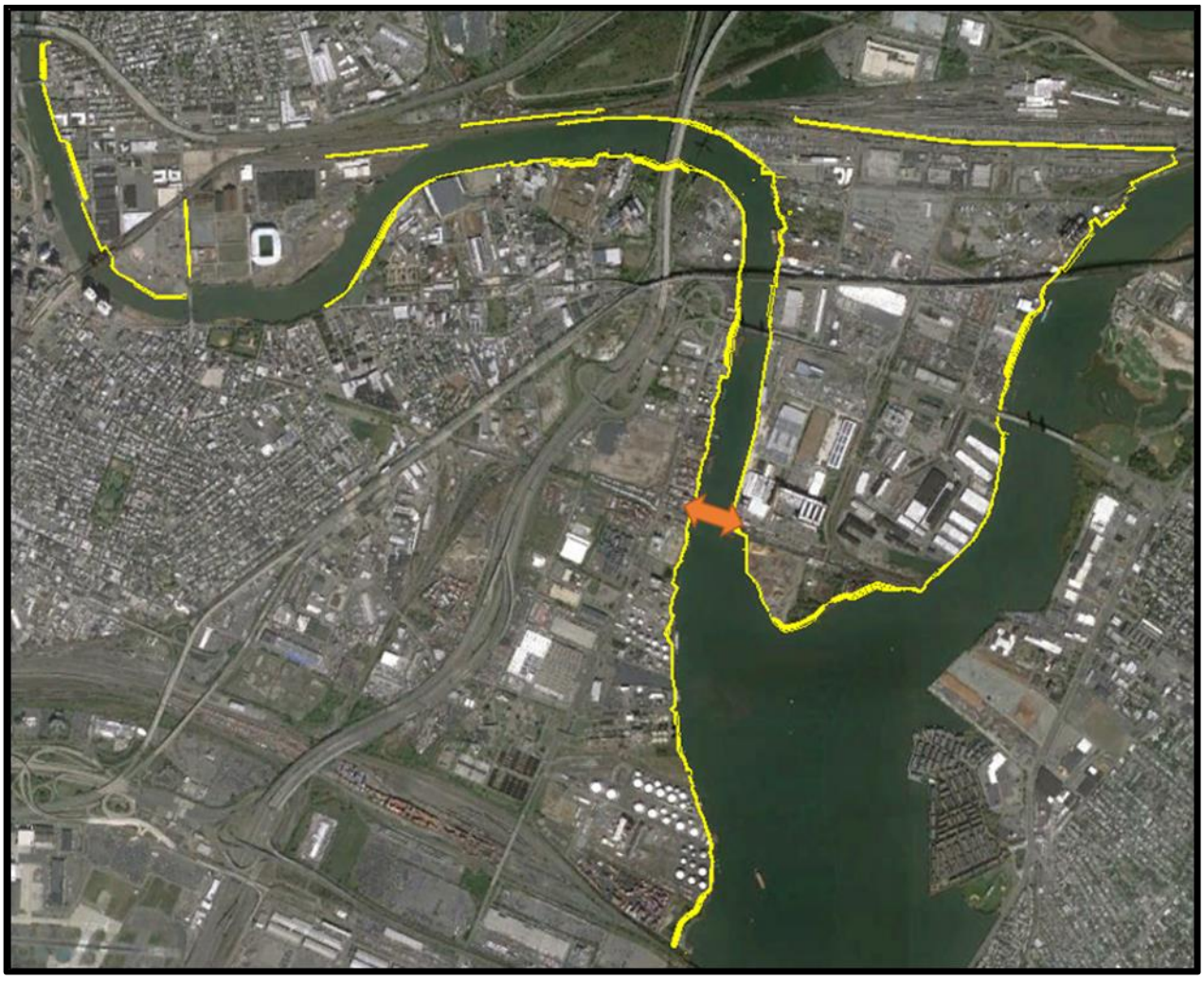

Figure 13: 1987 GDM Plans in the Passaic Tidal area.

Note: The ultimately-authorized levee and floodwall plan is shown in yellow. The tidal barrier plan is shown in orange. The barrier plan includes levees and floodwalls downriver of the gates.

4.8 Focused Array of Alternatives

The authorized alignment was modified in consideration of changes in the study area, and to avoid constraints. The dimensions of the authorized plan are presented in Table 28.

Table 28: Dimensions of the Authorized Alignment

	LEVEE			FLOODWALL	
SYSTEM	Height [ft]	Base [ft]	Length [ft]	Height [ft]	Length [ft]
Kearny Point	5.2	41	3,908	7.4	33,771
Lister/Turnpike/Doremus	5.5	44	5,599	8.1	17,657
South First Street	6.5	50	1,750	6.2	5,700

The following changes to the authorized plan were made to develop the new alternatives.

- The Harrison 2 floodwalls were added.
- The floodwall near the Passaic Valley Sewerage Commission wastewater treatment plant was removed because the facility is building its own floodwall to 19 feet NAVD88 that the USACE alignment can tie into.
- In-water gates were replaced with on-land gates; there are now floodwalls around slips in Kearny Point
- A floodwall in Minish Park was added to address newly identified low elevations found with updated topography.
- The Newark Flanking features were added to address newly identified low elevations found with updated topography.
- Levees were removed from consideration and replaced with floodwalls because HTRW may be encountered in the area and floodwalls have a smaller footprint than levees, decreasing the amount of remediation needed; the project area is also highly urbanized and floodwalls take up less space.

The focused array of alternatives includes the following three scenarios (heights) based on the authorized levee and floodwall project:

- +14 feet NAVD88 (height of the authorized project), 14.8 miles long
- +16 feet NAVD88 (authorized height +2 feet), 15 miles long
- +18 feet NAVD88 (authorized height +4 feet), 15.6 miles long

The focused array of alternatives is shown in Figure 14. The red lines identifies the proposed +14 feet NAVD88 alignment. The blue lines show the additional length that would need to be added to the +14 feet NAVD88 alignment to meet the +16 feet NAVD88 alternative; additional length is required to tie into ground that is at the same elevation. The yellow line represents the additional length needed to be added to the +16 feet NAVD88 alignment to tie into corresponding high ground.

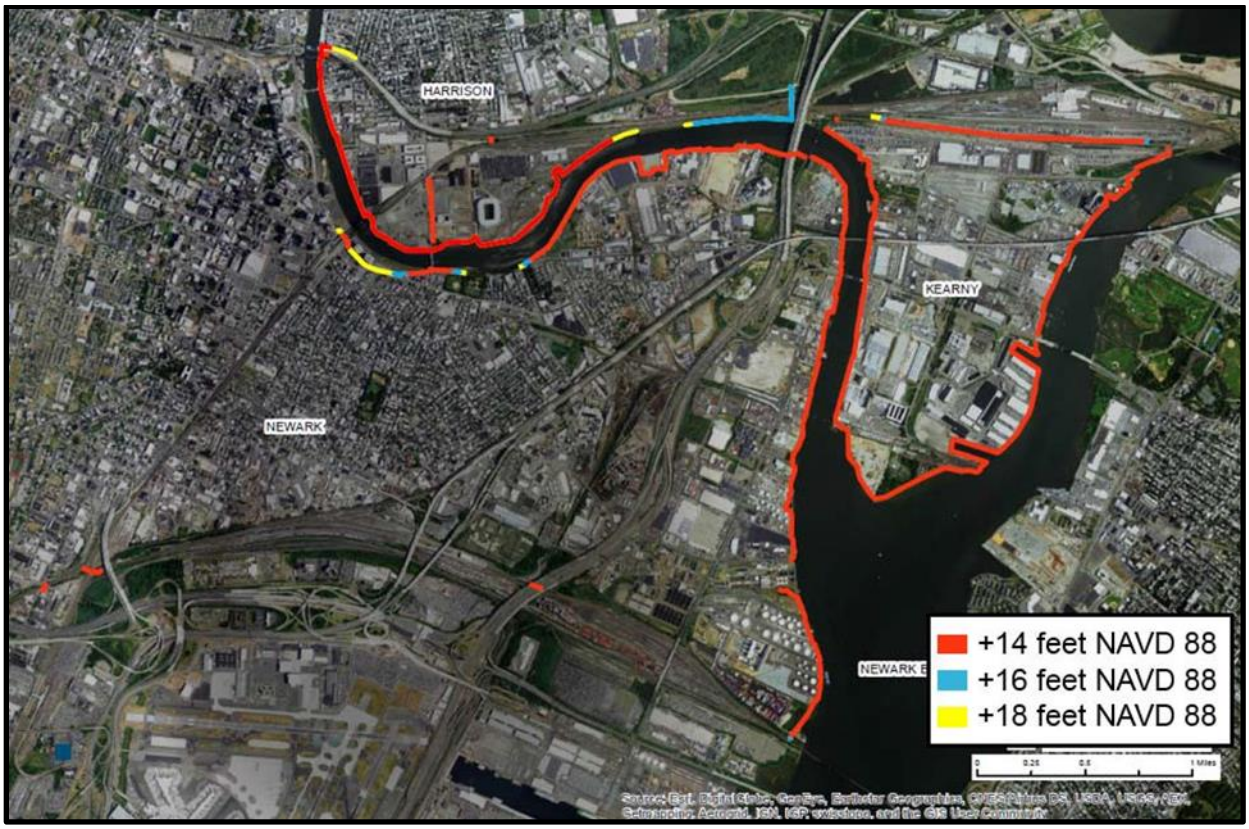

Figure 14: Focused Array of Passaic Tidal Alternatives.

Note: The blue and yellow floodwalls represent the additional floodwall length required to supplement the 14' (red) floodwall to complete the 16' and 18' line of protection, respectively.

The estimated costs associated with the focused array of alternatives is shown in Table 29.

Table 2: Estimated Total Cost of the Focused Array of Alternatives

	14 ft NAVD88	16 ft NAVD88	18 ft NAVD88
Total Cost	$657,015,000	$740,298,000	$832,350,000
Annual Cost	$28,947,000	$31,625,000	$35,284,000

4.9 Evaluation and Comparison of Alternatives

The following analyses and data sets were used in formulation and plan selection:

- Use of NACCS depth-damage function to estimate economic losses
- HEC-FDA (Flood Damage Reduction Analysis) modeling
- Geotechnical data
- Typical Cross Sections
- Cost Data
- Benefit cost comparison
- Incremental Assessments (height, segments)

Plans were evaluated in consideration of economic justification, environmental acceptability, policy compliance, and public acceptability.

This section will describe the process that resulted in a National Economic Development Plan and Locally Preferred Plan/ Tentatively Selected Plan.

With-Project Damages and Benefits

HEC-FDA was used to compute damages and hence benefits associated with three proposed storm damage reduction alternatives. Flood inundation benefits from the proposed alternatives were computed by comparing damages with and without the proposed measures under existing and future conditions. Alternatives incorporating levees were analyzed, with crest elevations of +14, +16, and +18 feet NAVD88, and the preliminary results are presented by economic reach in Tables 30 and 31. The preliminary with-project residual damages do not reflect ponding of run-off behind the alignment or the implementation of measures to minimize interior drainage damages. These analyses are ongoing, and while the frequency and extent of flooding behind the alignment is not yet established, it is not anticipated to significantly impact the plan formulation.

Table 30: Summary of With-Project Equivalent Annual Damage for the Focused Array

Economic Reach	Floodwall Alternative Elevations		
	14' NAVD	16' NAVD	18' NAVD
Harrison Section 1	$1,480,500	$613,600	$196,800
Harrison Section 2	$365,400	$149,400	$60,400
Kearny Section	$3,704,600	$1,366,700	$412,500
Newark Section	$3,872,100	$1,632,000	$552,600
Minish Park	$1,731,700	$758,800	$263,200
Newark Flanking Section	$849,800	$233,500	$30,000
Newark Gap	$1,320,600	$1,320,600	$1,320,600
Totals	*$13,324,700*	*$6,074,600*	*$2,836,100*

Price Level: February 2015
3.125% Discount Rate, 50-year period of analysis

Table 31: Summary of With-Project Equivalent Annual Benefits for the Focused Array

Economic Reach	Floodwall Alternative Elevations		
	14' NAVD	16' NAVD	18' NAVD
Harrison Section 1	$5,325,900	$6,192,800	$6,609,600
Harrison Section 2	$993,000	$1,209,000	$1,298,000
Kearny Section	$24,417,600	$26,755,500	$27,709,700
Newark Section	$18,785,800	$21,025,900	$22,105,300
Minish Park	$2,391,600	$3,364,500	$3,860,100
Newark Flanking Section	$7,871,000	$8,487,300	$8,690,800
Newark Gap	$0	$0	$0
Totals	*$59,784,900*	*$67,035,000*	*$70,273,500*

Price Level: February 2015
3.125% Discount Rate, 50-year period of analysis

4.9.1 Identifying the National Economic Development Plan

The economic performance of alternatives in the focused array was calculated by reach (Table 32). The Harrison 2 reach was found not to have positive net benefits as part of any alternative, and thus was excluded from the plans. Excluding Harrison 2 does not affect the performance of the remaining reaches because Harrison 2 is hydrologically independent. Comparing annual costs to annual expected benefits of the remaining reaches in the alternatives results in the +18 feet NAVD88 alternative providing the greatest net benefits for four of five reaches. The plan was selected as the National Economic Development (NED) Plan. It has an annual cost of $35,284,000, could provide $69,464,000 in annual benefits, and could provide annual net benefits of $37,550,000 (October 2015 price levels, Table 32, Figure 15).

In addition to the three stillwater design levels of 14, 16, and 18 feet NAVD, an additional analysis was conducted to evaluate the effectiveness of an 'adaptable' 16 feet NAVD88 plan. Under this plan (referred to as '16A') the floodwalls would be constructed initially to the 16 feet NAVD88 stillwater elevation design, but would be modified to raise the wall height to the 18 feet NAVD88 design at some point in the future. Plan 16A was analyzed and benefits were computed in HEC-FDA for the "Intermediate" and "High" sea level rise conditions under the assumption that the wall height would be raised when the sea level rise matched the total 50-year sea level rise under the historic/lower bound condition (Table 33). This elevation is anticipated to be reached in year 30 in the Intermediate condition and in year 15 in the High condition.

Table 32: Equivalent Annual Damage of the Focused Array

Project Section	Annual	Project Alternative		
		14 ft NAVD	16 ft NAVD	18 ft NAVD
Harrison Section 1	Benefits	$5,253,000	$6,143,000	$6,571,000
	Costs	$3,261,000	$3,585,000	$3,819,000
	Net Benefits	$1,992,000	$2,558,000	$2,752,000
	BCR	1.6	1.7	1.7
Harrison Section 2*	Benefits	$993,000	$1,209,000	$1,298,000
	Costs	$2,398,000	$2,841,000	$3,370,000
	Net Benefits	-$1,405,000	-$1,632,000	-$2,072,000
	BCR	0.4	0.4	0.4
Kearny Section	Benefits	$24,917,000	$27,317,000	$28,297,000
	Costs	$11,838,000	$13,054,000	$13,912,000
	Net Benefits	$13,079,000	$14,263,000	$14,385,000
	BCR	2.1	2.1	2
Newark Section	Benefits	$18,300,000	$20,601,000	$21,708,000
	Costs	$10,554,000	$11,042,000	$12,647,000
	Net Benefits	$7,746,000	$9,559,000	$9,061,000
	BCR	1.7	1.9	1.7
Minish Park	Benefits	$2,456,000	$3,455,000	$3,964,000
	Costs	$358,000	$497,000	$834,000
	Net Benefits	$2,098,000	$2,958,000	$3,130,000
	BCR	6.9	7	4.8
Newark Flanking Section	Benefits	$8,082,000	$8,715,000	$8,924,000
	Costs	$538,000	$606,000	$702,000
	Net Benefits	$7,544,000	$8,109,000	$8,222,000
	BCR	15	14.4	12.7
Total Average Annual Benefits		*$60,001,000*	*$67,440,000*	*$70,762,000*
Total Average Annual Cost		*$28,947,000*	*$31,625,000*	*$35,284,000*
System Net Benefits		*$31,054,000*	*$35,815,000*	*$35,478,000*
Total Benefits (excluding Harrison 2)		*$59,008,000*	*$66,231,000*	*$69,464,000*
System Net Benefits (excluding Harrison 2)		*$32,459,000*	*$37,447,000*	*$37,550,000*
Selected as NED Plan				✓

*Note: Benefits calculated for Harrison 2 do not incorporate estimated damages from residual interior drainage. See Economics Appendix and Engineering Appendix for more detail.

