RESILIENT BRIDGEPORT

National Disaster Resilience and Rebuild by Design Projects

Bridgeport, Connecticut

Draft Environmental Impact Statement / Environmental Impact Evaluation

January 2019

Prepared for

CONNECTICUT Department of Housing

Prepared by

wsp

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Resilient Bridgeport: National Disaster Resilience and Rebuild by Design Projects

LEAD AGENCY: Connecticut Department of Housing

COOPERATING AGENCIES: U.S. Department of Housing and Urban Development; Federal Emergency Management Agency; U.S. Environmental Protection Agency; Connecticut Department of Energy and Environmental Protection; and Connecticut State Historic Preservation Office

ABSTRACT: The Proposed Action consists of three projects located within the South End of Bridgeport, Connecticut – the Rebuild by Design (RBD) Pilot Project at the former Marina Village public housing site, a Flood Risk Reduction Project on the east side of the South End neighborhood, and a Resilience Center – all of which would combine to provide stormwater management, dry evacuation routes (dry egress), a coastal flood defense system, and resiliency education to the community. This Draft EIS includes a detailed project description and evaluates environmental impacts, including direct, indirect, and cumulative impacts, associated with the Proposed Action and several options, as well as a No Action Alternative.

The disaster recovery grants are under U.S. Department of Housing and Urban Development's (HUD) Community Development Block Grant Disaster Recovery (CDBG-DR) National Disaster Resilience (NDR) and RBD programs as part of HUD's response to the devastation following Superstorm Sandy. Per HUD regulations at 24 CFR Part 58, CDBG-DR funding requires compliance with the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321 et seq). CTDOH has prepared this Draft EIS in accordance with the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), HUD's Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 CFR 58), and the State of Connecticut Environmental Policy Act (CEPA) (Regulations of Connecticut State Agencies Section 22a-1).

Electronic copies of the Draft EIS are available for public review on the following websites: https://www.ct.gov/doh/cwp/view.asp?a=4513&q=588726 and www.ResilientBridgeport.com.

A public hearing on this Draft EIS will be held on February 12, 2019 from 6:00 to 8:00 pm. Advanced notice will be advertised stating the time and place of the hearing. Comments will be accepted through February 22, 2019 and can be submitted online through the project website or at the email address or through regular mail at the below addresses.

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Executive Summary

Contents

Tables

Executive Summary

S.1 INTRODUCTION AND BACKGROUND

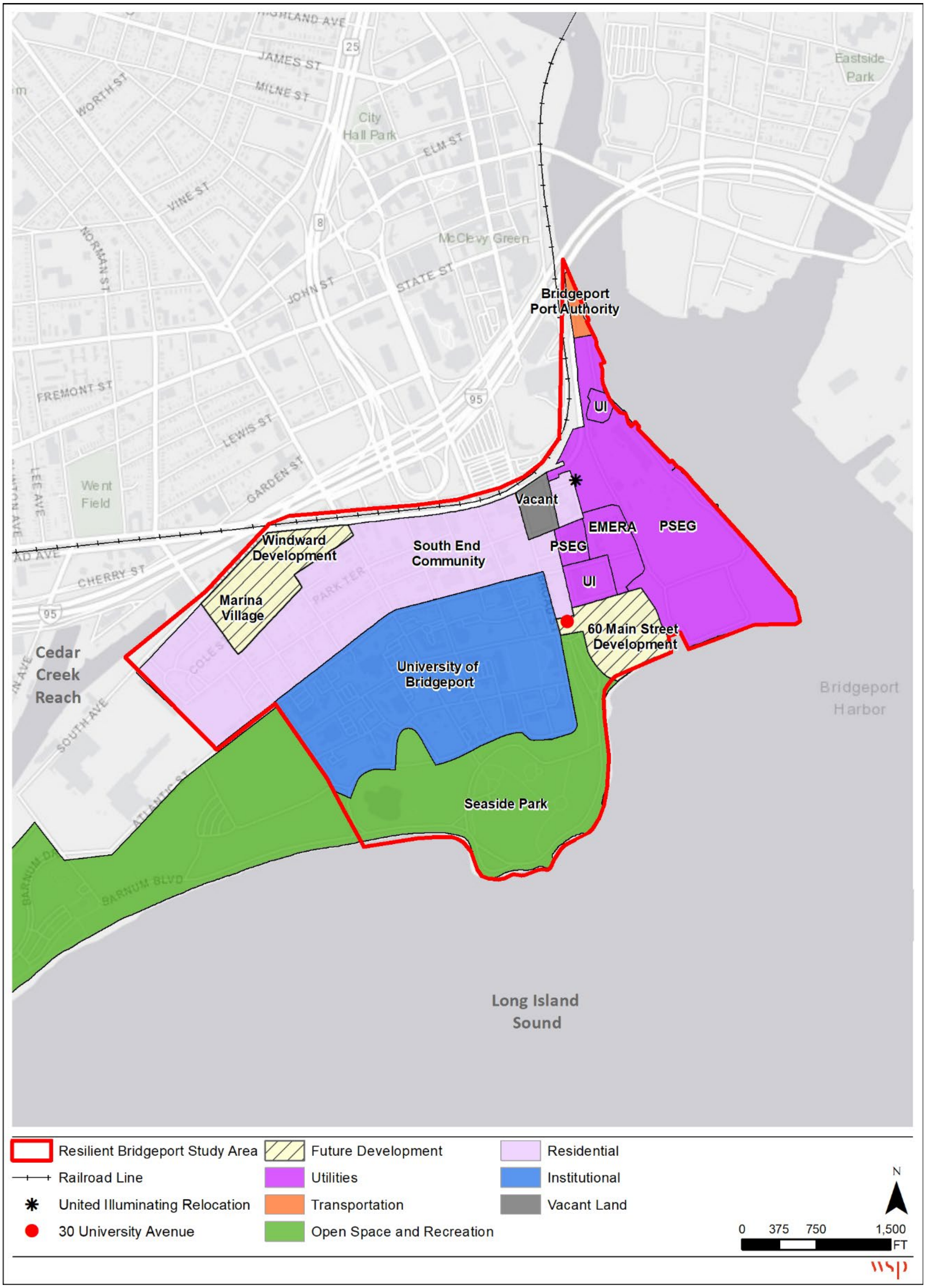
The State of Connecticut's Department of Housing (CTDOH) is the recipient of the U.S. Department of Housing and Urban Development (HUD) disaster recover grant funding and is the "Responsible Entity," as that term is defined by HUD regulations at 24 Code of Federal Regulations (CFR) Part 58.2(a)(7)(i)— CTDOH has prepared this Draft Environmental Impact Statement (DEIS) for the proposed Resilient Bridgeport: National Disaster Resilience and Rebuild by Design projects (Proposed Action). The disaster recovery grants are under HUD's Community Development Block Grant Disaster Recovery (CDBG-DR) National Disaster Resilience (NDR) and Rebuild by Design (RBD) programs as part of HUD's response to the devastation following Superstorm Sandy. The Proposed Action consists of three projects located within the South End of Bridgeport, Connecticut—the RBD Pilot Project at the former Marina Village public housing site, a Flood Risk Reduction Project on the east side of the South End, and a Resilience Center—that would provide stormwater management, dry evacuation routes (dry egress), a coastal flood defense system, and resiliency education to the community.

The Proposed Action is considered a "major federal action significantly affecting the quality of the human environment"; therefore, it must comply with the requirements of the National Environmental Policy Act of 1969 (NEPA). CTDOH has prepared this DEIS in accordance with the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508) and HUD's Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 CFR 58). In addition, the Connecticut Environmental Policy Act establishes environmental policy for the State of Connecticut and requires an Environmental Impact Evaluation (EIE) for any state action that could affect the natural environment. As such, this DEIS will jointly serve as an EIE and will meet Connecticut Environmental Policy Act requirements.

The study area is situated within the South End neighborhood of the city of Bridgeport (Figure S-1), a peninsula of the Connecticut coastal region located between Cedar Creek, the Long Island Sound, and Bridgeport Harbor. On the northern end, the study area is bound by the Connecticut Department of Transportation (CTDOT) New Haven Line railroad tracks. The South End neighborhood is susceptible to chronic flooding conditions due to a combination of inadequate stormwater infrastructure in the area and its coastal location. The population includes public housing residents and other vulnerable populations. The city of Bridgeport is considered a distressed municipality per Connecticut Department of Economic and Community Development criteria; therefore, the city of Bridgeport and the study area is considered an Environmental Justice Community.

The study area includes multifamily residential, utility, institutional, and open space. The former Marina Village site (to be redeveloped as Windward), currently consists of medium-density public housing. The Bridgeport Harbor Generating Station, a Public Service Enterprise Group (PSEG) Power Connecticut LLC-owned energy generating facility occupies the eastern portion of the study area along the Pequonnock River (Bridgeport Harbor). Adjacent to the PSEG facility are light industrial facilities including energy micro-grids and facilities owned by Emera and United Illuminating. The southern portion of the study area consists of the historic, 325-acre Seaside Park, which continues west following the Long Island Sound. To the north of Seaside Park, in the middle of the study area is the University of Bridgeport. The 86-acre campus has an enrollment of approximately 5,400 students and over 500 faculty members.

Figure S-1. Resilient Bridgeport Study Area



S.2 PURPOSE AND NEED

S.2.1 Purpose

The purpose of the Proposed Action is to create a more resilient South End community, support its long-term viability, and improve health and safety for the community's vulnerable populations. The principal targeted outcomes follow:

- Lower the risk of acute and chronic flooding
- Provide dry egress during emergencies
- Educate the public about flood risks and sea level rise

The Proposed Action could deliver additional benefits to the community, potentially unlocking development or public realm opportunities, enhancing connectivity between the South End and Downtown Bridgeport, improving existing open space amenities, building up the resilience of local energy systems, and leveraging public investment in ongoing resiliency efforts through coordination with local stakeholders.

The Proposed Action serves as an example of the State of Connecticut's long-term vision (as described in the State's NDRC Phase I application) of establishing more resilient coastal communities where structures and critical infrastructure in the flood zone are adapted to withstand occasional flooding and protected by healthy buffering ecosystems, where critical services, infrastructure and transport hubs are located on safer, higher ground, and where strong connections exist between the two. The South End of Bridgeport, with housing within walking and biking distance of the Metro-North train station downtown, critical power infrastructure, historical and cultural resources like the Freeman Houses, a university, and historic Seaside Park, is one of the state's identified resilience zones where adapting the area to flood risk and increasing investment provides an opportunity to increase economic resilience by strongly tying back to the regional transportation network and regional economic opportunities. These investments represent a "no regrets" approach to disaster mitigation and climate adaptation because in addition to providing long-term resilience, they would provide a myriad of co-benefits that would strengthen communities and economic opportunities in the short term and between storms. Additionally, the State of Connecticut will be taking lessons learned from the Proposed Action in the city of Bridgeport to further the development of the Connecticut Connections Coastal Resilience Plan, also funded under the NDR program, but exempted from the NEPA process as a planning only activity. Briefly, this Resilience Plan will include working with communities in Fairfield and New Haven Counties to integrate the State of Bridgeport's resilience vision into their local and regional planning with the support of local flood risk modeling.

S.2.2 Need

The South End neighborhood experiences flooding resulting from both coastal inland flooding and regular rainfall events. These chronic flooding issues are the result of both an aged and combined stormwater sewer system. The peninsula is exposed to storm surge from coastal storms, which pose an increasing risk due to sea level rise. Connecticut Institute for Resilience and Climate Adaptation's latest report utilized projections from the Intergovernmental Panel on Climate Change and National Oceanic and Atmospheric Administration, adjusting the projections based on local conditions. The report recommends: "…that planning anticipates that sea level will be 0.5 meters (1 foot 8 inches) higher than the national tidal datum in Long Island Sound by 2050. Further, we recommend that planners be made aware that it is likely that sea level will continue to increase to 1.0 meters (3 feet 3 inches) by 2100."[1]

During Superstorm Sandy, sustained 70 mph gale force winds assailed the area, which experienced the highest storm surge in the state (nearly 7 feet above normal high tide), and resulted in damages to over 570 single-family homes citywide. Within the South End, 211 buildings were inundated. Flooded buildings are susceptible to mold and other public health concerns. These buildings and other infrastructure assets in the South End remain vulnerable to future events. Connecticut Institute for Resilience and Climate Adaptation's modeling results predict that the frequency of areas experiencing coastal flooding at the current 10-year and 100-year levels will increase with sea level rise. For a 0.5-meter increase in seal level, the rate frequency of flooding is expected to be twice as high for Eastern Long Island Sound than for the Western Long Island Sound.[2]

Due to the low-lying geography, the area regularly experiences flooding from rainfall or tidal inundation. Flooding also occurs as stormwater flows south from a higher elevation at Downtown Bridgeport. Following rain events, extensive ponding often occurs in the railroad underpasses, including at Lafayette Street and Myrtle Street. Minimizing the flooding at roadways leading into and out of the South End is vital to resident egress and emergency evacuation. Repetitive flooding of local streets occurs in the valleys and low-lying areas caused by both rainfall runoff and storm surge, making the streets impassable. During a rain event as frequent as a 2-year storm, backflow of the system can cause street flooding for over 2 hours. During a severe flood event, the area near the intersection of Main Street and University Avenue can experience street flooding for over 13 hours. Improving the existing drainage system is important to minimize internal flooding and to manage stormwater in both high- and low-frequency storm events.

In the South End East, the sewer and stormwater system infrastructure is aging, including an existing outfall that runs along Singer Street in the study area and drains into Bridgeport Harbor during combined sewer overflow (CSO) events. Generally, when the area experiences a heavy rainfall event, the water volume exceeds the capacity of the system and discharges the stormwater and wastewater with pollutants directly into the harbor. In Bridgeport, a rain event as small as 0.4 inch of precipitation can trigger a CSO event.

In addition to flooded streets and damaged residential properties, after Superstorm Sandy residents experienced power outages, lasting from a few hours to more than a week. United Illuminating, which serves the larger region, reported that over 250,000 customers experienced power outages. Of the roughly 57,835 Bridgeport customers, over 41 percent (or 23,700) still experienced outages four days following the onset of Superstorm Sandy. Disruptions to regional supply chains and power interruptions caused serious complications for local industries. Ensuring the continuity of operations at the power-district scale is critical to maintaining industrial and commercial functions in the city.

Over the next 50 years, sea levels are expected to rise significantly, which will further compound existing flooding risks in Bridgeport's South End. Much of the critical infrastructure in the area, including electricity generation, transmission, and distribution facilities and low-lying stormwater and wastewater infrastructure, lies within the coastal floodplain and will face increasing risk of impact as sea levels rise.

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[1] O'Donnell, J. 2018. *Sea Level Rise in Connecticut* (Draft). Connecticut Institute for Resilience and Climate Adaptation and Department of Marine Sciences.

[2] *https://circa.uconn.edu/wp-content/uploads/sites/1618/2018/05/Legal-Policy-Analysis-to-Support-Resilience-Measures.pdf*

A lack of economic redevelopment poses a significant obstacle to recovery and long-term resilience within the study area. Flooding from Superstorm Sandy closed or relocated the remaining businesses (which were already experiencing an economic downturn) in the South End and further exacerbated housing vacancies in the neighborhood. The 2012–2016 American Community Survey 5-Year Estimates reported the homeowner vacancy rate at 22.4 percent for the South End, which is roughly twice the rate than in the city of Bridgeport and the state of Connecticut (12.7 percent and 9.3 percent, respectively). The vulnerability of the area to regular flooding, future storm events and sea level rise has limited the opportunities for redevelopment in the area – both for businesses and housing. Addressing the risk of storm and coastal flooding in the area creates the first layer of protection, creating opportunities to address larger economic and community efforts that support resiliency in the long term.

The Proposed Action is needed to protect residents, property, and infrastructure assets from future storm surge events and chronic flooding during high-frequency rainfall events. In addition to lowering the risk of chronic and acute flooding in the study area, the Proposed Action is needed to directly protect life, public health, and property in the study area by allowing for dry egress in emergency situations.

S.3 PROPOSED ACTION

The Resilient Bridgeport Proposed Action consists of three project components:

- RBD Pilot Project at the former Marina Village public housing site (to provide stormwater management and dry egress)
- Flood Risk Reduction on the east side consisting of a coastal flood defense system to reduce risk from acute storm events and a combination of natural/green and fortified/gray infrastructure solutions; and
- A Resilience Center to educate and facilitate increased resiliency within the community.

The intended combined effect of these three projects is to create flood resiliency within the study area for its various stakeholders, including residents and businesses, during typical rain events as well as more intense storm events, improving overall health and safety for the area. This would have the added effect of making the area more attractive for private investment.

S.3.1 RBD Pilot

In response to regular flooding issues in the area, the RBD Pilot Project would construct green and gray infrastructure improvements that reduce the flood risk to the former Marina Village public housing parcels during both acute and chronic flooding events. The project would be designed to be both an infrastructure upgrade and urban amenity, composed of natural and fortified solutions to facilitate a more resilient neighborhood. The RBD Pilot Project proposes the following elements:

- A new road, Johnson Street extension, raised to provide dry egress for the surrounding residents and facilitate emergency access during an acute flooding event
- Regrading of a portion of the existing Johnson Street
- Regrading of a portion of Columbia Street, north and south of the new Johnson Street Extension

- A new 2.5-acre stormwater park, to be located just south of Johnson Street Extension with a wet well pump and force main connection into Cedar Creek outfall to accept water from upland streets and adjacent parcels and to retain, delay and improve the quality of the stormwater runoff
- Additional street beautification and stormwater improvements along Ridge Avenue

S.3.2 Flood Risk Reduction Project

The Flood Risk Reduction Project of the Proposed Action would include a combination of measures within eastern South End that would reduce the flood risk within the study area from future coastal surge and chronic rainfall events. The measures would include a coastal flood defense system comprised of raising a portion of University Avenue and installing sheet piling and floodwalls, and implementing both green and gray stormwater and internal drainage management strategies (e.g., detention/retention features, drainage structures, and pump systems). Multiple routing options for the north-south section of the Coastal Flood Defense System and two options for addressing the intersection of University Avenue and Main Street are being considered in this DEIS, although all alignments include elevating a section of University Avenue.

The coastal flood defense system would consist of the following segments:

- University Avenue – The road would be improved and raised from a high point on University Avenue through to the east side of Main Street to provide dry egress, and multimodal transportation options (i.e., walking and cycling) for residents and students, while reducing future flooding risk from tidal waters during storms.
- 60 Main Street – This lot along the waterfront is vacant but development is expected in the near future. A floodwall would be constructed in the east-west direction through this lot.
- 60 Main Street to the CTDOT New Haven Line railroad viaduct – This north-south segment of the system would tie into the existing high ground of the rail abutment near the I-95 bridge. The height of the structure would be designed to reduce flood risk with considerations for wave overtopping. Where the coastal flood defense system would cross a street, a floodgate would be constructed that would remain open except during flood emergencies. Multiple potential north-south alignments are being analyzed, bound by Eastern (primarily PSEG property) and Western (entirely public right-of-way) Options, with potential variations in between.

S.3.3 Resilience Center

The Resilience Center would serve as a center for resilience activities, disseminating information to the community and assisting the community in future recovery efforts. The Mary and Eliza Freeman Center for History and Community, located on Main Street in the South End, is a significant historic resource to the local community. The project would provide funding to The Mary and Eliza Freeman Center to support renovations of a community space within the Freeman Houses complex that would provide a location in the South End that would operate as a community center, a central location for resilience information dissemination, and a location that could store supplies to assist the community with recovery efforts during or after storm events. The project would include another open-air site with green infrastructure improvements near the entrance to Seaside Park at University Avenue that would add to the South End East Resilience Network.

S.4 CONCEPT AND ALTERNATIVES DEVELOPMENT

In order to identify the alternatives evaluated in this DEIS, each project under the Proposed Action underwent an alternatives evaluation process through which alternatives selection criteria were developed and then used to comparatively screen potential alternatives (described in detail in Chapter 3). This evaluation process eliminated some of the alternatives from further study and refined the alternatives to be analyzed in the DEIS.

S.4.1 RBD Pilot

The Federal Register notice awarding the funds to State of Connecticut under the Rebuild by Design competition (79 FR 62182) specified that the "pilot project must reduce risk to public housing in the South End." The RBD Pilot Project was selected from a list of potential projects that would form a complementary system for decreasing chronic and acute flooding within the South End of Bridgeport and be a visible example of resilient planning in a coastal environment. An iterative process of team workshops, public events, and stakeholder meetings guided the selection of a pilot project. The RBD Pilot Project specifically aims to facilitate the redevelopment of public housing in the former Marina Village site by reducing the flood risk to those parcels in both acute and chronic flooding events. The project includes installing diverse types of stormwater detention methods and flooding prevention methods. Following the project identification, additional feasibility analysis and stakeholder engagement clarified the scope and depth of the RBD Pilot Project.

S.4.2 South End East Resilience Network

This element of the Proposed Action would include a combination of measures within eastern South End that would reduce the flood risk within the project area from future coastal surge and chronic rainfall events. The measures could include creating raised streets, coastal flood defense, landscaped berms, both green and gray stormwater internal drainage management strategies (e.g., detention/retention features, drainage structures, and pump systems), and a Resilience Center.

Alternatives were developed for establishing the South End East Resilience Network satisfying the purpose and need. Raising streets were considered to provide dry egress during emergencies, a Flood Risk Reduction Project consisting of a coastal flood defense system with associated internal drainage management strategies was considered for lowering the risk of acute and chronic flooding and options for a Resilience Center were considered for educating the public about flood risk and sea level rise.

For the Proposed Action, raised streets were considered to provide dry egress and flood risk reduction when incorporated into a full coastal flood defense system. During the alternatives analysis, individual streets were examined for effectiveness for providing dry egress. Later, raised streets were evaluated as segments of a full coastal flood defense system.

The alternatives screening process for the coastal flood defense system first determined a general approach to the system, then identified potential flood reduction elements, and finally screened potential alignment options against selected criteria. The two general approaches for creating a coastal flood defense system that were evaluated were 1) Edge Alignment Approach (a coastal flood defense system in the water or on-land along the water's edge) and 2) Integrated Alignment Approach (combination of both the edge alignment and raised street approaches). The integrated alignment approach was identified as likely to meet more of the goals and objectives and was selected as the preferred approach.

Options for the various components of the coastal flood defense system (flood control structures, floodwalls, raised streets and dry egress, green stormwater infrastructure) were evaluated. Finally, alignment segment combinations were identified and screened. The first stage of screening alternatives included stakeholder outreach and a high-level review of potential alignments. An alignment alternatives screening matrix was developed to qualitatively assess the effectiveness of each possible combination of segments against the project goals and selection criteria.

An alternatives screening process that incorporated community input was used to refine the Resilience Center specifications. To assess the community's needs in regards to a Resilience Center, data were collected on programs currently accessible to the community and residents' resilience programming preferences. Considering the objectives, original NDR Action Plan definitions, conceptual considerations, funds allocated, and community response, the project details were refined.

S.5 ENVIRONMENTAL CONSEQUENCES

Table S-1 presents a summary of the direct and indirect impacts of the No Action Alternative and Proposed Action on the resources that were analyzed. Details of the analysis are presented in Chapter 4 of the DEIS.

Table S-1. Environmental Consequences

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Land Use, Zoning and Public Policy	■ **Direct:** No impact. ■ **Indirect:** Regular flooding will continue and increased risk due to sea level rise and higher frequency of storm events will result in indirect adverse impact on land use. ■ Inconsistent with public policies related to improving coastal resiliency and reducing community vulnerability.	■ **Direct:** No adverse impacts. No changes to land use or zoning. ■ **Indirect:** Long-term indirect benefits to existing land uses from added dry egress and green space, and reduced flood risk. ■ Consistent with public policies related to improving coastal resiliency and reducing community vulnerability.	■ **Direct:** No significant adverse impacts. No changes to land use under Western Option; easement on private property required for Eastern Option. No changes to zoning. ■ **Indirect:** Long-term indirect benefits to existing land uses from added dry egress and reduced flood risk. ■ Consistent with public policies related to improving coastal resiliency and reducing community vulnerability.	■ **Direct:** No adverse impacts. No changes to land use or zoning. ■ **Indirect:** No impacts. ■ Consistent with coastal resiliency goal of the City of Bridgeport.
Socioeconomics	■ **Direct:** No Impact. ■ **Indirect:** Regular flooding will continue and increased risk due to sea level rise and higher frequency of storm events will continue adverse trends of low vacancy rates and residential and commercial disinvestment in the study area.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ■ **Indirect:** Long-term indirect benefits to residents and businesses by facilitating construction of Phase II of Windward Development public housing and promoting investment in the area.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ■ **Indirect:** Long-term indirect benefits to residents and businesses by facilitating development of 60 Main Street and promoting investment in the area by decreasing area of flood risk by 39 acres (Western Option) to 64 acres (Eastern Option).	■ **Direct:** Minor, temporary impacts may occur during construction. ■ **Indirect:** No indirect impacts to residents and businesses.

Table S-1. Environmental Consequences (continuation)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Environmental Justice	■ **Direct:** No Impact. ■ **Indirect**: Continued and increased risk of acute and chronic flooding would have an adverse indirect impact on EJ populations. Future development, including low-income housing, would be limited and/or delayed. Businesses with EJ employees may experience adverse impacts due to flooding.	■ **Direct:** No significant direct adverse impacts. Temporary impacts to air quality, noise and transportation during construction. Following construction, direct beneficial impacts to traffic and open space. No disproportionate adverse impacts to EJ communities. ■ **Indirect**: Long-term indirect benefits to the EJ community with dry egress and stormwater improvements that would facilitate construction of low-income housing.	■ **Direct:** No significant direct adverse impacts. Temporary impacts to air quality, noise and transportation during construction. Following construction, adverse impacts to visual resources. No disproportionate adverse impacts to EJ communities. ■ **Indirect**: Long-term indirect benefits to the EJ community with dry egress and reduced flood risk that would provide additional housing and commercial options for EJ populations.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. Direct benefits following construction by providing a community facility and improving public safety and visual resource. No disproportionate impacts to EJ communities. ■ **Indirect**: Long-term indirect benefits to the EJ community through resiliency education and restoring African-American resource.
Cultural Resources	■ **Direct:** No direct Impact. ■ **Indirect**: Adverse indirect impact to historic and archaeological resources through increased risk from flooding and sea level rise.	**Direct:** No direct adverse impacts to historical architecture. Potential adverse impacts to archaeological resources to be mitigated through additional investigation and monitoring. ■ **Indirect**: Long-term indirect benefits by protecting resources from future flooding events.	■ **Direct:** Direct adverse impact to National Register listed Seaside Park to be mitigated with agreement from consulting parties. Potential adverse impacts to archaeological resources to be mitigated through additional investigation and monitoring. ■ **Indirect**: Long-term indirect benefits by protecting resources from future flooding events.	■ **Direct:** Direct beneficial impact to the NR-listed Freeman Houses. Potential adverse impacts to archaeological resources to be mitigated through additional investigation and monitoring. ■ **Indirect**: No indirect impacts.

Table S-1. Environmental Consequences (continuation)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Urban Design and Visual Resources	■ **Direct:** No direct impact. ■ **Indirect**: Minor indirect impact as Freeman Houses would continue to deteriorate.	■ **Direct:** Temporary impacts may occur during construction. Beneficial impacts to the overall viewshed and Seaside Village with construction of stormwater facility. ■ **Indirect**: Beneficial indirect impacts due to construction of new development in place of dilapidated buildings.	■ **Direct:** Temporary impacts may occur during construction. No significant adverse impacts. Some obstructed views of Seaside Park; improved aesthetics along University Avenue and from elevated view of waterfront, as well as new landscaping features. **Indirect**: No indirect impact.	■ **Direct:** Temporary impacts may occur during construction. Beneficial impacts to the viewsheds near the Freeman Houses and Seaside Park entrance. ■ **Indirect**: No indirect impact.
Hazardous Materials	■ **Direct:** No direct impact. ■ **Indirect**: Potential indirect impact from flooding that may release hazardous materials from disturbed soils.	**Direct:** Direct adverse impacts during construction due to disturbance of contaminated soil or groundwater would be mitigated through BMPs. No adverse impacts in the long-term. ■ **Indirect**: Indirect benefits to public health from removal and disposal of contaminated materials.	**Direct:** Direct adverse impacts during construction due to disturbance of contaminated soil or groundwater would be mitigated through BMPs. No adverse impacts in the long-term. ■ **Indirect**: Indirect benefits to public health from removal and disposal of contaminated materials.	■ **Direct:** Limited adverse impacts may occur during construction. ■ **Indirect**: No indirect impact.
Noise and Vibration	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** Mitigation measures would be implemented to minimize the temporary impacts that may occur during construction. No long-term direct impacts. ■ **Indirect**: Minor adverse indirect impact from traffic generated by Windward Development on new Johnson Road extension.	■ **Direct:** Mitigation measures would be implemented to minimize the temporary impacts that may occur during construction. No long-term direct impacts. ■ **Indirect**: Minor adverse indirect impact from traffic generated by 60 Main Street development with reconfigured street network.	■ **Direct:** Temporary, less than significant impacts may occur during construction. No long-term direct impacts. ■ **Indirect**: No indirect impact.

Table S-1. Environmental Consequences (continuation)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Natural Resources	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** Minor adverse impacts to ecological communities resulting from repair and recommissioning work at Outfall E. No effect to T&E species. Long-term beneficial impact from trees and vegetation planted for stormwater facility. ■ **Indirect**: Long-term indirect benefits from expansion of the urban forest canopy and reduction of the pollutant load entering aquatic environments.	**Direct:** Temporary impacts may occur during construction. Minor (Eastern Option) to moderate (Western Option) adverse impacts due to removal of street trees and repair of existing outfall(s). ■ **Indirect**: Long-term indirect benefits from reduction of the pollutant load entering aquatic environments.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ■ **Indirect**: No indirect impacts.
Geology and Soils	■ **Direct:** No direct impact. ■ **Indirect**: Indirect adverse impact as a result of turbidity and sedimentation caused by soil erosion from continued and increased flooding.	■ **Direct:** Temporary adverse impact during construction from excavation and filling. ■ **Indirect**: Long-term indirect benefits due to decrease in impervious surface and increase in vegetated area.	■ **Direct:** Temporary adverse impact during construction from excavation and filling. ■ **Indirect**: Long-term benefits from reduced flood risk that would stabilize geologic conditions and soils.	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.
Hydrology and Flooding	■ **Direct:** No direct Impact. ■ **Indirect**: Compared to the Build Alternative, more intense rainfall over time from climate change could have direct potentially significant adverse impacts on hydrology and flooding in the study area.	■ **Direct:** No significant direct adverse impacts. Long-term beneficial impacts from dry egress and stormwater improvements. ■ **Indirect**: No indirect impacts.	■ **Direct:** No significant direct adverse impacts. Long-term beneficial impact with reduced flooding risk to 39 acres (Western Option) to 64 acres (Eastern Option). ■ **Indirect**: No indirect impacts.	■ **Direct:** No direct Impacts. ■ **Indirect**: No indirect impact.

Table S-1. Environmental Consequences (continuation)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Water Resources	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** Temporary adverse impact during construction. No significant direct adverse impacts. Long-term beneficial impacts to Cedar Creek due to stormwater improvements. ■ **Indirect**: Long-term indirect benefits to surrounding water bodies.	■ **Direct:** Temporary adverse impact during construction. No significant direct adverse impacts. Long-term beneficial impacts to Bridgeport Harbor due to stormwater improvements. ■ **Indirect**: Long-term indirect benefits to surrounding water bodies.	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.
Coastal Zone	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact. ■ Consistent with the Connecticut Coastal Management Act	■ **Direct:** No long-term direct adverse impacts. Reduced impervious surface and improved infiltration rates and enhanced visual quality. Temporary impacts may occur during construction because of work within the Coastal Zone. ■ **Indirect** Long-term indirect benefits due to reduced occurrence of CSO events. ■ Consistent with the Connecticut Coastal Management Act	■ **Direct:** No long-term significant direct adverse impacts. Impacts to vegetation. Reduced area of coastal flooding hazard (39 acres with Western Option; 64 acres with Eastern Option) and reduced discharge to surface waters. Temporary impacts may occur during construction because of work within the Coastal Zone. ■ **Indirect**: Long-term indirect benefits due to improved drainage, reduced occurrence of CSO events, and improvements to water quality. ■ Consistent with the Connecticut Coastal Management Act	■ **Direct:** No direct adverse Impacts. ■ **Indirect**: No indirect impacts. ■ Consistent with the Connecticut Coastal Management Act

Table S-1. Environmental Consequences (continuation)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Infrastructure	▪ **Direct:** No direct impact. ▪ **Indirect**: Increased coastal storm events and local flooding could have potentially significant adverse indirect impacts to sanitary sewer, utilities and transportation.	▪ **Direct:** No significant direct adverse impacts to utilities and infrastructure. Temporary impacts may occur during construction including temporary disruption of utility services service and road closures. Long-term benefits to stormwater infrastructure. ▪ **Indirect**: Minor indirect impacts associated with increased usage from future development.	▪ **Direct:** No significant direct adverse impacts to utilities and infrastructure. Temporary impacts may occur during construction including temporary disruption of utility services service and road closures. Long-term benefits to stormwater infrastructure, and under the Eastern Option, long-term benefits to utility providers. ▪ **Indirect**: Minor indirect impacts associated with increased usage from future development.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ▪ **Indirect**: No indirect impacts.
Community Facilities and Services	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ▪ **Indirect**: Long-term, beneficial impacts to public health and safety with dry egress.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ▪ **Indirect**: Long-term beneficial impacts to public health and safety with dry egress and coastal flood defense system.	▪ **Direct:** Direct beneficial impacts with new community facility within rehabilitated Freeman Houses. ▪ **Indirect**: Long-term beneficial impacts to public health and safety from added emergency relief infrastructure.

Table S-1. Environmental Consequences (continuation)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Open Space and Recreation	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.	▪ **Direct:** No significant direct adverse impacts. Long-term benefits from increased open space (stormwater facility). ▪ **Indirect**: No indirect impact.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction including disruption to access to Seaside Park. In the long-term, changes to Seaside Park entrance would not adversely impact access. ▪ **Indirect**: Long-term benefits to open space as elevating University Avenue would allow installation of future amenities.	▪ **Direct:** No significant direct adverse impacts. Direct beneficial impact with construction of design element near entrance to Seaside park. ▪ **Indirect**: No indirect impact.
Air Quality and Greenhouse Gas Emissions	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.	▪ **Direct:** No long-term direct impacts. Temporary adverse impacts may occur during construction due to usage of construction equipment and construction related traffic. ▪ **Indirect**: Impact from indirect increase in traffic from future development is not expected to have a potential to significantly affect the air quality in the vicinity.	▪ **Direct:** No long-term direct impacts. Temporary adverse impacts may occur during construction due to usage of construction equipment and construction related traffic. ▪ **Indirect**: Impact from indirect increase in traffic from future development is not expected to have a potential to significantly affect the air quality in the vicinity.	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.

S.5.1 Cumulative Impacts

In accordance with 40 CFR § 1508.7, and as detailed in the Council on Environmental Quality guidance entitled Considering Cumulative Effects Under the National Environmental Policy Act (1997) and Section 22a-1a-3 of the Regulations of Connecticut State Agencies, the CTDOH must analyze the potential cumulative effects that may occur when considering the Proposed Action "when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

The geographic scope of the cumulative impact analysis was identified as the same study area as each technical resource defined in Chapter 4. The timeframe for the analysis is from 2015 to 2025. This factors in recently completed projects, continues through the construction of the Proposed Action (to be completed by September 2022) and accounts for projects to be initiated immediately following the Proposed Action construction.

After identifying a comprehensive list of past, present and reasonably foreseeable future actions within the study area, the potential impacts from those actions were identified and then the magnitude of the cumulative impacts to each resource with potential adverse impacts was determined (see Chapter 5 of the DEIS).

S.5.2 Mitigation Measures and Best Management Practices

The Proposed Action would have potentially adverse impacts on multiple technical resources areas. Numerous mitigation measures and Best Management Practices have been identified to reduce potential adverse impacts that could result from the Proposed Action (see Section 4.17.5). The mitigation measures and BMPs address impacts to the following resources: historic Seaside Park, archaeological resources, hazardous materials, natural resources, water quality in Cedar Creek Reach and Long Island Sound, the Connecticut Coastal Zone, infrastructure (sanitary sewer, utilities and transportation), noise and air quality.

S.6 CONSULTATION AND COORDINATION

Chapter 6 of the DEIS describes the agency and public coordination efforts undertaken by CTDOH during the planning and design process for the Proposed Action to ensure the process remained open and inclusive to the extent possible.

S.6.1 Agency Coordination

In compliance with the NEPA requirements, CTDOH prepared an Agency Coordination Plan to facilitate and document the review of this DEIS and the Final EIS (FEIS) with cooperating and participating agencies listed in Table S-2. The plan describes the processes and communication methods for soliciting and considering information from these agencies, and will be in effect throughout the environmental review process, beginning with scoping and ending with the Record of Decision.

Agencies were invited to a webinar on October 12, 2018, during which a PowerPoint was presented with a summary of the Proposed Action and the analysis of environmental consequences. Agencies were provided the opportunity to ask questions and give initial comments. Agencies were also given the opportunity to provide pre-public review of this DEIS and will similarly be given the opportunity to review the FEIS prior to publication.

Table S-2. Invited Cooperating and Participating Agencies

COOPERATING AGENCIES	PARTICIPATING AGENCIES
U.S. Department of Housing and Urban Development	U.S. Army Corps of Engineers
Federal Emergency Management Agency	Connecticut Department of Transportation
U.S. Environmental Protection Agency	Delaware Nation, Oklahoma
Connecticut Department of Energy and Environmental Protection	Delaware Tribe of Indians
Connecticut State Historic Preservation Office	Mashantucket (Western) Pequot Tribal Nation
	Mohegan Tribe of Indians of Connecticut
	Narragansett Indian Tribe

All agencies will be notified of the availability of the DEIS and FEIS and be given appropriate comment opportunities. Following the Record of Decision by CTDOH, the appropriate agencies will be consulted to obtain any necessary permits.