Table 33: Impacts of Sea Level Rise on Damages and Benefits

Damages/ Benefits	Condition/ Alternative	Historic "Low"	Curve I "Intermediate"	Curve III "High"
Equivalent Annual Damages	WoP	$73,110,000	$84,123,000	$124,946,000
	L14	$15,644,500	$17,663,500	$24,351,500
	L16	$8,610,500	$9,743,500	$13,844,500
	L16A		$8,285,500	$10,062,500
	L18	$5,460,500	$6,141,500	$8,660,500
Total Benefits	*L14*	*$57,465,500*	*$66,459,500*	*$100,594,500*
	L16	*$64,499,500*	*$74,379,500*	*$111,101,500*
	L16A		*$75,837,500*	*$114,883,500*
	L18	*$67,649,500*	*$77,981,500*	*$116,285,500*
Annual Costs	L14	$26,549,000	$26,549,000	$26,549,000
	L16	$28,784,000	$28,784,000	$28,784,000
	L16A		$32,219,000	$34,344,000
	L18	$31,914,000	$31,914,000	$31,914,000
Net Benefits	L14	*$30,916,500*	*$39,910,500*	*$74,045,500*
	L16	*$35,715,500*	*$45,595,500*	*$82,317,500*
	L16A		*$43,618,500*	*$80,539,500*
	L18	***$35,735,500***	***$46,067,500***	***$84,371,500***
BCR	L14	2.2	2.5	3.8
	L16	2.2	2.6	3.9
	L16A		2.4	3.3
	L18	2.1	2.4	3.6

This analysis indicates that the Adapted 16 feet NAVD88 wall would not supplant the 18 feet NAVD88 wall as the NED Plan under either of the two higher sea level rise scenarios. The 18 feet NAVD88 wall remains the NED plan. Figure 15 shows the NED plan compared to the 1995 authorized alignment.

4.9.2 Identifying the Locally Preferred and Tentatively Selected Plan: Newark Flanking Plan

The New Jersey Department of Environmental Protection sent USACE a letter dated November 18, 2016 stating their support for USACE's continued work on the Newark Flanking component of the Passaic River Tidal Protection Project. The NJDEP proposed that the Newark Flanking component of the project be considered as a stand-alone flood risk management project, providing flood risk management to the South Ironbound area of Newark and other parts of Newark by cutting off inland storm surge flow paths. NJDEP stated the high benefit cost ratio and the lesser chance of encountering HTRW within the project footprint as their reasons for supporting the Newark Flanking component.

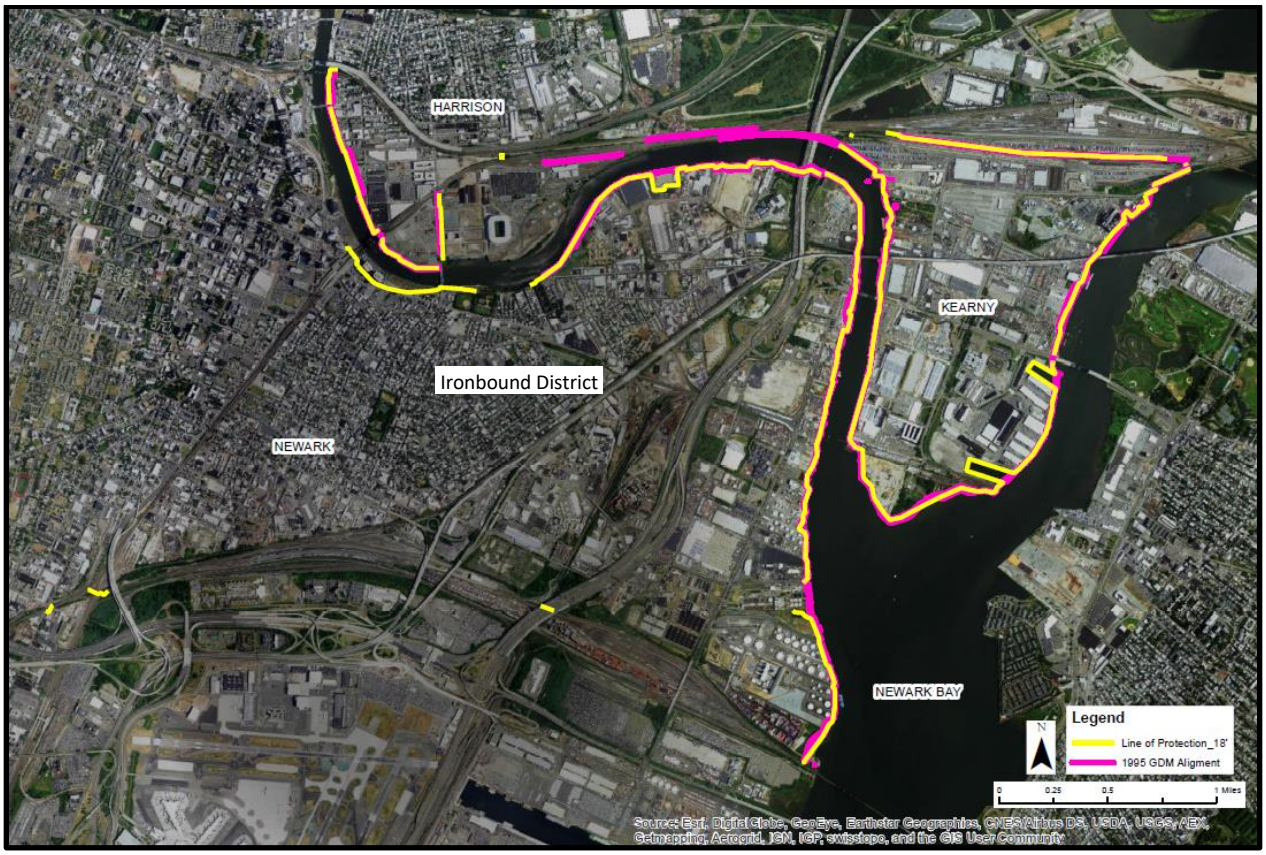

Figure 15: The NED Plan Compared to the Authorized Alignment

The Newark Flanking component of the Passaic Tidal project consists of two wall and gate segments that prevent storm surge from flanking from the South Ironbound area of Newark, entering the Perimeter Ditch around Newark Liberty Airport. These features were not part of the authorized plan, but would have been included during the design phase, as the updated mapping would have identified the need to address the southern flanking.

Each proposed segment was originally thought to be incrementally justified. However, further hydrologic analysis showed that the Newark Flanking segments cannot stand alone once the authorized project floodwalls are eliminated from the plan. Three additional areas with low elevations allow for flooding near I-95. Additionally, the updated analysis shows the Minish Park segment and the Newark Flanking segment connecting, due to low topography between the two segments (Figure 16). Therefore, in order for the Newark Flanking segment to function, the I-95 area and the Minish Park segment would need to be included as the "Newark Flanking Plan" (Figure 17).

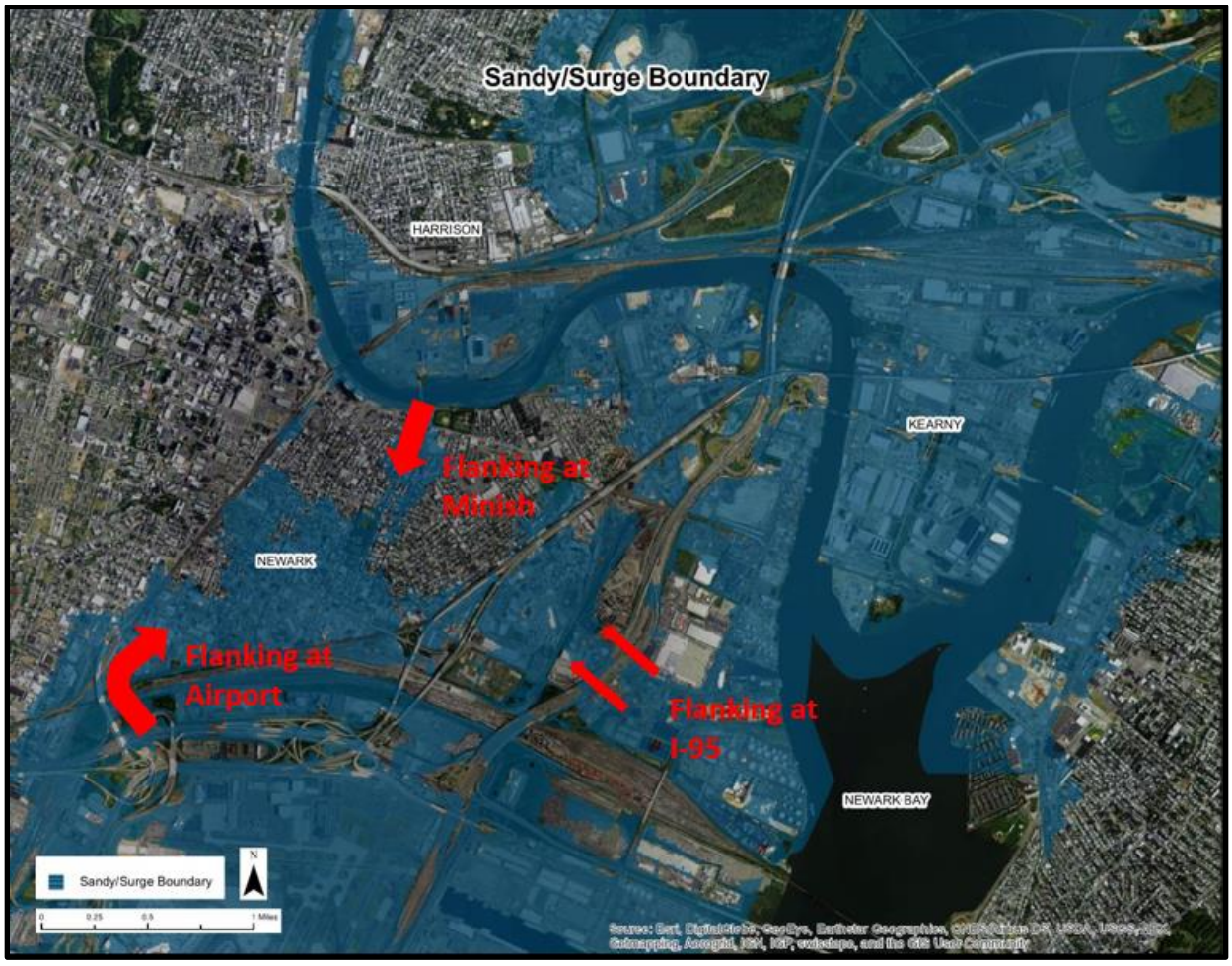

Figure 16: Flooding Pathways into Newark

In order to provide a complete flood risk management plan for the Newark Flanking section, the plan must include both the Minish Park and the Newark Flanking project features, including the three additional floodwall segments under I-95; south of Delancy Street, at Delancy Street, and at Wilson Avenue. These additional wall segments are 125, 225, and 200 feet in length, respectively. The narrow flow path along Raymond Plaza at Newark Penn Station was addressed by investigating two options, 6A and 6B. 6A is larger component closer to the Passaic River and 6B is a smaller section further up NJRR Avenue where the flow path is narrower. This iteration of the Newark Flanking Plan is shown in Figure 17.

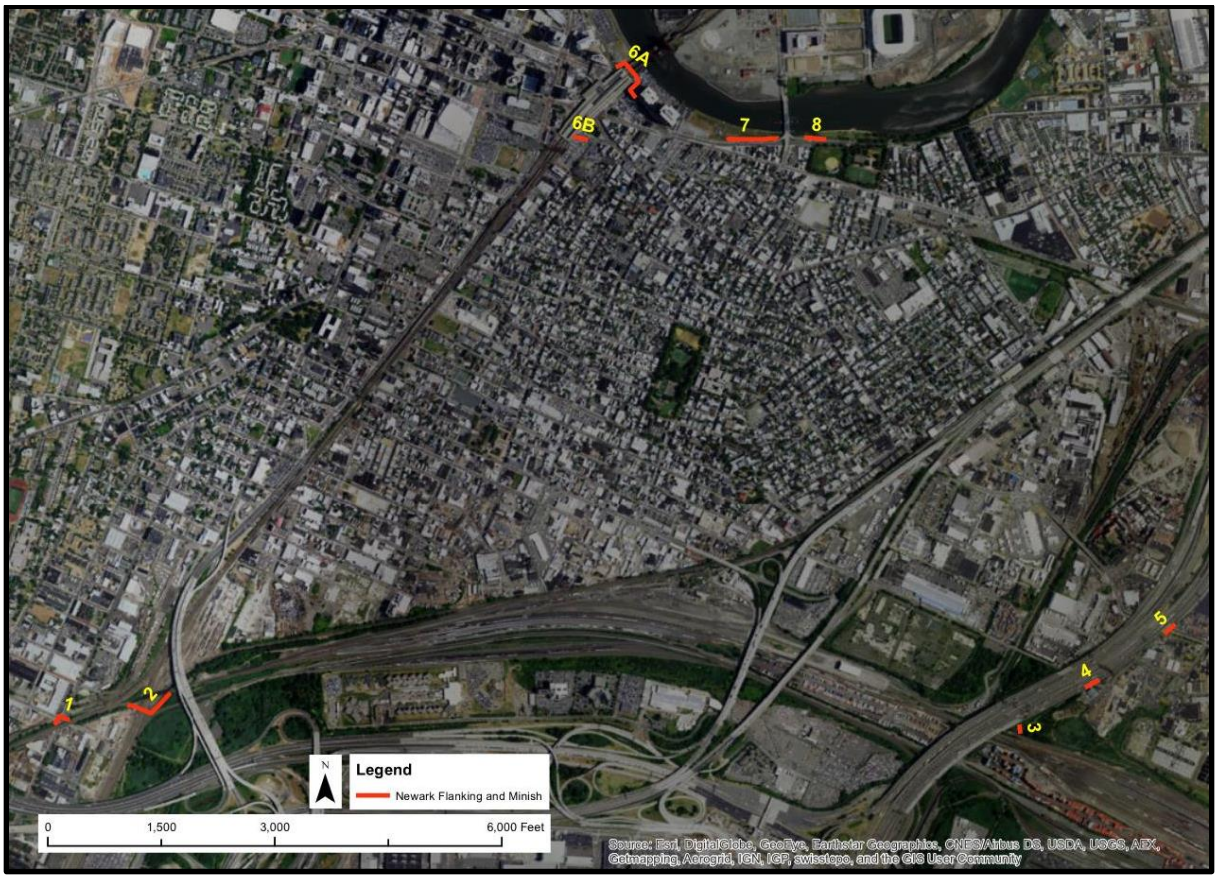

Figure 17: The First Iteration of the Newark Flanking Plan

After investigating 6A and 6B, 6A was eliminated from consideration since 6B provides higher net benefits. Segments 7 and 8 lie within the Newark Waterfront Park. As part of the Newark Passaic Riverfront Revitalization project, the City of Newark and the Trust for Public Land are redesigning and completing construction at the park. Part of the plan for the park included placing fill in the area. After reviewing the City's plans, the New York District made suggestions to increase the ground elevation to the height of the floodwall proposed in the area. The City incorporated the suggestions into their designs. By increasing the elevation of the park and meeting the proposed elevation grade, the low-lying areas were removed and the need for Segment 7 was eliminated.

The maximum estimated design elevation that can be achieved from the five segments without adding more significant elements to the line of protection is 14 feet NAVD. This assumption will be further analyzed during optimization of the TSP. The TSP is shown in Figure 18.

Figure 18: The Tentatively Selected Plan/ Locally Preferred Plan

The 14-feet NAVD88 floodplain is overlaid on Newark in Figure 19; with a stillwater elevation of 14-feet NAVD88, the majority of Newark would be inundated. Figure 20 shows the flooding Newark would experience during the same event as shown in Figure 19 with the proposed TSP segments in place; the TSP segments would reduce the risk of flooding to a large portion of Newark.

The NED plan and the TSP/LPP are compared in Table 34 below. For more detailed information about the costs and benefits of these plans, see the Cost Appendix (Appendix H) and the Economic Appendix (Appendix G).