S.6.2 Community Engagement

The primary goal of the Community Engagement Plan is to maximize opportunities to engage the public and neighboring communities through regular and proactive communication. The plan outlines how open communication with the public will be fostered and maintained. A Citizen Advisory Committee, comprising community leaders who represent the interests of the local community throughout the design effort, and a Technical Advisory Committee, comprising technical experts from state and city agencies, and other key technical stakeholders were formed to aid community engagement.

S.6.3 Stakeholders

CTDOH has regularly engaged the following project stakeholders throughout the NEPA and CEPA process and will continue to solicit input through the public comment period for this DEIS:

- PSEG Power Connecticut LLC
- Emera Energy
- United Illuminating
- University of Bridgeport
- Section 106 Consulting Parties

S.6.4 Public Involvement

As part of the NEPA/CEPA process, extensive consultation and coordination with the public, local, state, and federal officials took and will take place throughout the project development. Public involvement occurred or will occur at the following meetings:

- Project Kick Off Meeting (#1) .... October 18, 2017
- Concept Screening Meeting (#2) .... December 12, 2017
- DEIS Scoping Meeting (#3) .... March 14, 2018
- Alternatives Analysis Meeting (#4) .... June 6, 2018
- DEIS Public Hearing (#5) .... February 12, 2019

For the Proposed Action, the public scoping process began on February 27, 2018, with the publication of the Notice of Intent (NOI) in the *Federal Register*. The NOI notified the public of CTDOH's intent to prepare a DEIS for the Resilient Bridgeport: National Disaster Resilience and Rebuild by Design Projects, in accordance with NEPA and CEPA. The public scoping process also included publication of a draft Scope of Work, followed by a 30-day comment period and public Scoping Meeting.

The Scoping Meeting was held at 6:00 p.m. on March 14, 2018, at Schelfhaudt Gallery, Bridgeport, CT. At least two weeks in advance of the meeting, legal notices were published in local English and Spanish newspapers notifying the public of the time and location of the meeting, including contact information should anyone require translation services at the meeting. The public meeting included a presentation and discussion on the Draft Scoping Document for the Resilient Bridgeport's EIS, including a discussion on the purpose and need, preliminary design alternatives, and analysis methodologies. All comments received at the DEIS Scoping Meeting were recorded and were addressed in the Final Scoping Document located at the following location: (*https://resilientbridgeport.com/wp-content/uploads/2018/06/Resilient-Bridgeport-Final-Scoping-Doc_June2018.pdf*).

Following the notice of availability of this DEIS a public hearing will provide an opportunity for the public to submit comments on the DEIS orally and/or in writing. The public hearing will be held on Tuesday, February 12, 2019, from 6:00 p.m. to 8:00 p.m. at the Schelfhaudt Gallery (84 Iranistan Avenue, Bridgeport, CT). Comments on this DEIS will be recorded at the hearing. Those who do not wish to voice their comments publicly will be offered an opportunity to provide a private written or verbal comment at the meeting, or to submit comments at any point during the public comment period through the CTDOH website (*https://www.ct.gov/doh/cwp/view.asp?a=4513&q=588726*), Resilient Bridgeport website, (*www.ResilientBridgeport.com*) or by mail or email to CTDOH:

Rebecca French
Director of Resilience, CTDOH
505 Hudson Street
Hartford, CT 06106
ATTN: Resilient Bridgeport
info@resilientbridgeport.com

All comments received by February 22, 2019, will be addressed in the FEIS.

1

Introduction

Contents

Figures

1. Introduction

The State of Connecticut's Department of Housing (CTDOH) is the recipient of the U.S. Department of Housing and Urban Development (HUD) disaster recover grant funding and is the "Responsible Entity," as that term is defined by HUD regulations at 24 Code of Federal Regulations (CFR) Part 58.2(a)(7)(i). CTDOH has prepared this Draft Environmental Impact Statement (DEIS) for the proposed Resilient Bridgeport: National Disaster Resilience and Rebuild by Design projects (Proposed Action). The disaster recovery grants are under HUD's Community Development Block Grant Disaster Recovery (CDBG-DR) National Disaster Resilience (NDR) and Rebuild by Design (RBD) programs as part of HUD's response to the devastation following Superstorm Sandy. The Proposed Action consists of three projects located within the South End of Bridgeport, Connecticut—the RBD Pilot Project at the former Marina Village public housing site, a Flood Risk Reduction Project on the east side of the South End, and a Resilience Center—that would provide stormwater management, dry evacuation routes (dry egress), a coastal flood defense system, and resiliency education to the community.

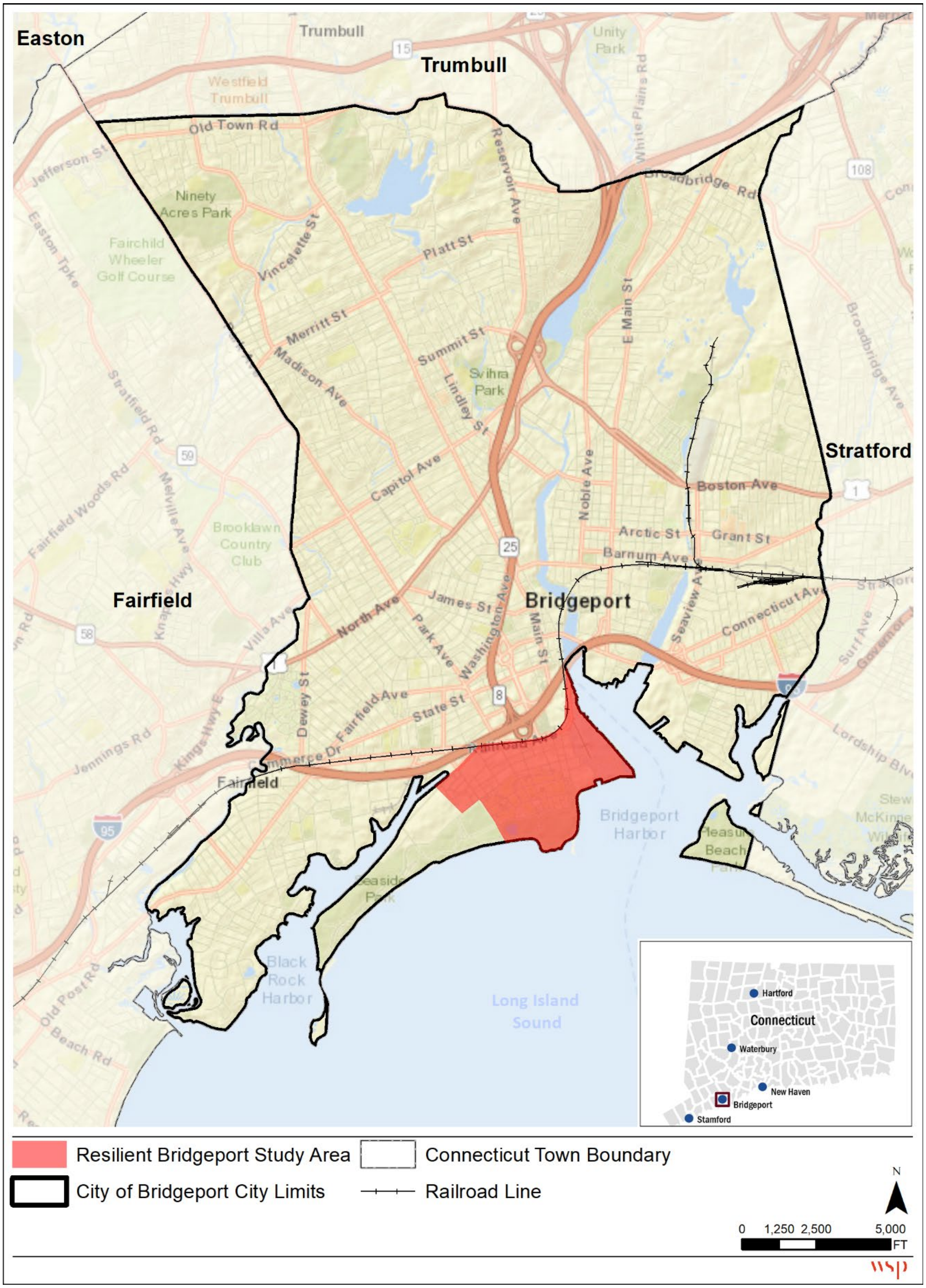
The Proposed Action is considered a "major federal action significantly affecting the quality of the human environment"; therefore, it must comply with the requirements of the National Environmental Policy Act of 1969 (NEPA). CTDOH has prepared this DEIS in accordance with the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508) and HUD's Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 CFR 58). In addition, the Connecticut Environmental Policy Act establishes environmental policy for the State of Connecticut and requires an Environmental Impact Evaluation (EIE) for any state action that could affect the natural environment. As such, this DEIS will jointly serve as an EIE and will meet Connecticut Environmental Policy Act requirements.

1.1 PROJECT BACKGROUND

1.1.1 Study Area

Bridgeport is Connecticut's most populous city with 147,000 residents. The study area is situated within the South End neighborhood of Bridgeport (Figure 1-1), a peninsula of the Connecticut coastal region located between Cedar Creek, the Long Island Sound, and Bridgeport Harbor. The study area boundaries were established through a combination of observation natural boundaries (the Long Island Sound and Bridgeport Harbor to the south and east, respectively), physical boundaries (rail lines to the north), and transitionary boundaries (the western extent of residential uses on the South End peninsula). Overall, the study area is a cross section of the residential, institutional, utility, and recreational uses that define the South End neighborhood, all of which are susceptible to chronic flooding conditions (i.e., moderate flooding conditions that constantly recur) due to a combination of inadequate stormwater infrastructure in the area and its coastal location.

Figure 1-1: Project Location



Source: WSP (2018); CTDEEP GIS Data, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, METI, NGCC, © OpenStreetMap contributors, and the GIS User Community

The South End has a population of approximately 4,300 people including public housing residents and other vulnerable populations. Within the four census tract block groups that make up the study area, approximately 62.6 percent of the population identified themselves as minority in 2016 and approximately 25.7 percent of the population lived below the federal poverty line. Bridgeport is considered a distressed municipality per Connecticut Department of Economic and Community Development criteria; therefore, the Bridgeport and the study area is an Environmental Justice Community.

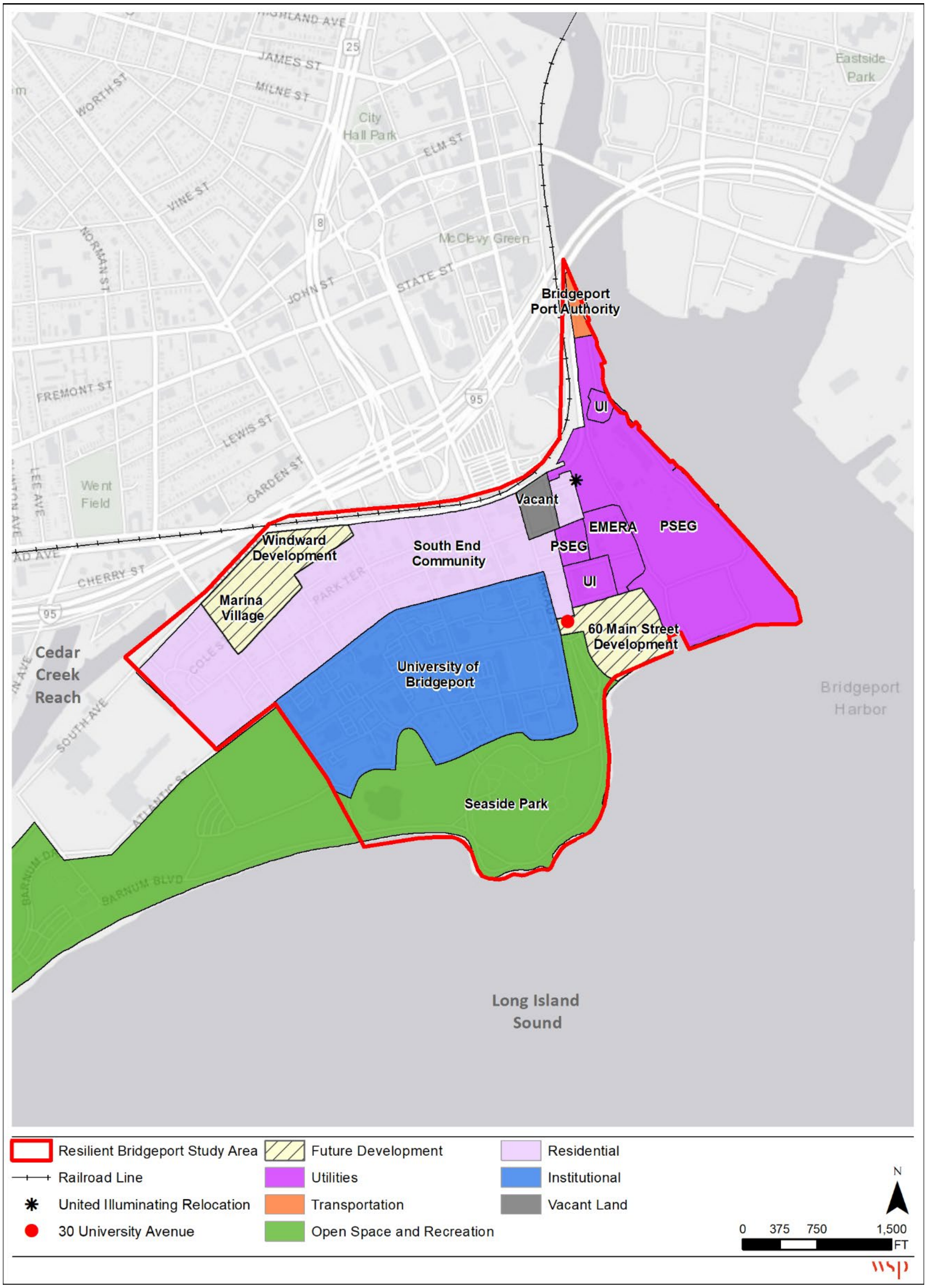
Based on the best available information provided by the Federal Emergency Management Agency's Flood Insurance Risk Maps, most of the study area, including nearly all the Proposed Action area, is within the 1 percent annual chance storm event, or 100-year, floodplain. Areas susceptible to flooding within the study area are identified as coastal "AE" zones, which means that a base flood elevation has been determined and the area is impacted by waves less than 3 feet in height. Bridgeport is within the Connecticut Coastal Area and the entirety of the Proposed Action and a significant portion of the study area falls within the Coastal Boundary.

As a result, the South End is one of the most vulnerable communities in Bridgeport, at risk of flooding from both coastal storm surge and regular ("interior") rainfall events. Much of the critical infrastructure in the area lies within the coastal floodplain, including electricity generation, transmission, and distribution facilities and low-lying stormwater and wastewater pipes, and will face increasing risk as sea levels rise.

The topography of the South End is dominated by a ridge-line along Park Avenue in the center of the peninsular that serves as a high point, with lower elevations along the waterfront and to the east and west of Park Avenue. The railroad viaduct that serves as a northern boundary to the neighborhood has multiple streets crossing underneath. These underpasses are at low elevations and are often flooded, restricting safe egress during flood events. Overall, the low-lying geography of the area, in addition to the aging combined sewer and stormwater system, results in flooding from interior rainfall or tidal inundation on a regular basis.

The predominant land uses within the study area include multifamily residential, utility, institutional, and open space (Figure 1-2). The northern part of the study area includes light industrial uses, with a small number of commercial/office buildings. The northwestern portion of the study area is primarily residential and includes a mixture of medium and high density residential structures consisting of multifamily dwellings, and low-rise apartment buildings. This area also contains the former Marina Village site (to be redeveloped as Windward), which currently consists of medium-density public housing. The Bridgeport Harbor Generating Station, a Public Service Enterprise Group (PSEG) Power Connecticut LLC-owned energy generating facility occupies the eastern portion of the study area along the Pequonnock River (Bridgeport Harbor). Adjacent to the PSEG facility are light industrial facilities including energy micro-grids, facilities owned by Emera and United Illuminating, small warehouses, and a storage facility. Directly to the southwest of the PSEG facility is a large parcel consisting of numerous abandoned and dilapidated structures and large underutilized surface parking lots abutting the Long Island Sound to the south. The southern portion of the study area consists of the historic Seaside Park, an approximately 325-acre park, which continues west following the Long Island Sound, providing residents and visitors with a large amount of recreational space and waterfront access. To the north of Seaside Park, in the middle of the study area is the University of Bridgeport. The 86-acre campus has an enrollment of approximately 5,400 students and over 500 faculty members. There are small number of vacant lots dispersed throughout the study area.

Figure 1-2. Resilient Bridgeport Study Area



Source: WSP (2018); CT DEEP GIS Data, Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, NGCC, © OpenStreetMap contributors, and the GIS User Community

In conjunction with the development of this DEIS, CTDOH is maintaining regular project engagement efforts to continue outreach and education, and to expand community capacity building in Bridgeport, building upon the momentum and knowledge base established during the development of Bridgeport's long-term strategy for resilience. This outreach is occurring primarily through periodic citizen advisory committee meetings, technical advisory committee meetings, public events, and meetings with individual stakeholders. The citizen advisory committee comprises community leaders (e.g., advocates, city of Bridgeport employees, local residents) serving as an advisory panel to represent the interests of the local community throughout the NEPA and design processes. The technical advisory committee comprises state and city agencies[1] and other key technical stakeholders who can advise and provide input toward design and assist in targeting permit requirements, critical design decisions, and policy concerns associated with potential project design elements. Federal agencies, including the U.S. Environmental Protection Agency, Federal Emergency Management Agency, and U.S. Army Corps of Engineers, are being consulted individually and as part of HUD's regular interagency meetings.

1.1.2 HUD Resiliency Competitions

In response to the extensive damage Superstorm Sandy caused to communities in Connecticut and throughout the Northeast, the federal government created the Superstorm Sandy Rebuilding Task Force, chaired by HUD. As an outgrowth of the task force, in June 2013 HUD launched the Rebuild by Design (RBD) Competition, a multistage planning and design competition to promote innovation by developing regionally scalable but locally contextual solutions to increase resilience in the region. Examples of design solutions were expected to range in scope and scale from large-scale green infrastructure to small-scale residential resiliency retrofits. The competition process aimed to strengthen understanding of regional interdependencies, fostering coordination and resilience both at the local level and across the United States.

In June 2014, HUD awarded $930 million to seven winning RBD ideas, one of which was Resilient Bridgeport. Interdisciplinary teams of scientists, engineers, designers, and architects spent months understanding the major vulnerabilities of the Superstorm Sandy-affected region and developing ideas to improve the region's resilience, with each winning idea comprising multiple phases. The RBD awards assist communities in developing master plans for the areas of focus. For Resilient Bridgeport, the master plan includes developing an overall resilience strategy that covers a study area extending from downtown Bridgeport to Black Rock Harbor. Resilient Bridgeport, a joint urban design, architecture, engineering, planning, and community engagement team has worked over the past several years with CTDOH, the City of Bridgeport, and Bridgeport residents and business owners to develop the resilience strategy, as well as identify a pilot project for Bridgeport's South End and Black Rock Harbor areas, with a specific focus on the historic footprint of Marina Village (pursuant to *Federal Register* Vol. 79, No. 200, dated October 16, 2014, 62187, Section 3, Part g. State of Connecticut: Bridgeport, which states, "At a minimum, the pilot project must reduce flood risk to public housing in the City's South End/Black Rock Harbor area"). The resilience strategy outlines an integrated approach to managing long-term risk, enabling equitable adaptation and growth, and enriching and enhancing the daily lives of Bridgeport residents.

In September 2014, HUD announced an additional round of funding through the National Disaster Resilience (NDR) Competition, a two-phase competition for disaster recovery and long-term community resilience, building on the success of Rebuild by Design. All states and units of general local governments with major

[1] In this instance, no federal agencies are involved in the technical advisory committee; however, it typically plays a role in this process.

disasters declared in 2011, 2012, and 2013 were eligible to participate in Phase 1 of the competition. In Phase 1, eligible applicants participated in workshops to identify shocks and stresses to their recovering communities and prepared their resilience vision to address those vulnerabilities. Applicants invited to Phase 2, proposed projects to implement their resilience vision.

In January 2016, HUD awarded almost $1 billion in funding for disaster recovery and long-term community resilience. Connecticut received approximately $54 million to continue implementing Resilient Bridgeport and expand its success to the regional and state scales. Approximately $42 million of the funding was allocated to the CTDOH to oversee design and construction of additional pilot projects in Bridgeport's South End, focusing on the eastern portion of the neighborhood.

With the RBD and NDR funding, and the support of federal, state, and local partners, the City of Bridgeport has the opportunity to show how a comprehensive and multilayered approach to building resilience that integrates adaptation, risk reduction, and revitalization possibilities can reduce risk and enhance quality of life along the water's edge. The South End of Bridgeport—with its location of housing and infrastructure within walking and biking distance of the Metro-North train station downtown—is one of the state's identified resilience zones, which are designed to implement the long-term resilience vision for the state's goal of establishing more resilient coastal communities where structures and critical infrastructure in the flood zone are adapted to withstand occasional flooding and protected by healthy buffering ecosystems, where critical services, infrastructure and transport hubs are located on safer, higher ground, and where strong connections exist between the two.

1.2 REGULATORY FRAMEWORK

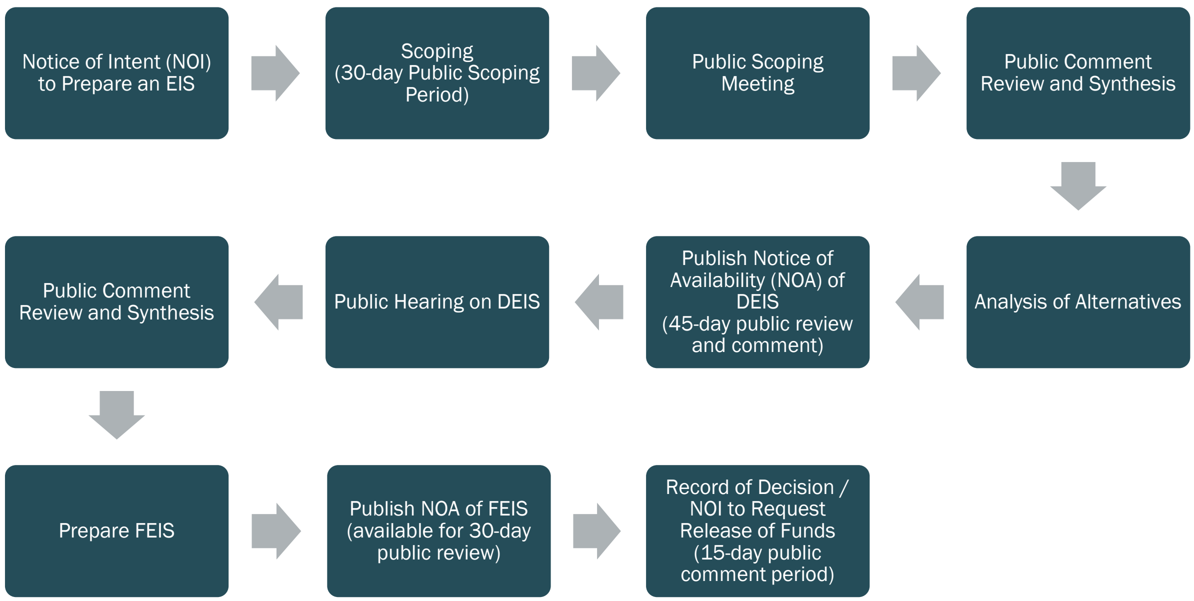
1.2.1 National Environmental Policy Act

This DEIS is the first formal step in documenting the environmental analysis of the Proposed Action (Figure 1-3). This DEIS describes the Proposed Action's purpose and need; discusses the alternatives analysis process and the public participation process; describes the Build Alternatives and the No Action Alternative; describes the affected natural and built environments; provides an analysis of potential impacts of the Build Alternatives and No Action Alternative; and identifies potential measures to avoid, reduce, or compensate for significant impacts.

A Notice of Intent to prepare a DEIS was published in the *Federal Register* on February 26, 2018—which formally began the NEPA review process by initiating the public scoping period for this DEIS—and was run until March 28, 2018. As part of the public scoping process, a Draft Scoping Document was prepared and made available for public review and comment. The Draft Scoping Document outlined, to the extent known at the early stage in the planning process, the proposed project actions, potential alternatives, and a description of areas of potential impact to be analyzed in the DEIS, as well as proposed methodologies to assess impacts. A public scoping meeting was held on March 14, 2018, where material was presented to the community. Comments were received at that meeting, and substantive comments were incorporated into a Final Public Scoping Document (published June 2018), which informed the development of this DEIS.

This DEIS is available for review and comment to the public, and has been circulated to stakeholders and government agencies identified as having particular interest in, or jurisdiction over, the Proposed Action. As required by Council on Environmental Quality and HUD regulations, a Notice of Availability (NOA) of the DEIS has been published in the *Federal Register* and in local media outlets, indicating where the DEIS is available for review and providing instructions on how to submit comments on it (see Chapter 6, Consultation and Coordination). Following the publication of the NOA, a 45-day public review and comment period begins, during which a formal public hearing will be held; the NOA indicates the date(s), time(s) and locations(s) of the hearing.

Figure 1-3. National Environmental Policy Act Process



Source: 40 CFR Parts 1500-1508

At the conclusion of the 45-day DEIS comment period, CTDOH will incorporate substantive comments and responses to them into the document and compile the Final EIS (FEIS). The FEIS will be circulated in the same manner as the DEIS—including the publication of an NOA in the *Federal Register* and local media—and will have a review and comment period of 30 days. At that time, CTDOH will determine whether a public hearing on the FEIS is appropriate.

If no additional substantive comments are received during the FEIS comment period, CTDOH will prepare a Record of Decision (ROD) and Statement of Findings. The ROD will summarize the government's decision, identify the environmentally preferred alternative, select the alternative that will be implemented, and disclose the potential environmental impacts of that alternative, as well as the mitigation measures that the government will implement. If additional substantive comments are received during the FEIS comment period, CTDOH will address these comments in the ROD.

1.2.2 Connecticut Environmental Policy Act

The Connecticut Environmental Policy Act establishes environmental policy for the State of Connecticut and requires an Environmental Impact Evaluation (EIE) for any state action that could affect the natural environment. Like the EIS required by NEPA, the EIE must include a range of alternatives along with the No Action Alternative. For projects that require a federally mandated EIS, as is the case for the Resilient Bridgeport projects, the EIS may be submitted in lieu of an EIE to avoid unnecessary duplication of effort as long as the EIS contents meet all the requirements for an equivalent EIE. As such, this DEIS will jointly serve as an EIE and will meet Connecticut Environmental Policy Act requirements. Appendix I presents a cross-reference table of the CEPA requirements for an EIE and the location where those items can be found within this DEIS. In addition, Appendix I includes the cost-benefit analyses for the RBD and NDR projects, as presented in the original applications. Notification of both the public scoping period and the DEIS public comment period have been placed in the Environmental Monitor, per Connecticut General Statues for CEPA.

1.3 PROPOSED ACTION

The Resilient Bridgeport Proposed Action consists of three project components:

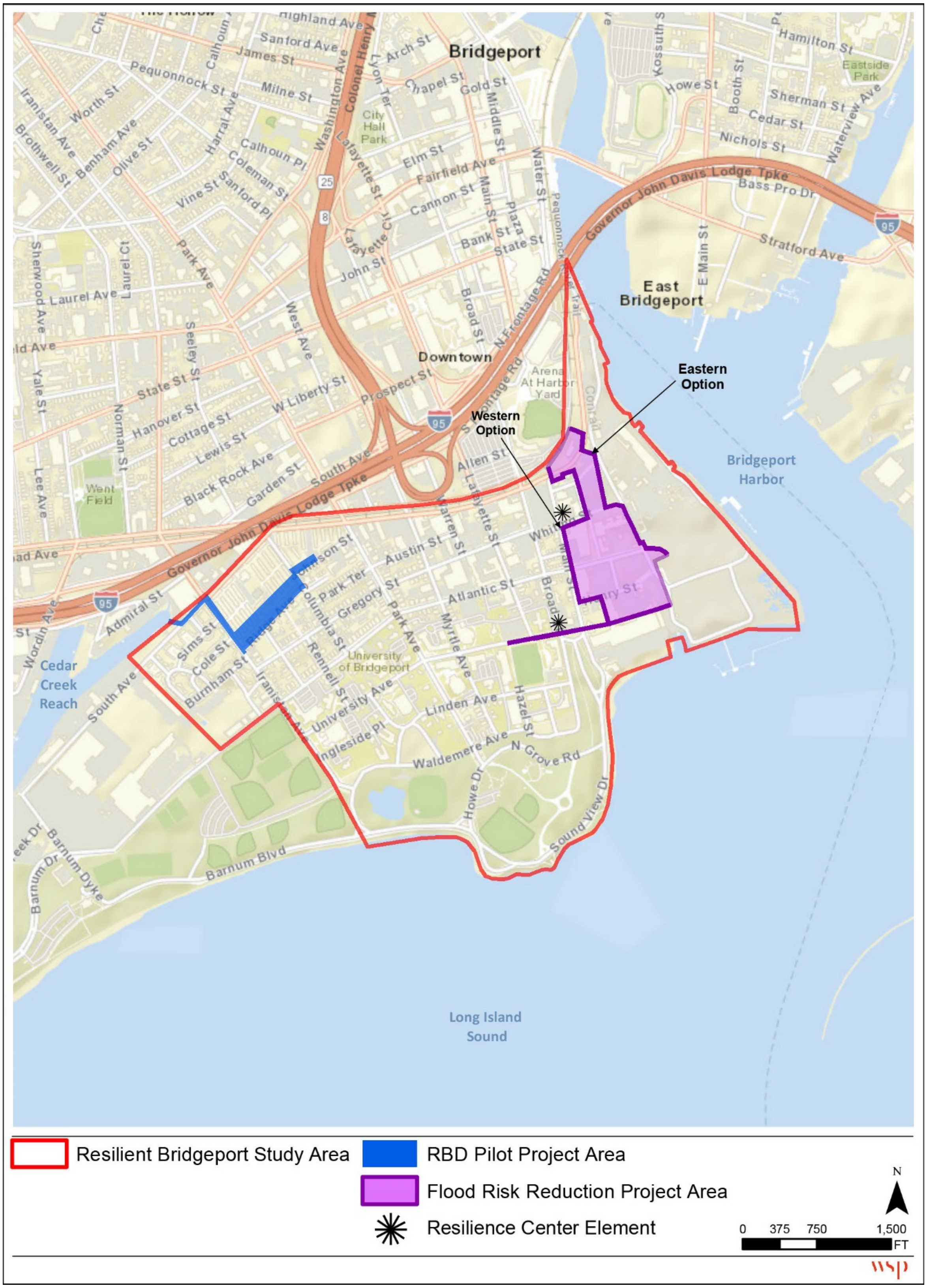
- **RBD Pilot Project** at the former Marina Village public housing site (to provide stormwater management and dry egress)
- **Flood Risk Reduction Project** on the east side consisting of a coastal flood defense system to reduce risk from acute storm events (i.e., severe or intense) and a combination of natural/green and fortified/gray infrastructure solutions
- A **Resilience Center** to educate and facilitate increased resiliency within the community

The Proposed Action would be in the South End of Bridgeport, which experienced the most significant impacts during Superstorm Sandy and has also faced acute challenges in other storms (e.g., Hurricane Irene) and chronic flooding challenges posed by an aged and combined stormwater sewer system. The intended combined effect of these project components is to create flood resiliency within the study area for its various stakeholders, including residents and businesses, during typical rain events as well as more intense storm events, improving overall health and safety for the area. This would have the added effect of making the area more attractive for private investment.

Following construction, continued operations and maintenance (O&M) would be required for the project elements. O&M measures for the Proposed Action would include regular landscaping of the grassed embankments and stormwater facility, removal of sediments, clearance of clogged lines, and repair of erosion damage to maintain proper function of the stormwater infrastructure, maintenance of the hinges, rollers and other components of the flood gates, scheduled testing of emergency generators, and trial operation of the pump station equipment and service of machinery, as needed. O&M would include regular inspections of the project elements as well as post-flood event inspection. These measures would be further defined during final design and implemented by a selected government entity.

Figure 1-4 presents the individual project areas for the RBD Pilot Project, Flood Risk Reduction Project, and Resilience Center components of the Proposed Action.

Figure 1-4. Resilient Bridgeport Project Component Areas



1.3.1 RBD Pilot Project

Following Superstorm Sandy, the Bridgeport Housing Authority (i.e., Park City Communities) decided to replace the nearly 75-year old Marina Village public housing complex with more modern and resilient housing. Prior to Superstorm Sandy the complex suffered from chronic flooding issues during rain and storm events. In addition, the buildings themselves were aging and in need of extensive repairs. Therefore, the severe flooding at Marina Village associated with Superstorm Sandy made replacement of the public housing development more urgent.

Park City Communities selected a private development partner to lead the first several phases of redevelopment, which will ultimately result in the 405 units of Marina Village being replaced with privately owned and managed mixed-income (and in some instances, mixed-use) developments on multiple parcels throughout the city. Land owned by Park City Communities in the South End as well as other neighborhoods was rezoned and prepared for revitalization, including the demolition of the first approximately 15 buildings of Marina Village. The first two phases of mixed-income redevelopment (including replacement units for Marina Village) occurred in the city's East Side neighborhood with support from the State of Connecticut, including CDBG-DR, Low-Income Housing Tax Credits, and state discretionary affordable housing grants and loans. Given the Marina Village parcels' proximity to downtown and employment opportunities, transit accessibility, higher educational institutions, and park amenities coupled with some residents' desire to remain in the South End neighborhood, the next phases of mixed-income redevelopment are slated for the parcels that formerly held the Marina Village public housing complex.

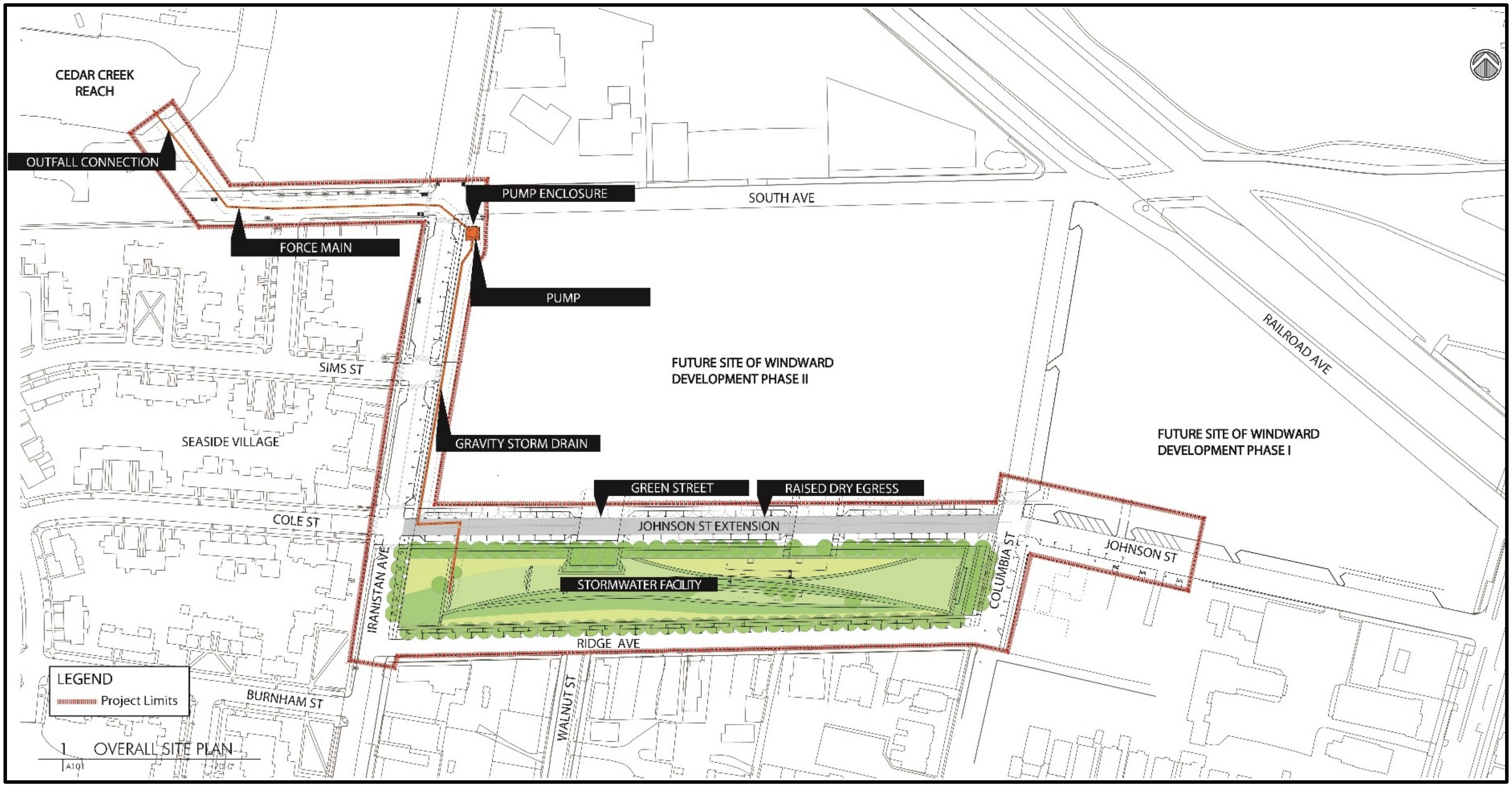
The former Marina Village site is bounded by South Avenue to the north, Park Avenue to the east, Ridge Avenue and Johnson Street to the south, and Iranistan Avenue to the west. Residents are being relocated to other housing throughout Bridgeport to allow for demolition of the buildings in the next year. (These actions were addressed in two environmental assessments that resulted in Findings of No Significant Impact.)

In response to regular flooding issues in the area, the RBD Pilot Project would construct green and gray infrastructure improvements that reduce the flood risk to the former Marina Village public housing parcels during both acute and chronic flooding events. Though the project activities would be limited to the area immediately adjacent to the former Marina Village, the project would be designed to benefit low- and moderate-income owner-occupied and rental housing in the surrounding neighborhood to the east and south (pursuant to *Federal Register* Vol. 79, No. 200, dated October 16, 2014, 62187, Section 3, Part g. State of Connecticut: Bridgeport, which states, "At a minimum, the pilot project must reduce flood risk to public housing in the City's South End/Black Rock Harbor area") as well as in the historic post-World War I community known as Seaside Village to the west. The project would be designed to be both an infrastructure upgrade and urban amenity, composed of natural and fortified solutions to facilitate a more resilient neighborhood. The primary objective of this component of the Proposed Action is to appropriately balance implementation of gray and green infrastructure for the site as required to facilitate future development of the site.

The RBD Pilot Project proposes the following elements (Figure 1-5):

- A new road, Johnson Street extension, raised to provide dry egress for the surrounding residents and facilitate emergency access during an acute flooding event
- Regrading of a portion of the existing Johnson Street

Figure 1-5. RBD Pilot Project Elements



Source: Waggoner & Ball, 2016

- Regrading of a portion of Columbia Street, north and south of the new Johnson Street Extension
- A new 2.5-acre stormwater park, to be located just south of Johnson Street Extension with a wet well pump and force main connection into Cedar Creek outfall to accept water from upland streets and adjacent parcels and to retain, delay and improve the quality of the stormwater runoff
- Additional street beautification and stormwater improvements along Ridge Avenue

The redevelopment of the Marina Village site is independent of the stormwater and raised egress improvements in the Proposed Action.

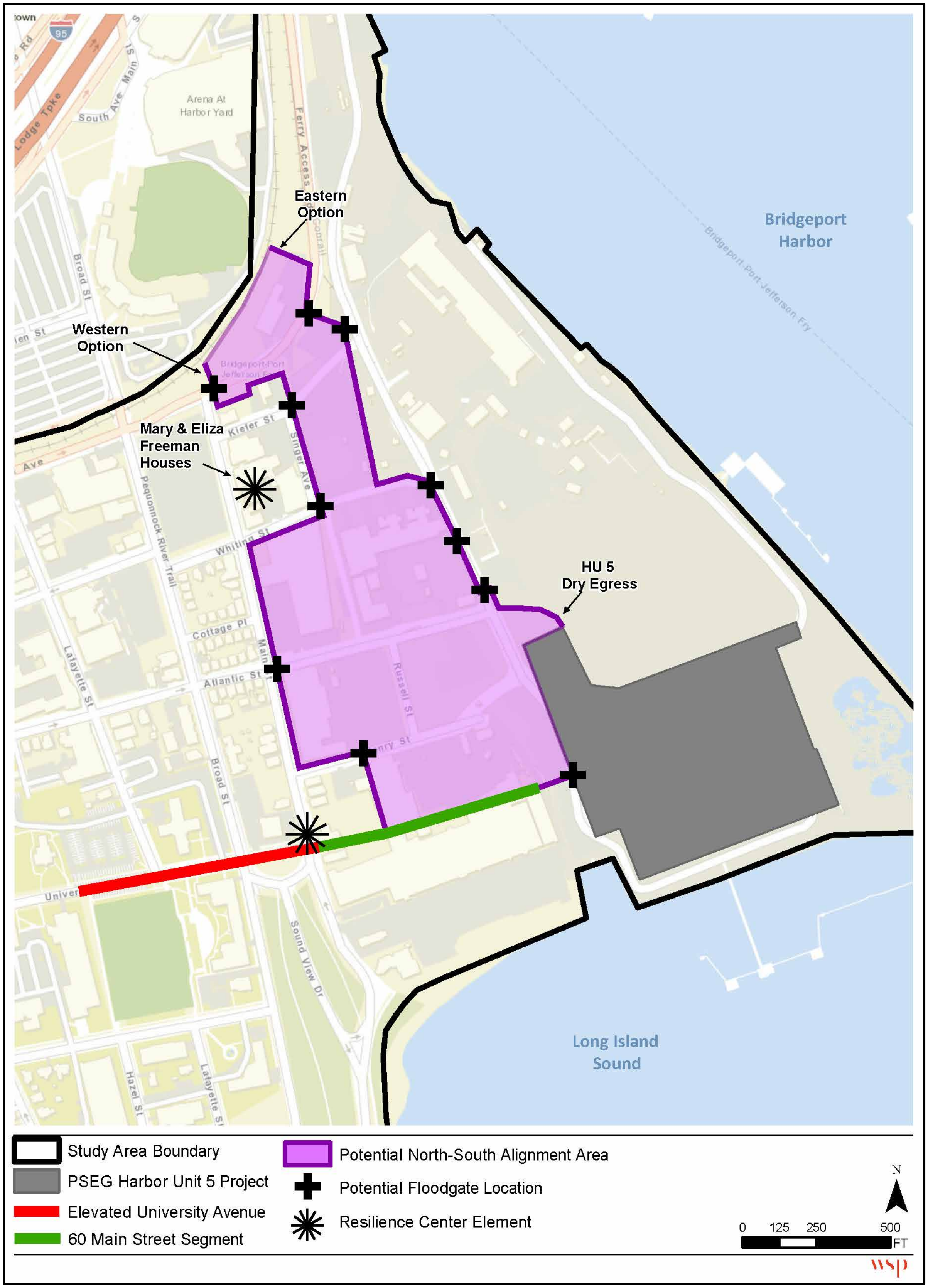
1.3.2 Flood Risk Reduction Project

The Flood Risk Reduction Project of the Proposed Action would include a combination of measures within eastern South End that would reduce the flood risk within the study area from future coastal surge and chronic rainfall events. The measures would include creating a coastal flood defense system that would raise a portion of University Avenue and install sheet piling and floodwalls, and implementing both green and gray stormwater and internal drainage management strategies (e.g., detention/retention features, drainage structures, and pump systems). Multiple routing options for the north-south section of the coastal flood defense system and two options for addressing the intersection of University Avenue and Main Street are being considered in this DEIS, although all alignments include elevating a section of University Avenue.

The success of constructing a reliable and permanent comprehensive flood-risk reduction system depends on designing project concepts that consider existing infrastructure and environmental constraints. The location of existing infrastructure such as parks, roads, transit systems, stormwater systems, subsurface and aboveground utilities, and foundation structures for various types of infrastructure are factors that were considered in identifying the available footprint for constructing the various project elements. The coastal flood defense system would consist of the following segments (Figure 1-6):

- **University Avenue –** The road would be improved and raised from a high point on University Avenue through to the east side of Main Street to provide dry egress, and multimodal transportation options (i.e., walking and cycling) for residents and students, while reducing future flooding risk from tidal waters during storms. This segment would leverage the South End's existing ridge-line along Park Avenue, connecting this naturally elevated street to key lateral streets through strategically designed and landscaped street elevation. Raising this east-west street would ensure the permitted development at 60 Main Street has vehicular and public transit access to the Park Avenue corridor during major storm events. It would set a new, higher, ground plain for independent future development (including the long-term master planning at University of Bridgeport). Future development projects would not be dependent on the proposed coastal flood defense system but would potentially benefit from the reduced flood risk. At the intersection of University Avenue and Main Street, there are two options for tying in Main Street to the higher elevation: keep Main Street as a through street by elevating up to University Avenue or maintain Main Street's current elevation and provide pedestrian access up to the new University Avenue elevation, resulting in a discontinuous Main Street at that location. Broad Street would remain a through street across University Avenue.

Figure 1-6. Proposed Flood Risk Reduction Project Alignments and Resilience Center Elements



- **60 Main Street –** This lot along the waterfront is vacant but development is expected in the near future. A floodwall would be constructed in the east-west direction through this lot. Development plan for the site may include raising the site and infrastructure above the required flood elevation. The proposed alignment would provide additional resiliency for the northern portion of the site.

- **60 Main Street to the Connecticut Department of Transportation (CTDOT) New Haven Line railroad viaduct –** A coastal flood defense system would be constructed to reduce flood risk at the outer edge of the eastern South End. The height of the structure would be designed to reduce flood risk with considerations for wave overtopping. The northern section of the proposed structure would tie into the existing high ground of the rail abutment near the I-95 bridge, and the southern section of the structure would tie into the planned development site at 60 Main Street. The type of structure would vary depending on engineering constraints. Where the coastal flood defense system would cross a street, a floodgate would be constructed that would remain open except during flood emergencies. Multiple potential north-south alignments are being analyzed, bound by Eastern and Western Options (described below and shown in Figure 1-6), with potential variations in between.
  - **Eastern Option –** The Eastern Option would continue the 60 Main Street alignment parallel to the shoreline across the 60 Main Street site to the eastern border, where it would cross to the east into PSEG's property and connect to the elevated podium for PSEG's newly built Harbor Unit 5 (HU5) perimeter sheet pile wall. HU5 would provide the southeast corner of the coastal flood defense system, which would extend north from HU5's access road ramp on the northwest corner of the perimeter wall. The alignment would connect from the ramp over to Emera's Bridgeport Energy's eastern border north of Atlantic Street. This arrangement would provide dry egress to HU5 via Atlantic Street. The alignment would continue along the eastern border of Emera's Bridgeport Energy's site until it reaches the Pequonnock Substation relocation site, where it would continue north along the eastern property line of the site across Ferry Access Road with a northern tie-in at the elevated CTDOT New Haven Line railroad viaduct.
  - **Western Option –** The Western Option would reside primarily within the urban fabric of the South End community. The alignment would turn north within the 60 Main Street site to the east side of 107 Henry Street and would continue across Henry Street. The alignment would continue on the east side of Main Street for two blocks heading north before turning east to Singer Avenue. Thereafter, the alignment would hug the western edge of the future site of the Pequonnock Substation, cross Ferry Access Road and tie in at the elevated CTDOT New Haven Line railroad viaduct.

The Flood Risk Reduction Project would also include internal drainage improvements and green infrastructure elements to accommodate stormwater during coastal storm conditions and to reduce flooding from chronic rainfall events. A likely scenario is that one or more new pump stations would be needed within this system to prevent stormwater flooding on the interior of the coastal flood defense system. It is anticipated that the pump stations would collect stormwater runoff and discharge through existing outfalls. Other potential stormwater improvements could include upsizing pipes in regions where capacity of the system causes upland flooding, isolating stormwater systems to prevent backflow from outside of the coastal flood defense system alignment to the interior, and incorporating green infrastructure elements.

1.3.3 Resilience Center

The Resilience Center is proposed to serve the South End community in the City and State's ongoing commitment to build a resilient Bridgeport. The site would serve as a center for resilience activities, disseminating information to the community and assisting the community in future recovery efforts.

The Mary and Eliza Freeman Center for History and Community is a located on Main Street in the South End and has been designated to "America's 11 Most Endangered Historic Places" list by National Trust for Historic Preservation. It is a significant historic resource to the local community. The project would provide funding to The Mary and Eliza Freeman Center to support renovations of a community space within the Freeman Houses complex. The Freeman Houses would provide a location in the South End that would operate as a community center, a central location for resilience information dissemination, and a location that could store supplies to assist the community with recovery efforts during or after storm events. The project would include another open-air landscaped site, including green infrastructure improvements, near the entrance to Seaside Park at University Avenue that would add to the South End East Resilience Network.

1.4 OVERVIEW OF THIS DOCUMENT

This DEIS analyzes the environmental impacts of alternatives for the construction of flood-risk reduction measures that are proposed to improve coastal and social resiliency in the South End of Bridgeport, Connecticut. Such measures will be designed to reduce the impacts of flooding on the quality of the natural and built environments in the study area caused by both sea level rise and storm hazards, including heavy rainfall events and intense coastal storm events. This DEIS evaluates the Proposed Action's potential impacts on the following categories: Land Use, Zoning and Public Policy; Socioeconomic Conditions; Environmental Justice; Cultural Resources; Urban Design and Visual Resources; Hazardous Materials; Noise and Vibration; Natural Resources; Geology and Soils; Hydrology and Flooding; Water Resources and Water Quality; Coastal Zone Management; Infrastructure; Public Services; Open Space and Recreation; Air Quality; Greenhouse Gas Emissions and Climate Change; and Cumulative Impacts.

The remainder of this DEIS includes the following chapters:

- Chapter 2: Purpose and Need
- Chapter 3: Concept and Alternatives Development
- Chapter 4: Affected Environment and Environmental Consequences
- Chapter 5: Cumulative Impacts
- Chapter 6: Consultation and Coordination
- Chapter 7: References
- Chapter 8: List of Preparers
- Chapter 9: Glossary and Acronyms

In addition, the following appendices provide additional detail:

- Appendix A: Agency Consultation
- Appendix B: Alternatives Evaluation Report
- Appendix C: Cultural Resources Documentation
- Appendix D: Hazardous Materials Documentation

- Appendix E: Supplemental Natural Resources Information
- Appendix F: Wetlands Letter Report
- Appendix G: Traffic Reports
- Appendix H: Public Involvement
- Appendix I: CEPA Documentation

2

Purpose and Need

Contents

Figure

2. Purpose and Need

2.1 NEED

The South End neighborhood experiences flooding resulting from both coastal inland flooding and regular rainfall events. The interrelationship between storm surge from coastal storms and regular rainfall events contributes to the recurring flooding conditions throughout the project area. Addressing both types of flooding is necessary to reduce the risk of damage from flooding to the South End. These chronic flooding issues are the result of both an aged and combined stormwater sewer system, which serves a multitude of uses within the study area, including Seaside Park, the University of Bridgeport, residences, planned development and other vacant land, some industrial buildings, and several energy providers (including both electricity generators and utility substations). The study area has a population of over 4,300 people (per the 2016 American Community Survey), including public housing residents and other vulnerable populations. The South End is largely composed of the 325-acre historic Seaside Park and University of Bridgeport's 86-acre campus. Residential neighborhoods surround the university campus with several Park City Communities to the north, including the former Marina Village sites, as well as the Seaside Village Historic District. The eastern portion of the South End contains regional energy providers including Public Service Enterprise Group's (PSEG) Harbor Unit 3 (a 400-megawatt (MW) coal plant) and Emera's Bridgeport Energy (a 520-MW combined-cycle natural gas-fired power plant). PSEG is constructing an elevated Harbor Unit 5, which will add 485-MW generating capacity to Connecticut's southwestern region, powering more than 500,000 homes. The United Illuminating Company (UI) serves approximately 60,000 people in Bridgeport and operates the Singer and Pequonnock Substations in the South End. In addition, two residential development sites are planned at 60 Main Street and 30 University Avenue that could add up to 1,200 residential units to the study area (assuming a full buildout of both projects) In conjunction with the planned 406 residential units associated with the Windward Development (also assuming a full build out), a total of 1,600 residential units are expected to be constructed within the study area.

The peninsula is exposed to storm surge from coastal storms, which pose an increasing risk due to sea level rise. Connecticut Institute for Resilience and Climate Adaptation's latest report utilized projections from the Intergovernmental Panel on Climate Change and National Oceanic and Atmospheric Administration, adjusting the projections based on local conditions. The report recommends: "…that planning anticipates that sea level will be 0.5 meters (1 foot 8 inches) higher than the national tidal datum in Long Island Sound by 2050. Further, we recommend that planners be made aware that it is likely that sea level will continue to increase to 1.0 meters (3 feet 3 inches) by 2100."[1] Connecticut Senate Bill 7, An Act Concerning Climate Change Planning and Resiliency (Public Act 18-82), incorporated this sea level projection and included a policy for flood-proofing for properties within the coastal boundary not less than an additional two feet of freeboard above base flood and any additional freeboard necessary to account for the most recent sea level change scenario.[2]

During Superstorm Sandy, sustained 70 miles per hour gale force winds assailed the area, which experienced the highest storm surge in the state (nearly 7 feet above normal high tide), and resulted in damages to over 570 single-family homes citywide. Within the South End, 211 buildings were inundated, resulting in over 100

1 O'Donnell, J. 2018. *Sea Level Rise in Connecticut* (Draft). Connecticut Institute for Resilience and Climate Adaptation and Department of Marine Sciences.

2 *https://www.cga.ct.gov/2018/ACT/pa/pdf/2018PA-00082-R00SB-00007-PA.pdf*

Federal Emergency Management Agency (FEMA) Individual Assistance Household inspections completed in this area, with 89 properties affected (including affordable and public housing) (see Figure 2-1 for FEMA flood zones and the areas inundated during Superstorm Sandy). Flooded buildings are susceptible to mold and other public health concerns. These buildings and other infrastructure assets in the South End remain vulnerable to future events. Connecticut Institute for Resilience and Climate Adaptation's modeling results predict that the frequency of areas experiences coastal flooding at the current 10-year and 100-year levels will increase with sea level rise. For a 0.5-meter increase in seal level, the rate frequency of flooding is expected to be twice as high for Eastern Long Island Sound than for the Western Long Island Sound.[3]

Due to the low-lying geography, the area regularly experiences flooding from rainfall or tidal inundation. Flooding also occurs as stormwater flows south from a higher elevation at Downtown Bridgeport. Following rain events, extensive ponding often occurs in the railroad underpasses, including at Lafayette Street and Myrtle Street. The protection of these intersections is vital to resident egress and emergency evacuation. According to the National Oceanic and Atmospheric Administration, Bridgeport experienced over 50 hours of nuisance flood events in 2012.[4] Repetitive flooding of local streets occurs in the valleys and low-lying areas caused by both rainfall runoff and storm surge, making the streets impassable. Flooding at the intersection of Lafayette and Atlantic Streets is driven by upstream capacity in the combined sewer system. During a rain event as frequent as a 2-year storm, backflow of the system can cause street flooding for over 2 hours. During a severe flood event, the area near the intersection of Main Street and University Avenue can experience street flooding for over 13 hours. Improving the existing drainage system is important to minimize internal flooding and to manage stormwater in both high- and low-frequency storm events. Flooding of streets (particularly low-lying underpasses under I-95 and the Connecticut Department of Transportation New Haven rail line causes safety concerns for the local residents when vehicles, including emergency responders (fire, police, medical), are prevented from accessing the area. Of the five north-south running roadways that pass under the elevated rail and I-95 to connect the South End with Downtown Bridgeport, only Myrtle Avenue and Park Avenue lie outside the 100-year floodplain. While close to its urban center, the interstate and the railroad isolate the South End area from the downtown which has been physically cutoff from help during and after storm events. Portions of the South End lack dry egress for residents, businesses, and emergency vehicles when flooding occurs. Minimizing the flooding at roadways leading into and out of the South End is vital to resident egress and emergency evacuation.

In the South End East, the sewer and stormwater system infrastructure is aging, including an existing outfall that runs along Singer Street in the study area and drains into Bridgeport Harbor during combined sewer overflow (CSO) events. Generally, when the area experiences a heavy rainfall event, the water volume exceeds the capacity of the system and discharges the stormwater and wastewater with pollutants directly into the harbor. In Bridgeport, a rain event as small as 0.4 inch of precipitation can trigger a CSO event. Two wastewater facilities treat the combined rain and waste water for Bridgeport. The East Side wastewater treatment plant is on Seaview Avenue directly east of the South End, across the Pequonnock River. The West Side wastewater facility is west of the South End on Bostwick Avenue and discharges into Cedar Creek Harbor. Both facilities are in close approximation to the South End and discharge frequently into the surrounding water bodies. During Superstorm Sandy, the West Side and East Side wastewater facilities released 17.1 and 2.5 million gallons of partially treated sewage, respectively.[5]

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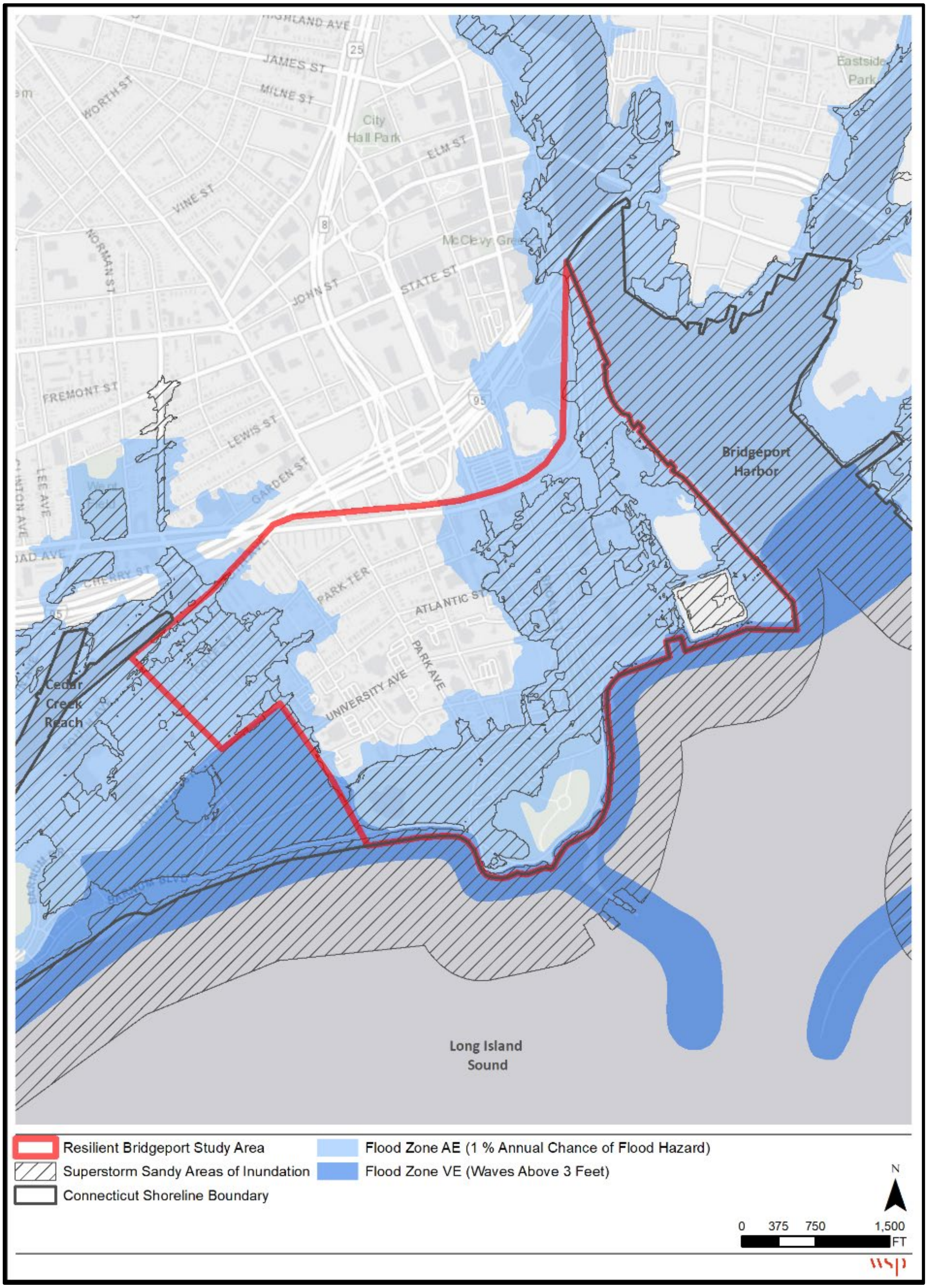
3 *https://circa.uconn.edu/wp-content/uploads/sites/1618/2018/05/Legal-Policy-Analysis-to-Support-Resilience-Measures.pdf*
4 *https://tidesandcurrents.noaa.gov/publications/NOAA_Technical_Report_NOS_COOPS_073.pdf*
5 *http://www.climatecentral.org/news/11-billion-gallons-of-sewage-overflow-from-hurricane-sandy-15924*

Figure 2-1. Flood Zones



Source: Federal Emergency Management Agency Flood Insurance Rate Map

In addition to flooded streets and damaged residential properties, after Superstorm Sandy residents experienced power outages, lasting from a few hours to more than a week. UI, which serves the larger region, reported that over 250,000 customers experienced power outages. Of the roughly 57,835 Bridgeport customers, over 41 percent (or 23,700) still experienced outages four days following the onset of Superstorm Sandy. Disruptions to regional supply chains and power interruptions caused serious complications for local industries. Ensuring the continuity of operations at the power-district scale is critical to maintaining industrial and commercial functions in the city.

Over the next 50 years, sea levels are expected to rise significantly, which will further compound existing flooding risks in Bridgeport's South End. Much of the critical infrastructure in the area, including electricity generation, transmission, and distribution facilities and low-lying stormwater and wastewater infrastructure, lies within the coastal floodplain and will face increasing risk of impact as sea levels rise.

A lack of economic redevelopment poses a significant obstacle to recovery and long-term resilience within the study area. Flooding from Superstorm Sandy closed or relocated the remaining businesses (which were already experiencing an economic downturn) in the South End and further exacerbated housing vacancies in the neighborhood. The 2012–2016 American Community Survey 5-Year Estimates reported the homeowner vacancy rate at 22.4 percent for the South End, which is roughly twice the rate than in the city of Bridgeport and the state of Connecticut (12.7 percent and 9.3 percent, respectively). The vulnerability of the area to regular flooding, future storm events and sea level rise has limited the opportunities for redevelopment in the area—both for businesses and housing. With both the current and future risk of storm events and flooding damages, the isolated street network and disconnection from downtown, the community has difficulty attracting new development in the area. Residents are unlikely to move into the neighborhood without reduced flood risk that would ensure their health and safety and developers are unlikely to invest in new construction without sufficient demand. Similarly, businesses require uninterrupted operations and protection of their resources from flooding that setting a new higher elevation for future development would provide. Addressing the risk of storm and coastal flooding in the area creates the first layer of protection, creating opportunities to address larger economic and community efforts that support resiliency in the long term.

The Proposed Action is needed to protect residents, property, and infrastructure assets from future storm surge events and chronic flooding during high-frequency rainfall events. In addition to lowering the risk of chronic and acute flooding in the study area, the Proposed Action is needed to directly protect life, public health, and property in the study area by allowing for dry egress in emergency situations.

2.2 PURPOSE

The purpose of the Proposed Action is to create a more resilient South End community, support its long-term viability, and improve health and safety for the community's vulnerable populations. The principal targeted outcomes follow:

- Lower the risk of acute and chronic flooding.
- Provide dry egress during emergencies.
- Educate the public about flood risks and sea level rise.

The Proposed Action would deliver additional benefits to the community, potentially unlocking development or public realm opportunities, enhancing connectivity between the South End and Downtown Bridgeport (located north of the railroad and I-95), improving existing open space amenities, building up the resilience of local energy systems, and leveraging public investment in ongoing resiliency efforts through coordination with local stakeholders.

The Proposed Action serves as an example of the State of Connecticut's long-term vision (as described in the State's National Disaster Resilience Competition Phase I application) of establishing more resilient coastal communities where structures and critical infrastructure in the flood zone are adapted to withstand occasional flooding and protected by healthy buffering ecosystems, where critical services, infrastructure and transport hubs are located on safer, higher ground, and where strong connections exist between the two. The South End of Bridgeport—with housing within walking and biking distance of the Metro-North train station downtown, critical power infrastructure, historical and cultural resources like the Freeman Houses, a university, and historic Seaside Park—is one of the state's identified resilience zones where adapting the area to flood risk and increasing investment provides an opportunity to increase economic resilience by strongly tying back to the regional transportation network and regional economic opportunities. These investments represent a "no regrets" approach to disaster mitigation and climate adaptation because in addition to providing long-term resilience, they would provide a myriad of co-benefits that would strengthen communities and economic opportunities in the short term and between storms. Additionally, the State of Connecticut will be taking lessons learned from the Proposed Action in the city of Bridgeport to further the development of the Connecticut Connections Coastal Resilience Plan, also funded under the National Disaster Resilience program, but exempted from the National Environmental Policy Act process as a planning only activity. Briefly, this Resilience Plan will include working with communities in Fairfield and New Haven Counties to integrate the State of Bridgeport's resilience vision into their local and regional planning with the support of local flood risk modeling.

2.3 GOALS AND OBJECTIVES

The following goals were developed to define project objectives while pushing for innovation and fulfillment of resiliency objectives. These goals helped to guide the alternatives selection process and served as the foundation to effectively measure, evaluate, and screen potential alternatives (as described in Chapter 3).

- **Goal 1: Minimizes risks associated with acute and chronic flooding**

  Located on a peninsula, surrounded by Bridgeport Harbor and the Pequonnock River to the east, Cedar Creek to the west, and Long Island Sound to the south, the South End is at risk of flooding from both coastal storm surge during storm events and from chronic rainfall events that are projected to become more frequent due to climate change and sea level rise projections. The Proposed Action would alleviate hardships associated with flooding from these types of events through creative and effective coastal and inland water impact mitigation strategies. The following objectives would help support this goal:

  – Reduce flood risk for vulnerable populations
  – Reduce flood risk for residents, businesses, and institutions
  – Consider present-day and future flood risk based on local climate change projections on storm intensity and frequency
  – Provide dry egress for redevelopment sites
  – Provide opportunities for green infrastructure management measures
  – Provide opportunities for adaptability to future conditions
  – Reduce flood risk for the design life of the Proposed Action considering sea level rise
  – Enhance reliability of energy generation, transmission, and distribution
  – Reduce flood risk for energy providers during storm events
  – Result in low-level of impact on existing drainage system

- **Goal 2: Integrates with plans and projects of key local stakeholders**

  There are several, significant and ongoing plans, developments, and facility operations in the South End study area. The Proposed Action will strive to integrate with and, at a minimum, coordinate with stakeholder initiatives to maximize leveraging the resources, impact, and ultimate success of this Proposed Action. The Proposed Action should gain efficiencies by coordinating risk reduction efforts and leveraging projects in the community to achieve the highest positive impact achievable for the South End.

  The South End community includes a range of stakeholders, with active projects and plans that will be considered for coordinated risk reduction measures, including utility companies, major power generation facilities, private developers, and the University of Bridgeport. This goal measures the extent to which shared efforts between these parties can lead to effective risk reduction, through integration with stakeholders' projects and future operations. The following objectives would support this goal:

  – Achieve stakeholder buy-in
  – Achieve community buy-in
  – Leverage investment through coordination with stakeholders
  – Maintain and/or improve access to stakeholder properties
  – Integrate with current master plans
  – Provide dry egress to future development sites

- **Goal 3: Delivers co-benefits to enhance community resiliency**

  Resilience is defined broadly by the South End community to include social, economic, and environmental factors in addition to risk reduction; therefore, the Proposed Action should employ a comprehensive approach to resilience and aim to reduce risk to the community while delivering co-benefits by enabling new economic development opportunities, improving mobility, and enhancing quality of life. Risk reduction should create tangible physical, economic, environmental, and social benefits for the community and the extent to which those benefits enable long-term community resiliency. The following objectives would support this goal:

  – Provide public amenities
  – Improve connectivity to Downtown Bridgeport during flood event
  – Improve mobility within South End
  – Facilitate transit-oriented development concepts
  – Preserve and/or enhance connection to water
  – Preserve and enhance community character
  – Integrate with and repair the urban fabric
  – Unlock potential for future development
  – Improve public health
  – Create and/or enhance the public realm
  – Serve as regional flood risk reduction prototype

- **Goal 4: Project needs to be implementable**

  Resilient Bridgeport has received a finite amount of funding through federal funding sources set on a defined schedule for implementation. The Proposed Action must be achievable with the available resources, must meet necessary relevant local, state, and federal permits and regulations, and be able to be constructed within the finite timeline provided by U.S. Department of Housing and Urban Development for funding this Proposed Action. This goal serves as a baseline requirement for project consideration and the following objectives would help support this goal:

  – Avoid potential right-of-way conflicts
  – Avoid private acquisition
  – Avoid significant utility obstructions/conflicts
  – Avoid known major environmental impacts
  – Avoid known unfavorable subsurface conditions
  – Consider spatial constraints
  – Estimated construction costs are within project budget or reachable with reasonable supplemental sources
  – Provide relative life-cycle cost benefits
  – Provide relative operations and maintenance cost benefits
  – Able to be permitted by local, state, and federal agencies
  – Buildable within allowable timeframe
  – Designed such that it could be accredited by FEMA

3

Concept and Alternatives Development

Contents

Tables

Figures

3. Concept and Alternatives Development

National Environmental Policy Act (NEPA) documents must evaluate all reasonable alternatives (40 CFR 1502.14, Alternatives including the proposed action). The alternatives to be considered in any NEPA document are driven by the purpose and need for the action. The purpose of this project is to lower the risk of acute and chronic flooding, provide dry egress during emergencies, and educate the public about flood risk and sea level rise (see Chapter 2, Purpose and Need). The Proposed Action for this Draft Environmental Impact Statement (DEIS) includes three individual projects that each address some part of the project purpose.

In order to identify the alternatives evaluated in this DEIS, each project under the Proposed Action underwent an alternatives evaluation process through which alternatives selection criteria were developed and then used to comparatively screen potential alternatives. This evaluation process eliminated some of the alternatives from further study and refined the alternatives to be analyzed in the DEIS. This section describes the alternatives' development and screening processes that led to the selection of the alternatives for each of the following projects: Rebuild by Design (RBD) Pilot Project and South End East Resilience Network (comprising a Flood Risk Reduction Project and Resilience Center).

3.1 NO ACTION ALTERNATIVE

Under the No Action Alternative there would be no measures to address either coastal storm surge or rainfall flood risk reduction. In addition, there would be no measures to educate the public about flood risks or sea level rise. As a result, there will be no negative environmental impacts related to construction; no impacts to visual or historic resources within the South End. However, this alternative would not meet the project purpose. There would be no flood risk reduction from either acute or chronic flooding in the South End; therefore, risk of flooding and the associated health and safety implications would remain. There would be no new raised egress within the South End; therefore, residents would continue to be stranded during regular rainfall and storm events and emergency vehicles would continue to have issues accessing the neighborhoods. Development opportunities in the South End would continue to be limited due to risk of flooding and damage to property. In addition, there would be no investment in historic resources in the neighborhood and no new community facility or open space resource.

Although the No Action Alternative is not a reasonable or prudent solution and is not recommended by Connecticut Department of Housing (CTDOH) or U.S. Department of Housing and Urban Development (HUD), it is required to be evaluated pursuant to Council on Environmental Quality regulations. As such, this alternative has been included and used as a baseline against which the effects of this Proposed Action are compared.

The No Action Alternative assumes the following:

- Public Service Enterprise Group (PSEG) and the United Illuminating Company will continue any planned resiliency projects along the edge of Bridgeport Harbor. PSEG is constructing a 485-megawatt duel fuel, single train combined-cycle power plant, using a combustion turbine, a steam turbine and a heat recovery steam generator to power more than 500,000 homes. The plant is being constructed on a podium above the 0.2 percent annual chance Federal Emergency Management Agency flood level and is expected to come online in mid-2019. PSEG has agreed to retire the existing Harbor Unit 3 coal-fired power plant by July 1, 2021 as part of the Community Environmental Benefits Agreement. United Illuminating's plans to relocate the existing Pequonnock Substation approximately 0.15-mile to the west to 1 Kiefer Street, which includes the relocation of the existing transmission and distribution lines that connect to the substation. The construction is expected to begin in the third quarter of 2019 and be operational by the end of 2021.

- The University of Bridgeport will implement their master plan over a span of 20 years. The university has a three-phase plan to be implemented over 20 years, which includes incorporating resiliency planning into proposed campus development, a new Health Sciences building, new Engineering Building, renovation of and addition to the Wheeler Recreation Center. The plan also includes the relocation of Campus Safety and Facilities, Engineering labs, School of Nursing, and the College of Chiropractic and Health Science and demolition of Norseman Hall, Milford Hall and North-South Hall. The near-term plan will construct new student housing, a Campus Safety and Facilities building, a student center, and an addition to the Hubbell Gymnasium. As with the initial phase, the near-term phase relocates and demolishes several buildings. The final long-term phase includes construction of new student housing, garages, mixed-use buildings, and redesigns of the Wellness and Student Life Quads and phase two of University Promenade. Knight's Field and College of Chiropractics and Health Sciences will be relocated north of University Avenue.
- The Bridgeport Water Pollution Control Authority has ongoing plans to separate the sanitary and stormwater systems in part of the South End of Bridgeport, referred to as the Area H Project.[1] The separation of sanitary and storm sewers, anticipated to be completed in 2021, will result in a separate system that will reduce the number of combined sewer overflow events, as rainfall will be discharged through a parallel sewer system, alleviating capacity issues that result from wet weather flows entering the combined sewer system.
- Windward Development is a multi-phase redevelopment of the former Marina Village site. Residents of Marina Village were relocated to other public housing as part of an earlier action. Next, demolition of the existing buildings on both parcels (38 brick residential buildings with multiple units and one community building) was initiated (Fuss & O'Neill, 2013; work still underway). Phase 1 is redevelopment of the triangular, easternmost parcel and consists of a four-story, 60-unit building with mixed-income guidelines. The estimated completion date is spring 2019. Phase 2, which will begin after completion of the proposed RBD Pilot Project, will complete the full build out and will similarly include mixed-income residential and some commercial space.
- 60 Main Street Development—the former Remington Shaver site—is located on a large lot adjacent to the waterfront in the South End. The brownfield has been remediated and is expected to be redeveloped as mixed-use development.
- 30 University Avenue is a 0.77-acre site planned for future multifamily residential development. The building on the site was demolished in summer 2018; however, the schedule for construction is unknown.
- A number of other projects would be implemented both within and near the proposed project areas through the 2022 analysis year.

[1] Implementation of the City of Bridgeport's combined sewer overflow separation project (Area H) between the railroad on the north and Seaside Park on the south and Lafayette on the west and Main Street will improve the system and have a direct, beneficial impact on infrastructure reducing the stormwater entering the sewer system and the wastewater treatment plant and freeing up system capacity to improve overall system performance.

Although the projects are not part of the Proposed Action, both the redevelopment of the former Marina Village site and development at 60 Main Street, as currently planned, depend on the Proposed Action to be complete prior to construction in order to provide dry egress for future residents. It is assumed that without the Proposed Action, the design for these redevelopment projects would be altered to provide the necessary dry egress and incorporate other flood risk reduction measures to allow the projects to move forward.