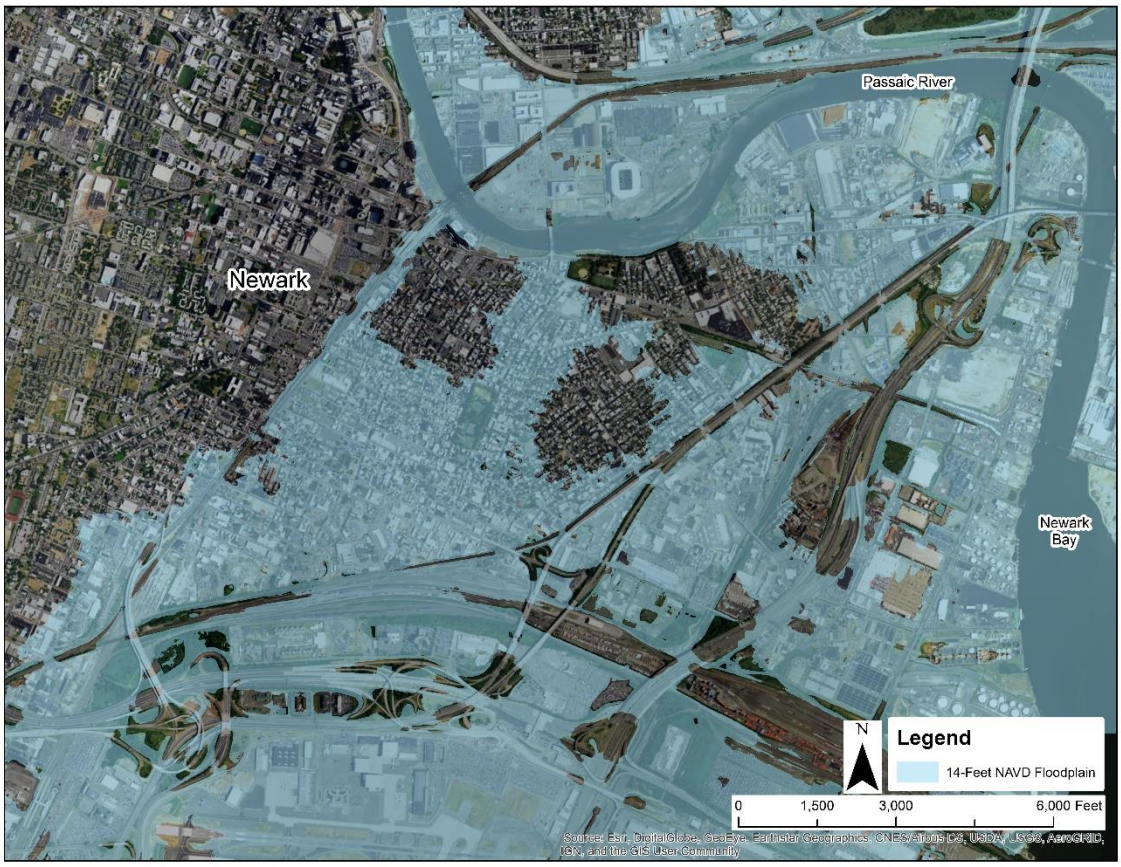

Figure 19: Newark Without the TSP/LPP with the 14-Feet NAVD88 Floodplain

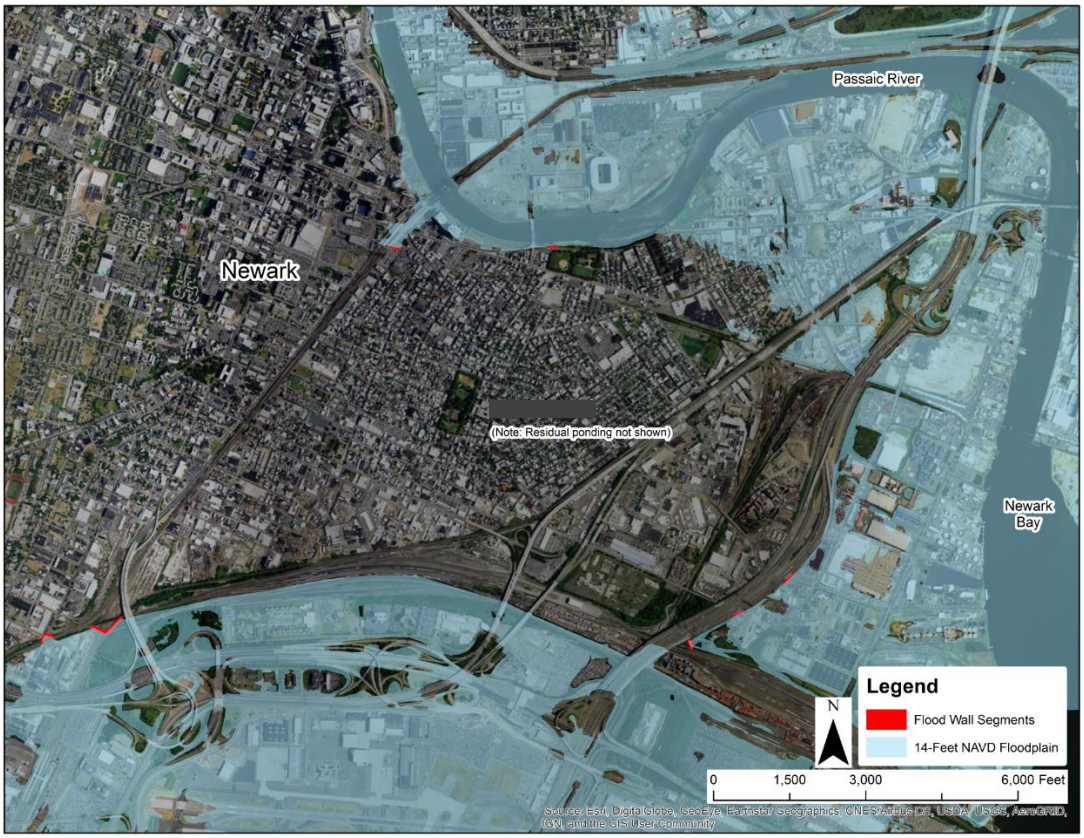

Figure 20: Newark With the TSP/LPP with the 14-Feet NAVD88 Floodplain

Table 34: National Economic Development Plan Compared to Locally Preferred Plan

	NED	TSP/LPP
Equivalent Annual Benefits	$69,464,000	$10,538,600
Average Annual Costs	$31,914,000	$2,261,000
System Net Benefits	$37,550,000	$8,277,000
BCR	2.2	4.7

Chapter 5: Tentatively Selected Plan*

5.1 Proposed Action/ Plan Components

The Tentatively Selected Plan is also the Locally Preferred Plan. The Proposed Action consists of construction and operation of a series of floodwalls and closure gates with integrated interior drainage systems and pump stations. A total of seven floodwall segments would be constructed within low lying areas of the City of Newark to reduce the risk of flooding in flood prone areas of the Ironbound section of the Study Area. The level of protection afforded by the Proposed Action would be to an elevation of +14 ft as referenced to the North American Vertical Datum of 1988 (NAVD88). The Proposed Action consists of the following seven floodwall segments (see Engineering and Design Appendix J for more information):

Segment 1: 290 linear feet (lf) of floodwall with two closure gates: a 100 lf gate across Frelinghuysen Avenue and a 45 lf gate across East Peddie Street. Both gates would be 4.0 ft high. The floodwall height would range from approximately 2.6 to 3.3 ft.

Segment 2: 705 lf of floodwall located between McCarter Highway and Frelinghuysen Ave, north of East Peddie Street. This segment includes five closure gates, totaling 190 lf to allow passage along the numerous railroad tracks at this location. Floodwall and gate height along this segment would vary from 4.8 to 8.2 ft.

Segment 3: 139 lf of floodwall with a tide gate across an unnamed creek just east of the New Jersey Turnpike. The floodwall height of this segment will be a maximum of 9.4 ft.

Segment 4: 180 lf of floodwall across Delancy Street, just east of the New Jersey Turnpike. The closure gate across Delancy Street would be 62 lf and the floodwall height would range from approximately 4.1 to 4.8 ft.

Segment 5: 226 lf of floodwall across Wilson Avenue just east of the New Jersey Turnpike. The closure gate across Wilson Avenue would be 60 lf and the floodwall height would range from approximately 3.1 to 3.2 ft.

Segment 6: 204 lf of floodwall along Edison Place and across New Jersey Railroad Avenue at Edison Place. The closure gate across New Jersey Railroad Avenue would be approximately 24 lf and the height of the floodwall would range from approximately 0.85 to 3.09 ft.

Segment 8: 297 lf of floodwall along the side of the off ramp from Raymond Blvd to Jackson Street. This segment boarders the sidewalk adjacent to Joseph G. Minish Passaic River Waterfront Park (Minish Park) and would have a height ranging from approximately 1.3 to 3.4 ft.

Features incorporated by NJDEP into the design of the newly created Minish Park would complete the level of protection afforded by the Proposed Action. The features in the park consist of a short

length of floodwall along Raymond Boulevard, west of Jackson Street with heights ranging from approximately 1.3 to 3.4 ft, and regraded berms to an elevation of 14 ft NAVD88. These park features are separate and complimentary actions and are not considered part of the Proposed Action. Had it not been included in the separate NJDEP project this feature would have been Segment 7.

The locations and elements associated with each segment are illustrated in Figure 21, Figure 22, and Figure 23 for Segments 1 and 2, Segments 3, 4 and 5, and Segments 6 and 8, respectively. Elements include the floodwalls, closure gates, a tide gate, and construction easements associated with the segments that make up the Proposed Action. When in the open position, the roadway closure gates would be wide enough to accommodate normal vehicular traffic as well as pedestrian passage along the sidewalks. A 15-ft wide temporary construction easement would be required around all segments. The typical ground elevation is between 6 and 10 ft NAVD88. For areas with a wall height of 6 ft or less the wall, a concrete I-wall would be constructed. This applies to Segments 1, 4, 5, 6 and 8. Segments 2 and 3 would require wall heights greater than 6 ft; a pile supported concrete T-wall would be constructed in these locations. The interior drainage design is in progress; therefore, locations of structures associated with drainage, if any, have not yet been identified. The interior drainage will be designed so as not to induce fluvial flooding or interfere with sewer function.

The Proposed Action would require 47 properties totaling two acres within the City of Newark. Approximately one acre would be permanent easements and approximately one acre would be temporary easements. Additional real estate that may be required for interior drainage features, such as pump stations, will be determined as the design of that aspect of the project advances. The property class distribution and number of parcels per class is as follows: vacant land (2); public property (4); other exempt properties (8); commercial (6); industrial (3); class I railroad (16); class II railroad (8).

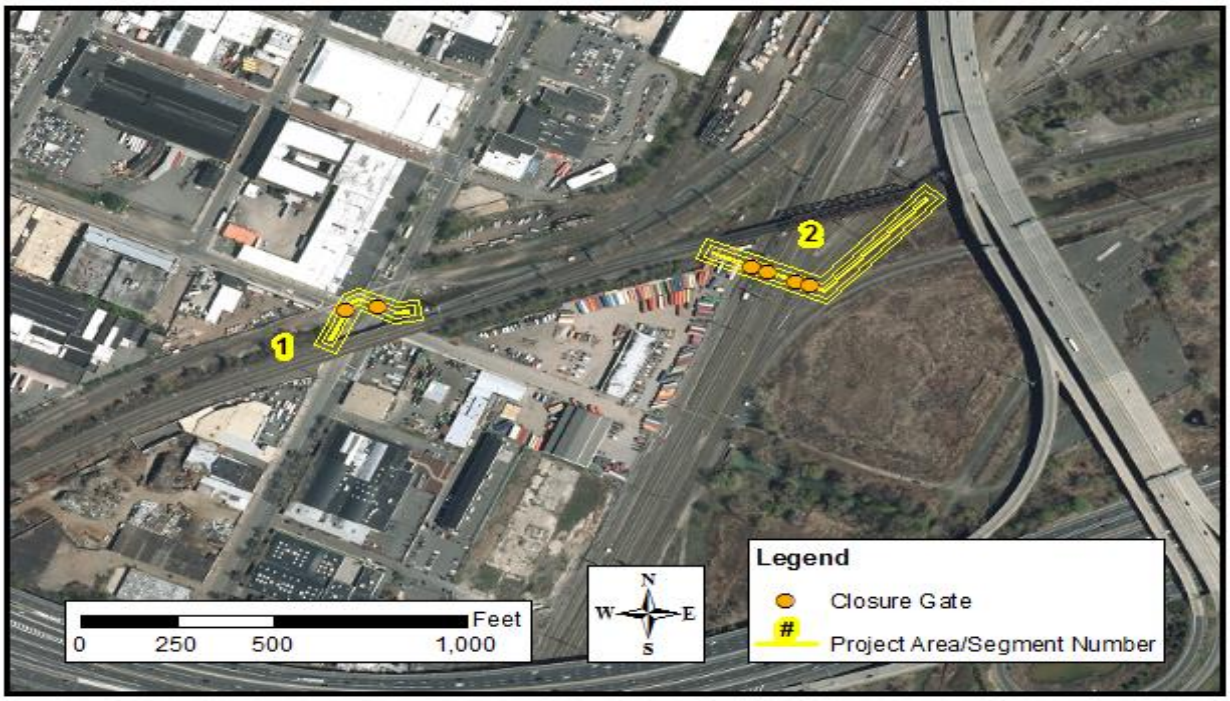

Figure 21: Passaic River Tidal Project Area - Proposed Action Segments 1 and 2

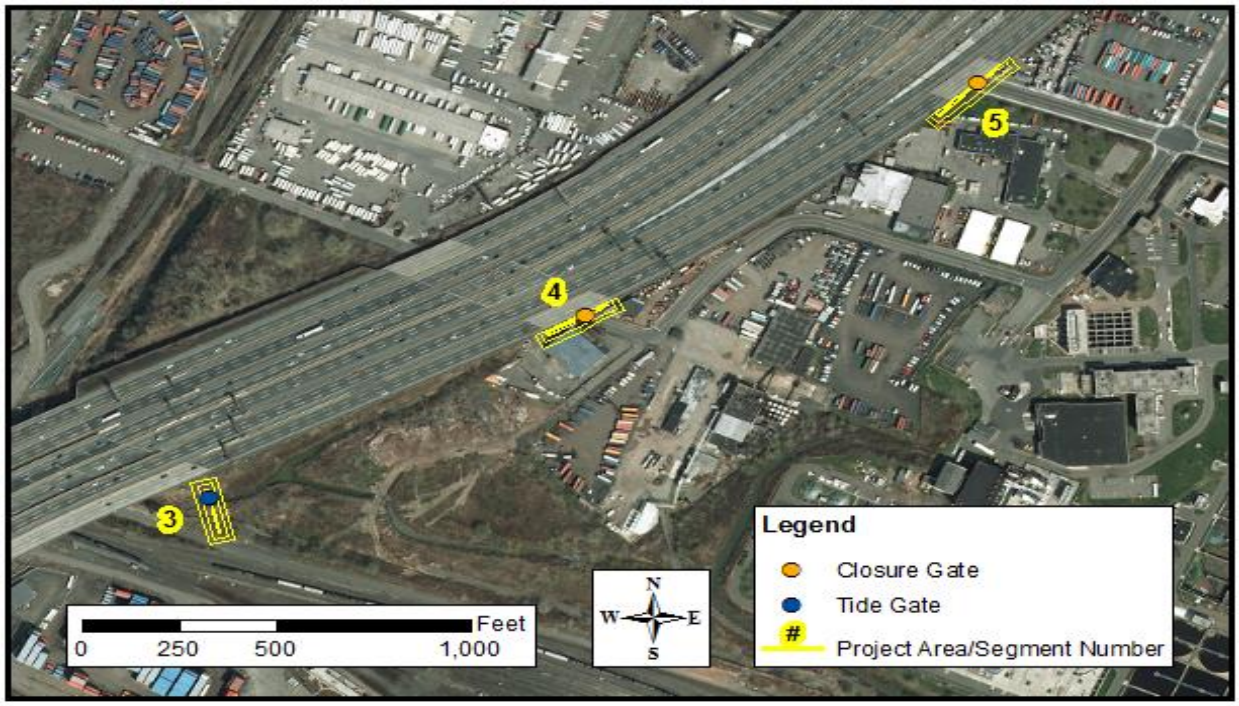

Figure 22: Passaic River Tidal Project Area - Proposed Action Segments 3, 4 and 5

Figure 23: Passaic River Tidal Project Area - Proposed Action Segments 6 and 8

5.2 Operation, Maintenance, Repair, Rehabilitation, and Replacement Considerations

The annual O&M cost includes annual inspections and maintenance of the project including pumps, gate chambers, closure gates, sluice gates and backflow prevention. Total annual O&M costs are $554,000. For more details see the Cost Engineering Appendix.

5.3 TSP Refined Cost Estimate

A summary of the costs of the TSP is presented in Table 35.

Table 35: TSP Refined Cost Estimate

Initial/First Project Cost	$45,666,000
Annualized Initial Cost*	$1,707,000
Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) Costs**	$554,000
Total Annual Cost*	$2,261,000

The initial project cost is $45,666,000. Project First Cost is the constant dollar cost of the TSP at current price level and is the cost used in the authorizing document for a project. Total Project Cost is the constant dollar cost fully funded with escalation to the estimated midpoint of construction. This is the "cost of money" because costs are expected to escalate over time due to various factors. Total Project Cost is the cost estimate used in Project Partnership Agreements for implementation of design and construction of a project. Total Project Cost is the cost estimate provided to non-Federal sponsors for their use in financial planning as it provides information regarding the overall

non-Federal cost sharing obligation. The fully funded cost of the TSP is $52,571,000. These costs include construction, lands and damages, design, supervision and associated administration costs. The material costs were based on a combination of MII database, RSMeans, quotes, and some historical information. Equipment rates were obtained from region 1, and Davis Bacon Wage Rates for Hudson and Essex Counties, NJ were utilized for labor costs. The contingencies were developed using Abbreviated Risk Analysis program (ARA). The summary of the results of this risk analysis, and more detail on the cost estimate, can be viewed in the Cost Appendix.

5.4 Refined Annual Cost and Benefit of TSP

The benefits of implementing coastal storm risk management measures are the estimated cost of flood damages that would be avoided by implementing the project. Benefits were calculated as the difference in damages before and after project implementation. Benefits were then amortized over a 50-year period to identify equivalent annual benefits using October 2015 price levels and an interest rate of 3.125%.

Table 36 provides a summary of the costs and benefits of the plan.