3.2 RBD PILOT PROJECT

In response to Superstorm Sandy, HUD launched the RBD Competition to promote innovation by developing regionally scalable but locally contextual solutions that increase resilience in the Northeast region. In June 2014, HUD announced the award of $930 million to seven finalists, one of which was Resilient Bridgeport. The Resilient Bridgeport project team prepared a master plan that includes developing an overall resilience strategy that covers a study area extending from downtown Bridgeport to Black Rock Harbor. In addition, the project team worked with CTDOH, the City of Bridgeport, and Bridgeport residents and business owners to identify a pilot project for Bridgeport's South End and Black Rock Harbor areas, with a specific focus on public housing in the South End. The effort focused on the area around the former Marina Village—a public housing facility located just south of I-95 and the railroad between Iranistan Avenue and Park Avenue— which faces a range of challenges, including flooding, sea level rise, limited emergency egress, few green spaces, limited community resources, and aging infrastructure.

3.2.1 Process

An iterative process of team workshops, public events, and stakeholder meetings guided the selection of a pilot project (see Chapter 6, Consultation and Coordination). This section describes the criteria used to select the pilot project and the design and engineering considerations that resulted in the final project definition.

3.2.1.1 Project Selection

CTDOH selected the RBD Pilot Project, which was funded specifically by the RBD Competition award, as the first investment toward the Resilient Bridgeport vision. The pilot project was selected from a list of potential projects that would help to form a larger complementary system for decreasing chronic and acute flooding throughout the South End of Bridgeport and be a visible example of resilient planning in a coastal environment.

The original RBD Competition award was to reduce flood risk for the most vulnerable public housing stock in the city and to leverage other funding. A Substantial Amendment to the Action Plan served to identify the pilot project that would be constructed using RBD funds to "reduce flood risk to public housing in the City's South End / Black Rock Harbor area."[2] The primary objective of this project is to reduce the risk from chronic storm water flooding in the most vulnerable public housing stock in the city, Marina Village, and the surrounding neighborhood rather than from the acute flooding from coastal storm surge that occurs during extreme events. Though the project activities are limited to this project site, the project is designed to provide benefits to low- and moderate-income home ownership and rental housing adjacent to the east and south as well as in the historic post-WWI, community known as Seaside Village to the west.

[2] Federal Register notice 79 FR 62182.

Following the project identification, additional feasibility analysis and stakeholder engagement clarified the scope and depth of the RBD Pilot Project. Project elements emerged from the public participatory and consultant planning and engineering process to meet the primary objective. The public has been meaningfully engaged in the decision-making process throughout. The team has organized nine workshops and has presented more than ten meetings hosted by other relevant organizations, in addition to dozens of meetings with individual citizens, civic groups, property owners, local businesses, and other key stakeholders.

The multidisciplinary design team, along with the Director of Resilience for the State of Connecticut (under the Department of Housing with responsibility for managing the RBD and National Disaster Resilience Competition grants), established the following selection criteria for the RBD Pilot Project competition, separate from the goals and objectives established in Chapter 2:

- Primary criteria:
  - Address acute flooding by providing dry egress.
  - Be highly visible within the community, to support ongoing resilience conversations with the public.
  - Leverage additional investments.
  - Address chronic flooding (i.e., from regular rainfall).
  - Push adaptation as a means to deal with sea level rise and build community capacity for sea level rise.
- Secondary criteria:
  - Build city stormwater capacity.
  - Integrate natural systems.
  - Stabilize property values.
  - Provide public amenities.
  - Create an educational tool.
  - Strengthen the neighborhood's sense of place.
  - Create adaptive design details.
  - Enhance connectivity within, and to and from the South End.
- Tertiary criteria:
  - Enhance ecological processes within the neighborhood.
  - Bury overhead utilities.
  - Serve as a destination or attraction for residents and visitors.
  - Create an interactive environment.

The area west of Park Avenue includes the former Marina Village site, along with Seaside Village and University of Bridgeport, and is low-lying in comparison to the surrounding area. As a result, this part of the South End is vulnerable to flooding from coastal storm events that is exacerbated by high tides. Additionally, the local combined sewer system floods during ordinary rainfall events, because the current drainage system has inadequate capacity to accommodate stormwater runoff and has insufficient flow (or elevation change) to convey the water to outfalls in Cedar Creek by gravity. Finally, there is a long-term plan to redevelop Housing Authority of the City of Bridgeport (HACB) housing complexes, including the former Marina Village. The buildings on the Marina Village site were built in the 1940s, were in poor condition, and were affected during Superstorm Sandy. HACB determined that it was not economically feasible to rehabilitate the existing structures since they are outdated and in disrepair. Based on the March 2010 South End Neighborhood Revitalization

Zone Strategic Plan, Marina Village was identified as needing to be rehabilitated and was within an area of housing development potential. The proposed demolition of and revitalization plan for Marina Village was designed to address the needs of the South End neighborhood for affordable housing, as well as to preserve and enhance the existing assets surrounding the site for future generations of South End residents. Two environmental assessments have been approved for demolishing the buildings within the complex and the development of the Phase 1 site (triangular lot bounded by Columbia Street, Railroad Avenue, Park Avenue and Johnson Street).[3] The Phase 2 site (rectangular lot west of the Phase 1 site bounded by Columbia Street, Ridge Avenue, Iranistan Avenue, and South Avenue) will be redeveloped in the future, following construction of the RBD Pilot Project.

The available amount of funding and the ability to create a complete system with independent utility and future expansion were critical factors in the decision making, along with the direction in the Substantial Amendment to the Action Plan for RBD to reduce flood risk to public housing. The former Marina Village site was selected as the pilot project site as a practicable and affordable investment (based on a Benefit-Cost Analysis) to reduce flood risk to public housing in the South End, and a first step toward a large system of resilient infrastructure for the neighborhood and a demonstration of Resilient Bridgeport.

3.2.2 RBD Pilot Project Alternatives

3.2.2.1 Alternatives Considered, but Eliminated from Further Consideration

Potential pilot projects evaluated and dismissed during the formulation of the RBD Pilot Project are described below (numbering corresponds with items presented in Figure 3-1):

1. **Raised Ballfields –** Existing ballfields within Seaside Park would have been elevated and stormwater stored below, which would have improved public health, community engagement, stormwater storage, and wave action attenuation. This project elements would have improved the quality of public space by allowing access after smaller storms. The timeline of other proposed improvements in the area would have determined where the stormwater to fill the subsurface storage would be directed from. Technical and cost feasibility would have greatly affected the implementation of the system; as such, it was eliminated as an RBD Pilot Project element.

2. **South End Berm –** Berm constructed through Seaside Park would have tied into higher ground along Park Avenue. This project element would have reduced risk from acute storm surge events and would have functioned as a public space, with a multiuse path on top that would have provided connections for pedestrians, cyclists, and people exercising. There were many unknowns and variables within the design of this project element (such as top-of-wall elevation, integration of raised road for egress, subsurface conditions, and interior drainage and stormwater management systems) that would have likely contributed to a total cost that exceeded the budget. Similarly, the length of the system required to tie in to high ground would have been substantial and was declared greater than the project element budget. This project element was eliminated from further consideration due to the cost necessary to provide a significant level of flood risk reduction.

[3] *Environmental Assessment (EA) for the Demolition of the Marina Village Apartment* (September 25, 2013) and Environmental Review Record and Statutory Checklist, prepared for Bridgeport Community Renewal Associates (November 4, 2015).

Figure 3-1. Potential Pilot Projects Considered

1. Raised Ballfields *
2. South End Berm *
3. Adapt Seaside Park *
4. Mirror Lake and Outfall *
5. Raised Egress - Johnson Street
6. Raised Egress - Iranistan Avenue *
7. Stormwater Facility
8. Green Streets

* Elements considered but eliminated from further consideration

Source: Design Strategies Report, Resilient Bridgeport, 2018

3. **Adapt Seaside Park –** General resilient design improvements throughout the park would have included replanting shoreline vegetation that was native and salt tolerant and excavating areas for water storage while using the excavated fill to build up higher areas. The project elements would have restored habitat, improved water quality, improved public amenity and recreational spaces, increased stormwater storage, and increased wave attenuation. The project element was eliminated from further consideration because of Seaside Park's historic status and community concern.

4. **Mirror Lake and Outfall –** This project element would have adapted the existing Mirror Lake, near the edge of Seaside Park, into a functioning treatment wetland. Stormwater from a new separated system would have been rerouted to Mirror Lake and filtered through an expanded wetland system. The project would have improved water quality and habitat as well as increased stormwater storage. Several unknown variables in this system would have affected the cost and scheduling, including the existing outfall condition, the location of groundwater, and soil salinity. The project was eliminated from further consideration because of cost variability and the Seaside Park's historic status.

3.2.2.2 Alternatives Carried Forward for Evaluation in this DEIS

In evaluating the potential alternative RBD Pilot projects, the design team, along with the Bridgeport community, prioritized reducing flood risk for the most vulnerable public housing stock in the city. In addition, the RBD Pilot Project needs to meet the following goals:

- Supports sustainable adaptation and growth because it improves dry egress during storms and enhances the viability of sites for residential and commercial development.
- Enriches the daily lives of residents because it enhances connections and amenities and improves neighborhood aesthetics.
- Aims to strengthen the environment, bolster the identify of Bridgeport, and serve as an exemplary and replicable project that stakeholders can collaboratively develop and successfully operate and maintain.

The RBD Pilot Project specifically aims to facilitate the future redevelopment of the former Marina Village site by reducing the flood risk to those parcels in both acute and chronic flooding events.

Following the site selection for the RBD Pilot Project, the specific design and engineering elements were identified.

Raised Egress

Raised egress corridors create opportunities for redevelopment, egress and evacuation, and access for emergency vehicles. Several streets within the South End are viable candidates to integrate with this system. Raised streets for access and egress were considered in several places within the South End as components of the pilot project. Raising an existing cross-street such as Ridge Avenue or South Avenue would either require elevating the adjacent development (at significant cost and community disruption) or result in an elevation differential between the road and houses. Iranistan Avenue could become a raised corridor linking the neighborhood to greater Bridgeport. The new corridor would provide dry egress during a 10- to 25-year storm event, and would increase the ability for emergency vehicles to navigate Iranistan Avenue during larger storms. However, to expand the dry egress route, Iranistan Avenue would have been raised from University Avenue past the Marina Village site, creating a system of raised streets for safe neighborhood circulation during rain and storm surge events. Costs for these systems relied highly on the coordination of utilities, the cost of fill material, easements, and the implementation of a separate stormwater system around the raised roads. In addition, residents of the adjacent Seaside Village development did not support raising the street. Raising Iranistan Avenue was eliminated from further consideration due to cost and lack of community support.

Extending Johnson Street through the Marina Village site would connect the elevated Park Avenue and egress north away from flooding. The new corridor would provide dry egress during storm events as well as increase the ability for emergency vehicles to navigate the area during larger storms. The extension could be constructed within a cleared site, allowing future development to be elevated to match the new road elevation. As part of the larger RBD Pilot Project, the Johnson Street extension would be connected to the proposed stormwater facility and drainage system, supplementing the street's existing drainage infrastructure. Raised egress would allow for future development of the site and increase the health and safety of the surrounding neighborhood during storm events.

Stormwater Facility

Capturing stormwater runoff from specific, targeted tributary drainage areas and creating a visible stormwater management feature would decrease the number of chronic flooding events in the study area and create an educational tool. A system that is primarily gray infrastructure and below ground would not be visible to passers-by and the surrounding community and would provide an educational tool and regular reminder of resilience to the public. The major stormwater components of the RBD Pilot Project are a stormwater facility, a gravity fed pipe to route stormwater from the park to a stormwater pump, and a force main to an existing outfall on Cedar Creek. The capacity and engineering components were based on the stormwater runoff calculations for the site.

The stormwater facility and accompanying drainage infrastructure would benefit the surrounding neighborhood (including the Windward Development site) during chronic flooding conditions by providing an aboveground, visible system to collect and quickly convey water through the neighborhood, while also providing a public amenity (green open space) during dry conditions. This element of the RBD Pilot Project would also decrease combined sewer overflow events occurring in the South End each year by diverting stormwater away from the combined sewer system.

Green Streets

Runoff from upslope areas contributes to flooding in low-lying areas. Enhancing streets on high ground—with bioswales, rain gardens, pervious paving, and trees—helps to hold water upslope and control the rate of infiltration into the soil, thus reducing runoff and flood risk for lower areas within the watershed.

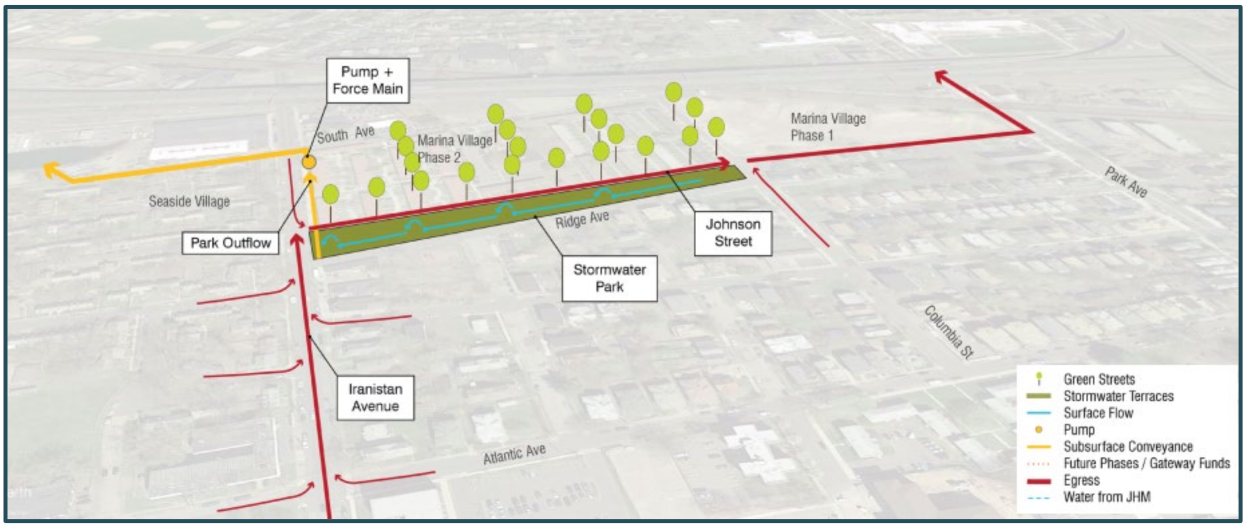
Within the RBD Pilot Project area watershed, upland Green Streets could be tied into a separate stormwater system and decrease flooding in the South End. Green Streets could also include the following benefits:

- Reduced heat island effect by expanding the urban tree canopy
- Increased habitat for birds
- Increased quality of streetscapes within the neighborhood
- Introduction of pocket parks into neighborhood

Summary

Raised egress through an extension of Johnson Street between Columbia Street and Iranistan Avenue would provide access during normal rainfall events, evacuation routes during larger events, and access for emergency responders into neighborhoods during flooding. The egress would continue the existing street grid to Iranistan Avenue and would provide dry egress to a vulnerable population in the South End. A 2.5-acre stormwater facility with a stormwater pump and force main connected to an outfall at Cedar Creek would reduce chronic flooding, improve water quality, provide a new public amenity, and anchor future development. The facility would accept water from upland areas and retain, delay, and improve the stormwater entering local waterways. The facility would also function as an amenity to the neighborhood that would provide recreational benefit during dry conditions and an educational tool on resilience. The Johnson Street extension would be designed as a Green Street to decrease stormwater runoff, improve water quality and decrease chronic flooding. Figure 3-2 presents the proposed RBD Pilot Project.

Figure 3-2. RBD Pilot Project



Source: Design Strategies Report, Resilient Bridgeport, 2018

3.3 SOUTH END EAST RESILIENCE NETWORK

This element of the Proposed Action would include a combination of measures within eastern South End that would reduce the flood risk within the project area from future coastal surge and chronic rainfall events. The measures could include creating raised streets, coastal flood defense, landscaped berms, both green and gray stormwater internal drainage management strategies (e.g., detention/retention features, drainage structures, and pump systems) and a Resilience Center.

Alternatives were developed for establishing a South End East Resilience Network satisfying the purpose and need. Raising streets were considered to provide dry egress during emergencies, a Flood Risk Reduction Project consisting of a coastal flood defense system with associated internal drainage management strategies was considered for lowering the risk of acute and chronic flooding and options for a Resilience Center were considered for educating the public about flood risk and sea level rise.

The project area under consideration for the South End East Resilience Network is defined as the region loosely bounded by South Railroad Avenue to the north, Park Avenue to the west, Long Island Sound to the south, and the Pequonnock River to the east (Figure 3-3).

Figure 3-3. South End East Resilience Network

3.3.1 Raised Streets

Streets can serve as a primary overland water-conveyance network. By anticipating storm surge and water flow both in and out, streets can function as a raised infrastructure corridor that doubles as flood defense. Streets can set the stage for new investment in key places, such as raised roads near potential redevelopment parcels. Making roadways more resilient would layer benefits of improving utilities, transportation, and flood risk reduction.

Providing dry egress or evacuation routes to neighborhoods is a concern for both safety and redevelopment. Critical facilities, for which even a slight increase in flooding is too great a threat, required dry egress in order to be redeveloped (i.e., the former Marina Village site). Raised connection corridors, or spines, can spur redevelopment in coastal areas while still promoting architectural adaptation to rising seas.

Raised corridors can be paired with a wayfinding program, such as signage and lighting, to provide clear directions during evacuations and better connections through the neighborhood year-round. Signage and lighting can denote important sites (e.g., shelters) or educational information (e.g., historic flooding heights). Better connections, raised or otherwise, can catalyze redevelopment in critical nodes around Bridgeport.

For the Proposed Action, raised streets were considered to provide dry egress and flood risk reduction when incorporated into a full coastal flood defense system. During the alternatives analysis, individual streets were examined for effectiveness for providing dry egress. Later, raised streets were evaluated as segments of a full coastal flood defense system as discussed in Section 3.3.3.

The streets within the project area generally run east-west or north-south. For a raised street to provide dry egress, all or part of the street to be raised needs to be in the floodplain prior to raising. East-west and north-south streets in the floodplain in the project area include the following:

- **East-West Streets** - Soundview Drive, Monument Drive, Grove Road, Waldemere Avenue, Linden Avenue, University Avenue, Atlantic Street, Gregory Street, Henry Street, Whiting Street, Kiefer Street
- **North-South Streets** - Main Street; Broad Street; Lafayette Street, Hazel Street, Myrtle Avenue, Park Avenue, Singer Avenue, Russel Street

Each street was evaluated for its effectiveness for providing dry egress if raised in isolation and a process of elimination was undertaken to evaluate a short list of streets for raising as follows:

- **Seaside Park Streets –** Soundview Drive, Monument Drive and Grove Road are all located in Seaside Park. The park does not have occupied infrastructure and therefore does not require dry egress. These streets were eliminated from for consideration for raising.
- **Waldemere Avenue, Henry Street, Whiting Street, Keifer Street, Hazel Street, Russell Street, Singer Avenue, Lafayette Street, Main Street, Broad Street** – The option of raising these streets was eliminated as both ends of the street are in the flood plain and therefore raising the street in isolation would not provide dry egress.
- **University Avenue, Atlantic Street, Gregory Street –** Raising the western ends of these streets would provide dry egress from the floodplain. Raising University Avenue provides dry egress to the University of Bridgeport campus as well as to the future development planned at the 60 Main Street site. Raising Atlantic

Street would provide dry egress to PSEG, Emera and properties along raised portions of the street. Raising Gregory Street provides dry egress to the vacant lot at 375 Main Street and properties along raised portions of the street. While raising Atlantic Street and Gregory Street could potentially provide dry egress, they were both eliminated from consideration when considering the full range of project goals and selection criteria as described in Section 3.3.3.1.

- **Myrtle Avenue –** While raising the southern end of Myrtle Street would provide dry egress opportunities, this would only benefit a very limited number of properties and therefore this option was eliminated.

Raised streets provide the purpose and need requirement to provide dry egress and can also moderately lower the risk of acute and chronic flooding locally when water pumping systems are incorporated. Of the raised street options considered only raising University Avenue with additional measures for stormwater management emerged as a viable alternative meeting the projects purpose and need. However, raising University Avenue, only does not meet all of the project goals. Additional risk reduction is achievable with a full coastal flood defense system in lieu of only a raised street. The development of alternatives that both provide dry egress and lower the risk of acute and chronic flooding including extreme events are provided in the following sections.

3.3.2 Flood Risk Reduction Project: Coastal Flood Defense System

The alternatives screening process for the coastal flood defense system first determined a general approach to the system, then identified potential flood reduction elements, and finally screened potential alignment options against selected criteria.

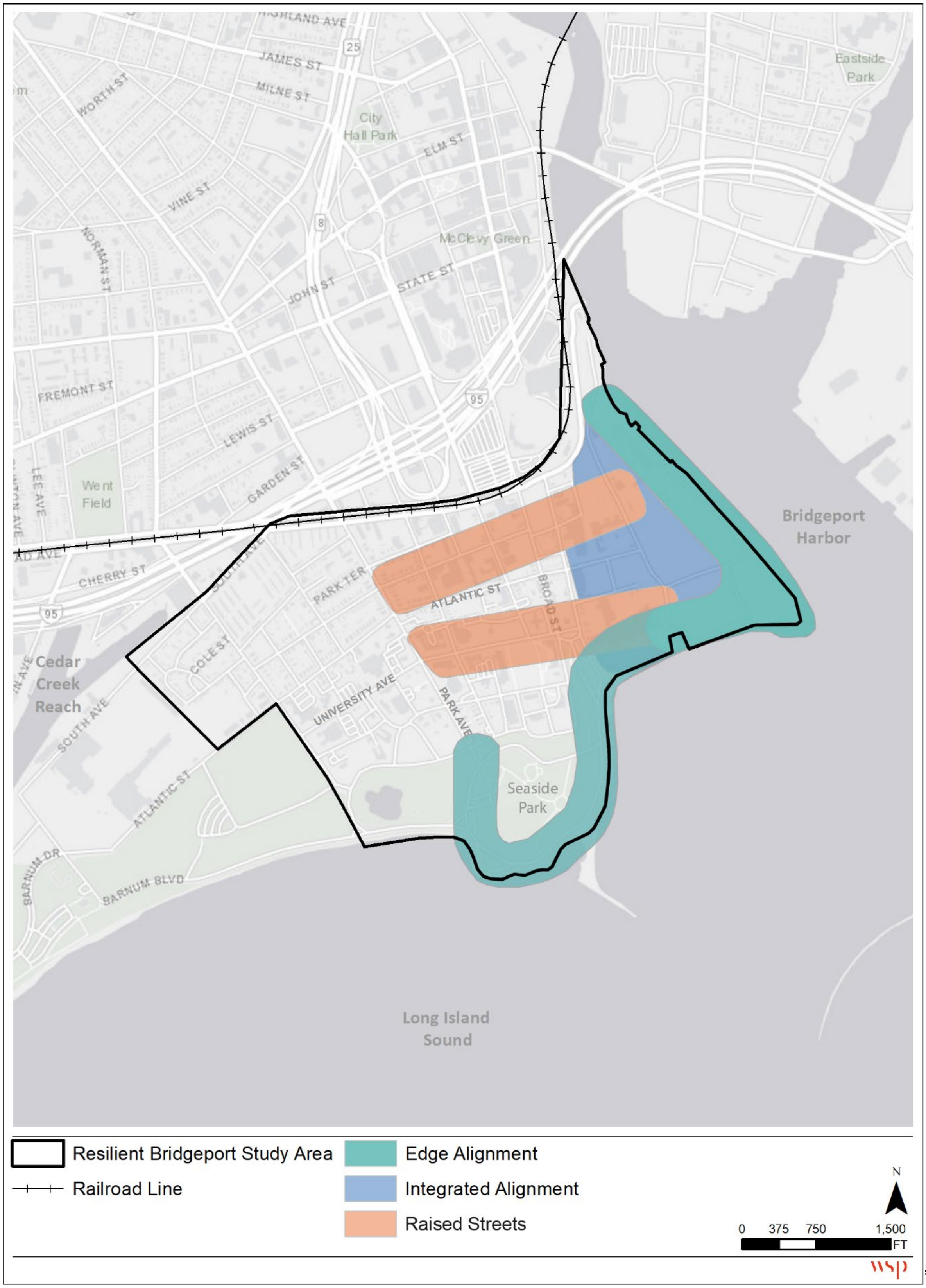
3.3.2.1 General Approaches

Two general approaches for creating a coastal flood defense system to reduce the impacts of flooding to vulnerable areas of the South End were developed for evaluation (Figure 3-4). Each is briefly discussed below.

<u>Edge Alignment Approach</u>

The edge alignment approach would consist of a coastal flood defense system in the water or on-land along the water's edge. The coastal flood defense system would start at the high ground on Park Avenue, continue through Seaside Park to the water's edge, and circle the South End either in the water on or above the Coastal Jurisdiction Line (Elevation +5.0 NAVD88). This alignment would affect the shoreline along Seaside Park, 60 Main Street, PSEG, the current United Illuminating Company Pequonnock Substation site, and possibly the Bridgeport Port Authority. A northern tie-in would be required along the elevated Connecticut Department of Transportation New Haven line. This approach would result in environmental impacts to water resources, including wetlands and biological resources (potentially threatened and endangered species), and would require permitting from various federal and state agencies.

Figure 3-4. Flood Risk Reduction Project: Alignment Approaches



Source: WSP, 2018

Integrated Alignment Approach

The integrated alignment approach would combine aspects of both the edge alignment and raised street (Section 3.3.1) approaches for resiliency. Similar to the edge alignment approach, the integrated alignment approach would consist of a closed-loop coastal flood defense system with the intent of providing a raised perimeter to reduce the risk of flooding to vulnerable areas on the inside of the newly constructed alignment. However, while the edge alignment approach considers only an in-water/water's edge perimeter, the integrated alignment approach considers alignments farther inland. An integrated alignment approach may include construction of structures on both public and private property and would require extensive coordination with stakeholders, agencies, and the community. However, the environmental impacts and permitting requirements from the edge alignment approach's in-water approach would be avoided.

Summary

Both of these approaches would meet the project purpose but would vary in their ability to meet the goals and objectives identified in Chapter 2. As shown in Figure 3-5 and Table 3-1, the integrated alignment approach was identified as likely to meet more of the goals and objectives and was selected as the preferred approach. For the purpose of comparison, the approach of raised streets is also included in the table. As discussed in Section 3.3.1, the Raised Street Approach has merit but does not fulfill all the project goals.

3.3.2.2 Coastal Flood Defense System Project Components

The Proposed Action is needed to reduce the risk of floods from coastal storm surges and/or systemic inland flooding from large rainfall events within the project area. To address one or both flooding scenarios, the Proposed Action would implement a wide variety of infrastructure components as part of its flood risk reduction solution. Each component would be sited within the east side of the South End to address a current need and operate in an integrated manner with other proposed or existing flood reduction infrastructure. These components are described in the following sections per the flooding scenario they are most commonly used to address.

Flood Control Structures

Levees

The National Flood Insurance Program defines a levee in Title 44, Chapter 1, Section 59.1 of the Code of Federal Regulations (44 CFR 59.1) as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practice to contain, control, or divert the flow of water so as to reduce the risk from temporary flooding. The core of a levee is generally composed of impermeable material to prevent seepage and structural weakening. The outer layer is vegetated or armored with rock in order to prevent erosion. Because levees consist of mounds of compacted earth, their width must be greater than their height in order to maintain structural integrity. As such, they require correspondingly large footprints of property in order to be constructed. The type of vegetation used for stabilizing can also be chosen and maintained in a manner that creates specific ecological habitats and improvements, such as the use of native vegetation. Further, levees can be incorporated into public open space to enhance community recreation areas (Figure 3-6). A berm can be designed to function as a public space, with a multiuse path on top that provides connections for pedestrians, cyclists, and people exercising. Another benefit of an accessible berm path is providing elevated views of the surrounding area, including the water.

Figure 3-5. Flood Risk Reduction: Integrated Alignment Approach

Source: WSP, 2018

Table 3-1. Flood Risk Reduction Project: Alignment Approach Selection

GOAL	SELECTION CRITERIA	ALIGNMENT		
		EDGE	RAISED STREET	INTEGRATED
1. Minimize Risks Associated with Acute and Chronic Flooding	Enhance reliability of energy generation, transmission, and distribution.	Y	N	Y
	Reduce flood risk for vulnerable populations.	Y	N	Y
	Reduce flood risk for residents, businesses, and institutions.	Y	N	Y
	Consider present day and future flood risk based on local climate change projects and storm intensity and frequency.	Y	Y	Y
	Provide dry egress for residents and redevelopment sites.	Y	Y	Y
	Provide opportunities for green infrastructure and management measures.	Y	Y	Y
	Provide opportunities for adaptability to future conditions.	Y	Y	Y
	Reduce flood risk for the design life of the project considering sea level rise.	Y	Y	Y
	Reduce flood risk for energy providers during storm events.	Y	N	Y
	Result in low-level of impact on existing drainage system.	Y	N	N
2. Integrate with Plans and Projects of Key Local Stakeholders	Achieve stakeholder buy-in.	Y	Y	Y
	Leverage investment through coordination with stakeholders.	Y	N	Y
	Maintain and/or improve access to stakeholder properties.	Y	Y	Y
	Integrate with current master plans.	Y	Y	Y
	Provide dry egress to future development sites.	Y	Y	Y
3. Deliver Co-benefits to Enhance Community Resiliency	Provide a multifunctional solution.	Y	Y	Y
	Provide public amenities.	Y	Y	Y
	Improve connectivity to Downtown Bridgeport during flood event.	Y	Y	Y
	Improve mobility within South End.	N	Y	Y
	Facilitate Transit-oriented development.	N	N	N
	Preserve and/or enhance connection to water.	N	Y	Y
	Preserve and enhance community character.	N	Y	Y
	Integrate with and repair the urban fabric.	N	Y	Y
	Unlock potential for future development.	Y	Y	Y
	Improve public health.	Y	Y	Y
	Create and/or enhance the public realm.	N	Y	Y
	Serve as regional flood risk reduction prototype.	Y	Y	Y

Table 3-1. Flood Risk Reduction Project: Alignment Approach Selection (continued)

GOAL	SELECTION CRITERIA	ALIGNMENT		
		EDGE	RAISED STREET	INTEGRATED
4. Project Needs to be Implementable	Avoid/minimize potential right-of-way conflicts.	N	Y	Y
	Avoid acquisition of private property.	N	Y	N
	Avoid significant utility obstructions/conflicts.	N	Y	N
	Avoid known major environmental impacts.	N	Y	Y
	Avoid known unfavorable subsurface conditions.	N	Y	Y
	Consider spatial constraints.	Y	Y	Y
	Estimated construction costs are within project budget or researchable with reasonable supplemental sources.	N	Y	Y
	Provide relative life-cycle cost benefits.	Y	Y	Y
	Provide relative Operations and Maintenance (O+M) cost benefits.	Y	Y	Y
	Able to be permitted by local, state, and federal agencies.	Y	Y	Y
	Buildable within allowable timeframe.	N	Y	Y
	Designed such that it could be certified by Federal Emergency Management Agency.	Y	N	Y

Figure 3-6. Example Berm

New Dutch Water Line designed by Maurice and Frederick Henry of Nassau in the early 17th century, Netherlands.

Floodwalls

A floodwall is a primarily vertical artificial barrier constructed in accordance with sound engineering practice to contain, control, or divert the flow of water so as to reduce the risk from temporary flooding. Floodwalls are structures usually constructed of manufactured materials such as concrete, masonry, or steel. Floodwalls are often more expensive than earthen structures due to the greater design and material requirements for construction and installation. However, they generally provide greater flexibility for design and implementation. For example, unlike earthen structures, floodwalls can be constructed at varying heights independent of their width because their foundation extends vertically into the ground beneath them. Floodwalls are surge-reduction structures that are useful when space is limited or land area is too valuable to forfeit. These are typically used in dense or industrial areas. This relatively small geographic footprint often makes them the preferred flood control structure in areas where space is limited, such as in developed areas. They also have a wider array of potential co-utilities. Whereas berms and levees must be maintained as vegetated mounds of earth, floodwalls have greater design flexibility to complement the existing landscape and/or land use. In areas where public use or aesthetic appearance is less important, floodwalls would be designed as, for example, simple sheet pile walls, which are just as effective at a lower cost. Finally, in some circumstances, floodwall alignments are required to traverse areas that normally must remain open, such as roadways. In these locations, portions of the floodwall (i.e., closure gates) can be deployed, as needed, when flooding is imminent.

The selection of a floodwall design primarily depends on the type of flooding anticipated. High water levels and velocities can exert hydrodynamic and hydrostatic forces and impact loads that must be accounted for in the floodwall design.

Raised Streets and Dry Egress

Streets can serve as a primary overland water-conveyance network. By anticipating storm surge and water flow both in and out, streets can function as a raised infrastructure corridor that doubles as flood defense. Streets can set the stage for new investment in key places, such as raised roads near potential redevelopment parcels. Making roadways more resilient would layer benefits of improving utilities, transportation, and flood risk reduction.

Providing dry egress to neighborhoods is a concern for both safety and redevelopment. Critical facilities, for which even a slight increase in flooding is too great a threat, required dry egress in order to be redeveloped (i.e., the former Marina Village site). Raised connection corridors, or spines, can spur redevelopment in coastal areas while still promoting architectural adaptation to rising seas.

Raised corridors can be paired with a wayfinding program, such as signage and lighting, to provide clear directions during evacuations and better connections through the neighborhood year-round. Signage and lighting can denote important sites (e.g., shelters) or educational information (e.g., historic flooding heights). Better connections, raised or otherwise, can catalyze redevelopment in critical nodes around Bridgeport.

Figure 3-7. Example Floodwall and Public Space

Hafencity public space designed by Miralles Tagliabue

Figure 3-8. Example Flip Gate

Waterfront in Wakefield, England designed and built by Flood Control Limited

Figure 3-9. Example Closure Gate

South Humberbank Power Station in Yorkshire, England

Figure 3-10. Example Flood Gate

Clifton, AZ

Figure 3-11. Example Floodwall

Sunbury, PA

Green Infrastructure for Stormwater

Green infrastructure for stormwater reintroduces ecological functions into the built environment. Soil-water-plant systems including biofiltration planters, bioretention swales, trees, and permeable pavements intercept stormwater before it reaches gray infrastructure. Some water is infiltrated into the ground, some is evaporated into the air, and some is temporarily stored before being slowly released into the sewer system. Green infrastructure helps to reduce runoff volume to gray infrastructure and filter pollutants, protecting water quality and mitigating risks of flooding. Investments in green infrastructure complement gray infrastructure and may extend the useful life of major capital street and sewer projects. An integrated approach to green stormwater management in the public right-of-way is central to the design of resilient urban landscapes. Green infrastructure that collects, slows, and infiltrates stormwater can be integrated into parks and plazas.

Green infrastructure goes beyond improving stormwater management and provides environmental, economic, and social benefits. For example, retaining stormwater minimizes the operating costs of a wastewater treatment plant, planting trees and vegetation improves air quality by filtering and removing pollutants from vehicles, and providing green spaces serves additional functions such as park spaces, which add community amenities. Green infrastructure can be organized into three main categories: subsurface conveyance, surface conveyance, and storage. Specific strategies in each of these groups could apply, depending on goals, available land, existing infrastructure, cost, operations and maintenance, visibility, and effectiveness. Each type of green infrastructure should be carefully evaluated to fulfill the aspiration and best outcome. While green infrastructure installations provide many community benefits, they are typically better suited to handle the rainfall volume from small rain events. In addition, they usually require a significant amount of space to be effective, which can be a sizable limitation for a city and a barrier to implementation. Lastly, maintenance is a critical consideration; green infrastructure installations need to be routinely maintained for peak performance. As a result, green infrastructure is recommended to complement gray infrastructure improvements as well as policy that helps manage runoff from new development. Many of these types of green infrastructure can be implemented at modestly priced, individual site scales such as rain barrels or rain gardens.

3.3.2.3 Project Goals and Selection Criteria

Employing both the Integrated Alignment and Edge Alignment Approaches numerous alternative alignments were considered and evaluated against the project goals and selection criteria. Project goals encompass project objectives and help to guide the alternatives selection process and serve as the foundation to effectively measure, evaluate, and screen potential alternatives. The project goals are listed in the first column of Table 3-2 and are discussed in greater detail in Section 2.3.

Selection criteria were developed to allow the design and engineering teams to understand and evaluate how each alternative will contribute to, and/or achieve the agreed upon project goals, which are listed in Table 3-2. The evaluation process qualitatively captures the positive and negative effects of alternatives and supports the development of a consensus for a shortlist of alternatives.

3.3.3 Alignment Screening

After establishing project goals and evaluation criteria, alignment segment combinations were identified, whereby a series of connected segments would form a coastal flood defense for Bridgeport's South End East. The first stage of screening alternatives included stakeholder outreach and a high-level review of potential alignments. The high-level review narrowed the numerous alternatives to a reasonable number in order to evaluate in further detail. Various segments of land within the South End were identified for potential integration into a coastal defense system alignment following the approaches described in Section 3.3.2.1. An alignment alternatives screening matrix was developed to qualitatively assess the effectiveness of each possible combination of segments against the project goals and selection criteria (see Table 3-1). Stakeholder outreach was primarily conducted to collect data, better understand future development plans and initiatives, discuss the project goals and proposed alignment locations, and look for opportunities to maximize the leveraging of resources.

Section 3.3.3.1 provides the alternatives development process that did not pass the screening criteria or meet the purpose and need, including some alternatives identified by the public during the public scoping process a discussion on presents these eliminated alternatives, as well as the rationale for eliminating them.