Table 36: Summary of Costs and Benefits of TSP

Fully funded/ Total Project Cost	$52,571,000
Equivalent Annual Cost	$2,261,000
Equivalent Annual Benefits	$10,538,000
Annual Net Benefit	$8,277,000
Benefit-to-Cost Ratio	4.7

5.5 Risk and Uncertainty Analysis

Risk and uncertainty has been explicitly factored into the economic analysis of this project. A statistical risk based damage model, HEC-FDA, was used in this study to formulate and evaluate the project in a life-cycle approach. HEC-FDA integrates the engineering and economic analyses and incorporates uncertainty in both physical parameters and storms, which enables quantification of risk with respect to project evolution and economic costs and benefits of project implementation. For more information please refer to Appendix G – Economics. For information on risk and uncertainty with respect to hydrology and hydraulics please refer to Appendix F – Hydrology and Hydraulics.

5.6 Economic, Environmental, and Other Social Effects

In reducing damages from future events, the TSP contributes to National Economic Development. National Environmental Restoration considerations are addressed in Chapter 6 (Environmental Impacts) of this report. As for Other Social Effects (OSE), the project would maintain the viability of routes of transportation, including emergency and other vital services. Implementation of the

project could induce Regional Economic Development (RED) benefits in the area as residents and business owners may be able to allocate resources and spending on other goods and services than repairing and replacing structures or goods damaged by flooding. The TSP provides risk reduction to the vulnerable population in Newark, three police department facilities, four fire stations, one hospital, two clinics, and multiple colleges, universities, and schools.

The majority of the residual risks from the TSP occur in Harrison and Kearny since the proposed segments are in Newark. Residual risks associated with the TSP includes remaining average annual damages of $62,847,100 out of a total average annual damage pool of $73,109,700.

5.7 Consistency with the North Atlantic Coast Comprehensive Study

The North Atlantic Coast Comprehensive Study (NACCS) report was released in January 2015, and provides a risk management framework designed to help local communities better understand changing flood risks associated with climate change and provide tools to help those communities better prepare for future flood risks. In particular, it encourages planning for resilient coastal communities that incorporates wherever possible sustainable coastal landscape systems that takes into account, future sea level and climate change scenarios (USACE 2015). The process used to identify the TSP utilized the NACCS Risk Management framework that included evaluating alternative solutions, and considering future sea level change and climate change. Recognizing the Federal government's commitment to ensure no inducement of development in the floodplain, pursuant to Executive Order 11988, this project will identify in the Project Partnership Agreement the need for the non-Federal sponsor to develop a Floodplain Management Plan, and a requirement for the sponsor to certify that measures are in place to ensure the project does not induce development within the floodplain.

Chapter 6: Environmental Impacts of the Tentatively Selected Plan*

This section provides an analysis of anticipated adverse effects or environmental consequences anticipated for each resource as a result of the No Action Alternative and the Proposed Action within the Project Area. The Proposed Action would avoid adverse project impacts during project construction and operations and maintenance to the fullest extent possible. Mitigation measures would be implemented to minimize or offset unavoidable impacts. Compensatory mitigation would be conducted in accordance with applicable rules and permit conditions and in cooperation with the appropriate agencies.

In the impact assessment, the duration of impact (temporary or permanent) is identified, along with the type (beneficial or adverse) and expected intensity of the impact.
Impact assessment magnitude/levels are defined as follows:

- **No Impact:** No effects on the resource.
- **Negligible Impact:** These beneficial or adverse effects would not be observable or measurable.
- **Minor Impact:** These beneficial or adverse effects would be observable or measurable but would not differ substantially from existing conditions or would be localized and would not change the character of the resource. Minor impacts may be minimized with mitigation measures and would not result in an exceedance of regulatory thresholds.
- **Moderate Impact:** These beneficial or adverse effects would be observable or measurable and would differ noticeably from existing conditions. Adverse moderate impacts may be minimized with mitigation measures and may result in an exceedance of regulatory thresholds.
- **Major Impact:** These beneficial or adverse effects would be very obvious, significant and would differ substantially from existing conditions. Major adverse impacts are generally associated with a loss of resource integrity, would require mitigation, and would result in an exceedance of regulatory thresholds.

6.1 Physical Setting

Potential environmental impacts on each resource resulting from the No Action Alternative and the Proposed Action are discussed in each resource section.

6.1.1 Geology and Physiography

No Action Alternative

There would be no impact on geology and physiography as a result of the No Action Alternative. The Project Area would continue to be subject to storm-induced flooding. Underlying geology and physiography would not be impacted from these events.

Proposed Action

Geology and physiography would not be adversely affected by construction and maintenance of

the Proposed Action. No permanent impacts on geology or physiography would occur. Structural components of the project would tie-in to bedrock formations as needed for structural integrity; however, there would be no impact on these geologic features.

6.1.2 Topography

No Action Alternative

There would be no impact to the topography of the Study Area as a result of the No Action Alternative. The Study Area would continue to be subject to periodic storm-induced flooding. Changes in topography would be localized, resulting from erosion and deposition, but would not change the character of the underlining topography in the Study Area.

Proposed Action

The vast majority of the Study Area would be untouched in terms of topographic alteration as a result of the Proposed Action. Minor impacts on topography would be limited to those within the Project Area. Changes in topography would be localized along the floodwalls. The Proposed Action would have an elevation of 14 ft NAVD88 (e.g., if the existing ground elevation is 10 ft the new floodwall would be 4 ft high). Height of the floodwall segments above the existing ground would be variable depending on the surrounding terrain, ranging from less than one to a maximum of approximately 9.4 ft where Segment 3 crosses an unnamed tributary to Jasper Creek which drains to Newark Bay.

6.1.3 Soils

No Action Alternative

There would be no or minor impact on soils within the Study Area as a result of the No Action Alternative. The Study Area would continue to be subject to periodic storm-induced flooding, resulting in localized soil erosion and deposition.

Proposed Action

The proposed action would result in minor impacts to soils within the Project Area portion of the Study Area. Temporary minor impacts would occur during construction within the limit of disturbance as a result of clearing and grading activities. Loss of access to native soils (where present) within the project footprint would result in minor adverse impact to this resource for the duration of the project life and would be considered permanent. Much of the Project Area consists of existing impervious surfaces; soils in these locations would not be impacted by Proposed Action. With the implementation of BMPs, including adherence to applicable requirements of the New Jersey Standards for Soil Erosion and Sediment Control (New Jersey Statute Annotated [N.J.S.A.] 4:24-39 et seq.) and the Stormwater Management Rules (New Jersey Administration Code [N.J.A.C.] 7:8), soil erosion during construction is expected to be minimal. Changes in soils would be localized along the floodwall alignment and within the temporary construction easement.

6.2 Climate and Weather

No Action Alternative

There would be no impact on climate or weather within the Study Area as a result of the No Action Alternative.

Proposed Action
There would be no impact on climate or weather within the Project Area as a result of the Proposed Action.

6.3 Floodplains and Coastal Processes

The following includes the environmental impacts of the floodplains and coastal processes in the Study Area.

6.3.1 Floodplains

No Action Alternative
There would be no direct impact on floodplains within the Study Area as a result of the No Action Alternative. The parts of the Study Area that are within the floodplain would continue to be subject to periodic flooding during storm events. Based on predicted sea level change (SLC), which is estimated to increase from 0.71 to 3.50 ft over the next 50 years, the extent of flooding is expected to increase (USACE-NYD, 2016). Therefore, an indirect impact of the No Action Alternative would be a larger floodplain area and increased depth of flooding. Impacts associated with increased flooding are expected to be adverse and moderate to major.

Proposed Action
A total of seven separate segments that consist of structural elements are proposed in the Newark portion of the Study Area to cut off inland storm surge paths and prevent inundation of the floodplain. During non-storm conditions there would be no impact on the flow of the rivers in the Study Area. The Proposed Action would reduce the potential for flooding of the Newark portion of the Study Area. Interior drainage systems would address flooding on the interior side of the floodwall, with pumping stations as needed to transfer stormwater to the river side of the floodwall. The Proposed Action has been designed to avoid induced flooding upstream or downstream of the Project Area and therefore, would have no impact beyond the Study Area. The Proposed Action would result in a major beneficial impact by reducing flooding in the Newark portions of the Study Area that are within the floodplain.

Presence of the structural elements in the segments would minimally alter the existing drainage patterns for stormwater runoff to the rivers. The Proposed Action includes flood walls, closure gates and a tide gate as depicted on Figure 21, Figure 22, and Figure 23. The Proposed Action would include an interior drainage system, consisting of a combination of gravity outlets, backflow prevention on existing outlets, and pump stations as needed, to manage stormwater runoff on the protected side of the flood walls/gates. During storms that exceed the design criteria of the pump stations, some ponding of stormwater in the interior portions of Newark would occur, resulting in localized residual flooding. This is expected to be an infrequent occurrence; however, any residual flooding is expected to be far less than any associated storm surge when compared to the No Action Alternative. In cases of excessive rainfall without an accompanying storm surge, the residual flooding may result in minor to moderate impact to the communities within the drainage areas.

6.3.2 Coastal Processes

No Action Alternative

There would be no impact on coastal processes within the Study Area as a result of the No Action Alternative. Sea Level Change would continue as per the current trend, with predicted increases from 0.71 to 3.50 ft over the next 50 years (USACE-NYD, 2016). This increase in sea level would exacerbate the effect of coastal processes in the Study Area, with increased erosion due to wave action and tidal fluctuations, resulting in moderate adverse impact to the area due to coastal processes.

Proposed Action

The Proposed Action would result in reducing the potential for flooding of the Newark portion of the Study Area during storms. The design elevation of the structural elements would provide flood risk management for surges in conjunction with SLC, providing a benefit to the community. Because the Proposed Action is located landward of the shoreline, there would be no change in Coastal Processes as compared to the No Action Alternative.

6.4 Water Resources

The following profile of water resources in the Study Area focuses on tidal surface waters, fresh surface waters, and regional hydrogeology and groundwater. Potential environmental impacts to each of these resources resulting from the No Action Alternative as well as construction and maintenance of the Proposed Action follow.

6.4.1 Surface Waters

No Action Alternative

There would be no direct impact on surface waters within the Study Area as a result of the No Action Alternative. Sea Level Change would continue as per the current trend, with predicted increases from 0.71 to 3.50 ft over the next 50 years (USACE-NYD, 2016). As a result, the normal water levels of surface areas within the Study Area would be higher than existing conditions, and the area of surface water may increase where this higher elevation causes waters to expand beyond existing banks or shorelines.

Proposed Action

The Proposed Action would result in reduced potential for flooding of the Newark portion of the Study Area during severe storm events thus cutting off inland storm surge paths and constraining the increased storm flow to the river channels. Therefore, the Proposed Action would result in a minor temporary increase in the flow of the river channels. As discussed under "Floodplains," ponding of surface water would occur as a result of stormwater accumulation on the interior side of the structural elements. The interior drainage system will direct this stormwater to the river side of the structural elements; however, during storm events which exceed the design criteria of the interior drainage system, localized fluvial flooding may occur. This is expected to be an infrequent occurrence when compared to the No Action Alternative, resulting in minor to moderate impact to the communities within the drainage areas.

6.4.2 Water Quality

No Action Alternative

Under normal flow conditions, there would be no impacts on water quality within the Study Area as a result of the No Action Alternative. Surface water classifications, flow characteristics and uses and impairments would not be changed. During extreme flood events, there would be temporary major adverse impacts on water quality. These impacts would result from the transport of unsecured materials and contaminants by floodwaters. Potential sources of contaminants and unsecured materials include oils, gasoline and de-icing salts/chemicals from road runoff, household chemicals, and hazardous wastes, commercial and industrial chemicals, raw sewage, and miscellaneous trash, debris, and floatables. As a result of SLC, with water levels predicted to increase by 0.71 to 3.5 ft over the next 50 years, the frequency and extent of flooding, and associated transport of contaminants to surface waters, is expected to increase, resulting in minor to moderate adverse impacts to water quality.

Proposed Action

Most of the structural elements in the segments are located in developed/disturbed areas such as paved roads, railroad tracks and disturbed upland vegetated areas. The only in-water structure associated with the Proposed Action is the tide gate in a small unnamed creek crossed by Segment 3. This small unnamed creek is a tributary to Jasper Creek, which is a tributary to Newark Bay. A tide gate at the mouth of Jasper Creek prevents tidal fluctuation in these surface waters upstream of the bay (FEMA 2015). During construction of the proposed tide gate there would be a potential for temporary, minor impacts on water quality in the vicinity of the Project Area. These water quality impacts could include temporary increases in turbidity and suspended solids, decreased dissolved oxygen, and increased biological oxygen demand. These temporary impacts would be limited to the construction phase and would be mitigated through implementation of BMPs. Additionally, impairments to water quality during construction due to increased suspended sediments would be minimized to the fullest extent possible by strict implementation of a sediment and erosion control plan, as well as meeting all requirements of state and local permits necessary for construction.

The land uses in the Study Area consist of dense urban residential development, industrial areas including sewerage treatment plants and transportation corridors along with hazardous waste sites. The proposed structural elements would have a moderate beneficial impact on water quality in that they would reduce the likelihood of floodwaters inundating the Newark portion of the Study Area and the subsequent transport of unsecured materials such as household chemicals, sewage, etc., by floodwaters and the associated negative impact to water quality.

Outfalls from the interior drainage system will be designed to avoid disturbance of the sediments in the receiving water bodies and avoiding associated water quality impacts from sediment resuspension, including increased turbidity and contaminant transport. Concentrated discharge velocities would be addressed by adding energy dissipaters or stilling basins before the discharged water entered the river, thus eliminating the potential for sediment resuspension.

6.4.3 Regional Hydrogeology and Groundwater

No Action Alternative

There would be no impact on regional hydrology or groundwater within the Project Area as a result of the No Action Alternative.

Proposed Action

The Proposed Action would have no adverse impacts on regional hydrogeology and groundwater resources.

6.4.4 Tidal Influences

No Action Alternative

There will be no impact on tidal fluctuations within the Study Area as a result of the No Action Alternative. The water bodies in the Study Area would continue to be subject to semi-diurnal tidal fluctuations as well as the full extent of tide surge during storm events. As a result of SLC, with water levels predicted to increase by 0.71 to 3.5 ft over the next 50 years tidal fluctuations will also rise accordingly.

Proposed Action

Most of the structural elements in the segments are located in developed/disturbed areas such as paved roads, railroad tracks and disturbed upland vegetated areas outside of areas inundated by the tide. The only in-water structure associated with the Proposed Action is the tide gate that is part of Segment 3. The channel crossed by Segment 3 is an unnamed tributary to Jasper Creek. An existing tide gate at the mouth of Jasper Creek on Newark Bay prevents tidal influence upstream. There would be no change in tidal influence to existing waters or wetlands as a result of the Proposed Action (see Section 3.8.2 for additional discussion on wetlands).

6.5 Land Use and Zoning

The Study Area is currently dominated by industrial and urban land uses and also includes some residential areas and limited suburban developments.

Current land use in the Project Area is a combination of: (1) urban land uses (2) industrial land uses, and (3) transportation corridors.

No Action Alternative

There would be no direct impact on land use within the Project Area as a result of the No Action Alternative. Any proposed land development projects would need to comply with State, regional and local land use and zoning rules and regulations that are in place at the time the project is proposed. Sea level rise would result in moderate to major impacts on land use, because low-lying areas subject to increased frequency and severity of flooding may no longer be able to sustainably support existing land uses.

Proposed Action

The Proposed Action would not adversely affect the current land use in the Project Area. The areas of economic growth and development would not be restricted by the floodwalls since they have been specifically located along roadways and other transportation corridors adjacent to industrial/commercial uses. The Proposed Action includes seven Segments, with floodwalls ranging from 139 lf to 705 lf in length that incorporate closure gates to accommodate vehicular

and pedestrian passage. These spatially separate, relatively sort segments would not adversely impact land use in the Project Area. The permanent easements required for the Proposed Action would be approximately one acre, with an additional acre of temporary easement area. The easements areas would be distributed between 47 separate parcels and would impact public, exempt, commercial, and industrial and railroad properties. Considering the small size of the permanent easement area, the Proposed Action would have minor direct impacts on these land uses. Implementation of the Proposed Action would have major beneficial impacts on land uses in the Study Area by offering improved flood risk management to homes, businesses, roads, churches, schools, parks, stores, and various other community services located in these flood-prone areas.

6.6 Socio-Economics

The Study Area falls within Essex and Hudson counties, specifically the City of Newark, Town of Harrison, and Town of Kearny. In general, the Study Area contains predominantly industrial facilities with a mix of residential development. Impacts to the three communities within the Study Area are presented below.

No Action Alternative

There would be no direct impact on socio-economics within the project area as a direct result of the No Action Alternative. The No Action Alternative would potentially have a major indirect adverse impact on socio-economics within the Project Area as there would be no reduction in the potential for future flooding and storm damage to remaining properties and the associated costs to repair such damages. Future growth and development opportunities may also be limited under the No Action Alternative, resulting in additional moderate indirect impacts to socio-economics of the Study Area.

Proposed Action

The Proposed Action would not directly, as a result of its physical construction, greatly alter or influence existing or future demographic characteristics because the area is almost completely developed and the project segments are primarily located along roads. However, a resulting reduction in the frequency and intensity of flooding in the Project Area may impact the number, density, or racial composition of residents living within the Project Area, as the reduction in flooding may lead to increased interest in residential or commercial development and redevelopment.