3.3.3.1 Alternatives Considered, but Eliminated from Further Consideration

The following segments or approaches were deemed insufficient to meet the project goals and were eliminated in the high-level initial alternatives evaluation:

- **In-Water Solution –** This alignment alternative consisted of a flood reduction feature built entirely in the water off the coast of Bridgeport, that would have extended from the western end of Seaside Park, east along the coast, then north to tie in to the higher ground land south of I-95. This concept was eliminated because the negative environmental impacts would have been significant; the permitting process would have been lengthy and arduous, which would have affected schedule goals; and the cost would have significantly exceeded funding availability. In addition, the community voiced significant concern regarding both viewsheds and waterfront access.
- **Alignment Segments in Seaside Park –** Seaside Park is a historic park within the project area that has been listed on the National Register of Historic Places since 1982. An existing berm extending along the perimeter of the park provides a level of protection against flooding, so this area is considered an area of lower risk for flooding. This concept was eliminated because of the historic nature of the park and the consideration that this area can withstand flooding with little negative impact on public safety or critical infrastructure (since no residences, businesses or utility companies are in the park).
- **Waldemere Avenue –** Waldemere Avenue is south of and runs parallel to University Avenue—marking the southern boundary of the University of Bridgeport—and adjacent to Seaside Park. This concept was eliminated because Waldemere Avenue is at a relatively low elevation, so the height of a flood wall would need to be much higher than would be necessary along University Avenue to provide the same level of risk reduction. In addition, a flood wall of the necessary height would have isolated the park from the rest of the community, hindering the community's access to the water, which would conflict with key project goals. The proximity to the historic park would have instigated a lengthy environmental review and approval process, also making it unfavorable with regards to schedule.
- **Linden Avenue –** Linden Avenue is located between University Avenue and Waldemere Avenue, so this concept posed similar challenges to the Waldemere Avenue concept. The elevation of Linden Avenue is slightly higher than Waldemere Avenue but is still significantly lower than University Avenue, and thus would require construction of a very high flood wall. The size and cost of such a structure, along with the negative impact on community character and water access, resulted in the rejection of this concept.

- **Myrtle Avenue –** Myrtle Avenue is a north-south roadway, located in the southwest region of the project area. This location is too far west to be of any meaningful value to the flood risk reduction alignment and was therefore rejected.
- **Hazel Street –** Hazel Street is located one block east of Myrtle Avenue and was eliminated for similar reasons as the latter. While it is farther east than Myrtle Avenue, any alignment established in this location would have been too far west to support any of the project goals.
- **Lafayette Avenue –** Lafayette Avenue is one block to the east of Hazel Street. Potential alignments along this segment were also eliminated because the location is too far west to provide meaningful flood protection.
- **Atlantic Street –** Atlantic Street is a main thoroughfare that runs east-west adjacent to the north side of the University of Bridgeport campus. A flood reduction strategy constructed in this location would have been too far north to be of significant value. Vulnerable residential areas, 60 Main Street, and a second future development to be located at 30 University Avenue would have received no benefit from the flood reduction strategy along Atlantic Street. In addition, because this roadway would have provided access to both Emera and PSEG, this concept would have presented significant construction constraints and would not have been favorable. This concept was therefore eliminated from consideration.
- **Broad Street –** Broad Street is the final north-south alignment that was eliminated in the initial assessment. Like the aforementioned north-south alignments, Broad Street is located too far west to provide a benefit to critical areas that need to be protected to meet project goals. Any north-south concepts located west of Main Street were thus eliminated, since they would not have been positioned to provide adequate protection to many residences and critical infrastructure.
- **Gregory Street -** Gregory Street was considered as an option for a raised street to provide dry egress to the potential development property at 375 Main Street. Gregory Street is densely populated with residences and community religious centers. Raising the street would have a major impact on the community as many of the existing buildings are located close to the street making transitions and access from the raised road to the adjacent parcels a challenge. In addition, there are several streets that would have to be raised to meet the raised elevation of Gregory Street. As the impacts of raising Gregory Street outweighed the benefits, this option was eliminated.

Figure 3-12 shows the eliminated segments. After inspecting the eliminated segments and considering current operations and infrastructure on PSEG's property, an envelope of land within the central portion of the east side of the South End was identified as the potential area that the coastal defense system could be constructed. The envelope for the potential alignment is shown in aqua in Figure 3-13 and a description of the potential alignment segments within this zone is provided in the following section.

Figure 3-12. Eliminated Alignment Segments

Source: WSP, 2018

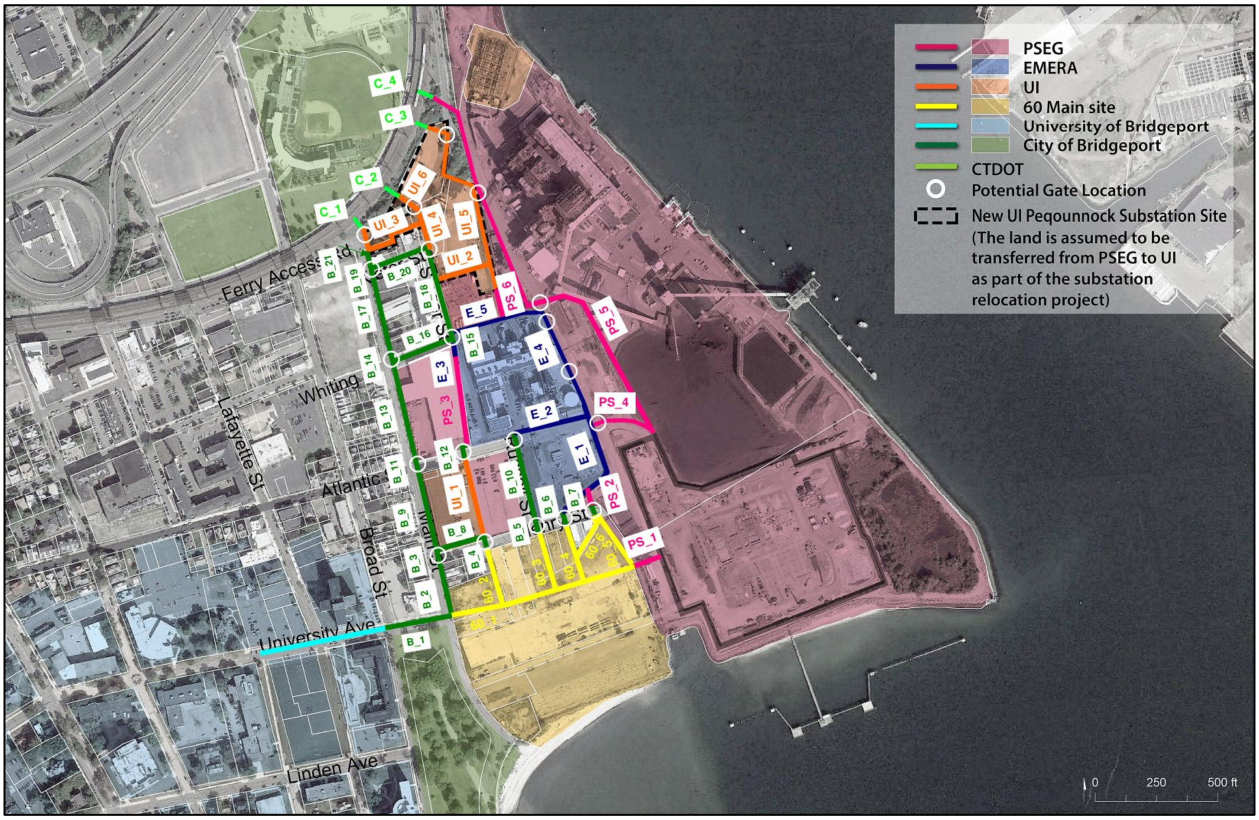
3.3.3.2 *Segment Evaluation*

After decreasing the number of alignment segments for further consideration, potential segments were identified to develop a closed-loop coastal defense system (within the shaded aqua area shown in Figure 3-13). The alignment segments require passing through various private and publicly owned land in the South End. Multiple crossings of the properties were explored and evaluated based on project goals, current operations, and future plans for the properties. The segments were color coded and numbered as shown in Figure 3-13. Numbering conventions used for the major property owners follow:

- PSEG: .... PS_1 to PS_6
- Emera: .... E_1 to E_5
- UI: .... UI_1 to UI_6
- 60 Main St: .... 60_1 to 60_6
- University of Bridgeport: .... UB_1
- City of Bridgeport: .... B_1 to B_21
- Connecticut Department of Transportation .... C_1 to C_4

In addition, to the numbered, color-coded segments, Figure 3-13 includes potential locations the gates would be needed. The gates would be open, except during flooding events, when they would be closed to complete the coastal defense system.

Figure 3-13. Alignment Segment Options for Evaluation



Source: WSP, 2018

An evaluation of the remaining alignment segments was conducted through a screening matrix (see Table 3-2). The Segment Evaluation Matrix includes an array of criteria by which the various concepts could be measured and compared. Individual screening criteria in the matrix were established based on the Proposed Action's purpose and need (see Chapter 2), including its goals and objectives; potential impacts to the natural environment and the community; and the project's overall feasibility. Using the features identified in Section 3.3.1, numerous design concepts were utilized to identify the most effective and feasible solutions to coastal and inland flooding in the project area.

The screening matrix was presented to and reviewed by the community advisory committee and technical advisory committee, and was subsequently revised to incorporate comments from these groups. Additional input was obtained from stakeholder groups and then presented in a community workshop setting. The community workshop allowed the public to provide input into the criteria. (Chapter 6 describes the public involvement process in greater detail.) The identified alignments were compared to the goal-based criteria and narrowed down through a process of elimination. The segments were evaluated against Goals 1 to 3 (because Goal 4 dealt with cost). Throughout the alternatives development process, these concepts were refined iteratively until the final Build Alternatives were selected.

- Goal 1: Minimize risks associated with acute and chronic flooding – The potential for each alignment segment to provide flood risk reduction for critical infrastructure, energy supply companies, vulnerable residential populations, local businesses, and institutions was evaluated. This also included the ability to provide dry egress to future development locations (namely, 60 Main Street).

- Goal 2: Integrate with plans and projects of key local stakeholders – Each alignment segment was evaluated based on future plans and feedback provided by locally based utility companies and the need to maintain adequate access to the various stakeholder properties. In addition, the potential to generate local stakeholder investment was considered.
- Goal 3: Delivers Co-benefits to Enhance Community Resiliency – The alignment segments were evaluated and compared for benefits to the community character and local resilience. This primarily included looking at what was inside and outside of the coastal defense system for each alignment segment.

Table 3-2. Segment Evaluation Matrix

SEGMENT	INCONSISTENT WITH GOAL	REASON FOR ELIMINATION
B_2	1, 2	Limits access to and does not reduce the risk of flooding or provide co-benefits to 146, 154, and 160 Main St.
B_4	N/A	Eliminated due to elimination of UI_1 and 60_2.
B_5	N/A	Eliminated due to elimination of B_10 and 60_3.
B_6	N/A	Eliminated due to elimination of 60_4.
B_10	3	Emera expressed a preference for keeping the land to the east of B_10 within the coastal defense system due to existing critical infrastructure on the property. B_10 was therefore eliminated and replaced with E_1.
B_12	N/A	Eliminated due to elimination of UI_1 and PS_3.
B_17	1,3	Limits access to and does not reduce the risk of flooding or provide co-benefits to the Freeman Homes or other existing buildings between Whiting and Keifer St.
B_20	1,3	Limits access to and does not reduce the risk of flooding to the properties on the north side of Keifer St.
B_21	1,3	Limits access to and does not reduce the risk of flooding to the properties on the north side of 418-420 Main St.
60_3	2	60 Main St. developer prefers an alignment that continues east-west through the property and B_10 was eliminated, which was the most logical northern connection.
60_4	2	60 Main St. developer prefers an alignment that continues east-west through the property, and segment 60_4 is located on the west side 21 and 27 Henry Street, where an active business is located. 60_5 and 60_6 are adjacent segments that do provide flood risk reduction to the business; therefore, 60_4 was eliminated.
60_6	2	60 Main St. developer prefers an alignment that continues east-west through the property, so 60_6 was eliminated in favor of 60_5.
E_2	2	E_2 crosses the main entrance to Emera's site and bisects their property; it was eliminated in favor of E_1.
E_3	2	E_3 leaves Emera outside the coastal defense system, but is located on their property; E_3 was eliminated in favor of E_4.
E_5	2	Interferes with the utility lines for the operation of Emera's plant.
PS_3	3	PS_3 leaves Emera outside the coastal defense system and was eliminated in favor of E_4.
PS_5	3	PS_5 was not preferred by PSEG for current and future operations and was eliminated in favor of PS_4.
UI_1	3	UI_1 interferes with PSEG's current operation of Harbor Unit 3 was eliminated.
UI_2	3	UI_2 leaves PSEG and Emera property outside of the coastal defense system and was eliminated in favor of E_1.

As the alternatives development process progressed, specific structural flood reduction and/or stormwater drainage improvement concepts were identified that would meet the purpose and need for the Proposed Action. These concepts were advanced as the Flood Risk Reduction Project and are subjected to full analysis within this DEIS (see Chapter 4). The Alternatives Evaluation Report (Appendix B) provides a more detailed summary of the alternatives development and screening process.

3.3.4 Alternatives Carried Forward for Evaluation in this DEIS

The remaining segments were arranged into two alignments for the eastern- and western-most limits of the coastal flood defense system within the Flood Risk Reduction Project area. The intent of the alignments is to show an envelope of solutions to reduce flood risk. While each alignment shows a discrete set of interconnected segments, interchanging of some of the north-south alignment segments within the envelope is possible. Each of these alignments includes raising University Avenue and instigating internal drainage management strategies that would vary, depending on the final alignment. In any instance where a street would be crossed in the north-south alignment segments, gate crossings are proposed. Due to the critical subsurface utilities in the roadways, it is proposed that the coastal defense system be placed above or bridge over critical infrastructure where possible.

The two alignment options are described in the following sections.

3.3.4.1 Western Option

The Western Option (Figure 3-14) would reside primarily within the urban fabric of the South End community. The alignment would start at approximately elevation +16 feet NAVD88 on University Avenue and continue east, down University Avenue and into the 60 Main Street site. Within the 60 Main Street site, the alignment would turn north to the east side of 107 Henry Street and continue across Henry Street. The alignment would continue north on the east side of Main Street for two blocks before turning east to Singer Street. Thereafter, the alignment would hug the western edge of the future site of the Pequonnock Substation site, cross Ferry Access Road, and tie in the elevated rail line.

This alignment would primarily avoid private utility provider property with the exception one segment (orange line in Figure 3-14 located on the future Pequonnock Substation site, which is owned by PSEG and is planned to be transferred to UI as part of the Pequonnock Substation relocation project. While this alignment includes coastal defense and flood risk reduction for the South End community north of University Avenue, critical utility providers are located outside the line of defense.

3.3.4.2 Eastern Option

The easternmost option (Figure 3-15) would continue across the 60 Main Street site up to the eastern border, where it would cross to the east into PSEG's property and connect to the newly built Harbor Unit 5 perimeter sheet pile wall. Harbor Unit 5 would provide the southeast corner of the coastal defense system, which would extend north from the plant's access road ramp on the northwest corner of the perimeter wall. The alignment would connect from the ramp over to Emera's eastern border north of Atlantic Street. This arrangement would provide dry egress to Harbor Unit 5 via Atlantic Street. The alignment would continue along the eastern border of Emera's site until it reaches the Pequonnock Substation relocation site, where it would continue north along the eastern property line of the site across Ferry Access Road with a northern tie-in at the elevated railroad. The Eastern Option would provide dry egress to Harbor Unit 5 and coastal defense to the new Pequonnock Substation relocation site.

Figure 3-14. Western Option

Source: WSP, 2018

Figure 3-15. Eastern Option

Source: WSP, 2018

3.3.4.3 Main Street / University Avenue Intersection Options

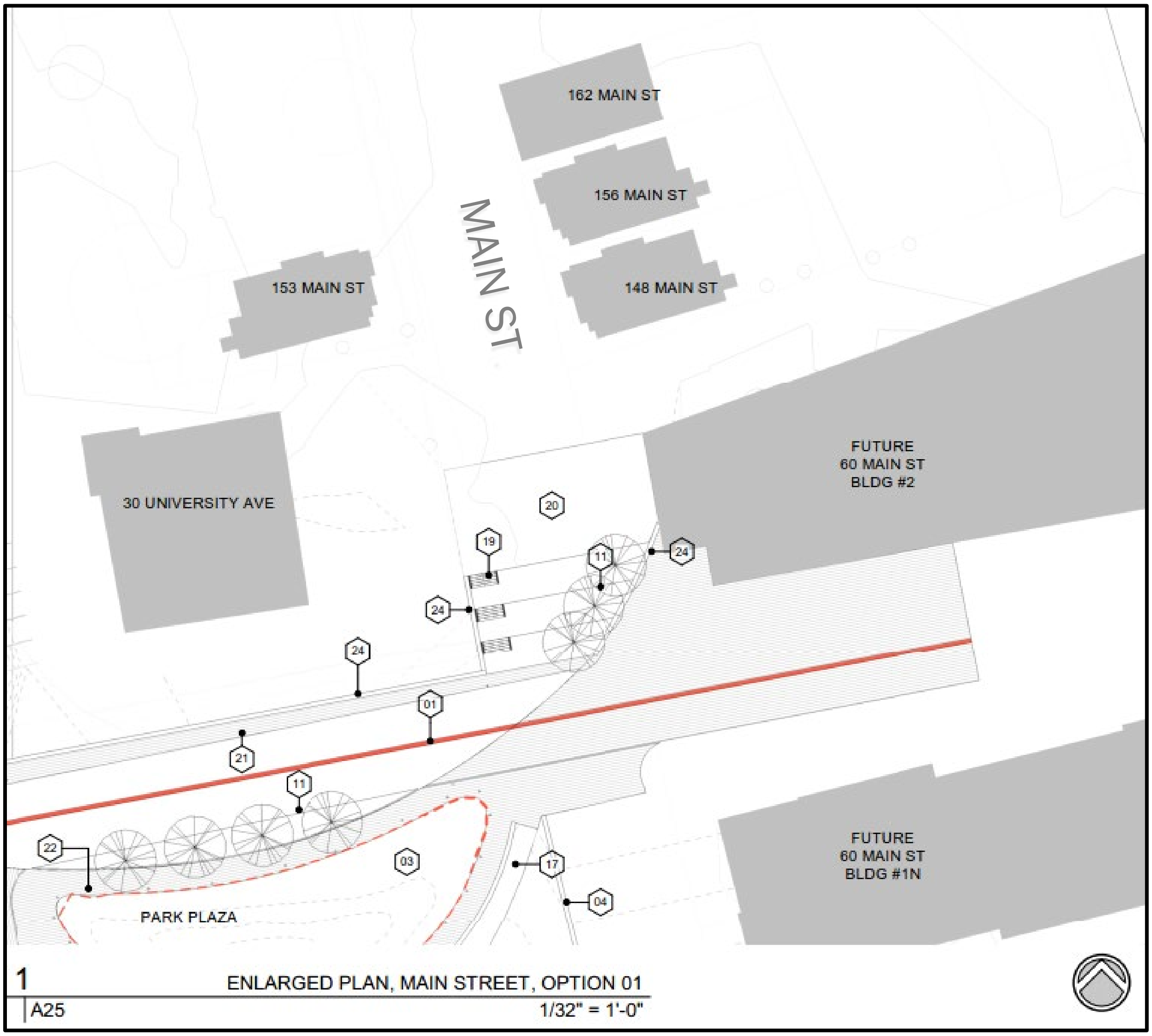
Each of the coastal flood defense system alignments would include an elevated University Avenue that would pass over the entrance to Seaside Park and end at the 60 Main Street site. Since the elevated road intersects with other roads at a lower elevation, in most cases the intersecting road would also be elevated in order to continue the street network. At the intersection of University Avenue and Main Street, two design options are carried forward for further review in this DEIS. The Dead-End Option would keep Main Street at its existing elevation and dead-end the street at University Avenue (Figure 3-16). On the northern side of University Avenue, stairs would be constructed to allow pedestrians to walk up to University Avenue and Seaside Park. Main Street would continue south of University Avenue but traffic would no longer be able to cross University Avenue on Main Street. The Through-Street Option would elevate Main Street immediately north and south of University Avenue so it would continue to function as a through street (Figure 3-17). This would maintain the existing street network but would result in an elevated road in front of four houses located north of University Avenue on Main Street.

3.3.4.4 Comparison of the Impacts of Alternatives

After conducting this comprehensive, holistic alternatives analysis process, two alignment options have been developed to analyze further. The Eastern Option would provide the widest area of flood risk reduction—including the community north of University Avenue, Singer Substation, Emera and the new Pequonnock Substation site—and would provide dry egress to PSEG's Harbor Unit 5. While this alignment meets the objectives of the project, it would require construction on private utility provider properties. The Western Option would reduce impacts to private land owners. As the alignment moves west, fewer critical utility provider properties would be included. (Dry egress to PSEG's Harbor Unit 5 would only be included in the Eastern Option.) In all cases the alignments would provide dry egress to 60 Main Street, 30 University Avenue, and 375 Main Street, unlocking future development to each of these sites. In addition, the community north of University Avenue would be within the coastal defense system, reducing the risk of flooding in both options.

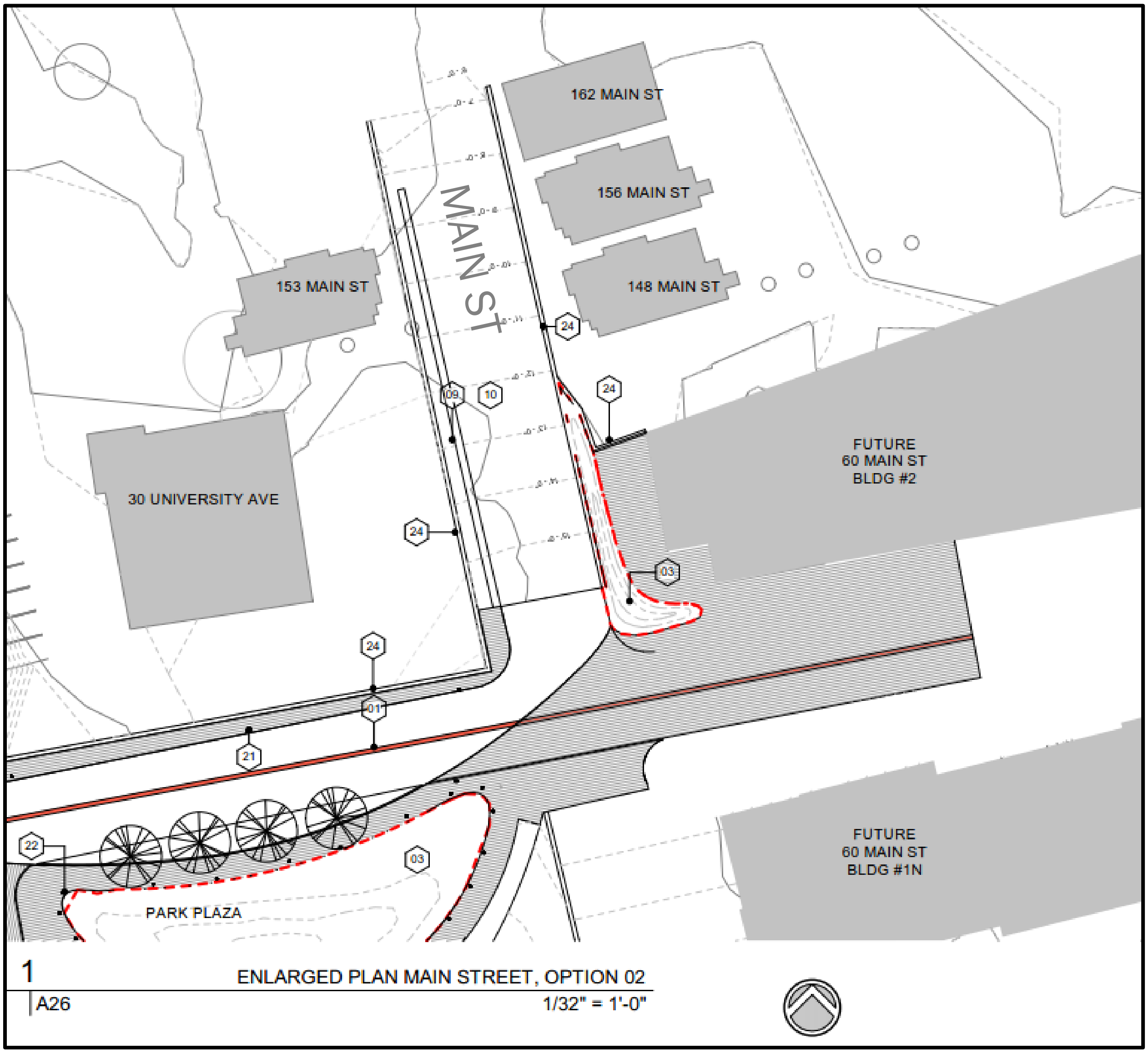
This DEIS evaluates these two alignment options further. The impacts from the two options will be compared and presented to the community, local stakeholders, and agencies in order to establish a preferred alternative that best fits within the project goals.

Figure 3-16. Main Street Dead-End Option



Source: WSP, 2018

Figure 3-17. Main Street Through-Street Option



Source: WSP, 2018

3.3.5 Resilience Center

This element of the Proposed Action would fund a Resilience Center in Bridgeport to serve the South End community in its ongoing commitment to build a resilient Bridgeport. The site would serve as a center for resilience activities, providing a method to disseminate information to the community and assist the community in future recovery efforts. The form and exact functions of the Resilience Center were left open-ended. An alternatives screening process that incorporated community input was used to refine the Resilience Center specifications.

3.3.5.1 Screening Process

The following two main objectives define the Resilience Center:

- Serve as a community center for resilience activities and dissemination of information.
- Assist the community in future recovery efforts.

The following conceptual considerations were identified to refine alternatives that would meet those two objectives:

- How will this cornerstone manifest?
- Will the Resilience Center be a centralized location or be distributed within the South End neighborhood?
- What is the urban design/architectural identity and character of resilience?
- How can site selection and design encourage the community and spur continued conversation about resilience among South End residents?
- Who are potential partners in developing, operating, and managing a resilience community?

As shown in Figure 3-18, the attributes of a Resilience Center would vary by form (x-axis) from multiple kiosks integrated within public spaces in the community to a new, free-standing building, and by function (y-axis) from full emergency response capabilities to education and outreach.

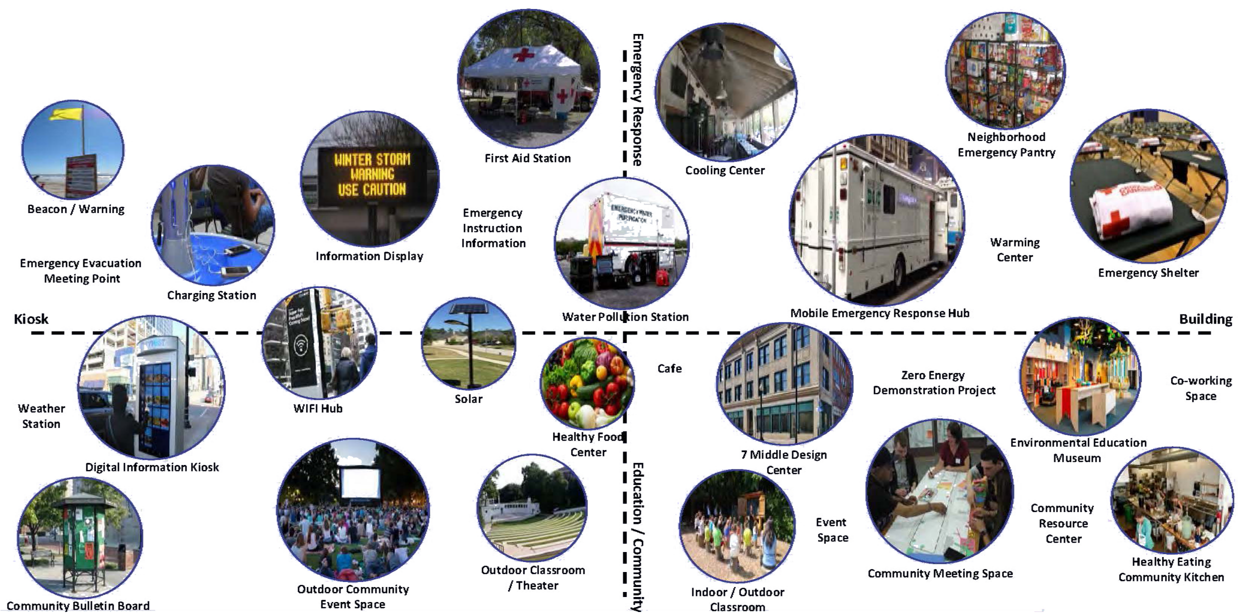
To assess the community's needs in regards to a Resilience Center, the data was collected data via two outlets:

- Groundwork Bridgeport collected data on programs currently accessible to the community
- Resilience programming preferences residents provided via a survey

The evaluation of existing resilience resources in the South End found that, although they are not extensive, the resources do contribute to the overall neighborhood-scale chronic and acute resilience. The resources are independently run and not coordinated and are often not well known in the community, and many have limited accessibility (some within the 100-year and 500-year floodplain). The commonly identified places of refuge during acute stresses are located north of the railroad, potentially making them inaccessible during a storm event.

The survey identified community priorities for emergency response programs, community use, connectivity, and educational programs, and informational and communication programs. Results did not indicate an overwhelming preference for any specific programs; rather an equal distribution among the various program options.[4]

Figure 3-18. Resilience Center Attributes



Considering the objectives, conceptual considerations, funds allocated, and community response, the following three resilience center sample projects were developed to test their feasibility, with each exploring a different scale of intervention:

- Decentralized network of data collection and information sharing stations aiming to encourage the community to associate with physical conditions throughout the community.
- Interior renovation of an existing building serving as a centralized place for the community to congregate.
- New building to serve as a centralized place for the community to congregate.

Based on the Action Plan for the National Disaster Resilience components of the Proposed Action, the Resilience Center is defined as follows:

> "This project would fund the construction /rehabilitation of a primary and satellite design center connecting the South End East to downtown Bridgeport and unifying the Rebuild by Design effort to build a resilient Bridgeport. The community center in South End will serve the design center function, operate as a community center and provide a central location for providing information to the community and assist the community in future recovery efforts."

The decentralized network option was eliminated from further consideration as it did not include a "community center." The options to provide a Resilience Center within as existing building or new building require identification of a sub-recipient. The Mary and Eliza Freeman Center for History and Community is a located

[4] Complete survey results can be viewed online at www.resilientbridgeport.com/archive

on Main Street and has been designated to "America's 11 Most Endangered Historic Places" list by National Trust for Historic Preservation. The center is raising funds to rehabilitate the homes to create an "African American site of national stature in the South End of Bridgeport."

The project would donate money to The Mary and Eliza Freeman Center to fund renovations of a community space within the Freeman Houses complex that would provide a location in the South End that would operate as a community center, a central location for resilience information dissemination, and a location that could store supplies to assist the community with recovery efforts during or after shock events. The project would also construct open-air landscaped site, including green infrastructure improvements, north of University Avenue at Main Street near the entrance to Seaside Park as part of the South End East Resilience Network.

3.3.5.2 Project Alternatives

Alternatives Considered, but Eliminated from Further Consideration

For the reasons described above, the decentralized option was eliminated from further consideration.

Alternatives Carried Forward for Evaluation in this DEIS

In response to community suggestion and government agency support, the Resilience Center at the Freeman Houses was moved forward for further evaluation. At Community Engagement Meeting #4, community discussions focused on the vitality and importance of Main Street's history to the community and the importance of the Freeman Houses. The alternatives analysis centered around determining the best use of space to provide a center for the community, educational opportunities, a local for providing information, and to assist the community with recovery efforts during or after shock events in the South End of Bridgeport. The design could incorporate historical, cultural, and environmental data. The center could be programmed for both daily and emergency response functions in keeping with previously polled public opinion.

At this stage, the Resilience Center has the following potential:

- Lead to greater community cohesion by physically reinforcing the cultural patterns of residents.
- Host community events.
- Tie the community to its history and future resilience.
- Provide public awareness of groundwater data by incorporating monitoring station.
- Incorporate visible green infrastructure and stormwater management interventions.

This alternative would fund the restoration of an important historical site, which would also serve as a Resilience Center to serve the South End community in its ongoing commitment to build a resilient Bridgeport.

4

Affected Environment and Environmental Consequences

Contents

Figures

Tables

4. Affected Environment and Environmental Consequences

4.1 LAND USE, ZONING, AND PUBLIC POLICY

4.1.1 Methodology

The analysis in this section begins by identifying existing land use and zoning in the study area. To determine existing land use and zoning, local plans, and zoning and land use maps for the City of Bridgeport were reviewed. Other data sources include GIS data provided by the Connecticut Department of Energy and Environmental Protection, and land use surveys and field visits conducted in December 2017. Zoning details were compiled from the Zoning and Subdivision Regulations of the City of Bridgeport, Connecticut.

Per the Council on Environmental Quality guidelines, agencies are required to identify possible conflicts between a proposed action and federal, regional, state, and local land use plans, policies, and controls (40 CFR 1502.16). Connecticut Environmental Policy Act requires an assessment of a proposed project for its consistency with the *Conservation & Development Policies: The Plan for Connecticut* and the corresponding regional and municipal *Conservation & Development Plans*. Planning and policy documents of the different governmental planning entities were reviewed, focusing on guidelines and directives that are most relevant to the Proposed Action. To determine planning consistency, the No Action Alternative and the Proposed Action were evaluated relative to their ability to support or conflict with the stated policies and plans.

Following the description of existing conditions, this section analyzes the potential impacts on land use, zoning, and public policy of the Proposed Action as compared to the No Action Alternative. An adverse land use impact could occur if a project results in a land use that is incompatible with existing or surrounding uses or development patterns. Similarly, adverse zoning and public policy impacts could occur when a project is not consistent with its site's zoning or a public policy. Further, the land use impact analysis considers the Proposed Action's consistency with local and regional plans, its effects on current development proposals within the study area, and potential changes to development opportunities within the study area.

4.1.2 Affected Environment

4.1.2.1 Land Use

Land use refers to the activity that occurs on land and within the structures that occupy it (e.g., residential, commercial, industrial, institutional and community facilities, transportation-related uses, parks and recreational uses, and vacant land). A city's zoning and land use regulations are central tools for controlling an array of land uses, and these controls can influence future development patterns. The approximately 0.57-square-mile (365 acres) study area is located within the South End neighborhood of Bridgeport, CT. The area is bounded by the Metro-North Railroad corridor to the north, the Pequonnock River (Bridgeport Harbor) to the east, the Long Island Sound to the south, and the western portion of Seaside Park to the west. Seaside Park is an approximately 325-acre park that runs along the southern edge of the South End neighborhood along the waterfront and provides residents and visitors with a large amount of recreational space.

As shown in Figure 4.1-1, the predominant land uses within the study area include multifamily residential, utility, institutional, and open space. The northern part of the study area includes light industrial uses, with a small number of commercial/office buildings. The northwestern portion of the study area is primarily residential and includes a mixture of medium- and high-density residential structures consisting of multifamily dwellings, and low-rise apartment buildings. The former Marina Village site (to be redeveloped as Windward Development medium-density public housing) is also located in the northwest portion of the study area. The Bridgeport Harbor Generating Station—a Public Service Enterprise Group (PSEG) Power Connecticut LLC-owned energy generating facility—occupies the eastern portion of the study area along the Pequonnock River (Bridgeport Harbor). Adjacent to the PSEG facility are light industrial facilities (including energy micro-grids, facilities owned by Emera and United Illuminating), small warehouses, and a storage facility. Directly to the southwest of the PSEG facility is a large parcel consisting of numerous abandoned and dilapidated structures and large underutilized surface parking lots abutting the Long Island Sound to the south. The southern portion of the study area consists of the historic Seaside Park, which continues west following the Long Island Sound. To the north of Seaside Park in the middle of the study area is the University of Bridgeport, which comprises approximately one-fourth of the study area. A small number of vacant lots are dispersed throughout the study area.

4.1.2.2 Zoning

Zoning is a legal method by which cities and municipalities define what land uses are allowed on a given parcel of land and the physical restrictions (e.g., bulk, height, or setbacks) that have been placed on development. The purpose of a zoning ordinance is to regulate the location, extent, and intensity of land use. Following the City of Bridgeport's 1996 Master Plan, Bridgeport updated its zoning regulations for the first time since 1949 to reflect existing development and streamline the process for permitting new development. The City of Bridgeport undertook a comprehensive effort to update its master plan in 2007, resulting in *Bridgeport 2020: A Vision for the Future* (BFJ Planning, March 2008). The master plan is currently being updated.

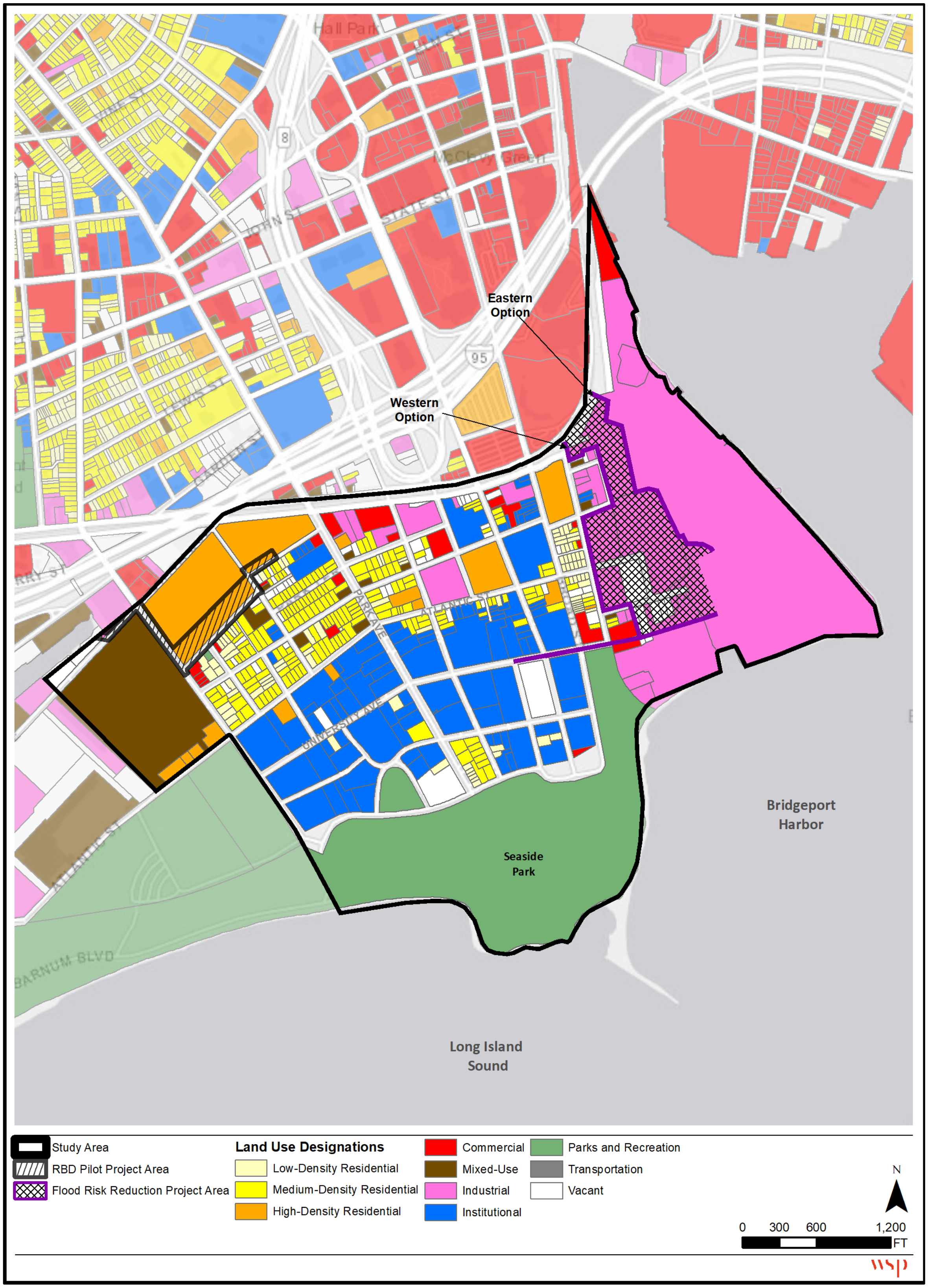
The study area for zoning analysis is the same as for the land use. As listed in Table 4.1-1 and shown in Figure 4.1-1, the study area contains 11 zoning districts. Bridgeport's zoning regulations are administered by the Planning and Zoning Commission, the Zoning Board of Appeals and zoning enforcement officers, as well as by the Department of Land Use Construction Review, the Historic Commissions, the Harbor Management Commission and the Port Authority.

Table 4.1-1. Zoning Districts in the Study Area

Single-family Residential (R-A)	Permits detached single-family dwellings, certain public and institutional facilities such as schools and parks, and, where appropriate, community residential facilities. The intent of R-A zones is to preserve existing low-density residential neighborhoods by restricting residential density and limiting non-residential uses.
Two-Family Residential (R-B)	Promotes medium-density residential neighborhoods by allowing two- and three-family residences, neighborhood retail and office uses, and institutional uses such as community facilities, religious institutions, schools, daycare centers, and parks.
Multifamily Residential (R-C)	Permits a variety of housing types, including multifamily residences, and a range of non-residential uses.
Neighborhood Center Village District (NCVD)	Promotes revitalization of Bridgeport in areas that are contiguous to the downtown, or are served by bus transit, or are within walking distance from transportation assets.
Downtown Waterfront Village District (DVD-WF)	Promotes the continued revitalization of Downtown Bridgeport as a transit-oriented, vibrant live/work neighborhood with a dense urban character that embodies the principles of smart growth.
Mixed-Use Light Industrial (MU-LI)	Allows a mix of commercial, office, retail, and light industrial uses within areas that have compatible industrial uses.
Mixed-Use Educational/Medical Zones (MU-EM)	Allows controlled expansion of major educational and medical institutions and related uses. MU-EM zones discourage displacement of existing residents by restricting the size and type of non-residential uses.
Mixed-Use Waterfront (MU-W)	Permits a mix of residential, commercial, and entertainment uses on properties along the Long Island Sound and Bridgeport Harbor waterfront. The MU-W zone allows a high degree of flexibility to promote large-scale developments that are responsive to the market place and beneficial to the city.
Office/General Retail (OR-G)	Allows a full range of retail and service businesses with a large local or city-wide market through access from major traffic ways.
Industrial-Heavy (I-H)	Permits high impact industries to locate in appropriate areas of the city while setting minimum performance standards to promote safe, functional, efficient, and environmentally sound development and operation.
Industrial Light (I-L)	Promotes a concentration of industrial uses with minimal off-site impacts. The development and performance standards of I-L zones are stricter than the I-H zones in order to minimize potential land use conflicts with nonindustrial uses.

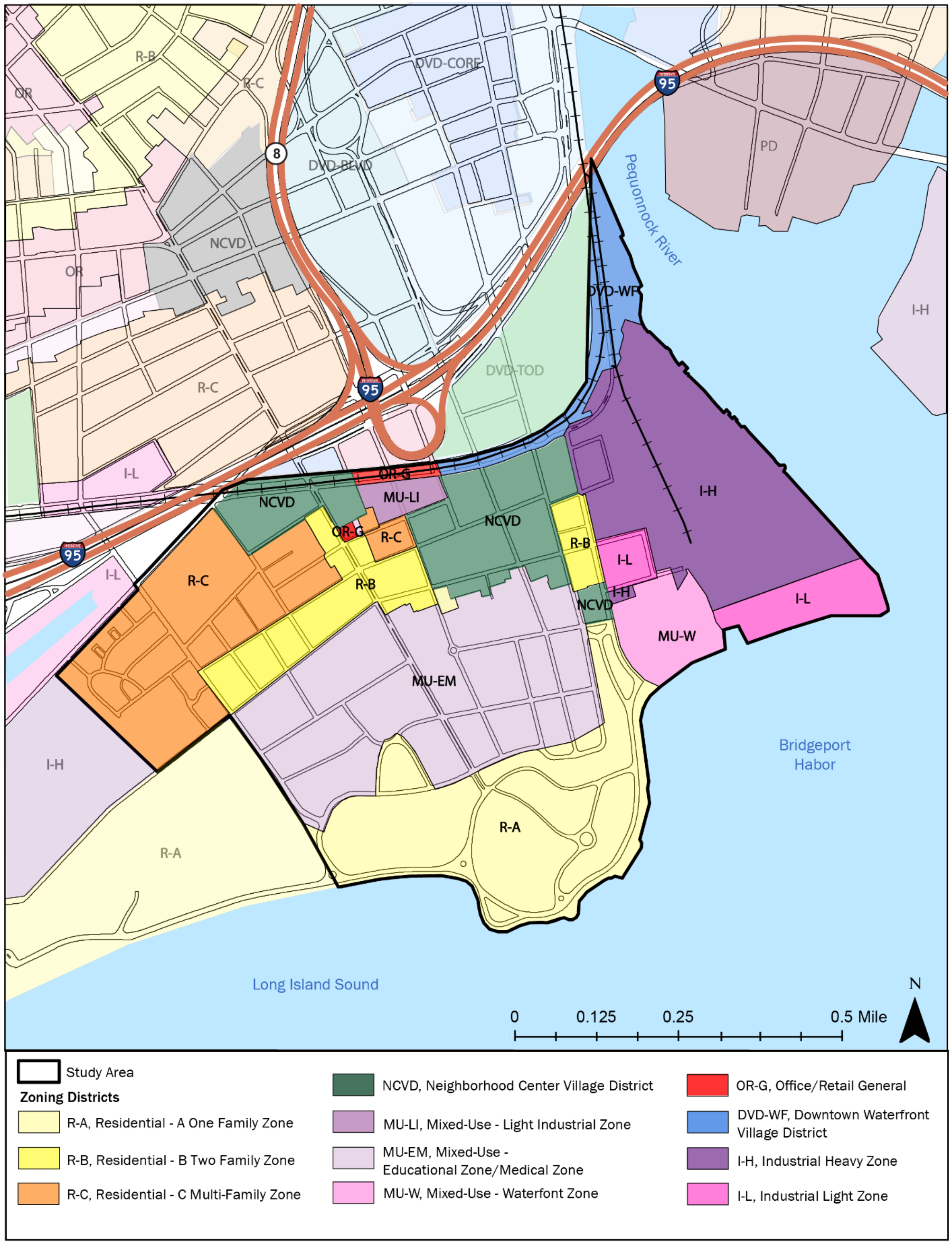
Source: Bridgeport Planning and Zoning Commission

Figure 4.1-1. Land Uses in the Study Area (Existing)



Source: ESRI, CTDEEP, City of Bridgeport

Figure 4.1-2. Zoning Districts in the Study Area (Existing)



Source: ESRI, CT DEEP, City of Bridgeport

4.1.2.3 Public Policy

Several governmental entities are responsible for various planning functions within the study area, which include the City of Bridgeport; the Connecticut Metropolitan Council of Governments (METROCOG), the regional planning organization that covers the study area; and the State of Connecticut. These governmental entities have published plans and policies.

State and Regional Plans

Reconnect 1 Region: A Comprehensive Plan for the METROCOG Region

METROCOG a multidiscipline, regional planning agency with six member communities (Bridgeport, Easton, Fairfield, Monroe, Stratford, and Trumbull) centered on the city of Bridgeport. METROCOG adopted the Reconnect 1 Region: Comprehensive Plan in December 17, 2015, to provide a framework for future growth and development in the region. The plan has three core principles: reconnected, revitalized, and resilient, with a resiliency component that states that "the impacts of natural hazard events are minimized and short-lived." Within the regional land use and development framework, coastal hazard areas are given special consideration. The plan includes hazard mitigation initiatives to protect property, minimize the potential for coastal flooding, and restore natural systems that mitigate flooding, and retrofitting or relocating existing development in these areas (Connecticut Metropolitan Council of Governments 2015).

The following goals of the plan are relevant to the Proposed Action:

- **4.3B Coastal Area Hazard Mitigation –** Identify key coastal areas and hazard mitigation strategies to better protect the region from the destructive impacts of coastal flooding, storm surge, and sea level rise.
- **4.4C Resiliency –** Continue to assist communities in planning for coastal and inland flooding along local waterways and the Long Island Sound and develop a unified approach to responsible and resilient infrastructure networks, sustainable inland development, preservation, and wetlands restoration.
- **8.1C Buffer and Riparian Zones –** Ensure that adequate natural buffers are provided along rivers and streams to filter and reduce stormwater runoff and reduce the potential impacts of flooding.
- **8.3A Drainage Capacity –** Increase the capacity of drainage systems, including the separation of combined sewer systems, utilization of low impact development techniques, and construction of green infrastructure.
- **8.3B Disaster Planning –** Foster interagency cooperation and natural disaster contingency planning between local governments, public safety providers, and state and federal agencies to ensure coordinated and efficient responses to natural disasters.
- **8.3D Protecting Community Facilities –** Develop infrastructure that can protect critical community facilities (e.g., hospitals, wastewater facilities or power generators) from natural disasters and relocate facilities susceptible to repetitive loss.
- **8.3E Citizen Education –** Educate residents, businesses, and stakeholders throughout the region about natural hazards and disasters, and ensure they are fully informed about shelter locations, evacuation routes, flood insurance and technical assistance programs.

Natural Hazard Mitigation Plan (2014)

The METROCOG also released the Natural Hazard Mitigation Plan to ensure safety and reduce risk from natural disaster in the METROCOG region (Greater Bridgeport Regional Council n.d.). Following are the goals of the Natural Hazard Mitigation Plan:

- Continue pre-disaster mitigation planning that assesses impacts from natural hazards and identifies effective strategies to mitigate future events and increase hazard resiliency.
- Protect buildings from the impacts of natural hazards and implement projects to safeguard against the impacts of natural hazards.
- Protect infrastructure from the impacts of natural hazards and implement projects (structural and infrastructure) to safeguard against the impacts of natural hazards.
- Protect and restore natural system and features that mitigate the impact of natural hazards.
- Educate residents, businesses, and stakeholders throughout the region about natural hazards and increase the awareness of severe and extreme weather events.
- Improve upon and ensure the continuity of emergency services during severe and extreme weather events.

Connecticut Conservation & Development Policies Plan

State law requires the Connecticut Office of Policy and Management to prepare a conservation and development policies plan every five years. The statewide land use and conservation development plan—Conservation and Development Policies: The Plan for Connecticut (State C&D Plan), adopted in June 2013—provides the policy and planning framework for administrative and programmatic actions, and capital and operational investment decisions for state government. State agencies are required to be consistent with the State C&D Plan if a proposed action exceeds a total cost of $200,000. If a proposed action is subject to the consistency requirement of the State C&D Plan, it must then be determined to be a “growth-related project,” to be considered for funding. If a proposed action is considered a “growth-related project,” it must then be located on the Locational Guide Map, where it will be determined whether a proposed action is within a “priority funding area”.

The major categories in the Locational Guide Map are as follows:

- **Priority Funding Areas** include Urban Area or Urban Cluster (based on the 2010 census), with boundaries that intersect a ½-mile buffer surrounding existing or planned mass transit stations, existing or planned sewer service, and/or water service, and local bus service.
- **Conservation Areas** include core forest areas, existing or potential drinking water supply watersheds, Aquifer Protection Areas, wetland soils, agricultural soils, Hurricane Inundation Zones or 100-year flood zones, critical habitats, and locally important conservation areas.
- **Balanced Priority Funding Areas** meet the criteria of both Priority Funding Areas and Conservation Areas.
- **Village Priority Funding Areas** are traditional village centers located in the state’s more rural municipalities, intended to recognize the unique characteristics, and needs of these areas.

- **Undesignated Areas** are typically rural in nature and lack the criteria necessary for being delineated as either Priority Funding Areas or Conservation Areas.

The entire study area is located within a Priority Funding Area on the Locational Guide Map. The plan is based on six growth management principles. When a state agency is required to assess the consistency of a proposed action with the State C&D Plan, it is required to cite only the relevant policies contained in the plan as opposed to all the policies. Accordingly, the following three principles are relevant to the Resilient Bridgeport program:

- Redevelop and revitalize regional centers and areas with existing or currently planned physical infrastructure.
- Expand housing opportunities and design choices to accommodate a variety of household types and needs.
- Protect and ensure the integrity of environmental assets critical to public health and safety.

Local Plans

Bridgeport 2020: A Vision for the Future

The Bridgeport Planning and Zoning Commission approved the Bridgeport 2020: A Vision for the Future (Bridgeport 2020 Master Plan) in March 2008, which serves as the central planning document for the City of Bridgeport. Section 8-23 (Plan of Development) of the Connecticut General Statutes states that Planning Commissions of the state's municipalities "… shall prepare, adopt, and amend a plan of development for the municipality, outlining recommendations for the most desirable mix of land uses within the community." The Bridgeport 2020 Master Plan is centered on six major planning themes: Downtown, Jobs, Neighborhoods, Education, Infrastructure, and Environment.

The following policies and goals relate to the Proposed Action:

- Create downtown design standards that are pedestrian-friendly, environmentally sensitive, and respectful of the city's historic core.
- Continue to aggressively reduce blight, disinvestment, and abandonment in neighborhoods.
- Promote environmentally friendly building design and construction.
- Expand and upgrade parks and open spaces.
- Improve stormwater quality.
- Protect and enhance Bridgeport's natural resources, including its coastal area.

For management of its coastal area includes the following policy, the Bridgeport 2020 Master Plan supports beneficial use and conservation of Bridgeport's coastal land and water resources in a manner consistent with the Bridgeport Coastal Plan (adopted in 1982), City of Bridgeport Harbor Management Plan, and Connecticut Coastal Management Act. As required by the State of Connecticut Department of Energy and Environmental Protection, all development activities proposed for Bridgeport's coastal area must be consistent with these policies. Therefore, for the Proposed Action to be consistent with the Bridgeport 2020 Master Plan, the Proposed Action must be consistent with the plans aforementioned policies and goals (The City of Bridgeport 2008).

South End Neighborhood Revitalization Zone Strategic Plan (2014)

The Neighborhood Revitalization Zone (NRZ) process was established by the Connecticut General Assembly in 1995 via Public Act Number 95-340. The Office of Planning and Economic Development, Planning Division released the final South End Neighborhood Revitalization Zone Strategic Plan in 2014. The plan is made up of four planning themes: Coastal Resilience & Sustainability, Urban Village Character, Mobility and Connectivity, and Cultural Resources. The main goals of the plan follow:

- Attract context-sensitive redevelopment and infill development efforts
- Increase the population and the amount of neighborhood retail
- Provide local employment opportunities
- Create community open spaces
- Invest in public and private infrastructure that will help to mitigate climate risks.

The implementation strategy organizes the more than 50 key recommendations into a set of actionable projects and outlines a set of performance measures to help the NRZ process and evaluate progress (City of Bridgeport 2014).

Waterfront Bridgeport: Bridgeport, Connecticut Waterfront Master Plan (2017)

The Waterfront Bridgeport: Bridgeport, Connecticut Waterfront Master Plan was created in 2017 by the Office of Planning and Economic Development, with the purpose to guide decisions about land use, public space and access, neighborhood connections, and pathway characteristics. It addresses overarching elements of waterfront revitalization and offers strategies for economic development, zoning and compliance, public access and amenities, waterfront design standards, natural restoration and resiliency, and waterfront advocacy and programming. The plan consists of five overarching goals (City of Bridgeport 2017):

- Increase public access.
- Create jobs and economic prosperity.
- Repurpose vacant and abandoned properties.
- Encourage water-based recreation.
- Boost resiliency to protect against climate change effects.

4.1.3 Environmental Consequences

4.1.3.1 No Action Alternative

Under the No Action Alternative, the existing land use patterns and zoning in the study area will remain essentially unchanged. There will be no direct impact to land use and zoning. However, the No Action Alternative also assumes that current trends with respect to coastal conditions will continue with regular flooding and increased risk due to sea level rise and higher frequency of storm events. The resiliency measures associated with the Proposed Action will not be in place and vulnerable land uses within the study area (residences, businesses, utilities) will continue to experience adverse effects associated with wave action, erosion, and storm events. In this sense, the No Action Alternative will have an indirect adverse impact on land use and be inconsistent with several public policies discussed previously, which encourage positive action to be taken to improve coastal resiliency and reduce communities' vulnerability to future storm damage.

4.1.3.2 Proposed Action

The Proposed Action would be compatible with existing land uses and zoning in the study area. The proposed projects would support future redevelopment projects in the South End and be consistent with state, regional and local public policies and plans.

RBD Pilot Project

In the future, it is expected that the former Marina Village site would be redeveloped to replace existing or recently demolished public housing complex with mixed-used development (Windward). The Marina Village site was rezoned and prepared for revitalization prior to 2012. Residents of the site are being relocated to other housing throughout the city to allow for demolition of the buildings on the site under two separate actions with approved Environmental Assessments. The RBD Pilot Project would result in dry egress (on the Johnson Street extension) and stormwater improvements (stormwater facility, force main, pump house and green infrastructure) prior to any future redevelopment on the site. The project would be compatible with the existing residential land uses in and around the former Marina Village site and there would be no change to the existing zoning on the former Marina Village site under the Proposed Action.

The RBD Pilot Project would also include construction of infrastructure improvements that would reduce the flood risk to the former Marina Village parcels in both acute and chronic flooding events. Although, the project activities would be limited to the area immediately adjacent to the Marina Village site, the RBD Pilot Project would benefit low- and moderate-income owner-occupied and rental housing in the surrounding neighborhood to the east and south as well as in the historic post-WWI community known as Seaside Village to the west. Benefits would include new green space associated with the proposed stormwater facility as well as infrastructure dry egress option from the raised Johnson Street extension. Therefore, the proposed project would promote the regional policies to increase coastal resiliency and hazard mitigation, as well as be consistent with the policies of the Natural Hazard Mitigation Plan and Waterfront Bridgeport: Bridgeport, Connecticut Waterfront Master Plan. The RBD Pilot Project would provide infrastructure upgrades and facilitate a more resilient South End neighborhood.

Flood Risk Reduction Project

Under the Proposed Action, the Flood Risk Reduction Project would include a combination of measures within eastern South End that would reduce the flood risk within the study area from future coastal surge and chronic rainfall events. These measures would include a coastal flood defense system from the raising of University Avenue construction of and floodwalls, and both green and gray stormwater and internal drainage management strategies. The proposed design and construction would consider the existing infrastructure within the study area, and would not result in adverse impact to the area's land use. The elevated University Avenue would not change the use of the land on either side that is part of the University of Bridgeport, and the action would be consistent with University of Bridgeport Campus Master Plan.

Regardless of the north-south flood wall alignment—Western Option or Eastern Option—there would be no impact to land use or zoning. The Eastern Option would result in a larger area of primarily industrial or vacant land (zoned heavy industrial) to be taken out of the 1 percent chance floodplain; however, a portion of the flood wall (approximately 1,500 linear feet) would be on private property, requiring an easement for construction and maintenance. The Western Option would be entirely on public right-of-way and no easements would be required. Gates at each street crossing along the alignment would remain open during normal conditions, allowing existing traffic flow and access to continue. The gates would be closed only during storm events.

At the intersection of Main Street and University Avenue two options are under consideration: elevating Main Street to intersect with the elevated University Avenue, or dead-ending Main Street with the road continuing south of University Avenue. (Section 4.13.3, Transportation, describes the impacts to transportation from the Dead-End Option.) The analysis found there would be limited impacts to traffic. Pedestrian access to Seaside Park and the waterfront would be incorporated into the design of the Dead-End Option. Neither intersection option would result in significant adverse impacts to land uses.

All the flood risk reduction measures complying with the underlying zoning and would further the coastal resiliency policies of the City of Bridgeport. In addition, the Flood Risk Reduction Project would promote the regional policies to increase coastal resiliency and hazard mitigation, as well as be consistent with the policies of the Natural Hazard Mitigation Plan and Waterfront Bridgeport: Bridgeport, Connecticut Waterfront Master Plan.

Resilience Center

Under the Proposed Action, a Resilience Center would be constructed to serve the South End community in its ongoing commitment to promote resiliency education and provide support during emergency events in the study area. The Resilience Center would serve as a community center and provide a central location for providing information to the community and assist the community in future recovery efforts. In addition, the proposed Resilience Center would tie in to the local history by including an investment in the protection of the Freeman Houses, a historic resource of local and national significance. The Resilience Center would provide a meeting place for the community and would provide educational information to the public on coastal resiliency and the history of Bridgeport and the South End. The Resilience Center would involve rehabilitating an existing building and integrating design elements into the public right-of-way near the entrance to Seaside Park along University Avenue. The proposed Resilience Center would be compatible with the existing land use and zoning in the study area, and would further the coastal resiliency goal of the City of Bridgeport.

4.2 SOCIOECONOMIC CONDITIONS

The analysis in this section describes the potential effects that could occur from the modifications resulting from the Proposed Action on the socioeconomic character of the study area. The socioeconomic character of an area includes its population, housing, and economic activity. Changes to the area's socioeconomic character could occur directly or indirectly as a result of a project.

4.2.1 Methodology

The assessment begins with a description of the existing socioeconomic environment in the study area spanning from 2010 to 2016, as well as comparative data of Bridgeport, Fairfield County, and Connecticut. The analysis then looks at the No Action Alternative and the Proposed Action.

4.2.1.1 Study Area

The study area for socioeconomic assessment typically mirrors that of the land use assessment, and includes an area that could be directly affected by the Proposed Action. As shown in Figure 4.2-1, the study area boundary for the socioeconomic assessment has been adjusted to align with census tract block groups in the South End and includes:

- Block Group 1, Census Tract 704
- Block Group 1, Census Tract 705
- Block Group 2, Census Tract 705
- Block Group 2, Census Tract 706

The socioeconomic study area is bounded by I-95 to the north, the Pequonnock River (Bridgeport Harbor) to the east, the Long Island Sound to the south, and Cedar Creek Reach and Black Rock Harbor to the west. The assessment includes socioeconomic trend data within the study area from 2010 to 2016, as well as comparative data of Bridgeport, Fairfield County, and Connecticut.

4.2.1.2 Data Sources

A variety of sources were used to collect demographic, economic, and business data. For the demographic profile, population and age distribution data were obtained from the U.S. Census Bureau's 2010 Census and 2012-2016 American Community Survey (ACS) 5-Year Estimates. These data were accessed through the U.S. Census Bureau, American FactFinder. For the household and income profile, housing characteristics data were obtained from the U.S. Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates; and household income data were obtained from 2009-2013 and 2012-2016 ACS 5-Year Estimates. Household income data for year 2010 were not available at the block group or census tract levels; therefore, 2013 data were used for comparison to the 2016 household income data.

Demographic and housing trends were analyzed by comparing data from the 2010 Census and 2013 to 2016 ACS. Finally, business data on the number of firms and employees in Bridgeport were taken from Connecticut Data Collaborative and the City of Bridgeport. Impacts to socioeconomic conditions in the study area were assessed in terms of changes to demographics, employment, demands for local goods and services, and other economic indicators.

Figure 4.2-1. Census Tract Block Groups within Study Area

Source: U.S. Census Bureau's, 2010 Census and 2012-2016 American Community Survey 5-Year Estimates

4.2.2 Affected Environment

4.2.2.1 Demographic Profile

Residential Population

As of 2016, there were an estimated 4,308 residents in the study area (Table 4.2-1), which represents an 18.4 percent decrease from the 2010 population of 5,099 residents. Since 2000, the study area's population has declined significantly compared to the slight population growth in Bridgeport (1.9 percent), Fairfield County (2.6 percent), and Connecticut (0.4 percent).

Table 4.2-1. Residential Population (2010–2016)

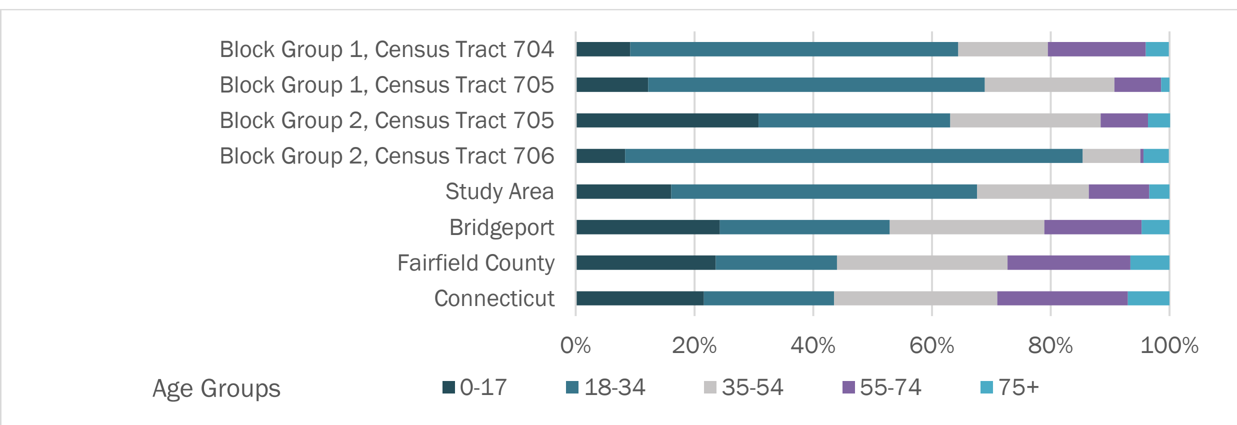
AREA	POPULATION		PERCENTAGE CHANGE
	2010	2016	
Block Group 1, Census Tract 704	1,693	1,604	-5.5%
Block Group 1, Census Tract 705	1,238	866	-43.0%
Block Group 2, Census Tract 705	1,563	1,283	-21.8%
Block Group 2, Census Tract 706	605	555	-9.0%
Study Area	5,099	4,308	-18.4%
Bridgeport	144,229	147,022	1.9%
Fairfield County	916,829	941,618	2.6%
Connecticut	3,574,097	3,588,570	0.4%

Source: US Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

Age Distribution

Figure 4.2-2 shows the distribution of age groups within the study area. As shown, the median age in Bridgeport is 32.8 years, which is less than the medium age in Fairfield County (39.7) and Connecticut (40.4). The two largest cohorts in Bridgeport are 35-44 years and 45-54 years (13.36 percent and 12.72 percent of the total population, respectively). Together these two cohorts make up one-quarter of the population in Bridgeport. In comparison, the cohorts in Fairfield County and Connecticut trend older with 45-54 years being the largest cohort (approximately 16 percent of the populations). Due to the location of the University of Bridgeport, the study area contains the largest population of residents 18-34 years of age.

Figure 4.2-2. Age Distribution (2016)



Source: U.S. Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

4.2.2.2 Household and Income Profile

Households Characteristics

As of 2016, there was a 13.8 percent decrease in households in the study area since 2010 (Table 4.2-2). The decrease in the number of households in the study area is consistent with the decline in population but is approximately eight times greater than the decrease in the number of households in Bridgeport overall, which saw 1.8 percent decrease in the number of households over the same period. The number of households in Fairfield County and Connecticut saw a decrease by 0.1 percent and 1.2 percent, respectively. Block Group 1 Census Tract 705, saw the largest decrease in households, where the development of the former Marina Village site is planned, following the demolition of the existing housing stock on the site. Block Group 2 Census Tract 706, on the eastern side of the South End, saw the only increase in the number of households (7.9 percent).

The average household size within the study area in 2016 was 2.29, which was smaller than the three comparison geographies.

Table 4.2-2. Household Characteristics (2010–2016)

AREA	TOTAL HOUSEHOLDS			AVERAGE HOUSEHOLD SIZE		
	2010	2016	PERCENTAGE CHANGE	2010	2016	PERCENTAGE CHANGE
Block Group 1, Census Tract 704	517	461	-12.1%	2.07	1.96	-5.6%
Block Group 1, Census Tract 705	458	330	-38.8%	2.7	2.62	-3.1%
Block Group 2, Census Tract 705	533	510	-4.5%	2.82	2.52	-11.9%
Block Group 2, Census Tract 706	116	126	7.9%	3.03	2.06	-47.1%
Study Area	1,624	1,427	-13.8%	2.65	2.29	-15.9%
Bridgeport	51,255	50,357	-1.8%	2.72	2.82	3.5%
Fairfield County	335,545	335,209	-0.1%	2.68	2.75	2.5%
Connecticut	1,371,087	1,354,713	-1.2%	2.52	2.56	1.6%

Source: US Census Bureau, 2010 Census and 2012–2016 ACS 5-Year Estimates

Household Income

Table 4.2-3 illustrates the distribution of household incomes, and the changes in distribution from 2013 to 2016. In 2016 in the study area, most households (approximately 69 percent) had incomes less than $34,999, which was a 6-percentage-point increase from 2013. In contrast, 42 percent of households in Bridgeport had income less than $34,999, which was a slight decrease from 2013. Additionally, approximately 23 percent of households in the study area had incomes between $35,000 and $74,999 (a 2.6-percentage-point increase from 2013) as compared to 30 percent in Bridgeport; and approximately 8 percent had incomes greater than $75,000 (a 7-percentage-point decrease from 2013) as compared to 27 percent in Bridgeport.

In contrast, in 2016, most households in Fairfield County and Connecticut (approximately 56 and 48 percent, respectively) had incomes greater than $75,000. From 2013 to 2016, households in Fairfield County with income less than $34,999 decreased by 23 percentage points, while households earning over $75,000 increased by 30 percentage points. For the same time, Connecticut saw a moderate rate of increase in household income less than $74,999 and a moderate decrease in household income greater than $75,000.

Table 4.2-3. Annual Household Income, Total Households, and Median Household Income (2013–2016)

AREA	LESS THAN $34,999 COUNT	LESS THAN $34,999 %	$35,000 - $74,999 COUNT	$35,000 - $74,999 %	OVER $75,000 COUNT	OVER $75,000 %	TOTAL HOUSEHOLDS	MEDIAN HOUSEHOLD INCOME
2013								
Block Group 1, Census Tract 704	227	46.7%	161	33.1%	98	20.2%	486	$33,976
Block Group 1, Census Tract 705	201	55.1%	97	26.6%	67	18.4%	365	$30,066
Block Group 2, Census Tract 705	382	80.9%	25	5.3%	12	25%	472	$11,821
Block Group 2, Census Tract 706	628	64.9%	181	18.7%	159	16.4%	968	$19,615
Study Area	1,428	62.8%	464	20.3%	336	14.7%	2,291	$24,370
Bridgeport	22,596	44.9%	15,194	30.2%	12,543	24.9%	50,333	$41,050
Fairfield County	74,698	22.5%	79,033	23.8%	178,924	53.8%	332,655	$82,283
Connecticut	350,077	25.8%	372,480	27.5%	633,298	46.7%	1,355,849	$69,461
2016								
Block Group 1, Census Tract 704	249	54%	152	33%	60	13%	461	$29,063
Block Group 1, Census Tract 705	169	51.2%	108	32.7%	53	16.1%	330	–
Block Group 2, Census Tract 705	467	91.6%	43	8.4%	0	0%	510	$16,954
Block Group 2, Census Tract 706	99	78.6%	24	19%	3	2.4%	126	$19,000
Study Area	984	69.0%	327	22.9%	116	8.1%	1,427	$21,676
Bridgeport	21,185	42.1%	15,539	30.9%	13,633	27.1%	50,357	$43,137
Fairfield County	71,764	21.4%	77,204	23.0%	186,241	55.6%	335,209	$86,670
Connecticut	338,140	25.0%	364,892	26.9%	651,681	48.1%	1,354,713	$71,755

PERCENTAGE CHANGE (2013–2016)

	LESS THAN $34,999	$35,000 - $74,999	OVER THAN $75,000	MEDIAN HOUSEHOLD INCOME
Study Area	-31.1%	29.5%	-65.5%	-11%
Bridgeport	-6.2%	-2.3%	8.7%	5.1%
Fairfield County	-3.9%	-2.3%	4.1%	5.3%
Connecticut	-3.4%	-2.0%	2.9%	3.3%

Source: US Census Bureau 2009-2013 ACS 5-Year Estimates and 2012-2016 ACS 5-Year Estimates

Also shown in Table 4.2-3, the average median household income within the study area in 2016 was $21,676, which was significantly lower than that of Bridgeport, Fairfield County, and Connecticut. From 2013 to 2016 the median household income in the study area decreased by approximately 11 percent, while the median household income for Bridgeport, Fairfield County, and Connecticut increased by approximately 5 percent, 7 percent, and 6 percent, respectively. The distribution of household income and median household income for Bridgeport and the study area translates to higher poverty status levels for the study area and Bridgeport, compared to the rest of Connecticut. Per the Connecticut Department of Economic and Community Development criteria, Bridgeport is considered a distressed municipality, which is discussed in further detail in Section 4.3, Environmental Justice. The poverty rate in Bridgeport was approximately 20 percent, while the poverty rate in the study area was approximately 25 percent.

4.2.2.3 Housing Profile

The study area consists of primarily 2- to 4-family residences and 5+ family residences in the former Marina Village site and the adjacent Seaside Village. As shown in Table 4.2-5, in 2010, the study area had 1,871 housing units, which decreased to 1,840 housing units in 2016 (approximately 2 percent decrease). In contrast, Bridgeport and Fairfield County experienced an approximately 1-percent increase in the number of housing units during the same period, and Connecticut experienced a 0.4-percent increase. In 2016, the housing occupancy rate in the study area was 77.7 percent, which was slightly lower than that of Bridgeport, Fairfield County, and Connecticut. Overall, housing occupancy rate from 2010 to 2016 decreased in the study area, Bridgeport, Fairfield County, and Connecticut; however, the study area experienced the most dramatic decline in occupancy (approximately 10 percent).

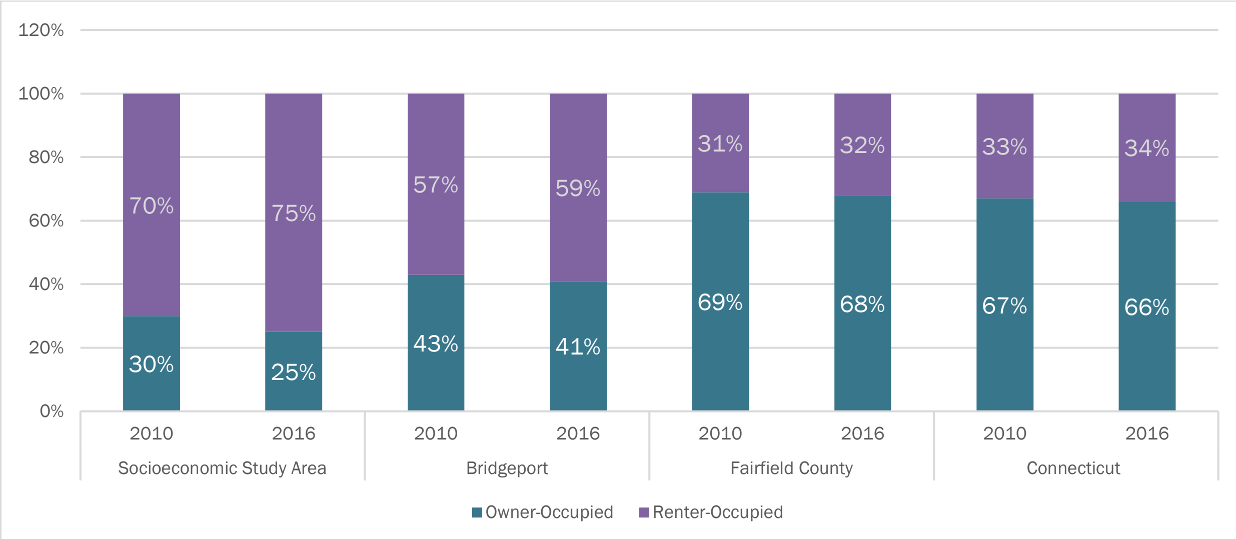
Table 4.2-4. Housing Units and Occupancy Rates (2010–2016)

AREA	2010			2016			PERCENTAGE CHANGE IN HOUSING UNITS
	HOUSING UNITS	OCCUPANCY RATE	VACANCY RATE	HOUSING UNITS	OCCUPANCY RATE	VACANCY RATE	
Block Group 1, Census Tract 704	620	83.4%	16.6%	606	76.1%	23.9%	-2.3%
Block Group 1, Census Tract 705	520	88.1%	11.9%	418	78.9%	21.1%	-24.4%
Block Group 2, Census Tract 705	585	91.1%	8.9%	644	79.2%	20.8%	9.2%
Block Group 2, Census Tract 706	146	79.5%	20.5%	172	73.3%	26.7%	15.1%
Study Area	1,871	86.8%	13.2%	1,840	77.6%	22.4%	-1.7%
Bridgeport	57,012	89.9%	10.1%	57,658	87.3%	12.7%	1.1%
Fairfield County	361,221	92.9%	7.1%	364,737	91.9%	8.1%	1.0%
Connecticut	1,487,891	92.1%	7.9%	1,493,798	90.7%	9.3%	0.4%

Source: US Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

As shown Figure 4.2-3, most of these units in the study area and Bridgeport were renter-occupied. In 2010 and 2016, 30 percent and 25 percent, respectively, of the units were owner-occupied. The rate of home ownership in the study area was less than Bridgeport (41 percent), Fairfield County (68 percent), and Connecticut (66 percent).