The Proposed Action would have major, beneficial economic impacts on existing businesses in the Study Area due to the reduced potential for future flooding and storm damages as well as improved accessibility to the area during storm events. The larger metropolitan region would benefit from the protection of the regional transportation centers in the Study Area and maintenance of regular or near regular transportation services during and following major storm events. There also would be a minor, beneficial economic impact on the local economy during construction as a result of the introduction of construction workers and the resulting purchase of supplies and food during the construction phase.

Major, beneficial impacts on housing and structures in the Study Area would also occur due to a

reduction in the potential for future flooding and storm damage to existing properties, and the subsequent reduction in associated costs to repair such damages. In locations where the floodwalls block roadways or alter travel routes when the closure gates are shut, businesses may be negatively impacted. However, without the project, these businesses would continue to be directly and negatively impacted by flooding. The building inventory and flood damage model for the project area identified 951 commercial or industrial buildings that flooded above the main floor during Superstorm Sandy, with estimated damages of approximately $500 million. Under the existing conditions, there are over 1,400 commercial and industrial buildings in the 1-percent annual chance of exceedance floodplain. Accordingly, the end result of the Proposed Action is a benefit to local businesses.

6.6.1 Environmental Justice Summary

No Action Alternative

The No Action Alternative would potentially have a major indirect adverse impact on the community within Project Area as there would be no reduction in the potential for future flooding and storm damage to properties and the associated costs to repair such damages. Future growth and development opportunities may also be limited under the No Action Alternative.

Proposed Action

No adverse human health impacts are anticipated to result from the implementation of the Proposed Action. No residential relocations would be required for implementation of the Proposed Action. The Proposed Action would provide an increased level of flood protection to the Project Area and flood prone communities in the surrounding Study Area. Residents of the Project Area neighborhoods would experience beneficial impacts in terms of protection of property and life. No disproportionately high and adverse impacts to minority and low-income populations would be expected from the Proposed Action. As noted above, the reduction in frequency and intensity of flooding in the Project Area may result in a secondary effect of increased interest in residential or commercial development and redevelopment. This interest may lead to increased housing costs that may negatively affect the future affordability of housing.

Construction projects within Newark must be particularly sensitive to how these projects affect air quality within the city. Although the Proposed Action are well below de minimus levels for the criteria pollutants, cumulatively any emissions adds to an already overburdened system. To minimize impacts, construction contractors will be required to use newer equipment and vehicles with emission controls. No equipment idling will be allowed at any of the segments.

Table 37: Demographics in the Three Project Area Municipalities, as of the 2010 U.S. Census

Distribution of Race/Ethnicity								
	Kearny		Harrison		Newark		New Jersey (State of)	
	Total	%	Total	%	Total	%	Total	%
	40,684	100	13,620	100	277,140	100	8,791,894	100
White alone	29,933	73.6	7,91	58.3	72,914	26.3	5,214,878	59.3
Black alone	2,186	5.4	297	2.2	145,085	52.4	1,204,826	13.7
American Indian alone	163	0.4	76	0.6	1,697	0.6	29,026	0.3
Asian/Pacific Islander alone	1,825	4.5	2,219	16.3	4,603	1.7	725,726	8.3
Other race alone	5,099	12.5	2,517	18.5	42,181	15.2	559,722	6.4
Two or More Races	1,478	3.6	570	4.2	10,660	3.8	240,303	2.7
Hispanic Origin	16,253	39.9	6,017	44.2	93,746	33.8	819,975	9.3
Source: U.S. Bureau of Census: 2010								

Table 38: Household Income Levels in the Three Project Area Municipalities

Household by Income - 2010								
Household Income Base	Kearny		Harrison		Newark		New Jersey (State of)	
	Total	%	Total	%	Total	%	Total	%
	13,518	100	4,582	100	92,618	100	3,172,421	100
<10,000	604	4.5	335	7.3	14,538	15.7	174,342	5.5
$10,000-14,999	526	3.9	272	5.9	7,385	8.0	130,977	4.1
$15,000-24,999	1,247	9.2	385	8.4	12,166	13.1	270,609	8.5
$25,000-34,999	1,261	9.3	305	6.7	11,503	12.4	256,073	8.1
$35,000-49,000	2,178	16.1	921	20.1	13,464	14.5	353,152	11.2
$50,000-74,999	2,642	19.5	1,099	24.0	15,053	16.3	541,530	17.1
$75,000-99,999	1,812	13.4	533	11.6	8,628	9.3	414,452	13.1
$100,000-149,999	2,239	16.6	505	11.0	7,259	7.8	526,854	16.6
$150,000-199,999	718	5.3	175	3.8	1,608	1.7	264,604	8.3
>$200,000	291	2.2	52	1.1	1,014	1.1	257,828	8.1
Source: U.S. Bureau of Census: 2010								

6.7 Coastal Zone Management

No Action

The No Action Alternative would be consistent with CZM.

Proposed Action

The Proposed Action is consistent to the extent practicable with applicable policies detailed in the New Jersey CZM Rules. CZM policies would be adhered to during the construction and maintenance of the Proposed Action. If required in addition to the Federal Consistency, appropriate coastal permits/authorization would be obtained from the NJDEP, including an Individual Waterfront Development Permit and Section 401 Water Quality Certification. For policies that strict compliance is not feasible, such as public access/public open space and scenic resources, mitigation will be implemented to satisfy the intent of the policy. Additional details regarding the consistency of the Proposed Action with applicable coastal policies is provided in Appendix A.

6.8 Vegetation

The Study Area is largely developed with commercial, industrial, and residential land uses where vegetation is limited to disturbance tolerant species that are typical of an urban/industrial setting. Vegetated areas are limited to maintained transportation corridors, lawns, and parks. These vegetative communities have been degraded as a result of centuries of anthropogenic disturbance. The wetland and upland habitats that comprise these communities are described below.

6.8.1 Upland Habitat

No Action Alternative

Under the No Action Alternative, coastal storm flooding would continue to periodically affect the Study Area, inundating and damaging upland vegetation that is not adapted or otherwise resistant to saturation and/or saline waters. Because coastal storms are predicted to be more frequent and severe due to climate change, under the No Action Alternative inundation of upland vegetation areas due to storm surge would be expected to increase gradually over time in direct relation to sea level change.

Proposed Action

The Proposed Action would result in minor temporary and permanent impacts to upland vegetation as a result of changes to vegetation cover types associated with construction of the Proposed Action. The majority of the elements would be located in existing developed areas along paved roadways and railroad tracks, avoiding vegetated areas and riparian zones. However, vegetated upland areas are found along roadways and railroads at Segments 1 and 5, and Minish Park along Segment 8. A 50-ft riparian zone is also present along the Passaic River at Segment 8 and the unnamed tributary to Jasper Creek at Segment 3. Temporary minor impacts to these areas would be associated with construction access and staging. There would also be minor permanent impacts to vegetation associated with the construction of the Proposed Action. A total of approximately 0.12 acres of permanent and 0.29 acres of temporary disturbance to vegetated upland habitat are anticipated, as outlined in Table 39. Approximately 0.09 acres of temporary and 0.01 acres of permanent disturbance to the regulated riparian zone are also proposed. Additional impacts to upland vegetation and riparian zones may result from construction of pump stations and other

interior drainage features. The extent of these impacts will be determined as the interior drainage design is finalized.

Table 39: Area of Impacts to Vegetated Upland Habitat

Community Type[1]	Permanent Impact	Temporary Impact
Mowed Roadside Pathway	0.01 ac	0.03 ac
Urban Vacant Lot	0.02 ac	0.04 ac
Mowed Lawn	0.09 ac	0.22 ac
Note: Community types determined using aerial photographs of the plan segments. [1]Communities categorized based on the Ecological Communities of New York State, Second Edition (Edinger et al. 2014)		

Because invasive species dominate the small, isolated urban habitats occurring within the footprint of the Proposed Action, they are considered to be of low ecological value. Impacts to these upland communities are minor adverse impacts and would be minimized to the furthest extent practicable. All areas impacted by temporary construction activities would be revegetated with native species. Additionally, impacts to vegetation occurring within 50 ft of the riverbank that falls within the NJDEP designated riparian zone, would require compensatory mitigation. Mitigation would be conducted in accordance with applicable rules and permit conditions and in cooperation with the appropriate agencies.

6.8.2 Wetlands Habitat

No Action Alternative

Under the No Action Alternative, coastal storm flooding would continue to periodically affect the Study Area, inundating areas and damaging coastal wetlands and freshwater wetlands that are not adapted or otherwise resistant to saline waters. Because coastal storms are predicted to be more frequent and severe due to climate change, under the No Action Alternative inundation of wetland habitat due to storm surge would be expected to be more frequent; thereby disrupting these habitats more often. Additionally SLC will cause wetlands to migrate landward gradually over time where space is available. Where landward migration is not possible wetland habitats will become inundated and submerged, eventually converting to open water habitat. Considering the limited extent and low functional value of wetlands in the Study Area, wetland impacts associated with the No Action Alternative would be adverse and moderate resulting from conversion of wetlands to open water.

Proposed Action

The project was designed primarily in uplands and previously developed sites to avoid and minimize impacts to wetland areas to the extent practicable. However, due to engineering and/or feasibility constraints avoidance of all wetland impacts would not be possible. Based on the existing wetland mapping, the Proposed Action would result in 0.22 acres of temporary and 0.38 acres of permanent impacts to wetlands, as outlined in Table 40.

Table 40: Area of Impacts to Mapped NWI and NJDEP Wetland Habitat

Segment	Community Type	Permanent Impact	Temporary Impact
2	Freshwater Wetlands	0.30 ac	0.16 ac
3	Tidal Wetlands	0.02 ac	0.02 ac
	Freshwater Wetlands	0.06 ac	0.04 ac

Following construction, temporarily disturbed wetland areas would be revegetated with native species and wetland functions would quickly reestablish. Permanent minor impacts to wetlands would result from construction of Segments 2 and 3 (Figure 24). The wetland area at Segment 3 includes a drainage feature that is an unnamed tributary to Jasper Creek which drains to Newark Bay. Based on NWI maps this feature is tidal up to a point near Segment 3 where it changes to a riverine feature. Construction in Segment 3 includes a tide gate that would allow for upstream reaches of the ditch to continue to drain into Newark Bay, but would prevent storm surge and tidal flow from the bay to affect areas upstream of the segment.

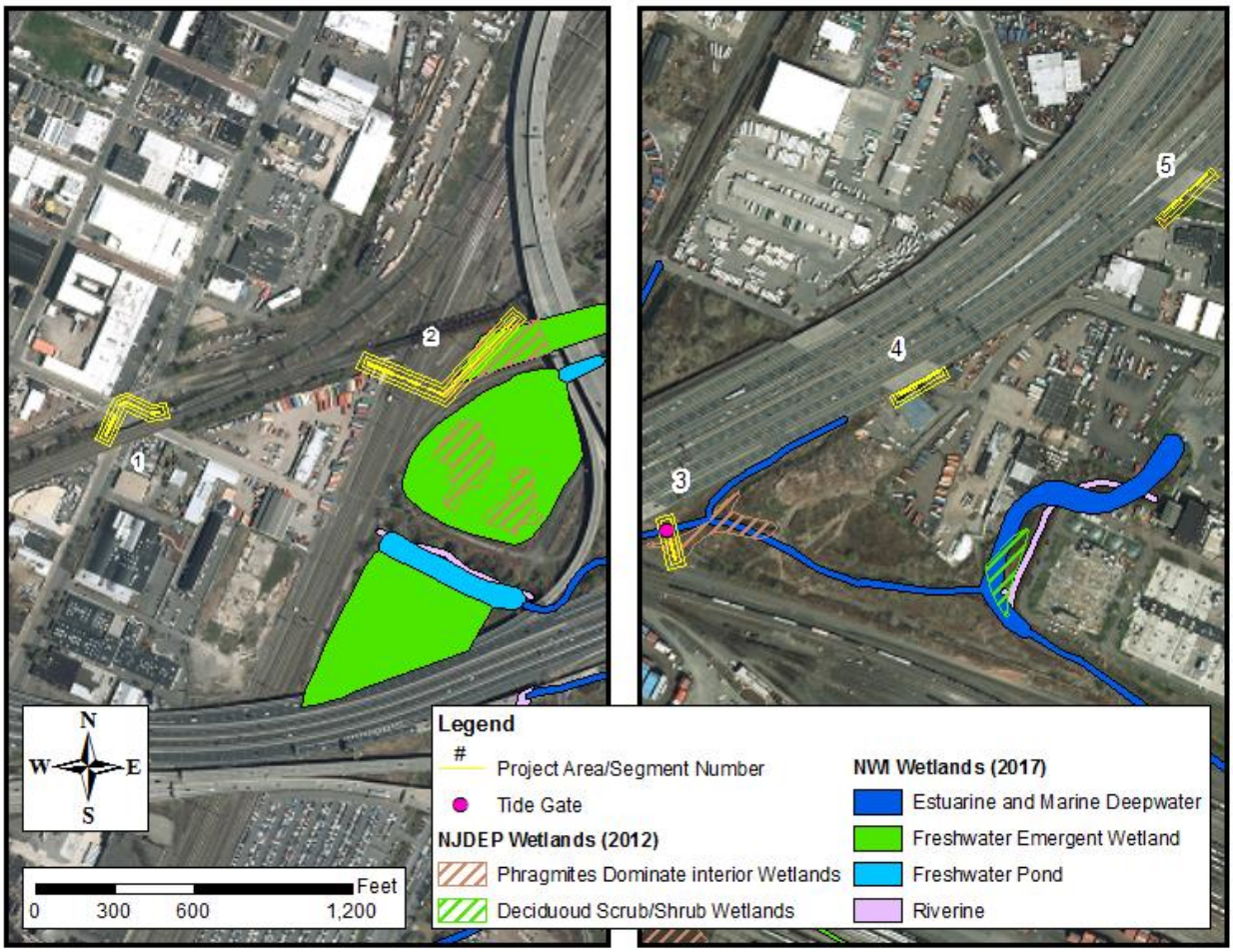

Figure 24: Detail of NJDEP and NWI Mapped Wetlands at Segments 2 and 3

Additional impacts to wetlands and watercourses may result from construction of pump stations and other interior drainage features. The extent of these impacts will be determined as the interior drainage design is finalized. Impacts to wetlands and watercourses have been minimized to the greatest extent possible by siting most of the project footprint in upland areas and installing a tide gate across the tributary at Segment 3 to allow for continue downstream flow.

There would be no other anticipated impacts to wetlands and watercourses during the operation and maintenance phase. The tide gate at Segment 3 would prevent coastal storm influence to riparian wetland areas and watercourses upstream of the gate; however, precipitation events would continue to contribute to the hydrologic cycle within the Project Area, with minimal disruption of inflows and outflows.

Impacts to wetlands and watercourses would be mitigated through implementation of a compensatory wetland mitigation plan consistent with NJ Freshwater Wetland permit program and the 2008 Final Rule on Compensatory Mitigation for Losses of Aquatic Resources (USACE 33 Code of Federal Regulations [CFR] Parts 325 and 332 and USEPA 40 CFR Part 230). Mitigation would be conducted in accordance with applicable rules and permit conditions and in cooperation with the appropriate agencies.

6.9 Fish and Wildlife Resources

6.9.1 Shellfish

No Action Alternative

Under the No Action Alternative, future flooding events due to coastal storms would increase in frequency and intensity, resulting in degradation of shellfish habitats due to sedimentation and scour resulting from increased flow velocity of coastal waterways and causing a major impact to shellfish. In addition, contaminated sediments are present throughout the Study Area.

Proposed Action

Construction of the Proposed Action would have no direct impacts on shellfish species within the Project Area because in-water construction activities are limited to Segment 3, within an unnamed tributary to Jasper Creek which drains to Newark Bay. The unnamed tributary is part of a network of drainage features constructed to convey surface water to the bay. Shellfish resources are unlikely to occur in this tributary for the following reasons: 1) the presence of multiple culverts between Segment 3 and Newark Bay that limit shellfish movement; 2) presence of a tide gate at the mouth of Jasper Creek at Newark Bay; 3) an overall lack of shellfish found in Newark Bay; and 4) the distance of Segment 3 to the Bay, which is approximately 1.4 miles. As such, no adverse impacts to shellfish resources are expected as a result of the construction of the Segment 3.

6.9.2 Finfish

No Action Alternative

Under the No Action alternative, sea level would continue to rise and coastal storms would occur with more frequency and intensity. Rising sea levels would flood coastal wetlands and shallow marshes that provide the limited habitat for young fish species present in the Study Area. Because the Study Area is highly developed up to the boundary of most watercourses and wetlands, there is no room for wetlands to migrate landward. Existing wetlands and mudflats would become open water habitat having moderate permanent impacts in the Study Area. These impacts would be beneficial for species utilizing open water habitats and adverse for young and small fish species that utilize wetlands and shallow intertidal and subtidal habitats. Considering the limited extent of wetland and mudflats in the Study Area, both types of impacts would be minor.