Figure 4.2-3. Housing Tenure (2010–2016)



Source: US Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

4.2.2.4 Economic Profile

Table 4.2-5 shows labor force participation and unemployment rates. In 2016, there were 1,800 people in the labor force within the study area and the overall unemployment rate was 22.6 percent. The unemployment rate for the study area was the highest compared to Bridgeport, Fairfield County, and Connecticut. From 2013 to 2016, the unemployment rate decreased in the study area by approximately 5 percent. There was a much smaller decrease in unemployment rates in Bridgeport, Fairfield County, and Connecticut.

Table 4.2-5. Labor Force Participation and Unemployment Rates (2013–2016)

	2013		2016		PERCENTAGE CHANGE IN UNEMPLOYMENT RATE
	IN LABOR FORCE	UNEMPLOYMENT RATE	IN LABOR FORCE	UNEMPLOYMENT RATE	
Block Group 1, Census Tract 704	849	7.1%	639	4.9%	-2.2%
Block Group 1, Census Tract 705	655	9.7%	626	10.5%	0.8%
Block Group 2, Census Tract 705	381	5.8%	312	4.0%	-1.8%
Block Group 2, Census Tract 706	294	5.4%	223	3.2%	-2.3%
Study Area	2,189	28%	1,800	22.6%	-5.4
Bridgeport	76,481	15.7%	79,549	15.2%	-0.5
Fairfield County	498,574	9.9%	510,737	8.2%	-1.7
Connecticut	1,958,723	9.7%	1,957,060	7.9%	-1.8

Source: US Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

Table 4.2-6 shows the top five employers in Bridgeport in 2016. As of 2016, other prominent employers in Bridgeport were United Services (professional, scientific, and technical services), Lindley Food Service (food service management), Visiting Nurse Service of Connecticut Inc., Southwest Center Mental Health Systems, Bridgeport Police Department, Prime Resources (advertising agency), Derecktor Shipyard, Sikorsky Aircraft Corporation, Santa Fuel, Inc., and Bridgeport Board of Education (Connecticut Department of Labor 2017).

Table 4.2-6. Top Five Employers in Bridgeport (2016)

EMPLOYER	RANK	INDUSTRY (NAICS CODE)
Trefz Corporation	1	722511 – Full Service Restaurant
Bridgeport Hospital	2	622110 – General Medical and Surgical Hospitals
St. Vincent's Medical Center	3	621111 – Offices of Physicians (except Mental Health Specialists)
People's United Financial Inc.	4	52111 – Monetary Authorities – Central Bank
Allied Barton Security Service	5	561612 – Security Guards and Patrol services

Source: Connecticut Data Collaborative 2016

As of 2016, 2,511 businesses were in Bridgeport, of which healthcare and social assistance sectors made up 12 percent of all the businesses and employed approximately 30 percent of people in Bridgeport. Retail trade made up almost 12 percent of businesses but employed only about 7 percent of people in Bridgeport. The next leading sector of employment in Bridgeport was government, which employed 18.5 percent of people in Bridgeport. The largest employers in the South End were University of Bridgeport, Santa Energy Corporation, and Public Service Enterprise Group (PSEG).

Table 4.2-7. Business Profile of Bridgeport (2016)

SECTOR	UNITS	PERCENTAGE	EMPLOYMENT	PERCENTAGE
Health Care and Social Assistance	301	12.0%	12,649	29.3%
Retail Trade	294	11.7%	3,093	7.2%
Construction	200	8.0%	1,181	2.7%
Manufacturing	154	6.1%	3,978	9.2%
Total Government	82	3.3%	7,989	18.5%
Other	1,480	58.9	14,260	33.0
Total – All Industries	**2,511**	**100%**	**43,150**	**100%**

Source: Connecticut Data Collaborative 2016

As shown in Table 4.2-8, in 2016, there were 1,394 employees in the study area, of which approximately 32 percent were employed in the Educational and Health Care Services industry (457 jobs), which is likely due to local schools and the University of Bridgeport. The next largest employers were retail trade, with approximately 13 percent employees (183); Arts, entertainment, and recreation, and accommodation and food services, with approximately 12 percent employees (169); and Other excluding public administration, with approximately 11 percent employees (148).

Table 4.2-8. Employment by Industry (2016)

INDUSTRY	STUDY AREA		BRIDGEPORT		FAIRFIELD COUNTY		CONNECTICUT	
	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%
Educational services, and health care and social assistance	457	32.5	17,188	26.5	105,072	22.4	474,976	25.5
Retail trade	183	13.1	8,961	13.3	49,420	10.5	193,853	10.8
Arts, entertain, and recreation, and accommodation and food services	169	12.1	7,363	10.9	39,616	8.5	153,754	8.6
Other services, except public administration	148	10.6	4,286	6.4	23,708	5.1	81,588	4.5
Professional, scientific, management, administrative and waste management	134	9.5	6,876	10.2	73,207	15.6	206,042	11.5
Finance and insurance, and real estate, rental and leasing	128	9.2	3,296	4.9	56,387	12.0	163,765	9.1
Manufacturing	52	3.7	6,313	9.4	38,689	8.3	190,713	10.6
Information	51	3.7	1,576	2.3	13,222	2.8	42,374	2.4
Transportation and warehousing, and utilities	32	2.3	3,098	4.6	15,401	3.3	66,516	3.7
Public administration	20	1.4	2,006	3.0	11,038	2.4	66,291	3.7
Wholesale Trade	12	0.9	1,196	1.8	11,604	2.5	45,110	2.5
Agriculture	8	0.6	131	0.2	1278	0.3	7,209	0.4
Construction	0	0.0	5,169	7.7	29,928	6.4	101,497	5.7
Total Civilian Employed Population	1,394	**100**	67,459	**100**	468,570	**100**	1,793,688	**100**

Source: US Census Bureau 2016

4.2.3 Environmental Consequences

4.2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action will not be constructed and resiliency improvements will not occur. The No Action Alternative assumes that current trends with respect to acute and chronic flooding will continue, and vulnerable property within the study area (residences, businesses, and utilities) will continue to experience adverse effects associated with wave action, erosion, and storm events. Based on the March 2010 South End Neighborhood Revitalization Zone (NRZ) Strategic Plan, Marina Village was identified as needing to be rehabilitated and within an area of housing potential. The No Action Alternative would not meet the community objective of revitalizing the neighborhood nor the HUD and Housing Authority of the City of Bridgeport objective of providing well-built and well-maintained housing. Planned development projects such as Windward Development at the former Marina Village site and 60 Main Street would be expected to proceed under the No Action Alternative; however, an investment in dry egress and stormwater improvements would need to be incorporated into the project plans. This would likely increase costs (potentially reducing the scope of the projects) and delay construction.

The Water Pollution Control Authority Area H project will still be implemented, which will reduce combined sewer overflow events in the eastern South End. In terms of potential socioeconomic effects, as compared to the Proposed Action, under the No Action Alternative there will be greater potential for residential and commercial disinvestment within the study area that will continue to be susceptible to damage from regular rainfall and major storm events. The trends in housing vacancy rates and number of housing units will be expected to continue. Although the major employers in the South End (utilities and University of Bridgeport) will likely remain, the area will unlikely attract new businesses or employers.

4.2.3.2 Proposed Action

RBD Pilot Project

The RBD Pilot project would construct an extension of Johnson Street (to provide dry egress), a stormwater facility, and green infrastructure within the western portion of the former Marina Village public housing complex. These improvements would help to manage stormwater for the eastern lot of the site, which will be redeveloped in the near future, and allow for the subsequent redevelopment of the western site as mixed used. Prior to demolition of the buildings on the former Marina Village site, a memorandum of agreement that addressed relocation requirements was approved by the President of the Marina Village Resident Council and by Connecticut Legal Services, Inc. and was submitted to HUD for review with the demolition-disposition application (executed version dated May 30, 2013). Resident rights and responsibilities with regards to the demolition and redevelopment of Marina Village are detailed in the memorandum of agreement. There will be no loss of total affordable units in the City of Bridgeport since the Housing Authority of the City of Bridgeport will replace all affordable units at Marina Village, one for one, within the City of Bridgeport. However, all units will not be replaced at the existing site. Instead, some units will be replaced on the existing site, some units will be replaced on other Housing Authority properties at 375 Main Street (former Marina Apartments) located in the eastern South End and 252 Hallett Street (a portion of former Father Panik Village) located in the city's East Side. The new mixed income, mixed use (where feasible) developments will offer approximately 550 new state of the art residential units and are expected to be completed around 2025.

The RBD Pilot project would allow for the construction of more resilient housing units, both privately owned and managed mixed-income and would have the potential to increase residential property values over time. By providing dry egress on the Johnson Street extension, the project would improve health and safety for the local residents, making the area more appealing for future investment. The dry egress and reduced flooding risk may result in increased business retention and new investment by businesses in the area, resulting in increased employment opportunities and job stability for the area.

Flood Risk Reduction Project

The Flood Risk Reduction project would decrease the area at risk of flooding during a severe coastal event by between 39 and 64 acres (from the Western or Eastern Options of the coastal flood defense system, respectively). The Western Option would reduce the risk for primarily residential properties (and the University of Bridgeport). The Eastern Option would provide dry egress to PSEG's Harbor Unit 5 and reduce flood risk to the Emera site and UI's relocated Pequonnock substation. In addition, the green and gray stormwater infrastructure and internal drainage management strategies associated with both alignment options would reduce flooding from chronic rainfall events.

Reducing flood risk to an area would reduce the cost of property damage repairs for homes and businesses, as well as repairs to the public infrastructure. In addition, these flood risk reduction measures could lead to an increase in residential and commercial property values over time due to increased desirability of the area, reduction in risk of property damage, and the potential reduction of costs associated with investing in resiliency measures for individual properties. The disparity in the housing vacancy rates between the study area and the

City of Bridgeport is likely partly attributed to acute and chronic flooding concerns in the South End. Housing vacancy rates in the South End would be expected to decrease and the number of housing units would be expected to increase due to increased investment in the area. The dry egress and reduced flooding risk may result in increased business retention and new investment by businesses in the area, resulting in increased employment opportunities and job stability for the area.

The potential increase in residential and commercial property values attributable to the proposed projects under the Proposed Action would not result in significant indirect residential displacement. Considering the Proposed Action would not include new land uses, but only improvements to existing public infrastructure and there are many large vacant or underutilized lots within the study area available for future development, new development can progress without displacing existing residents or businesses.

Resilience Center

The Resilience Center proposed under the Proposed Action would provide a meeting place for the community, distribute information on coastal resiliency and local history, and assist in future recovery efforts. It would not be expected to have an impact on socioeconomic conditions in the South End.

4.3 ENVIRONMENTAL JUSTICE

4.3.1 Methodology and Regulatory Context

Executive Order 12898 (EO 12898), Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 11, 1994), requires federal agencies to consider whether actions they might fund or approve may have any disproportionately high and adverse environmental or human health effects on low-income or minority populations. Since the Proposed Action would require federal approval from the U.S. Department of Housing and Urban Development (HUD) subject to review under National Environmental Policy Act, this section considers the Proposed Action's potential for disproportionately high and adverse effects on minority and low-income populations. HUD's regulations found at 24 CFR Parts 50 and 58, mandate compliance with EO 12898 for HUD and/or Responsible Entities.

Connecticut Department of Energy and Environmental Protection's (CTDEEP) Environmental Equity Policy (effective December 17, 1993) is implemented to further the department's goals of preserving and enhancing the environment for all the people of Connecticut. CTDEEP's Policy is that no segment of the population should, because of its racial or economic makeup, bear a disproportionate share of the risks and consequences of environmental pollution or be denied equal access to environmental benefits and proposes the following course of action:

- The Department will review and assess the impacts of and opportunities provided by its activities with regard to racial and ethnic minority groups and lower income residents.
- The Department will enhance communication with, and improve environmental education opportunities for, minority and lower income communities. The Department will encourage community participation in the Department's ongoing operations and program development, including but not limited to inclusion on the agency's advisory boards and commissions, regulatory review panels, and planning and permitting activities.
- The Department will foster a heightened awareness of environmental equity issues among its own staff and will provide training on the environmental issues affecting low-income and minority communities. Managers will implement specific environmental equity goals in their respective programs.
- The Department will work with other federal, state and municipal agencies and coordinate on environmental equity issues.
- The Department will continue to diversity the racial and ethnic makeup of its staff to better reflect and represent the Department's diverse constituency.
- The Department will employ a staff person responsible for ensuring that environmental equity principles are incorporated into all the Department's policies and programs.

According to CTDEEP Environmental Justice Program, "Environmental Justice" means that all people should be treated fairly under environmental laws regardless of race, ethnicity, culture or economic status. Section 22a-20a of the Connecticut General Statutes (formerly Public Act No. 08-94), with an effective date of January 1, 2009, along with CTDEEP's existing Environmental Justice Policy, ensures that environmental justice communities are provided enhanced notice leading to meaningful public participation in certain permitting processes. This statute requires a meaningful public participation plan for environmental justice communities and defines environmental justice communities, instances and projects where this would apply, and requirements of public participation plans.

The Environmental Justice Policy states that no segment of the population should, because of its racial or economic makeup, bear a disproportionate share of the risks and consequences of environmental pollution or be denied equal access to environmental benefits. Under the Environmental Justice Policy, environmental justice communities are defined as the following:

- U.S. census block groups, as determined in accordance with the most recent U.S. census, for which 30% or more of the population consists of low-income persons who are not institutionalized and have an income below two hundred percent of the federal poverty level, or
- Distressed municipalities[1]

According to the Connecticut Department of Economic and Community Development's (DECD) criteria for 2016, Bridgeport is considered a distressed municipality, with a score of 1305 (the 8th highest score in 2016).[2] As such, the project area is located in an Environmental Justice Community due to Bridgeport's designation as a distressed municipality.

In addition, data on race, ethnicity, and poverty status were gathered from the U.S. Census Bureau's 2010- 2016 American Community Survey (ACS) for the census tract block groups within the study area, and then aggregated for the study area as a whole. For comparison purposes, data for Bridgeport, Fairfield County, and Connecticut were also compiled. Based on ACS data and Council on Environmental Quality (CEQ) guidance, minority and low-income populations were identified as follows:

- Minority communities: CEQ guidance defines minorities to include American Indians or Alaskan Natives, Asian and Pacific Islanders, African Americans or Black persons, and Hispanic persons. This environmental justice analysis also considers minority populations to include persons of "some other race" or "two or more races." Following CEQ guidance, minority communities were identified where the minority population of the affected area exceeds 50 percent or where the minority population percentage (either an individual minority group or the total minority population) is meaningfully greater than in the geographic reference areas.
- Low-income communities: The percentage of individuals living below the poverty level in each census block group was used to identify low-income populations. The term low-income refers to individuals that are below the poverty thresholds as defined by the U.S. Census Bureau. Low-income populations are communities where the presence of low-income people is greater than 50 percent or meaningfully greater than in a geographic area of comparison.

As with the analysis of socioeconomic conditions, the study area boundary for the environmental justice assessment aligns with census tracts in the South End and includes Census Tract 704 Block Group 1, Census Tract 705 Block Groups 1 and 2, and Census Tract 706 Block Group 2 (Figure 4.3-1).

[1] *http://www.ct.gov/ecd/lib/ecd/distressed_municipalities_list/distressed_municipality_criterions.doc*
[2] The year 2016 is used to match U.S. Census Bureau data used throughout the section.

EJSCREEN is an environmental justice mapping and screening tool that provides the U.S. Environmental Protection Agency with a nationally consistent dataset and approach for combining environmental and demographic indicators.[3] The Demographic Index in EJSCREEN is a combination of percent low-income and percent minority, the two demographic factors that were explicitly named in EO 12898. For each Census block group, these two numbers (calculated from the Census Bureau's ACS 2011-2015) are averaged together. EJSCREEN compares a community to the rest of the state, U.S. Environmental Protection Agency region and nation, by using percentiles. The state percentile identifies what percent of the State population has an equal or lower value, meaning a lower percent minority and/or low income.

4.3.2 Affected Environment

According to 2016 United States Census Bureau data 4,308 people live in the study area and 147,022 live in Bridgeport. A summary of the population characteristics in relation to Fairfield County and the State of Connecticut is shown in Table 4.3-1.

Table 4.3-2 shows the ethnic breakdown of the study area by census tract block group. In Bridgeport, 59.6 percent of the population identified themselves as minority, which is above the CEQ guidance threshold of a minority population greater than 50 percent of the population. Within the four census tract block groups that make up the study area approximately 62.6 percent of the population identified themselves as minority. This is higher than the City of Bridgeport and significantly higher than the rates of those identifying as minority populations in both Fairfield County and Connecticut. Within the study area, the percentage of total minority population ranges from 48.6 percent in Census Tract 704 Block Group 1 to 73.3 percent in Census Tract 706 Block Group 2. Figure 4.3-1 shows the minority population breakdown of the study area.

[3] *https://www.epa.gov/ejscreen*

Table 4.3-1. Ethnicity of Residential Population (2016)

GEOGRAPHIC UNIT	STUDY AREA		BRIDGEPORT		FAIRFIELD COUNTY		CONNECTICUT	
Total Population	4,308		147,022		941,618		3,588,570	
ETHNICITY	**Total**	**Percentage**	**Total**	**Percentage**	**Total**	**Percentage**	**Total**	**Percentage**
White	1,612	37.42%	59,363	40.38%	694,622	73.77%	2,768,080	77.14%
Black or African American	1,442	33.47%	52,155	35.47%	107,282	11.39%	372,696	10.39%
Hispanic (of Any Race)	1,234	28.64%	57,688	39.24%	175,480	18.64%	537,728	14.98%
American Indian and Alaska Native	26	0.60%	851	0.58%	2,441	0.26%	9,399	0.26%
Asian	673	15.62%	4,595	3.13%	47,742	5.07%	152,782	4.26%
Native Hawaiian or Other Pacific Islander	0	0%	57	0.04%	392	0.04%	1,031	0.03%
Some Other Race	382	8.87%	23,788	16.18%	62,931	6.68%	177,594	4.95%
Two or More Races	173	4.02%	6,213	4.23%	26,208	2.78%	106,988	2.98%
Total Minority Population	2,696	62.58%	87,659	59.62%	246,996	26.23%	820,490	22.86%

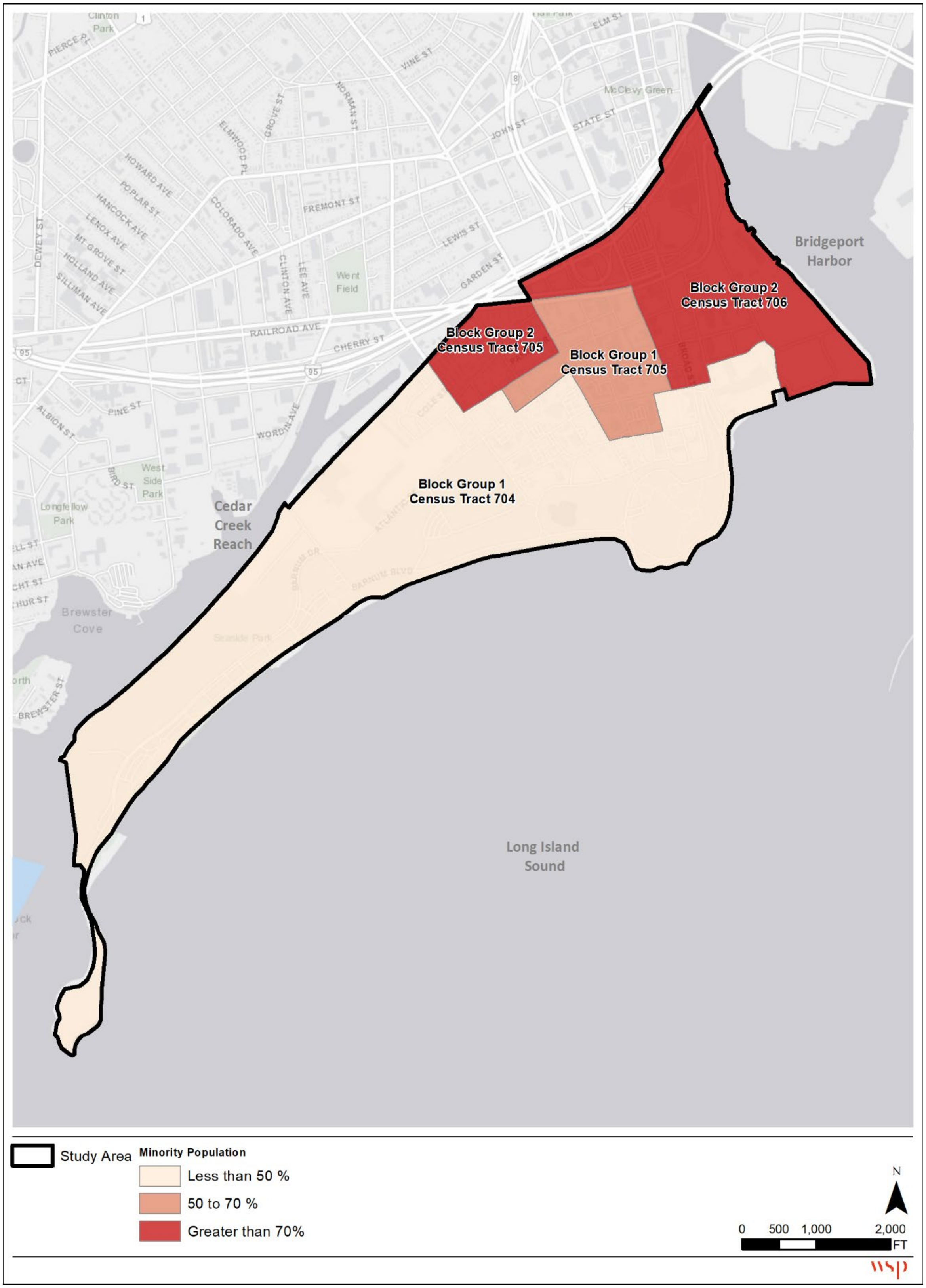
Source: U.S. Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

Table 4.3-2. Ethnicity of Residential Population in Study Area (2016)

GEOGRAPHIC UNIT	CENSUS TRACT 704 BLOCK GROUP 1		CENSUS TRACT 705 BLOCK GROUP 1		CENSUS TRACT 705 BLOCK GROUP 2		CENSUS TRACT 706 BLOCK GROUP 2		STUDY AREA	
Total Population	1,604		886		1,283		555		4,308	
ETHNICITY	**Total**	**Percentage**	**Total**	**Percentage**	**Total**	**Percentage**	**Total**	**Percentage**	**Total**	**Percentage**
White	825	51.43%	290	32.73%	349	27.20%	148	26.67%	1,612	37.42%
Black or African American	408	25.44%	157	17.72%	584	45.52%	293	52.79%	1,442	33.47%
Hispanic (of Any Race)	211	13.15%	305	34.42%	628	48.95%	0	0%	1,234	28.64%
American Indian and Alaska Native	26	1.62%	0	0%	0	0%	0	0%	26	0.60%
Asian	276	17.21%	186	20.99%	144	11.22%	67	12.07%	673	15.62%
Native Hawaiian or Other Pacific Islander	0	0%	0	0%	0	0%	0	0%	0	0%
Some Other Race	40	2.49%	108	12.19%	206	16.06%	28	5.05%	382	8.87%
Two or More Races	29	1.81%	125	14.11%	0	0%	19	3.42%	173	4.02%
Total Minority Population	779	48.57%	596	67.27%	934	72.80%	407	73.33%	2,696	62.58%

Source: U.S. Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

Figure 4.3-1. Minority Populations in Study Area (2016)



Source: U.S. Census Bureau's, 2010 Census and 2012-2016 American Community Survey 5-Year Estimates

The area of the highest percentage of minority population is Census Tract 705, Block Group 2, includes the former Marina Village public housing site. The next highest percentage of minority population (Census Track 704, Block Group 1) is the area that includes Seaside Park and the residential areas immediately adjacent to the park, including Seaside Village. The area of the lowest percentage of minority population (Census Tract 706, Block Group 2) is just below the 50 percent threshold at 48.6 percent and includes the residences between Lafayette Street and Main Street, near the utilities on the east side of the South End.

In 2016, approximately 25.7 percent of the population within the study area lived below the federal poverty line, as compared to 19.1 percent for the City of Bridgeport. Block Group 1 Census Tract 704 and Block Group 2 Census Tract are above the CEQ guidance threshold for low-income populations greater than 50 percent of the population. Table 4.3-3 shows the breakdown of low-income population in the study area as compared to Bridgeport, Fairfield County, and the State of Connecticut. Figure 4.3-2 illustrates the low-income population by census tract block group in the study area. Detailed household income breakdown by census tract block group is presented in Table 4.3-3.

Table 4.3-3. Low-Income Populations, 2016

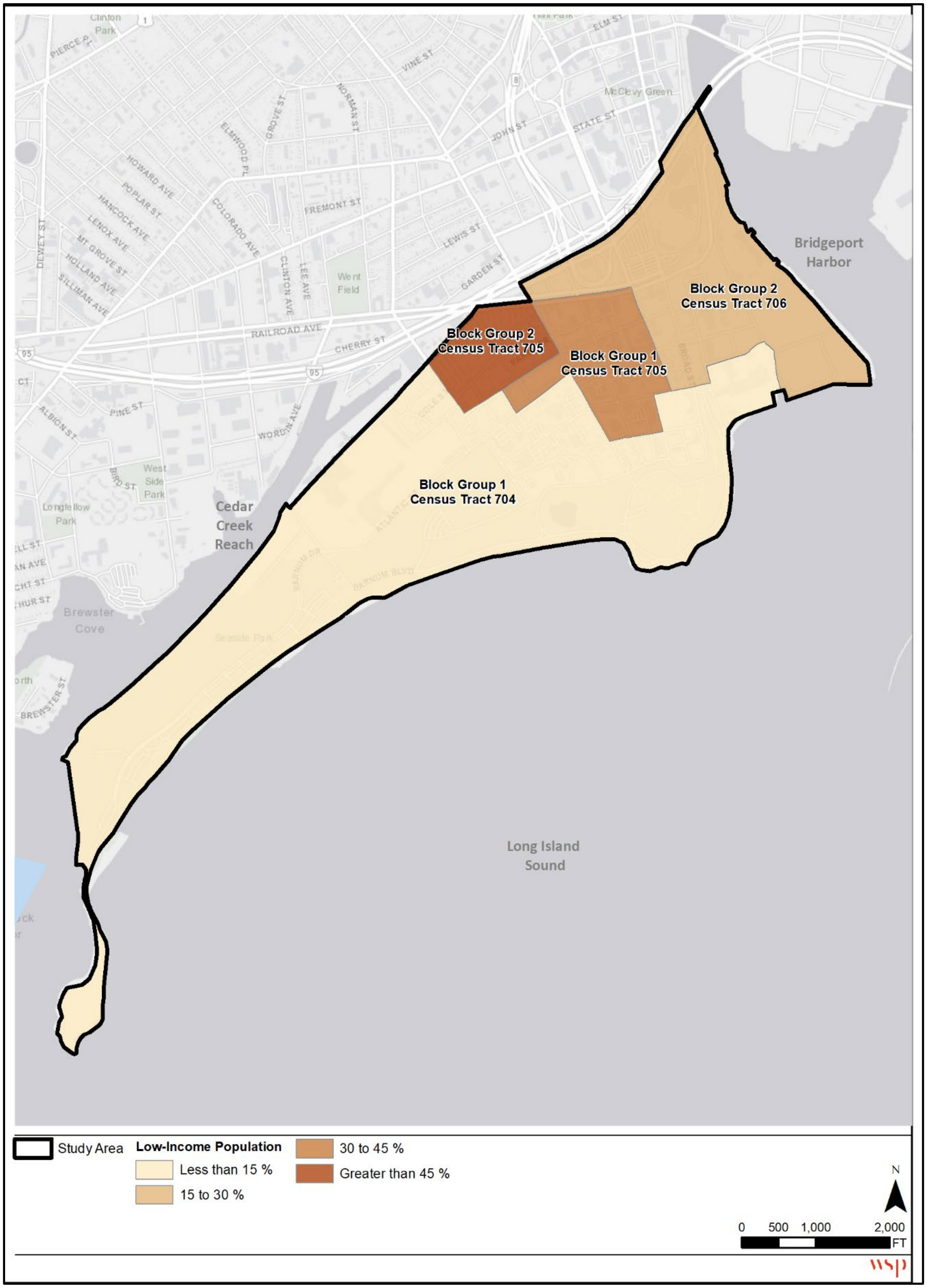
GEOGRAPHIC UNIT	TOTAL POPULATION	POPULATION BELOW POVERTY LEVEL	
		TOTAL	PERCENTAGE
Study Area	**595**	**153**	**25.7%**
Bridgeport	32,376	6,200	19.1%
Fairfield County	235,064	15,067	6.4%
Connecticut	894,413	65,559	7.3%

Source: U.S. Census Bureau, 2010 Census and 2012-2016 ACS 5-Year Estimates

Figure 4.3-3 presents the percent of Connecticut's population that has an equal or lower value of EJSCREEN's Demographic Index (the average of the percentage low income and percent minority) for each of the Census block groups in the study area. The figure shows that the population within the study area has a higher Demographic Index (EJ characteristics) than 80 percent or more of Connecticut population.

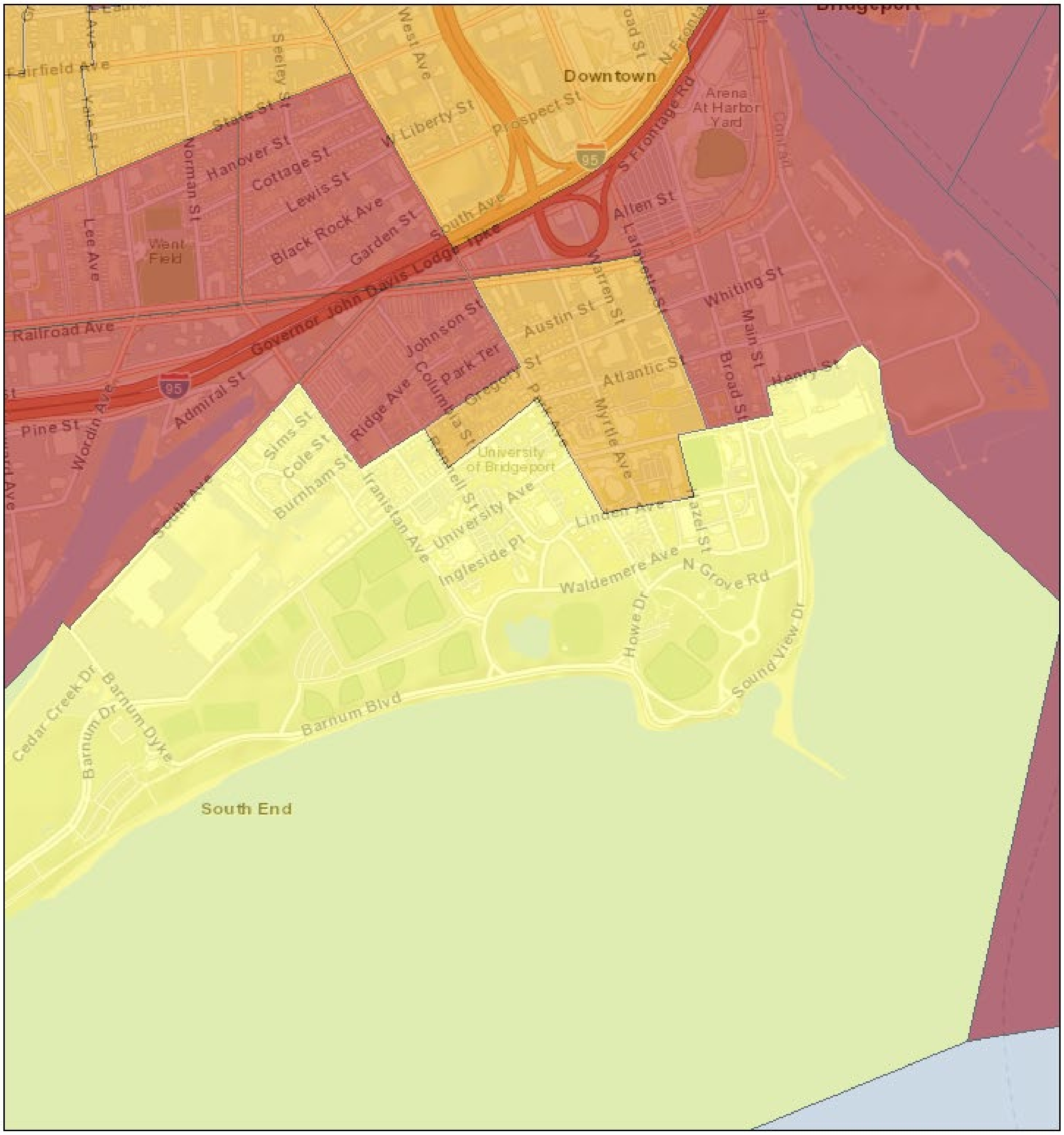
As stated above, the City of Bridgeport is considered a distressed municipality per DECD criteria. According to Connecticut's Environmental Justice Policy, distressed municipalities are defined as environmental justice communities; therefore, the City of Bridgeport and the study area is considered an environmental justice community.

Figure 4.3-2. Low-Income Populations in Study Area (2016)



Source: U.S. Census Bureau's, 2010 Census and 2012-2016 American Community Survey 5-Year Estimates

Figure 4.3-3. State Percentile of EJSCREEN's Demographic Index



December 2, 2018

EJSCREEN State Percentiles

- Data not available
- Less than 50 percentile
- 50 -60 percentile
- 60 -70 percentile
- 70 -80 percentile
- 80 - 90 percentile
- 90 - 95 percentile
- 95 - 100 percentile

1:18,056

0 0.15 0.3 0.6 mi
0 0.25 0.5 1 km

EPA OEI, OEJ, and OP
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

EJSCREEN 2018

4.3.3 Environmental Consequences

The No Action Alternative and Proposed Action were evaluated to determine the potential effects to environmental justice communities. To determine the magnitude of any potential direct or indirect impacts on EJ populations, the EJ analysis was conducted using the results from the other technical resource area analyses within this chapter.

4.3.3.1 No Action Alternative

In 2016, approximately 62.6 percent of the population within the study area identified themselves as minority and approximately 25.7 percent of the population lived below the federal poverty line. Under the No Action Alternative, the Proposed Action would not be implemented and the conditions of the study area would not be affected by construction activities. However, the EJ population within the study area would not benefit from the long-term operational impacts associated with the Proposed Action.

However, without the Proposed Action there would be continued and increased risk of acute and chronic flooding in the study area, potentially adversely impacting EJ populations. In addition, dry egress would not be provided within the study area, reducing access to community facilities and increasing safety risks to EJ populations during storm events. Ongoing and increased risk of flooding in the study area would likely affect residences owned or rented by low-income and minority persons.

Without the RBD Pilot Project, there would be no dry egress provided by the extension of Johnson Street and no stormwater improvements at the former Marina Village site. These elements would facilitate the redevelopment of the site. Without the RBD Pilot Project, Phase II of the Windward Development, which would include some proportion of units set aside for low-income populations, would likely be delayed and the cost of development would be expected to increase (due to costs associated with dry egress and stormwater management), possibly resulting in reduced amenities provided to residents.

The State of Connecticut has invested in the cleanup of the 60 Main Street site (the former Remington Shaver facility); therefore, any future development of the site would require dry egress. If the coastal flood defense system is not constructed as part of the Flood Risk Reduction Project, dry egress would not be provided to the site. Development would be delayed and project costs would increase as a dry egress option is developed and constructed, ensuring the safety of future residents of the site. In addition, future development of other vacant sites north and west of the coastal flood defense system that could provide additional housing options for EJ populations would be limited without the Flood Risk Reduction Project.

Businesses with low-income and minority employees may also experience adverse impacts due to ongoing and increased risk of flooding. Coastal storm events may impact existing utility infrastructure resulting in the disruption of service to EJ customers within and outside of the study area. Since low-income individuals are more vulnerable to disruptions to employment, impacts to housing, access to community facilities, and health effects associated with flooding, the No Action Alternative has the potential to adversely affect low-income populations significantly and disproportionately as compared other segments of the population.

4.3.3.2 Proposed Action

There are minority and low-income populations within the study area that would be impacted by the Proposed Action.

Construction activities would occur within the study area in multiple concurrent phases lasting approximately 36 months beginning fall 2019 through September 2022. To minimize temporary construction impacts to air quality, mitigation measures and BMPs, such as dust control, use of ultra-low-sulfur diesel fuel, idling restrictions, and use of best available tailpipe reduction technologies, Tier 3 emissions standard equipment and electrically powered equipment to the extent possible, should be implemented: Noise control measures, such as idling restrictions and requiring impact devices be equipped with acoustically attenuating shields, internal combustion equipment to have mufflers and shield paneling, and debris conveyors and containers to be lined or covered with sound absorbing materials, are recommended to minimize potentially adverse effects in the community: In addition, construction would be limited to daytime. Ground disturbances should also be monitored by an archaeologist to limit any possible impacts to human remains that could be buried within the area of potential effect.