Proposed Action

Finfish habitat within the project area is limited to the unnamed tributary to Jasper Creek at Segment 3 and its adjacent wetlands which may offer nursery and foraging habitat for fish species. The wetlands at Segment 2 lack connections to surface waters or open water habitat to support fish species. While many finfish species are present in Newark Bay, it is unlikely that large fish are able to enter the Project Area at Segment 3. There are multiple culverts along the unnamed tributary to Jasper Creek, as well as a tide gate at the mouth of Jasper Creek and the Segment is located 1.4 miles upstream of the bay. Small fish species such as mummichog or silversides (*Menidia* spp.) could potentially enter the Project Area during significant high tides or storm events. Construction of the Proposed Action would have temporary, minor, adverse impacts on fish habitat and populations occurring in the Project Area at Segment 3. Because adult fish are highly mobile, fish potentially present in the Project Area would be able to find comparable habitat in the vicinity during construction. If fish species requiring seasonal restrictions on in-water work are present within the unnamed tributary to Jasper Creek at Segment 3, construction would be completed in accordance with the specified windows to avoid impacts to fish species.

Potential minor indirect impacts during construction include changes in water quality due to sediment resuspension in the water column and adjacent wetlands. However, suspended sediment would settle quickly out of the water column thus causing only temporary minor impacts to water quality. This impact would be minimized by the use of BMPs such as erosion and sediment control measures during construction activities The tide gate at Segment 3 would prevent fish from swimming upstream into the drainage network; however, the tributary does not appear to extend very far upstream from the tide gate; therefore, this impact would be minor. Fish would continue to be able to pass downstream during low tides. Additional minor permanent impacts would be sustained from the loss of nursery and foraging habitat potentially present within the wetlands adjacent to the floodwall segment. Under the Proposed Action the impacts of SLC, including habitat conversion from wetlands and shallows to open water, would still be incurred downstream of Segment 3 and the other plan segments.

Permanent impacts to EFH designated habitats within the Study Area would be anticipated due to the loss of benthic habitat and potential food sources at Segment 3, where the floodwall and tide gate would be placed within the unnamed tributary to Jasper Creek. Based on the minimal area of permanent impact and the habitat present within the project area, the Proposed Action would yield minor permanent adverse impact to finfish species and EFH designated habitat.

6.9.3 Benthic Resources

No Action Alternative

Under the No Action Alternative future flooding events resulting from coastal storms would increase in frequency and intensity, resulting in increases in sedimentation and scour from increased flow velocities. Based on the low abundance of benthic species, impacts resulting from scouring and sedimentation would be minor.

Proposed Action

Construction of the plan segments would be limited to the upland areas with the exception of Segments 2 and 3. Segment 2 involves construction of a floodwall in a freshwater wetland and Segment 3 involves construction of a floodwall with a tide gate across an unnamed tributary to Jasper Creek. Construction of Segment 3 would result in minor permanent and temporary impacts to benthic species resulting from construction of the floodwall and tide gate within benthic habitat. Erosion and sediment control measures would be implemented during construction to minimize any potential downstream sedimentation impacts on aquatic resources resulting from construction.

The proposed project would minimize coastal storm flooding events upstream of the floodwall segments. As such, the benthic community located upstream of the floodwall segments would sustain minor benefits as a result of the Proposed Action, which would minimize high velocity coastal flooding during storm events.

6.9.4 Reptiles and Amphibians

No Action Alternative

Under the No Action Alternative, coastal storm flooding is expected to become more frequent and intense, inundating areas and damaging coastal habitats utilized by reptile and amphibian species. These habitats include wetlands, open waters, and vegetated uplands. Permanent impacts to these habitats will result from habitat conversion due to SLC. Due to a lack of area for wetlands to

migrate landward, most existing wetlands and shallow water habitats will be lost and become open water. Considering the limited extent of habitat in the Study Area, associated indirect impacts to reptiles and amphibians would be minor, adverse, and permanent.

There would be no direct impacts on reptiles and amphibians in the Project Area as a result of the No Action Alternative, because the proposed project would not be constructed.

Proposed Action

Construction of the Proposed Action may have minor adverse temporary and permanent impacts on amphibian and reptile populations potentially occurring in the Project Area. Construction activities may result in the temporary and permanent loss of habitat and possible direct mortality of less mobile species. However, amphibian and reptilian mortality and habitat loss is expected to be minimal since a majority of the Project Area lacks habitat for these species. At Segments 2 and 3 where impacts to wetlands and the unnamed tributary to Jasper Creek are anticipated, species would be able to migrate to comparable habitats in the vicinity (i.e. further upstream or downstream). Additional impacts to reptile and amphibian species may result from construction of pump stations and other interior drainage features. Based on the lack for potential habitat areas for reptiles and amphibians, and the developed nature of the study area with commercial, residential, and industrial uses, it is anticipated that impacts from interior drainage features would be minimal. The extent of these impacts will be determined as the interior drainage design is finalized.

The proposed project would minimize coastal storm flooding events upstream of the floodwall segments. As such, the reptile and amphibian community located upstream of the floodwall segments would sustain minor benefits as a result of the Proposed Action, which would minimize high velocity coastal flooding during storm events.

6.9.5 Birds

No Action Alternative

Under the No Action Alternative, coastal storm flooding is expected to become more frequent and intense due to SLC, inundating areas and damaging coastal habitats utilized by bird species. These habitats include wetlands, open waters, and shorelines. Permanent impacts to these habitats will result from habitat conversion due to SLC. Due to a lack of area for wetlands to migrate landward, most existing wetlands and shallow water habitats will be lost and become open water. This would be a permanent minor adverse impact for certain bird species utilizing wetlands and shallow shorelines, and a benefit for those species utilizing open waters.

Proposed Action

The Proposed Action would have minor temporary and permanent, adverse impacts to birds in the Project Area. During construction, increased noise and heavy machinery activity could cause displacement of individuals, or nest disruption resulting in minor temporary impacts. Species that use the existing wetland and upland habitats would be impacted by a potential decrease in this habitat type; however, these species can utilize comparable suitable habitat in the vicinity. Therefore, the permanent impact would be minimal. The indirect impacts related to seal level rise as discussed under the No Action Alternative would also occur with the Proposed Action.

6.9.6 Mammals

No Action Alternative

Under the No Action Alternative, coastal storm flooding would likely become more frequent and intense, inundating areas and potentially damaging upland habitats utilized by mammals. This would be a temporary indirect moderate adverse impact, but if storms are more frequent and intense species may not recolonize flood prone areas leading to major impacts resulting from permanent habitat loss.

There would be no direct impacts on mammals in the Project Area as a result of the No Action Alternative, because the proposed project would not be constructed.

Proposed Action

The Proposed Action would have temporary and permanent, minor, adverse impacts on mammals in the Project Area. During construction, heavy machinery activity could cause direct mortality of less mobile small mammal species, or cause displacement of individuals near construction activities because of increased noise levels. Construction activities would result in the temporary and permanent loss of habitat and possible mortality of burrowing or denning wildlife species such as small rodents. However, most of the mammals likely to occur in the Project Area are mobile and highly tolerant of human activities. Therefore, while disturbances from construction activities would temporarily displace mammals from construction areas, these individuals would likely avoid direct mortality. Therefore, impacts to mammal species are anticipated to be minor and temporary resulting from project construction. Additional impacts to mammals may result from construction of pump stations and other interior drainage features. Based on the lack for potential habitat areas for mammal species, and the developed nature of the study area with commercial, residential, and industrial uses, it is anticipated that impacts from interior drainage features would be minimal. The extent of these impacts will be determined as the interior drainage design is finalized. The same indirect moderate adverse impacts attributable to SLC as described for the No Action Alternative would occur with the Proposed Action.

6.10 Threatened and Endangered Species

No Action Alternative

Under the No Action Alternative, coastal storm flooding is expected to become more frequent and intense, inundating areas and damaging coastal habitats utilized by listed species. These habitats include vegetated uplands, wetlands, open waters, and shorelines. Permanent impacts to these habitats will result from habitat conversion due to SLC. Due to a lack of area for wetlands to migrate landward, most existing wetlands and shallow water habitats will be lost and become open water. This is a minor permanent adverse impact for certain species and a benefit for those species utilizing open waters.

There would be no direct adverse impacts on Federal or State-listed endangered, threatened, and special concern species or areas of designated critical habitat in the Study Area a result of the No Action Alternative.

Proposed Action

The State-listed species identified as potentially occurring in the vicinity of the Project Area are

generally piscivore avian species that utilize open water and near-shore habitats to forage. Potential minor impacts to foraging species may occur as a result of construction of Segment 3 within an unnamed tributary to Jasper Creek. While many forage species are found in the Study Area within the Passaic River and Newark Bay, forage species within this drainage feature are likely to be low in numbers. Therefore, impacts resulting from construction are anticipated to be minor and temporary, and piscivore species would be able to utilize comparable forage habitat in the vicinity of the Proposed Action. No impacts to Federally-listed or State-listed species resulting from operation of the Proposed Action are anticipated. Additional impacts to threatened and endangered species may result from construction of pump stations and other interior drainage features. The extent of these impacts will be determined as the interior drainage design is finalized. However, impacts to Federally-listed and State-listed species from the construction of the pump stations is highly unlikely considering the developed urban, transportation and industrial character of the Project Area.

Minor permanent adverse impacts and benefits resulting from SLC and the conversion of wetlands and shallows to open water would also occur as part of the Proposed Action.

6.11 Cultural Resources

No Action Alternative

There would be no cultural resource impacts as a result of the No Action Alternative.

Proposed Action

The Area of Potential Effect (APE) is considered to be located along the floodwall alignment in Segments 1 – 8, as currently proposed. The APE for archaeology, historic structures and historic landscapes has been defined as those areas along the proposed LOP that would likely be directly impacted by project construction. The APE for historic structures and historic landscapes includes also those locations that would be anticipated to have impacts visually from the completed project. Interior drainage measures will be necessary for the proper functioning of this coastal storm risk management project. At this time, there are no staging areas, access roads, or other ancillary features defined for the study but these areas will be considered within the APE once they are defined. Interior drainage may be achieved by modifying existing storm sewers. Once the location and design of the interior drainage measures are better defined they will become part of the APE.

A number of NRHP-listed or eligible properties are located within the APEs identified above. Several potentially eligible properties have been identified for which further study is required. It is anticipated that project actions may have direct and/or indirect impacts to several of these properties. Potential impacts to specific historic properties are outlined below by project segment and summarized in Table 41.

Table 41: Identified and Potential Historic Properties within the APE and Need for Further Study

Segment	Above Ground	Further Study	Below Ground	Further Study
1	a. Lehigh Valley RR HD (NAE)	a. no	a. Newark City Sewer System b. Peddie's Ditch c. LVRR-related resources	a. yes b. yes c. yes
2	a. Lehigh Valley RR HD (NAE) b. Pennsylvania RR HD (NAE) c. Pennsylvania RR NYBB (NAE)	a. no b. yes c. no	None	no
3	a. Lehigh Valley RR HD (NE) b. Lehigh Valley RR Oak Is. Yard (NE) c. PVSCNBOSW (NE)	a. no b. no c. no	None	no
4	a. 106 Rutherford Pl. (NE) b. Passaic Valley Sewerage Commission/Newark Bay Outfall Sewerage Works (NE)	a. yes b. no	None	no
5	Passaic Valley Sewerage Commission/Newark Bay Outfall Sewerage Works (NE)	no	None	no
6	a. Pennsylvania RR HD (NAE) b. Newark Penn Sta. (NAE w/ TP) c. Second Reformed Dutch Church & Rectory (NE) d. Ironbound Trust Co. (NE)	a. yes b. yes c. no d. no	Robinson & Roders Company Factory site	yes
8	a. Jackson Street Bridge (NE) b. Riverbank Park & Fieldhouse (NE)	a. no b. no	a. Morris Canal HD b. Site 28-Ex-129 c. Newark City Sewer System	a. yes b. yes c. yes
Interior Drainage	TBD	yes	TBD	yes
Other Features	TBD	yes	TBD	yes
NAE = No Adverse Effect, NE = No Effect, AE= Adverse Effect, TP = Treatment Plans, TBD= To Be Determined				

The proposed action intersects several times with the Lehigh Valley Railroad (LVRR) and the Pennsylvania Railroad (PRR) HDs however it is not anticipated that the construction of protection measures will have adverse effects on the historic railroads. The construction of walls and closure gates will likely have effects but they will not be adverse given that the work will be limited to selected locations along these lengthy rail lines. These corridors have already experienced extensive modifications themselves, as well as changes to the surrounding communities, over the decades in this highly urban area. It is not anticipated that construction of any proposed measure will structurally impact any of the contributing railroad bridges although there may be visual impacts to these structures from the construction of floodwalls and gates. The USACE will work

with the NJHPO on finishing treatments as determined necessary. The individually eligible Newark Penn Station will be directly impacted by construction. The USACE will develop treatment plans that minimize effects through design and finish. Potential effects to the LVRR and PRR are outlined below by project segment.

6.11.1 Above Ground Resources

Segment 1: Two walls of the proposed measure tie into the NRHP-eligible LVRR northern embankment near the abutments of the plate girder bridge carrying the rail line over Frelinghuysen Avenue. Approximately seventy feet of alignment is proposed adjacent to the southern edge of the at-grade LVRR spur which runs to the railyard just north of Peddie Street. The proposed action will directly impact the LVRR HD as it ties into the railroad embankment near the bridge abutments. The construction of three segments of 3-foot high wall and gates will have an effect on the HD but it will not be adverse as the work will not alter the eligibility of the LVRR line or its contributing elements; the at-grade spur and the bridge over Frelinghuysen Avenue. No other above ground historic resources are present.

Segment 2: Segment 2 is adjacent to and/or crosses the PRR New York to Philadelphia HD (now Amtrak's Northeast Corridor), the PRR New York Bay Branch HD and the LVRR HD; all of which are NRHP-eligible resources.

This segment was initially proposed to run directly under the historic truss bridge, a contributing element that carries the LVRR over the other two lines. The alignment was relocated to avoid being directly beneath the bridge but still ties into the LVRR HD embankment near the bridge abutments. Introducing segments of wall, with gates, across rail lines will have an effect on the historic property but it will not be adverse as the work will not alter the eligibility of the LVRR HD, the PRR HD or the PRR New York Bay Branch HD. The proposed wall will be located where the PRR New York Bay Branch branches off the main PRR line and heads east towards the New Jersey waterfront. Although this alignment is considerably shorter in length than the PRR HD the presence of a 6-foot wall at its junction with the main PRR line will have an effect but it will not be adverse as the work will not alter the eligibility of the HD. The setting of the truss bridge, a contributing element, will be adversely affected by the addition of a wall and gates that tie in near the structure's abutments. The USACE will work to minimize these effects and will coordinate with the NJHPO and other interested parties on finishing treatments for unavoidable impacts.

There may be ancillary historic railroad features extant such as catenary, lamps, etc., within the Segment 2 vicinity. As plans are developed an access to the railroad corridor is obtained a survey may be conducted to identify any such historic features.

Segment 3: A 9-foot high wall running across a small stream, is proposed just north of the LVRR HD and LVRR Oak Island Yard HD and immediately east of the New Jersey Turnpike overpass. The stream is well below grade of the railyard. The construction, as presently proposed, is to tie into an access road that runs between the stream and the historic rail lines, and will not directly impact these districts. The wall will be located approximately 100 feet north of the western end of the LVRR Oak Island Yard, where the LVRR rail lines begin to fan into the rail yard. The proposed action will have no effect on the LVRR Oak Island Yard HD or the LVRR HD. The

proposed action will have no effect on the Passaic Valley Sewerage Commission Newark Bay Outfall Sewerage Works which is located approximately 1,000 feet east of Segment 3. No other above ground historic resources are present. No additional work will be conducted.

Segment 4: The Quonset hut-like "Butler Building" structure at 106 Rutherford Street may be eligible for the NRHP. The construction of an adjacent wall and closure gate to a height of 4 feet above ground surface will have no direct effect on the structure. The setting has already been heavily modified by the presence of the NJ Turnpike overpass. The USACE will conduct additional research on the structure to determine eligibility and will prepare a NJHPO Architectural Survey Base Form and Eligibility Worksheet for the structure in the next phase of the project. The proposed action will have no effect on the Passaic Valley Sewerage Commission Newark Bay Outfall Sewerage Works which is located approximately 1,000 feet east of Segment 4. No other above ground historic resources are present.

Segment 5: The proposed action will have no effect on the Passaic Valley Sewerage Commission Newark Bay Outfall Sewerage Works which is located approximately 1,000 feet east of Segment 5. No other above ground historic resources are present. No additional work will be conducted.

Segment 6: The construction of a 3-foot high wall one a block to the west of the Second Reformed Church and across a park from the Ironbound Trust Company will have no effect on these properties.

The wall and closure gate may tie-off at Newark Penn Station and the PRRR HD which will have an effect on these historic properties. The effect will not be adverse on the lengthy PRR HD but construction will directly impact the individually eligible train station. Project plans will be developed to minimize direct effects to the historic fabric of the station, as feasible. Mitigations measures for any unavoidable impacts will be coordinated with NJHPO. The USACE will work with NJHPO and other interested parties to develop a treatment plan that leads to no adverse effects to the structure.

Segment 8: As currently proposed, a 5-foot high wall will run along the sidewalk on the north side of Raymond Boulevard for 690 feet beginning approximately 100 feet east of the NRHP-eligible Jackson Street Bridge. There is a low wall with a fence already in place along the entrance ramps to the bridge. The construction of the wall 100 foot east will have no effect on this historic property or its setting given the major changes to the bridge approaches and surrounding landscape over time.

The LOP was initially proposed to run within Riverbank Park but was relocated based on input from the local community. The wall, as now proposed, will run along the sidewalk near the road. This wall will have effect on the NRHP-listed Riverbank Park however the park has already undergone major renovations on the riverside of Raymond Boulevard and the addition of a low wall along the sidewalk is not considered an adverse impact. The USACE has been working with the local community as part of the overall planning of the project and the final wall design will be informed by community input. The proposed action will have no effect on the Riverbank Park Field House which located on the south side of the playing field and across Raymond Boulevard from the APE or on Riverbank Park as a whole.

6.11.2 Below Ground Resources

Segment 1: Project plans, as they are developed, will be compared with detailed maps of the historic City of Newark Sewers to ensure that that the historic sewer is not impacted by the proposed measures. If impacts are anticipated, measures to minimize or mitigate them will be developed. Additional research on Peddie's Ditch will be undertaken to confirm it will not be impacted by construction. Pending final design archaeological monitoring during construction for remains of railroad gate mechanism and railroad embankment may be undertaken.

Segment 2: The walls will tie into the LVRR railroad embankment which will create a similar impact as the construction of the walls in Segment 1. The monitoring of construction in Segment 1 is considered sufficient to document LVRR embankment construction techniques in this vicinity. No additional archaeological resources are anticipated and no further work will be undertaken. Should Segment 1 monitoring not be undertaken due to unanticipated project issues, then monitoring of Segment 2 construction may be conducted instead.

Segment 3: No archaeological resources anticipated and no further work will be undertaken.

Segment 4: No archaeological resources anticipated and no further work will be undertaken.

Segment 5: No archaeological resources anticipated and no further work will be undertaken.

Segment 6: Archaeological evidence of the Robinson & Roders Company plant are likely to be encountered. Historic research will determine the need for, and direction of, archeological investigations.

Segment 8: This area is sensitive for remains from the industrial development of the Passaic River waterfront and in particular evidence of the Morris Canal may be encountered. As project plans are developed the need for, and extent of, archaeological investigations will be coordinated with NJHPO and other interested parties. The plans will also be compared with detailed maps of the historic City of Newark Sewers to ensure that that the historic sewer is not impacted by the proposed measures. If impacts are anticipated, measures to minimize or mitigate them will be developed.

Interior Drainage: Plans, as they are developed, will be compared with detailed maps of the historic City of Newark Sewers to ensure that that the historic sewer is not impacted by the proposed measures. If impacts are anticipated, measures will be developed to minimize or mitigate for adverse impacts. The need for archaeological investigations will be determined in coordination with NJHPO for measures proposed outside the sewer system.

Other Project Features (access roads, staging areas, etc.): As project plans are developed, and locations for these ancillary features are proposed, the need for archaeological investigations will be determined in coordination with NJHPO.

6.11.3 Section 106 Coordination and Mitigation

Agreement documents were developed previously by the USACE for two projects along the Passaic River whose study areas encompass all or part of the Passaic Tidal APE. As part of the Passaic River Basin study a Programmatic Agreement (PA) was signed in 1993 by the USACE, the NJHPO and the Advisory Council on Historic Preservation to address the need for further

cultural resource investigations. A Memorandum of Agreement (MOA) was developed and signed in 1997 by the USACE, the New Jersey Historic Preservation Office (NJHPO) and the Advisory Council on Historic Preservation to address historic properties identified in the Joseph G. Minish Passaic River Waterfront Park and Historic Area in the City of Newark. Several stipulations of the MOA have been completed to date including stipulations implemented in part by the City of Newark with regards to their work on Riverfront Park. These agreements served as useful tools for preparing Section 106 documents for the Passaic Tidal study.

The USACE project archaeologist reached out by telephone and/or email to the following local community members or experts to get their input on cultural resources within the APE:

- David Robinson, City of Newark, Office of Planning, Zoning & Sustainability, Landmarks & Preservation Commission and Ironbound Community Corporation
- Nancy Zak, Ironbound Community Corporation
- Scott Dvorak, Trust for Public Land
- Ulana Zakalak, architectural historian, Newark
- Caroline Scott, New Jersey railroad historian

Attempts were also made to contact Newark Preservation and Landmarks Committee by phone but no response was given. Additional outreach to them will be made.

In order to address the anticipated adverse impacts that may result from the proposed action the USACE has prepared a Case Report summarizing the research, findings and potential impacts. Also prepared was a preliminary draft PA which stipulates the actions the USACE will take with regard to cultural resources as the project proceeds. The Draft PA is available for public review as Appendix E and will serve as the USACE's Section 106 public coordination. The Case Report and Draft PA has been provided to the NJHPO, the Delaware Nation, the Delaware Tribe of Indians, the Eastern Shawnee Tribe and the Shawnee of Oklahoma for their review and participation. Consultation was also initiated with other interested parties including the City of Newark Landmarks & Historic Preservation Commission (Appendix D – Pertinent Correspondence). The Advisory Council on Historic Preservation will be provided an opportunity to participate. The final PA will incorporate comments received on the draft document, as appropriate, and will be used to ensure that the USACE satisfies its responsibilities under Section 106 of the NHPA and other applicable laws and regulations.

6.12 Air Quality

Construction projects within Newark must be particularly sensitive to how these projects affect air quality within the city. Although the Proposed Action are well below de minimus levels for the criteria pollutants, cumulatively any emissions adds to an already overburdened system. To minimize impacts, construction contractors will be required to use newer equipment and vehicles with emission controls. No equipment idling will be allowed at any of the segments.

The operation of the pump stations and any mechanized gates would be designed using the most up-to-date equipment that will avoid to adversely contributing to poor air quality. The location of the pump stations need to consider the locations where they would optimally function without impacting neighborhoods or community resources. Pump stations are typically designed to be non-descript, maintained structures that fit into the community and should not adversely impact the neighborhood.

6.13 Noise

No Action Alternative

There would be no noise impacts as a result of the No Action Alternative.

Proposed Action

Construction of the Proposed Action would last approximately 2.5 years for all of the segments, and would involve the construction of floodwalls and other elements of the plan segments. Construction would involve the use of heavy construction equipment, including pile hammers, mechanical cranes, excavators, front end loaders, and dewatering pumps, resulting in a temporary increase in noise. Sensitive land uses directly adjacent to the Project Area which could be affected by construction noise include community open spaces along the waterfront in Newark.

Based on USEPA estimates, noise levels associated with site preparation and construction activities at a distance of 50 ft from the source and within the urban environment are likely to be in the range of 70 to 90 dBA for each piece of equipment (FHWA 2006). Blasting is not anticipated to occur, and minimal demolition may occur as a result of construction of the Proposed Action.

An increase in noise levels may be experienced during the operation of the pump stations proposed as part of the interior drainage plan. The increase in noise levels would be minor due to the infrequent operation during emergency storm events. If operation is required outside of emergency storm situations, a noise variance may be required if sensitive resources are identified in proximity to the pump stations. Maintenance and operation of the proposed manual storm gates, and floodwalls would have a minimal impact on noise.

6.14 Recreation

No Action Alternative

If substantial flooding occurred as a result from a hurricane or storm, some waterfront parks could be severely damaged, resulting in direct, adverse impacts to recreation in the Project Area as a result of the No Action Alternative. Even if the park features were not damaged, while inundated

with floodwaters, parks would not be available for use, resulting in a minor to moderate impact to the recreational users of the park.

Proposed Action

The Proposed Action maintains access to the parks and the adjoining waterfront. The floodwall in Segment 8 would be aligned adjacent to the north side of Raymond Boulevard north of Minish Park. Access to Minish Park in this location may be temporarily restricted during construction of Segment 8, resulting in temporary minor impact. There would be no permanent impact to the park or park users. The Project would protect interior parks within the Study Area, from storm surges, floods, and erosion. By protecting the park facilities from coastal storms, the Proposed Action would yield a moderate beneficial impact to recreation.

6.15 Aesthetics and Scenic Resources

No Action Alternative

Under the No Action Alternative, the risk of coastal storm flooding would continue and the potential for damaging flooding of scenic resources including the riverfront parks located within the Project Area would be expected to increase gradually over time in direct relation to sea level change.

Proposed Action

The visual effects of construction-related activity would be minor and temporary. These temporary, minor impacts would affect pedestrians and bicyclists primarily on the roadways along Segments 1, 4, 5, 6, and 8, and within the public parks and boaters on the river along Segment 8. Construction-related visual effects may result from the presence and usage of construction materials, signage, barriers, and various types of heavy machinery at construction locations. These visual impacts would be temporary and would cease upon completion of construction.

Impacts to the viewshed of the Passaic River and viewshed of the waterfront from the river were analyzed for Segment 8. Due to the location of Segment 8 along the edge of Minish Park along the lower Passaic River, the Proposed Action would result in minor benefits to the aesthetic and visual character of the Project Area once construction is complete. The proposed floodwall would extend approximately 300 ft along Raymond Boulevard and would be a maximum of 3.4 ft in height.

Under the proposed alignment of Segment 8, the viewshed from Minish Park, which includes visibility of open water and mudflats, would be maintained. Views of Minish Park from the water would also be maintained and the proposed floodwall would potentially provide a structural backdrop that that blocks views of the roadway adjacent to the park, resulting in benefits to the aesthetics of the park.

Visual impacts in the park would be mitigated through incorporation of context sensitive design features that would complement the recreational uses of the parks and enhance user experience. Examples of such features include, but are not limited to: pedestrian/bike paths, racket ball or basketball courts, climbing walls, benches, etc. Barrier free design considerations would be factored into these features as appropriate. The specific features would be developed in

conjunction with the City of Newark and community groups (e.g., the Ironbound Community Center) during the detailed design phase of the Project.

6.16 Hazardous, Toxic, and Radioactive Waste

No Action Alternative

Under the No Action Alternative, there would be no impacts to any known or buried contaminated sites. However, flooding

Proposed Action

Of the KCS within Newark there are six sites located near (4 city blocks or less) or adjacent to the proposed action. These include:

- PI 497543 Passaic River Waterfront Park
- PI 005878 Conrail Oak Island Yard 611 Delancy Street
- PI 709101 283 299 Frelinghuysen Avenue
- G000001420 ADCO Chemical Company 49 Rutherford Street
- PI 537551 ATCO Products 189 195 Frelinghuysen Avenue
- PI 033104 Clinton Square Auto Parts Corp 221 Frelinghuysen Avenue
- PI 017945 CSS Realty 57 75 Peddie Street
- PI 703333 LEMCOR Inc 170 Frelinghuysen Avenue
- PI 554994 Metal Parts Processing Co. Inc. 182 Frelinghuysen Avenue
- G000000606 Zamelsky Scrap 307 Frelinghuysen Avenue

Segment 1 is within the intersection that is adjacent to city block within which the CSS Realty site at 57 75 Peddie Street. The Conrail Oak Island Yard is located immediately adjacent to Segment 3. Segment 8 is along a short length of the Jackson Avenue Bridge downstream abutment and sidewalk along the southern edge of the Passaic River Waterfront Park. As part of construction, soil testing will be able to determine if any of the contaminant concerns from any of these sites has affected each individual segment location.

In addition, Sites 283 299 Frelinghuysen Avenue, ATCO Products, Clinton Square Auto Parts, LEMCOR Inc., Metals Parts Processing Co., and Zamelsky Scrap are located nearby Segment 1. The ADCO Chemical Co. is situated one block east of Segment 4, between Segment 4 and 5. It is recommended that soil testing be conducted prior to construction to determine if there is any associated contamination.

The Pierson's Creek National Priority List site is located about one mile west of Segment 5, on the other side of the New Jersey Turnpike. Given the areas industrial history, soil testing prior to construction of segments is recommended to determine if any undocumented contamination exists.

6.17 Transportation and Other Infrastructure

No Action Alternative

Under the No Action Alternative the risk of coastal storm flooding would continue and the potential for damaging flooding of existing transportation and other critical infrastructure would be expected to increase gradually over time in direct relation to sea level change.

Proposed Action

There would be a potential temporary disruption of transportation systems and infrastructure along roads in the Study Area during construction activities. Construction would result in temporary, minor impacts on vehicular traffic flow and volume, which may include commuter bus service. An increase in large, slow-moving construction vehicles needed for construction of the Proposed Action would temporarily decrease traffic flow and increase traffic volume in the area between the hours of approximately 7:00 am and 4:00 pm. Increased construction traffic volume would also occur at staging areas and along routes between staging areas and the project segments, resulting in potential minor temporary impacts during construction. To help alleviate the temporary impacts associated with construction activities, the selected construction contractor would be required to develop a Maintenance and Protection of Traffic plan, in coordination with local transportation officials, to minimize traffic impacts. Construction crews would be encouraged to carpool or use alternative modes of transportation (e.g., shuttles, commuter rail, etc.) to reduce the project-generated vehicle trips in the Project Area.

During construction there would be potential temporary, major impacts on commuter and freight rail service, particularly along Segment 2, which consists of five closure gates across the railroad tracks. Proper implementation and planning with key stakeholders would be used to minimize the potential temporary impacts and construction in these areas referenced above will require close coordination with the local railroad companies.

There would be no impact on the navigation channels in the Passaic and Hackensack Rivers in the Study Area, as construction would not occur navigable waterways. Construction would have no impacts on the local water infrastructure in the Project Area. Pump stations would be designed to prevent sewer backflow during storm events.

Upon completion of construction, no adverse impacts on local modes of transportation would occur. Construction would have no long term impacts on the existing transit and road infrastructure systems. Upon completion of construction the plan segments and associated structures would allow the local roadways and pedestrian pathways to remain accessible. During storm and flood events, Segments 1, 2, 4, 5, and 6 would disrupt rail transit and road infrastructure system as the flood gates would be closed to prevent flooding. Gate closures would result in temporary impacts the transportation systems; however, the protection offered by the Proposed Action would also benefit transportation modes and would allow non-gated roadways to remain unflooded and open to vehicular and pedestrian travel. The gates would be opened and transportation corridor connectivity would be restored when flood conditions become safe. Once completed, the Proposed Action would reduce the incidence and cost of existing transportation infrastructure damage due to flooding.

Upon completion of construction the Proposed Action would have no adverse impacts on

infrastructure in the Project Area. Substantial population growth or concentration in the Project Area would not occur as a result of the proposed project. Therefore, the Proposed Action would not require the extension of local infrastructure, such as roadways or water and sewer infrastructure. Equally, the Proposed Action has the opportunity to improve interior drainage in the Project Area. The plan segments and associated drainage structures would reduce the amount of stormwater that enters the combined sewer system in the Project Area during storm and flooding events. This would help reduce the frequency and duration of CSO events in the Project Area.

6.18 Summary: Environmental Impacts of Hurricane and Storm Risk Management Measures

A summary of impacts on each resource category associated with the each alternative evaluated is provided in Table 42.

Table 42: Summary of Impacts Associated with the Proposed Action

Resource	Environmental Impact Summary
Geology and Physiography	No impact.
Topography	Permanent, minor impact overall.
Soils	Permanent, minor impact overall.
Climate and Weather	No impact.
Floodplains	Permanent, major beneficial impacts associated with reduced flooding.
Coastal Processes	No impact
Surface Waters	Temporary, minor to moderate impacts during storm events that exceed the design criteria of the interior drainage system resulting in stormwater accumulation on the interior of the floodwall.
Water Quality	Temporary, minor impacts during construction, resulting in negligible impacts as an end result.
Regional Hydrogeology and Groundwater	No impact.
Tidal Influences	No impact.
Land Use and Zoning	Permanent, major beneficial impacts to future land use associated with flood protection. Minor direct impact on land use within permanent easement footprint.
Socio-Economics	Temporary, minor beneficial economic impacts on existing business and the local economy during construction. Permanent, major beneficial economic impacts on existing businesses and protection of regional transportation centers in the larger metropolitan region.
Coastal Zone Management	No impact. Proposed Action consistent with Coastal Zone Management regulations.

Resource	Environmental Impact Summary
Upland Habitat	Temporary, minor impacts associated with construction and permanent minor impacts associated with operation resulting from changes to vegetation cover type. The project would result in the permanent loss of approximately 0.09 acres of mowed lawn, 0.01 acres of maintained roadside, 0.02 acres of urban vacant lot habitat, and 0.01 acres of temporary disturbance to the regulated riparian zone. Mitigation would be conducted to offset minor adverse impacts to the riparian zone.
Wetlands Habitat	Temporary, minor impacts associated with construction and permanent minor impacts associated with operation resulting from conversion of wetlands and open water to uplands.
Shellfish	The project would result in permanent loss of approximately 0.38 acres of wetlands and watercourses. Compensatory mitigation would be conducted to offset minor adverse impacts to wetlands and watercourses.
Finfish	No direct impacts are anticipated. Negligible impacts caused by sediment suspension resulting from operation of pump stations.
Benthic Resources	Potential minor temporary impacts associated with construction stormwater and minor permanent impacts from habitat conversion.
Reptiles and Amphibians	Potential minor temporary impacts associated with construction and permanent habitat conversion. Negligible impacts from operation of pump stations.
Birds	Potential temporary and permanent, minor impacts associated with construction and habitat loss.
Mammals	Potential temporary and permanent, minor impacts associated with construction and habitat loss.
Threatened and Endangered Species	Potential temporary and permanent, minor impacts associated with construction and habitat loss.
Cultural Resources	Potential permanent impacts to above and below-ground historic properties are addressed through a Programmatic Agreement.
Air Quality	Pending.

Resource	Environmental Impact Summary
Noise	Temporary minor increase in noise as a result of the use of construction equipment, as well as infrequent operation of the pumps during storm events.
Recreation	Temporary minor impacts associated with construction. Long term moderate benefit from flood reduction to interior parks.
Aesthetics and Scenic Resources	Temporary, minor impacts associated with construction. Permanent, benefits from blocking view of roadway from the park and Passaic River.
Hazardous, Toxic, and Radioactive Waste	Potential temporary impacts associated with construction and the potential to encounter compromised or contaminated soils.
Transportation and Other Infrastructure	Potential temporary major disruption of transportation systems and infrastructure during construction activities. No impact on commuter or freight rail service during construction.

6.19 Relationship between Short-Term Uses and Long-Term Productivity

The Proposed Action would entail a short-term commitment of resources, including construction equipment, labor, public monies to fund the Project and to purchase property easements, and equipment necessary for minimization and mitigation of environmental impacts.

Some areas within the Project Area would be subject to removal of vegetation, disruption of associated habitat, and ground disturbance during construction. There would be a temporary disruption of transportation systems and infrastructure along roads in the Project Area during construction. A temporary disruption of the availability of recreational and scenic uses would also occur. These disruptions would preclude the use of local recreational facilities and transportation routes by local residents and tourists, and habitats by indigenous animal species.

To contrast this short-term commitment of resources, there are several long-term enhancements in productivity that would result from the Proposed Action. Beneficial impacts on the local economy would occur, such as decreased cleanup and repair costs to local residents and businesses as hurricane and storm damages are reduced. There may also be a greater economic attraction to the community resulting from a decreased potential for flooding.

In the long-term, the Proposed Action is anticipated to result in a more economically and environmentally stable community, both in the immediate Project Area and in the surrounding municipalities. Therefore, the long-term productivity of the overall region may experience benefits from this short-term impact of the environment.

6.20 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy and mineral) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species).

Irreversible and irretrievable resources would be committed to the Project Area by the federal government, the non-federal project partner (NJDEP), and any involved local agencies and municipalities. Resources committed include construction and mitigation materials and costs; labor costs for project planning; natural resources such as soil, and water, and energy resources such as fossil fuels (gasoline, petroleum products, and lubricants) and electricity; and land to accommodate the CSRM features.

Not all of these resources are irretrievable. The monies committed to the Proposed Action would be offset through savings in municipal, residential, and commercial hurricane and storm damage costs in the future, and potentially through increased, resultant commercial viability in the community from reduced flooding. This may also result in an increase in the revenues of the local municipalities in the event of increasing property tax values.

Chapter 7: Cumulative Impacts*

Industries located along the waterfront have in the past and will continue to construct flood mitigation structures and measures to protect their infrastructure. In addition, NJDEP has issued funding in the form of grants in the waterfront area to enhance and increase public access and enjoyment of waterfront resources. Procurement of these funds will likely spur interest in development along the waterfront. NJDEP and the U.S. Department of Housing and Urban Development (HUD) are also evaluating alternatives for the construction of flood risk reductions measures within the Boroughs of Little Ferry, Moonachie, Carlstadt and Teterboro, and the Township of South Hackensack in nearby Bergen County as part of the Rebuild by Design (RBD) Meadowlands Flood Protection Project. Although still in the design and public review process, this project may consist of a range of structures including levees, berms, barriers, drainage structures, pump stations, floodgates, and/or other hard and soft infrastructure to achieve improved protection from inland and coastal storm surge flooding of the Hackensack River. NJDEP and HUD have also evaluated alternatives for flood risk reduction along the Hudson River, specifically within the City of Hoboken, as part of the RBD Hudson Flood Protection Project. This Preferred Alternative for the RBD Hudson Project would also consist of a series of "resist structures" such as flood walls and closure gates and integrated landscaping features to provide protection to the design elevation. When evaluated in conjunction with the Proposed Action, these projects may cumulatively result in temporary or minor adverse impacts to resources in the Project Area. However, the cumulative impacts resulting from other flood protection and coastal storm risk management projects such as the USACE Passaic River Mainstem and the RBD Meadowlands and RBD Hudson projects would result in beneficial impacts within the Study Area and region resulting from flood and coastal storm protection enhancements.

Chapter 8: Coordination & Compliance with Environmental Requirements*

The Proposed Action would comply with all applicable environmental quality statutes and environmental review requirements. Following is a list of federal environmental quality statutes to which this project is in compliance:

- National Environmental Policy Act of 1969,
- Fish And Wildlife Coordination Act of 1958 (see Appendix C),
- Endangered Species Act of 1973,
- National Historic Preservation Act of 1966,
- Clean Water Act of 1972 (see Appendix B1),
- Clean Air Act of 1972,
- Section 307 of the Coastal Zone Management Act,
- Wild And Scenic River Act of 1968,
- Federal Water Project Recreation Act of 1965,
- Resource Conservation And Recovery Act of 1976,
- Toxic Substances Control Act of 1976,
- E.O. 11988, Floodplain Management,
- E.O. 11990, Protection of Wetlands, and
- E.O. 12898, Environmental Justice.

Several regulatory programs which are explicitly pertinent to the project, including Floodplain Management and CZM, are discussed in detail in the remainder of this Section or in other sections of this EA. The following State permits are expected to be required to authorize construction of the Proposed Action:

- Individual Flood Hazard Area Permit,
- Individual Freshwater Wetlands Permit,
- Individual Upland Waterfront Development Permit,
- Section 401 Water Quality Certificate, and
- Green Acres Diversion.

The flood hazard area permit application would demonstrate project compliance with New Jersey's floodplain management regulations, including requirements for riparian zone mitigation, and would also address compliance with State Stormwater Management Rules. The Waterfront Development Permit application would demonstrate compliance with New Jersey's Coastal Permit Program Rules, constituting CZM Consistency. A Freshwater Wetland Permit would be required for any unavoidable impact to freshwater or coastal wetlands and would incorporate requirements for mitigation of any impacts.

8.1 Floodplain Management

All of the flood prone municipalities within the Passaic River basin participate in the National Flood Insurance Program and, as required for participation, have adopted floodplain management ordinances in their municipal codes. The 100- and 500-year flood elevations (in ft referenced NAVD88), which represent 1-percent and 0.2-percent annual chance of exceedance, are 10.8 and 14 ft in the Study Area, as established by FEMA based on Preliminary Flood Insurance Rate map and Flood Insurance Study data for Essex County (no Flood Insurance Study report available for Hudson County). In addition to local ordinances, the State of New Jersey regulates activity in floodplains under the NJ Flood Hazard Area Control Act and implementing regulations (N.J.A.C. 7:13).

Recent implementation of the FEMA buyout program, as executed by NJDEP through the NJDEP Blue Acres program, is consistent with floodplain management regulations. Within the Passaic Tidal Project, there are approximately 422 impacted properties that have been purchased or are being removed through the NJDEP Green and Blue Acres programs. These properties are the most flood-prone structures within Kearny, Harrison, and Newark and represent a loss of a portion of the potential flood risk reduction benefits for the Proposed Action.

Applicable requirements of floodplain management regulations have been considered in the design of the Proposed Action, which would be compliant with such regulations. The Proposed Action would not result in increases in flooding extent or depth nor would it induce flooding on other properties.

8.2 List of Report Preparers

Preparation of this Environmental Assessment included coordination with appropriate federal and state resource agencies. Requests for information and/or coordination were also sent to the New Jersey Natural Heritage Program and USFWS to obtain information regarding protected species in the Project Area. Copies of pertinent correspondence are provided in Appendix D.

The following individuals were primarily responsible for preparation of this report:

Jason Shea, USACE (Plan Formulation)
Karen Baumert, USACE (Plan Formulation)
Nancy Brighton, USACE (Environmental Resources)
Matthew Voisine, USACE (Environmental Resources)
Lynn Rakos, USACE (Environmental Resources)
Richard Dabal, USACE (Environmental Resources)
Steven Weinberg, USACE (Engineering)
Nicholas Kilb, USACE (Engineering)
Carlos Gonzalez, USACE (Real Estate)

Sherri Albrecht, URS|HDR JV
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Krista Matatt, URS|HDR JV
Jennifer Bienemann, URS|HDR JV
Elaine Du, URS|HDR JV
Jennifer Curran, URS|HDR JV

Chapter 9: Plan Implementation

As non-Federal sponsor, the NJDEP must sign a Project Partnership Agreement (PPA) that will carry the project through the Preconstruction Engineering and Design (PED) phase to project construction. A Project Management Plan will be prepared to identify tasks, responsibilities, and financial requirements of the Federal Government and the non-Federal partner during PED and construction. A project schedule has been estimated to serve as the basis of the cost estimate based on reasonable assumptions for the detailed design and construction schedules. It will be refined as more data are available in subsequent phases of the project.

9.1 Consistency with Laws and Policy

This draft feasibility report has been prepared in accordance with relevant laws and USACE policy. Specifically, this section of the report addresses:

- the specific requirements necessary to demonstrate that the project is technically feasible, economically justified and environmentally complaint;
- and the costs and cost-sharing to support a Project Partnership Agreement (PPA).

Economics Justification and Environmental Compliance. The prior sections of this draft report demonstrate that the TSP is technically feasible. It also identifies the TSP at this point in the study to have benefits greater than costs. The draft Environmental Assessment has been prepared to meet the requirements of NEPA and demonstrate that the TSP is compliant with environmental laws, regulations, and policies and has effectively addressed any environmental concerns of resource and regulatory agencies.

9.2 Cost Sharing and Non-Federal Sponsor Responsibilities

The non-Federal costs include the value of lands, easements, rights-of-way, relocations, and dredged or excavated material disposal areas (LERRD), estimated to be $1,243,000.

In accordance with the cost share provisions in Section 103 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C. 2213), project design and implementation are cost shared 65% Federal and 35% non-Federal.

The TSP First Cost is $45,184,000 and the TSP Total Project Cost is $52,016,000.

Operation, maintenance, repair, replacement and rehabilitation (OMRR&R) requirements are considered in the economic analysis for the project. The non-Federal sponsor is responsible for 100% of annual OMRR&R requirements. The Federal government is responsible for preparing and providing an OMRR&R manual to the sponsor.

9.3 Real Estate Requirements

USACE projects require the non-Federal sponsor provide lands, easements, rights-of-way and relocations, and disposal/borrow areas (LERRDs) for a project. Currently, the TSP will require the non-Federal sponsor to acquire temporary and permanent easements for construction. The non-Federal costs include the value of lands, easements, rights-of-way, relocations, and dredged or excavated material disposal areas (LERRD), estimated to be $1,243,000. Details are provided in Appendix I (Real Estate Plan).

9.4 Financial Analysis

For purposes of executing the PPA, NJDEP has a source of funding for coastal storm risk management projects and has indicated its intent to enter into a PPA at the conclusion of the study. The Letter of Support from NJDEP is included in the Pertinent Correspondence Appendix.

9.5 Preconstruction Engineering and Design

Because Passaic Tidal has been included as an authorized but unconstructed project as part of the P.L. 113-2 response to Hurricane Sandy, Preconstruction Engineering and Design (PED) could be cost shared under a Project Partnership Agreement (PPA) (which typically only covers construction), if there are sufficient P.L. 113-2 funds to complete initial construction of the project. Initial construction does not include subsequent periodic nourishment of beach elements, if applicable, to the project. A separate Design Agreement for PED is not required unless P.L. 113-2 funds are insufficient to complete initial construction of a project.

9.6 Construction Schedule

The draft schedule for plan implementation was developed for planning and cost estimating purpose. The project assumes a start date of May 2018 with an overall duration of 38 months with a completion date in July 2021. See Appendix H (Cost Engineering) for the proposed construction schedule.

9.7 Cost Sharing and Non-Federal Sponsor Responsibilities

The details behind the total first cost of implementing the Recommended Plan are shown in Table 43. The Federal share of the project's total first cost is 65-percent of the total. The Federal Government will design the project, prepare detailed plans/specifications and construct the project, exclusive of those items specifically required of non-Federal interests. The non-Federal share of the estimated total first cost of the proposed project is 35-percent of the total. The non-Federal share consists of a number of components including real estate (of which the Non-Federal portion is deducted from the Non-Federal cash contribution) and cost-sharing for PED and construction. The Total Project Cost, also known as the fully funded cost, is $52,571,000 and with monitoring is $52,721,000.

Table 43: Cost Apportionment

Federal Project Cost (65%)	**$34,269,000**
Non-Federal Project Cost (35%)	**$18,452,000**
LERR	
LER	$606,000
Relocations	$637,000
Cash Balance	$17,059,00
Monitoring	$150,000
Total Project Cost with Monitoring (100%)	**$52,721,000**

9.8 Views of the Non-Federal Partner and Other Agencies

The non-Federal sponsor, the NJDEP, has indicated their support for releasing this report for public and agency input. The non-Federal sponsor's support for the TSP will be confirmed through a Letter of Support following Public and Agency reviews.

The Ironbound Community Corporation and Community Advisory Groups for the Lower Passaic voiced their preference for little to low impact to existing park facilities along the Passaic River. The PDT incorporated this request into the proposed plan and the groups have voiced their support.

9.9 Summary of Public Coordination

In January 2017, the PDT and NJDEP met with the mayors of Newark, Harrison, and Kearny to communicate the proposed plan before the draft report was released. During these meetings, the local officials supported the plan an accepted the residual risk associated with it.

The PDT coordinated with local, state, and Federal stakeholders through Ironbound Community Cooperation, Community Advisory Group, and Urban Rivers meetings. These meetings have aided in plan development as community is heavily engaged as an Environmental Justice community.

A public meeting will be held in Newark in October 2017 during the draft report review period to answer questions and address the concerns of the public.

Chapter 10: Local Cooperation Requirements

The non-Federal Sponsor would need to provide their support of the recommendations presented in this report and agree that they intend to execute a Project Partnership Agreement (PPA) for the Recommended Plan before the Draft Integrated Hurricane Sandy General Reevaluation Report and Environmental Assessment can move forward to the Civil Works Review Board Milestone or equivalent. A coordinated PPA package would be prepared subsequent to the approval of the Feasibility Report, which would reflect the recommendations of the report.

Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

a. Provide a minimum of 35-percent of initial project costs assigned to coastal storm risk management:

(1) Provide, during design, 35-percent of design costs allocated to coastal storm risk management in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

(2) Provide all lands, easements, rights-of-way, and perform or assure performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the initial construction or operation and maintenance of the project;

(3) Provide, during construction, any additional amounts necessary to make its total contribution equal to 35-percent of initial project costs assigned to coastal and storm damage reduction plus 100-percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Participate in and comply with applicable Federal floodplain management and flood insurance programs; comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12); and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the coastal storm risk management features;

d. Operate, maintain, repair, replace, and rehabilitate the completed project, or function portion of the project, at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal government;

e. For so long as the project remains authorized, ensure continued conditions of public ownership and use of the shore upon which the amount of Federal participation is based;

f. Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms;

g. At least twice annually and after storm events, perform surveillance of the project area to inspect for condition and damages and provide the results of such surveillance to the Federal government;

h. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

i. Hold and save the United States free from all damages arising from the initial construction, operation, maintenance, repair, replacement, and rehabilitation of the project, except for damages due to the fault or negligence of the United States or its contractors;

j. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence are required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

k. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal government determines to be necessary for the initial construction, operation and maintenance of the project;

l. Assume, as between the Federal government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way required for the initial construction, or operation and maintenance of the project;

m. Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and, to the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA;

n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

o. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction, operation, and maintenance of the project including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material; and inform all effected persons of applicable benefits, policies, and procedures in connection with said act;

p. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)); and

q. Not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that such funds are authorized to be used to carry out the project.

Chapter 11: Recommendations (DRAFT)

In making the following recommendations, I have given consideration to all significant aspects in the overall public interest, including environmental, social and economic effects, engineering feasibility and compatibility of the project with the policies, desires and capabilities of the State of Jersey and other non-Federal interests.

I recommend that the selected plan for coastal storm risk management for the Passaic River Tidal Protection Area, New Jersey, Coastal Storm Risk Management General Reevaluation Study (Passaic Tidal), as fully detailed in this draft interim Hurricane Sandy General Reevaluation Report and Environmental Assessment, be authorized for construction as a Federal project, subject to such modifications as may be prescribed by the Chief of Engineers.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of highest review levels within the Executive Branch. Consequently, the recommendations may be modified (by the Chief of Engineers) before they are transmitted to the Congress as proposals for authorization and implementing funding. However, prior to transmittal to Congress, the partner, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Thomas D. Asbery
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