The construction of the Proposed Action would have a temporary impact on traffic as a result of increased trucks for material deliveries and debris removal and construction employee vehicles. Hauling routes to and from the construction sites would be through the I-95 / Wordin Avenue interchange and would travel along collector roadways. A Traffic Management Plan would be developed in order to minimize impacts on existing traffic patterns. In order to mitigate potential adverse impacts to traffic during construction of the Proposed Action, the contractor would coordinate with the City of Bridgeport and Connecticut Department of Transportation in order to collaboratively address any traffic concerns. This may require coordination of construction schedules, road/lane closures, and street realignments to avoid conflicts and reduce impacts. If required, monitoring of intersections of concern may be implemented, combined with adaptive management to reduce cumulative traffic impacts to the extent possible. The increased truck traffic and temporary road closures from construction of the Proposed Action is not anticipated to result in a significant adverse impact to traffic in the study area.

There would be direct, short-term impacts to air quality, noise and transportation during construction that would affect both EJ and non-EJ populations in the study area. These impacts would be mitigated to the extent practicable and there would not be a disproportionate adverse impact on EJ populations. In the long-term, EJ populations would benefit from the flood risk reduction measures, dry egress, and resiliency education under the Proposed Action. The Proposed Action would meet CTDEEP's Environmental Equity Policy.

RBD Pilot Project

Those EJ populations in the area of the RBD Pilot Project would experience direct, short-term impacts from construction that would be managed through BMPs and coordination with local agencies. from increased air emissions, noise, traffic, and lane closures. These impacts would be temporary and not significant.

Following construction, the area of the RBD Pilot Project would benefit from dry egress (proposed Johnson Street extension). Dry egress would allow residents to evacuate and emergency vehicles to access the area during storm events, increasing safety for the EJ populations within and surrounding the project site. The stormwater facility and green infrastructure installed as part of the RBD Pilot Project would reduce the likelihood of damage from flooding to housing or businesses owned or rented by low-income or minority populations. The dry egress and stormwater improvements would allow for future development of the site with some proportion set aside for low-income populations. There would be no displacement of residents or businesses from the study area.

The proposed stormwater facility would provide a new open space facility that would benefit the neighborhood and the EJ population. It is expected that visual aesthetics would improve by the replacement of dilapidated structures and chain link fencing with green space and reconfigured and resurfaced streets and sidewalks.

The traffic assessment for the RBD Pilot Project evaluated the traffic impacts for the proposed extension of Johnson Street between Iranistan Avenue and Columbia Street. Based on recent data collection and traffic data inventory gathered from various sources, the intersections in the study area were analyzed using the methodology described in the 2000 and 2010 Highway Capacity Manual. The 2038 Build Condition was developed using the background traffic volumes and incorporating the traffic to be generated by the future development of the former Marina Village site (Windward Development). It was assumed that no additional traffic would be generated by the RBD Pilot Project itself. For the 20-year Build Condition (2038 Build Year) the delays and level of service would slightly improve over the 2038 Background Conditions. It is anticipated that the proposed Johnson Street extension (two-way; one lane each direction) would not have a negative impact on the surrounding roadway network. It would have capacity to accommodate approximately 1,000 peak hour vehicles. The vehicles in the Background Condition that used Ridge Avenue would use the Johnson Street extension in the Build Condition. Therefore, the proposed Johnson Street extension, and its conversion to a two-way roadway, would not have any negative impacts on traffic and would provide for the proposed future developments that would include EJ populations.

There would be no significant adverse impacts to minority or low-income populations as a result of the RBD Pilot Project. The project would result in long-term beneficial impacts to minority and low-income population.

Flood Risk Reduction Project

Those EJ populations on the east side of the South End (the area of the Flood Risk Reduction Project) would experience direct, short-term impacts from construction that would be managed through BMPs and coordination with local agencies from increased air emissions, noise, traffic, and lane closures. These impacts would be temporary and not significant.

Following construction, the eastern South End would have a direct, long-term benefit from reduced flood risk from coastal storm events, including dry egress (University Avenue) and improved stormwater infrastructure that would improve water quality. The coastal flood defense system and stormwater infrastructure installed as part of the Flood Risk Reduction Project would reduce the likelihood of damage from flooding to housing or businesses owned or rented by low-income or minority populations. The Western Option of the coastal flood defense system would provide flood risk reduction to the residential land uses in the eastern South End, but would not incorporate any of the utilities inside the coastal flood defense system. The Eastern Option of the coastal flood defense system would include the Pequonnock Substation and Emera.

During a severe coastal surge event, it is anticipated that the Western Option of the coastal flood defense system would decrease the area at risk of flooding by approximately 39 acres. While this alignment would include coastal defense and flood risk reduction for the South End residential community north of University Avenue (including EJ populations), critical utility providers would be located outside the line of defense and would likely be impacted by future coastal floods, unless they provide their own coastal defense structures. The Eastern Option of the coastal flood defense system would reduce risk to approximately 64 acres of land within the project area, as well as provide dry egress to Harbor Unit 5 and coastal defense to the Emera site and new Pequonnock Substation relocation site. By incorporating these properties behind the Flood Risk Reduction

Project measures, the proposed project would reduce risk to several critical utility locations that serve both EJ and non-EJ populations in the study area and throughout the region.

Dry egress (provided by the Western and Eastern Options of the coastal flood defense system) would allow residents to evacuate and emergency vehicles to access the area during storm events, increasing safety for the EJ populations within and surrounding the project area. The dry egress, coastal flood protection and stormwater improvements would allow for future development of 60 Main Street and other vacant sites north and west of the coastal flood defense system, providing additional housing and commercial options for EJ populations, as well as employment opportunities. There would be no displacement of residents or businesses from the study area.

The traffic assessment for the Flood Risk Reduction Project evaluated the traffic impacts for the proposed closure of University Avenue to vehicular traffic between Lafayette Street and Broad Street, the closure of Soundview Circle to vehicles and dead-ending Main Street just north of University Avenue (the worst case option for the Main Street and University Avenue intersection with respect to traffic). Based on recent data collection and traffic data inventory gathered from various sources, the intersections in the study area were analyzed using the methodology described in the 2000 and 2010 Highway Capacity Manual. The 2038 Build Condition was developed using the background traffic volumes and incorporating assumptions for the traffic to be generated by the future development in the area (60 Main Street). It was assumed that no additional traffic would be generated by the Flood Risk Reduction Project itself. Based on the traffic analysis, site access and circulation would be at a satisfactory level of service under the future Build condition. All movements would operate at level of service B or better during peak periods. Thus, elevating University Avenue and rerouting traffic to the proposed roadway network, would not adversely impact traffic operating conditions at study intersections in the 2038 Build condition; traffic would remain at satisfactory level during peak periods. There would be minor increases in delay at each of the intersections between the future No Build and Build scenarios and one intersection – Main Street and University Avenue – would decrease level of service from A to B, between the No Build and Build scenarios. All other intersections would maintain the same free flow condition.

The project would impact visual viewsheds but the impacts would not be significantly adverse and would not disproportionately affect the EJ population. The coastal flood defense system would be designed keeping in mind the existing context and visual aesthetic of the project area, in a manner that would allow these features to blend with the surrounding built and natural environments. Such measures may include, but would not be limited to, use of building material that would soften the visual intrusion of the proposed flood wall and flood gate; landscape features, such as green-walls; and use colors that would blend in with the surrounding structures. Based on this, it is anticipated that the proposed Western Option of the coastal flood defense system alignment would not result in adverse visual impact to the surrounding uses including EJ residences along Main Street. The Eastern Option of the coastal flood defense system would be set back within the industrial land uses and would not be visible to the public.

The elevation of Broad Street north of University Avenue (same for both Western and Eastern options of the coastal flood defense system) would slightly obstruct existing views from the neighborhood immediately north of University Avenue to Seaside Park, for both EJ and non-EJ populations; however, the tree canopy within the park would still be visible. Landscaping and amenities added to Seaside Park in this location would mitigate any loss in view of the park. In addition, the visibility of the park would increase as a pedestrian or motorist moves south toward a higher elevation at University Avenue.

Under the Dead-End Option for the proposed Main Street intersection with the elevated University Avenue, Main Street would remain at its current elevation and dead-end at University Avenue. Under this option, existing access to homes along Main Street, north of University Avenue, would be maintained. Existing views to Seaside Park, south of University Avenue, would be slightly obstructed by the raised portion University Avenue; however, the tree canopy within the park would still be visible. The proposed enhancements would include landscaped area along Main Street, where practicable. In addition, the southern end of Main Street would include an ADA-accessible ramp and a staircase that would provide a pedestrian connection from Main Street to an approximately 10–11 feet elevation of University Avenue and provide continued access to Seaside Park.

Under the Through-Street Option for the proposed Main Street intersection with the elevated University Avenue, Main Street would be elevated starting at Henry Street to the north to meet the approximately 10- to 11-foot elevation of University Avenue. There would be direct pedestrian access to the existing homes to the east of Main Street from the proposed elevated Main Street portion. Existing views to Seaside Park, south of University Avenue would be slightly obstructed by the raised portion University Avenue; however, the tree canopy within the park would still be visible.

There would be no significant adverse impacts to minority or low-income populations as a result of the Flood Risk Reduction Project. Overall, the Flood Risk Reduction Project would result in long-term beneficial impacts to the EJ population.

Resilience Center

The Resilience Center would serve the South End community, providing a community meeting place, resiliency and local history education, and resources during storm events. These services would benefit the EJ populations within the study area by providing a new community facility and improving public safety.

The Freeman Houses are the last remaining dwellings of Little Liberia and together are individually listed in the National Register of Historic Places. They are also included on the Connecticut Freedom Trail. The effects of the proposed adaptive re-use of a portion of one or both buildings would be expected to provide a benefit to the African American community.

Rehabilitation of the Freeman Houses would improve the viewshed toward that important resource, with the rehabilitation of dilapidated structures that currently have a negative visual impact. Other elements of the project such as design features north of Seaside Park at University Avenue would enhance the visual and aesthetic quality of the neighborhood and are anticipated to result in beneficial visual impacts.

There would be only minor direct, short-term impacts from construction associated with the Resilience Center. In the long-term, the project would not impact land use, infrastructure, or other resources that would affect the EJ population in the study area. The Resilience Center would result in long-term beneficial impacts to the EJ population.

4.4 URBAN DESIGN AND VISUAL RESOURCES

Visual and aesthetic resources characterize the landscape of the built environment and play a major role in shaping the experiences shared by the residents and visitors within that built environment. Visual resources range from urban landscapes such as cityscapes or skylines, to natural landscapes such as open ocean views or mountain ranges.

4.4.1 Methodology and Regulatory Context

The National Environmental Policy Act (NEPA) requires the analysis of the potential impacts on the visual resources of the study area within a proposed project. Several federal agencies, including the Federal Highway Administration have responded to NEPA by establishing guidelines for this type of visual assessment; however, the Department of Housing and Urban Development has not established specific guidelines for visual impact assessments. Therefore, the guidelines chosen for this visual assessment have been adopted from the Federal Highway Administration to create a foundation for further analysis.

This section characterizes the existing visual environment by identifying the existing visual quality, local aesthetics, and visual resources of the study area in order to provide a baseline for determining potential changes to the visual environment as a result of the Proposed Action.

Several key views were established within the RBD Pilot Project and Flood Risk Reduction Project areas. The key views within the RBD Pilot Project area are around the former Marina Village site in the northwestern area of the South End. The key views within the Flood Risk Reduction Project area are along the proposed coastal flood defense system alignment options throughout the eastern section of the South End. It was assumed that key views for the proposed Resilience Center would overlap with those of the Flood Risk Reduction Project area. These key views were chosen to analyze and evaluate the impacts that each project would have on the most important existing visual resources within the study area. To identify potentially affected visual resources and the existing views within the project area, field visits of the area were completed in December 2017 and spring 2018, during which photos of the surrounding area were taken and later reviewed. Additionally, online aerial and street-view photographs, existing reports, and information available from the National Park Service were reviewed.

4.4.2 Affected Environment

Connecticut is part of the tri-state region that includes New Jersey and New York and is considered the largest and most populated metropolitan region in the country. Fairfield County is in southwestern Connecticut (along the Long Island Sound bordering New York to the west) and is the most urbanized and densely populated county within the state. The approximately 0.57-square-mile (365 acres) Proposed Action study area is located within the South End neighborhood of Bridgeport (the largest city in the state) and is bounded by the New Haven Metro-North rail corridor to the north, Pequonnock River (Bridgeport Harbor) to the east, Long Island Sound to the south, and the western portion of Seaside Park to the west. Downtown Bridgeport is to the north of the study area across from the Connecticut Turnpike (I-95).

4.4.2.1 Existing Visual Character and Quality

The eastern part of the study area along the Bridgeport Harbor primarily consists of heavy industrial uses, which includes large energy generating facilities (PSEG, Emera, and UI Energy) with tall smokestacks, coal mounds, warehouses, storage facilities, energy micro-grids, and large overhead electrical service lines traveling from the generating facilities out into the rest of the city and region (see Photos 1 and 2). The southeastern tip of the study area is a small low-lying wetland called Tongue Point, and is immediately adjacent to the Bridgeport Harbor Station 5 energy generating facility site, which is expected to be built by 2021. The lighthouse at the tip of Tongue Point (built in the early 1800s) still operates.

Photo 1: Looking east from the intersection of Main Street and University Avenue

Photo 2: Looking east from the intersection of Main Street and Ferry Access Road

To the west of the PSEG property, along the waterfront, south of Henry Street, is the site for future mixed-use development at 60 Main Street (see Photo 3).

Photo 3: Looking southeast (at the 60 Main Street Site) from the intersection of Main Street and University Avenue

The study area south of Waldemere Avenue is occupied by the eastern part of Seaside Park, an approximately 375-acre public park along the Long Island Sound. Within the study area, the park contains landscaped areas for passive recreation, trees, a water body, ballparks, play areas, shoreline beaches, and a pedestrian path along the waterfront. To the east, the park stems up along Broad Street connecting to the historic Cottage District to the north, and the University of Bridgeport campus to the west.

The Cottage District covers one-and-half blocks and is bounded by Whiting Street to the north, Main Street to the east, Broad Street to the west, and ends where Henry Street meets Main Street to the south. This district includes 35 two- and three-story wood cottages with gabled roofs on the front and sides and a small grassed front lawn enclosed by either a chain-link, white-picket, or wooden fence leading out on to the sidewalk (see Photo 4). Many of these homes have small front porches with stoops, and some have small driveways for car storage along the side. These structures are almost uniform in architectural style, but vary greatly in a vibrant scheme of colors. Homes located at the southern end of the district have waterfront views from their front-yards along Main Street.

The University of Bridgeport campus is located just north of Seaside Park and occupies a significant part of the study area, bounded by Atlantic Avenue to the north, Broad Street to the east, Waldemere Avenue to the south, and Iranistan Avenue to the west. As shown in Photo 5, the university campus is comprised of mostly mid-rise structures made of various brick types and colors, separated by small grassed lawns, and surface-level parking lots. The campus buildings area a mix of pre-war (World War II), mid-century, and modern architectural styles that make up the aesthetic of the built environment on campus. The nine-story, Magnus Wahlstrom Library building is the largest and tallest building on the campus at Park Avenue and Linden Avenue. The university campus also includes a 950-capacity, large outdoor field for soccer and lacrosse, called the Knights Field located at the corner of Lafayette Street and University Avenue. The core of campus at the intersection of Myrtle Avenue and University Avenue, is closed to vehicular traffic, which creates a calm and quaint aesthetic and physical environment.

There are a small number of residential and commercial uses within the campus bounds, which include one- and two-family homes and a small number of multifamily residential buildings (see Photo 6). Commercial uses are primarily located along Atlantic Avenue.

Photo 4: Looking south on Main Street at the intersection of Main Street and Atlantic Avenues (Cottage District on the right)

Photo 5: Looking west on University Avenue, between Main Street and Broad Street

Photo 6: Looking east on Atlantic Avenue, between Broad Street and Main Street

North of the University of Bridgeport campus, between Broad Street to the east and Myrtle Avenue to the west, the study area includes predominantly commercial, light-industrial, and institutional buildings (churches), along with large surface-level parking lots and few vacant lots. Aside from the two, massive one-story brick buildings between Myrtle Avenue and Lafayette Street, south of Gregory Street, the all buildings in this part of the study area differ greatly in architectural style resulting in a weak visual quality and disconnected local aesthetic. To the north, the study area is bounded by the elevated Amtrak and New Haven Metro-North railroad line.

The northwestern part of the study area is predominantly residential, comprising single- and multifamily residential buildings. There are a few low-rise commercial buildings that include restaurants, local markets, and convenient stores to service the local community. The aesthetic of the built environment throughout this part of the study area is cohesive. Multifamily residential includes two housing complexes, the former Marina Village public housing complex and Seaside Village residential complex located in a historic district. The former Marina Village is a federal housing project located on two adjacent parcels, totaling approximately 15.9 acres (separated by Columbia Street), bounded by South Avenue to the north, Park Avenue to the east, Johnson Street and Ridge Avenue to the south, and Iranistan Avenue to the west. Residences within the complex consist primarily of long low-rise brick structures separated by small pedestrian pathways and linear parking lots (see Photo 7). A portion of the former Marina Village, to the north of Ridge Avenue, was demolished and the vacant areas are enclosed by a chain-link fence and include vegetative overgrowth, a few trees and construction rubble/debris (see Photo 8). The remaining buildings will be demolished prior to construction of the RBD Pilot Project (see Photo 9).

Seaside Village is an approximately 16.5-acre co-operative housing complex, within the National Register of Historic Places (NRHP)-listed Seaside Village Historic District, to the west of the former Marina Village, bounded by South Avenue to the north, Iranistan Avenue to the east, Atlantic Avenue to the south, and the western edge of the study area to the west. It includes low-rise brick buildings with dormers and slate-covered gable roofs, separated by small pedestrian pathways and green lawns (see Photo 10). The irregular site plan features slightly curved tree-lined streets, cul-de-sacs, and spacious interior courts, yards, and gardens. The edges of the Seaside Village Historic District are bordered by nineteenth and twentieth-century residential and commercial construction (NPS, 1990). The aesthetic of the built environment within Marina Village and Seaside Park is cohesive.

Photo 7: Looking east from Seaside Village toward Marina Village on Iranistan Avenue

Photo 8: Looking northeast at Marina Village from the intersection of Iranistan Avenue and Ridge Avenue

Photo 9: Looking north at Marina Village housing complex (eastern portion) from Ridge Avenue, between Walnut Street and Columbia Street

Photo 10: Looking west at Seaside Village from Iranistan Avenue

The primary roadways within the study area include Interstate 95 (I-95, the Connecticut Turnpike) to the north, which runs east-west; Main Street that runs north-south to the east; Iranistan Avenue that runs north-south to the west; Waldemere Avenue that runs east-west along Seaside Park to the south; Park Avenue, and Atlantic Street that run north-south, and east-west, respectively, through the center of the study area.

4.4.2.2 Area of Visual Effect

The Proposed Action consists of three components: (i) RBD Pilot Project at the former Marina Village site; (ii) Flood Risk Reduction Project in the eastern part of the study area; and (ii) the Resilience Center, which would include features to educate and facilitate increased resiliency within the community and would be integrated with the study area's existing built fabric (as well as include funding toward rehabilitation of the Freeman Houses). The Area of Visual Effect (AVE) for the Resilience Center is within the AVE for the Flood Risk Reduction Project area.

RBD Pilot Project

The RBD Pilot Project area includes a portion of South Avenue west of Iranistan Avenue; Iranistan Avenue, between South and Ridge Avenues; southern portion of the two Marina Village parcels; and a portion of Johnson Street to the east of Columbia Street. There are no visual resources within the RBD Pilot Project area. The Seaside Village co-operative housing complex borders the western boundary of the RBD Pilot Project area, between South Avenue and Burnham Street and is a significant visual resource located within the Seaside Village Historic District, which is listed on the NRHP. There are no other visual resources within the proximity of the RBD Pilot Project area.

Flood Risk Reduction Project

The Flood Risk Reduction Project area would include flood risk reduction measures along properties within the eastern portion of the South End neighborhood. The Flood Risk Reduction Project area includes an area roughly bounded by the Metro-North New Haven rail viaduct to the north, PSEG property to the east, University Avenue (Seaside Park) to the south, and Main Street and Singer Avenue to the west. Visual resources within the Flood Risk Reduction Project area include Seaside Park and the Long Island Sound waterfront.

4.4.3 Environmental Consequences

4.4.3.1 No Action Alternative

RBD Pilot Project

Under the No Action Alternative, no new green space will be created within the RBD Pilot Project area, the streets will not be reconfigured or repaved with trees along the streets, and no new visual enhancements will be part of the urban landscape. It is anticipated that under the No Action Alternative, buildings in the former Marina Village site will be demolished and that existing low-lying Sycamore trees within the lot will remain following demolition of the apartment buildings. Additionally, it is anticipated that the planned redevelopment of the triangular parcel of the former Marina Village site (Phase 1), located to the north of Johnson Street and east of Columbia Avenue, will be completed as a multiuse complex known as The Windward Development. Land owned by Park City Communities in the South End was rezoned and prepared for revitalization including the demolition of the first approximately 15 buildings of Marina Village, some of which have been vacant since 2012. Under the No Action Alternative, the land within other former Marina Village parcel will also be redeveloped following removal of the existing buildings; however, stormwater management will need to be incorporated into that redevelopment plan. The key viewsheds in the RBD Pilot Project area will include some unknown new development which will be expected to improve on the existing views of dilapidated buildings and chain-link fencing. In addition, the vacant land once occupied by single-family homes, the Faith Temple Sounds of Praise Pentecostal Fellowship Ministries, and a market/delicatessen to the south of the intersection of Columbia Street and Johnson Street will be demolished by others.

Flood Risk Reduction Project

Under the No Action Alternative, the coastal flood defense structures, stormwater management facilities and green infrastructure associated with the Flood Risk Reduction Project would not be in place and vulnerable land uses within the eastern part of the study area (residences, businesses, and parkland) would continue to experience adverse effects associated with wave action, erosion, and storm events. Construction associated with the University of Bridgeport Campus Master Plan and development of the 60 Main Street site would take as place along with required dry egress and resiliency measures. Views of the waterfront along the 60 Main Street site would be impeded by the future development project but otherwise the existing built fabric within the study area would remain essentially unchanged under the No Action Alternative.

Resilience Center

Under the No Action Alternative, there will be no funding toward the rehabilitation of the Freeman Houses and no new resilience education sites integrated into the entrance to Seaside Park at University Avenue. The Freeman Houses will continue to deteriorate and the existing built fabric within the study area will remain essentially unchanged.

4.4.3.2 Proposed Action

Temporary, moderate, negative impacts to visual aesthetics would result from the construction activities associated with the Proposed Action. These impacts would be caused by the presence of construction equipment and vehicles, the regrading of surfaces, and the opening of streets for purposes of installing subsurface stormwater utilities and appurtenances. Following construction, there would be minor obstruction of views of Seaside Park as a result of elevating University Avenue as part of the coastal flood defense system. In addition, the Proposed Action would result in positive effects to urban design and visual resources from the new stormwater facility green infrastructure as part of the RBD Pilot Project, from improved aesthetics along University Avenue, an elevated view of the waterfront from the entrance of Seaside Park, and new landscaping features as part of the Flood Risk Reduction Project, and from rehabilitation of the Freeman Houses and design elements added near Seaside Park at University Avenue as part of the Resilience Center.

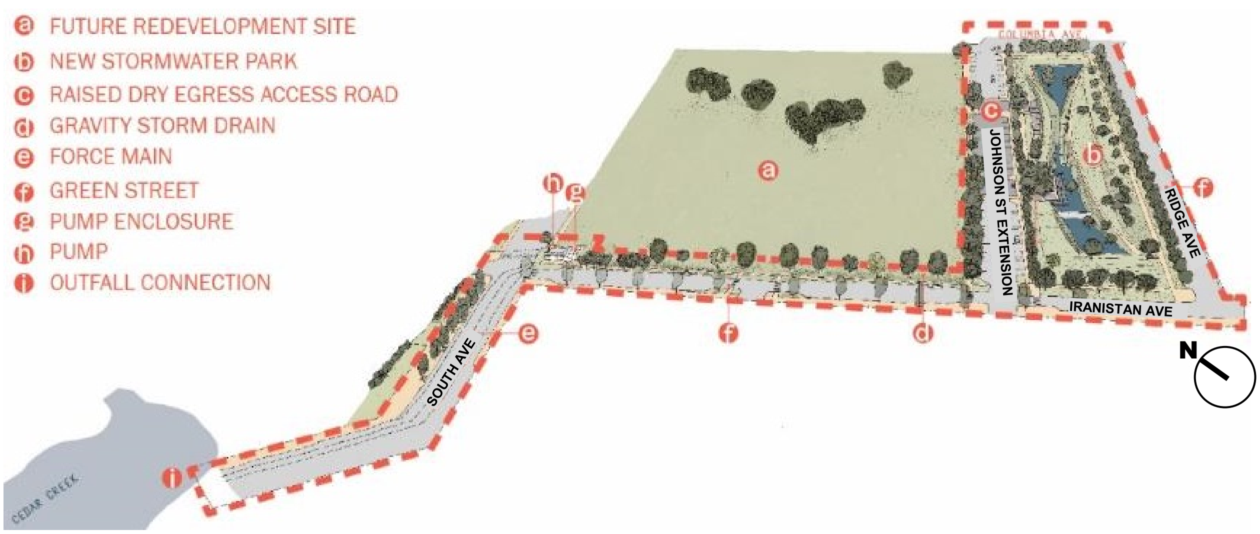
RBD Pilot Project

The RBD Pilot Project would include construction of green and gray infrastructure improvements to reduce the flood risk to the former Marina Village public housing complex located in the northwestern portion of the study area. Temporary, moderate, negative impacts to visual aesthetics would result from the construction activities associated with the RBD Pilot Project; however, construction is anticipated to occur in one phase over the period of approximately 16 months. These impacts would be caused by the presence of equipment and construction vehicles, the regrading of surfaces, and the opening of streets for purposes of installing subsurface stormwater utilities and appurtenances. Permanent, significant, positive effects to urban design and visual resources would result from implementation of the RBD Pilot Project.

Photo 11: Looking northwest at the intersection of Columbia Street and Johnson Street

As shown in Figure 4.5-1, based on the preliminary design under the RBD Pilot Project, Johnson Street would be extended from the current intersection at Columbia Street (see Photo 11), through the former Marina Village parcel located to the north of Ridge Avenue and would connect with Iranistan Avenue. The Johnson Street extension would be raised to provide dry egress during storm and flooding events. The new Johnson Street extension would be a two-lane bi-directional roadway with a crosswalk providing pedestrian access between the north and south sides of the street. These new crosswalks would separate the Johnson Street extension into thirds, with each third containing several new parking spaces on both the north and south sides of the street. Additional new parking spaces would also be located along the south side of existing Johnson Street, near the intersection with Columbia Street. The Johnson Street extension would be at a higher elevation than the proposed stormwater facility, and as such, the area within the stormwater facility would be within the view shed of the elevated street.

Figure 4.5-1. RBD Pilot Project: Preliminary Design



Source: Waggoner & Ball, 2016

The new stormwater facility would be constructed within an area bordered by the new Johnson Street extension on the north, Ridge Avenue on the south, Columbia Street on the east, and Iranistan Avenue on the west and would consist of green space, including a rain garden soft edge that would encompass all sides of the stormwater facility and would be visible from all points surrounding the stormwater facility. The stormwater facility would be publicly accessible and would be designed to incorporate passive recreational space, which may include benches and picnic areas, all of which would be visible from the surrounding areas.

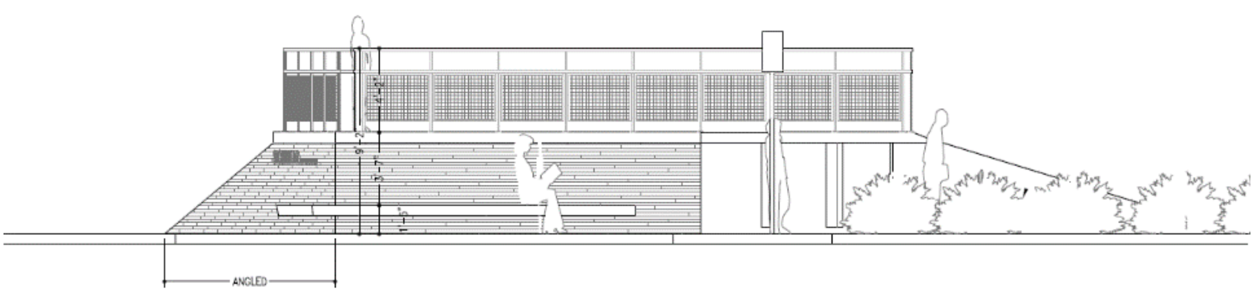
The views of visitors from within the stormwater facility would generally consist of the stormwater facility itself, and the elevated Johnson Street extension as well as the existing buildings along Iranistan, Ridge Avenue, and Columbia Street. Beyond the Johnson Street extension, the views from the east and west and impacts from cleared building within former Marina Village site would be similar as under the No Action Alternative. From within the stormwater facility, the existing single-family homes located to the south of Ridge Avenue would be visible beyond the rain garden soft edge. To the west of the stormwater facility, visitors to the stormwater facility would see the existing Seaside Village homes. The visual aesthetics of the future condition with the proposed RBD Pilot Project from within the stormwater facility would include viewsheds of the planned development on the triangular parcel located to the east of Columbia Street, which would become The Windward Development, a planned multiuse complex designed to fit within the context of the surrounding neighborhood. The complex would include multifamily housing, commercial or retain space, a park, and a recreation area. The roads would be redesigned to reconnect existing infrastructure (Crosskey Architects, 2018). In addition, the vacant land to the south of the intersection of Columbia Street and Johnson Street once occupied by single-family homes, the Faith Temple Sounds of Praise Pentecostal Fellowship Ministries, and a market/delicatessen to be demolished by others would be visible from within the eastern portion of the new stormwater facility.

As part of the RBD Pilot Project, a new pump station would be constructed at the southeastern corner of the intersection of Iranistan Avenue and South Avenue (see Photo 12). The pump station would be visible from both Iranistan Avenue and South Avenue, near the intersection.

Photo 12: Looking northeast at the proposed site for the pump station at the intersection of Iranistan Avenue and South Avenue

As shown Figure 4.5-2, the preliminary design calls for the pump station enclosure to be constructed above grade on the northwest corner of the former Marina Village site and would consist of a salvaged stone and concrete clad retaining wall, landscaped and bermed up to an accessible top enclosure platform with a metal-mesh guardrail.

Figure 4.5-2. RBD Pilot Project: Pump Station – Proposed Enclosure



Note: This visualization represents preliminary design. Final site details would be refined during final design.

A publicly accessible enclosure platform would be located at the top of the pump station enclosure (approximately 5 feet above grade), and a new concrete bench would be secured to the pump station enclosure retaining walls at the corner of Iranistan Avenue and South Avenue, for passive public use. The enclosure platform would be accessible via stone steps located on the south side of the enclosure. The enclosure platform would feature two accessibility/vision panels and the pump station enclosure facia wall on Iranistan Avenue would feature an additional two vision panels allowing visitors to view the enclosed pump station from the top and side exteriors of the enclosure. New cobble paving would be located between the pump station enclosure and the sidewalks on both Iranistan and South Avenues. The tallest structure, the new pump station at the southeast corner of Iranistan and South Avenues, has a relatively low profile and does not appear to overwhelm the neighborhood or adjacent historic resources.

As illustrated in Figure 4.5-3, the proposed stormwater facility design would not be visually intrusive. Similarly, proposed street improvements on Iranistan Avenue are not anticipated to have a negative impact on visual quality of the project area, including the historic Seaside Village. Additionally, proposed regrading of Columbia Street near the new Johnson Street extension intersection is not anticipated to affect any potentially eligible NRHP-eligible properties that might otherwise be considered a visual resource.

Figure 4.5-3. RBD Pilot Project: Existing View and Rendering of Future View from Seaside Village

This visualization represents preliminary design. Final site details would be refined during final design.

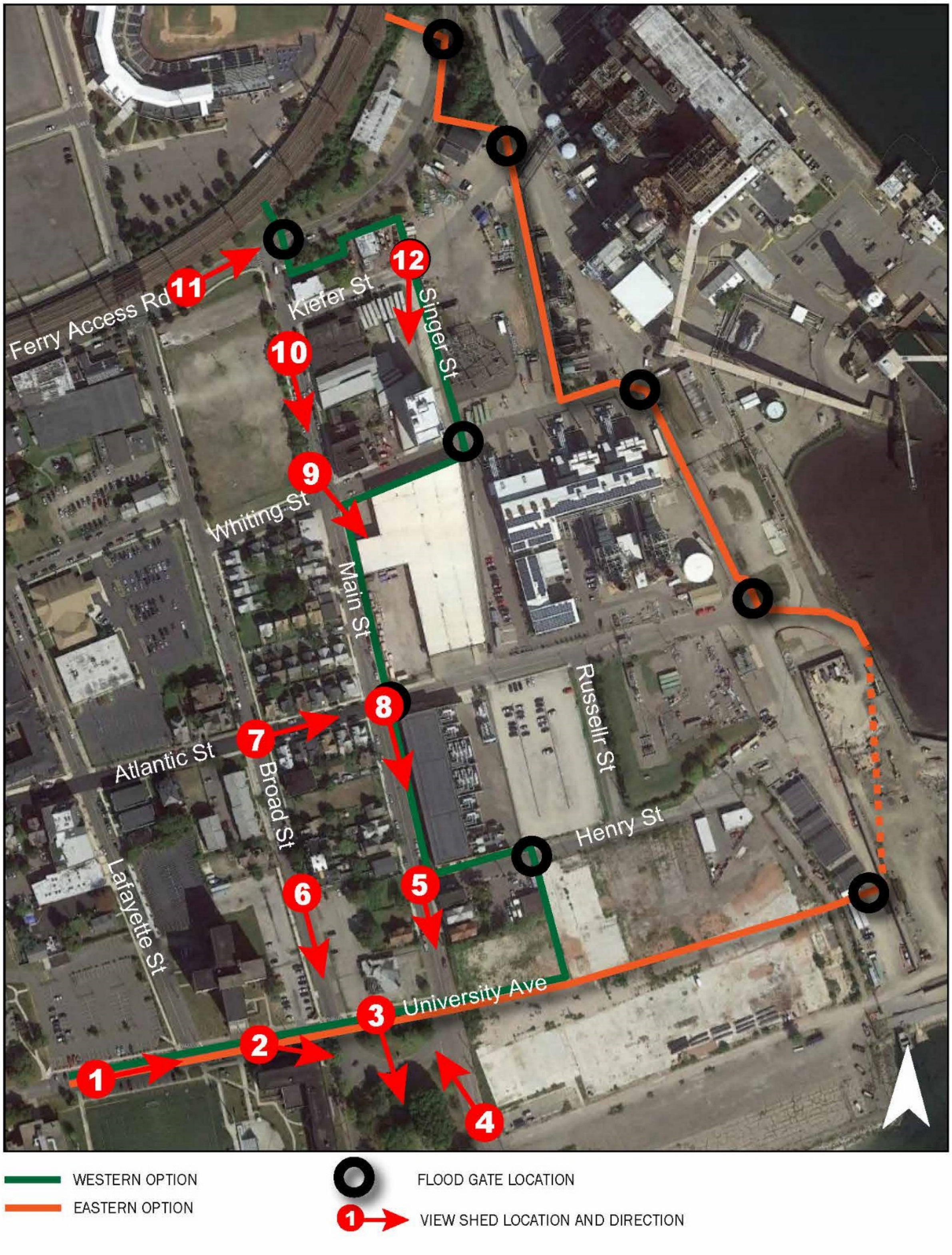
The construction of the proposed RBD Pilot Project would ultimately result in permanent, beneficial impacts to the overall view shed and Seaside Village, a significant visual resource. It is expected that visual aesthetics would improve by the replacement of dilapidated structures with green space and reconfigured and resurfaced streets and sidewalks.

Flood Risk Reduction Project

There would be temporary, moderate, negative impacts to the visual aesthetics within the project area because of construction activities related to the Flood Risk Reduction Project; however, construction is anticipated to occur over the period of approximately three years. Work would not be constant along the entire project area. These impacts would be caused by the presence of construction equipment and vehicles, the regrading and elevating of portion of University Avenue, Main Street, and Broad Street, the construction of flood walls and flood gates, and regrading of a portion of Seaside Park. Permanent, significant, positive effects to urban design and visual resources would result from implementation of the Flood Risk Reduction Project.

As shown in Figure 4.5-9, 12 key view sheds have been identified that have the potential to be affected by the proposed changes under the Flood Risk Reduction Project. In addition, the proposed design elements illustrated in the following viewsheds are representative of preliminary design. Final site details would be refined during final design.

Figure 4.5-4. Flood Risk Reduction Project: Viewshed Location Map



Source: WSP, 2018

This visualization represents preliminary design. Final site details to be refined during final design.

Viewshed 1: Looking east on University Avenue at the intersection of University Avenue and Lafayette Street

As shown in Viewshed 1, University Avenue would be elevated starting from the west of Lafayette Street and would reach an approximate height of 7-8 feet at the intersection of Lafayette Street. The proposed elevated street at this location would be pedestrian-only and would include publicly accessible landscaped areas along the elevated street, which may include benches, trees, new lighting, and water features. The proposed elevation would not obstruct existing views to the east of University Avenue and proposed enhancements would improve the overall aesthetic of the area surrounding this intersection.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 2: Looking east on University Avenue at the intersection of University Avenue and Broad Street

Viewshed 2 shows the raised intersection of University Avenue and Broad Street, looking east. Based on the proposed design, Broad Street would be elevated starting south of Atlantic Avenue to meet University Avenue at an approximate height of 11–12 feet. At this intersection, the pedestrian-only portion of University Avenue would terminate and vehicular access would be permitted from Broad Street onto University Avenue. Immediately south of this intersection (toward the right in the above illustration) is the entrance to Seaside Park. As shown in the illustration, the proposed enhancements would include an ADA-accessible ramp at the head of the park. The proposed enhancements at this location would include publicly accessible landscaped areas along the elevated street, which may include benches, trees, new lighting, and water features. The proposed elevation would not obstruct existing views to the east of University Avenue and Seaside Park to the south, and are anticipated to improve the overall aesthetic of the area surrounding this intersection, in addition to providing ADA-access to Seaside Park from the raised University Avenue.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 3: Looking south toward Seaside Park, on University Avenue between Broad Street and Main Street

As illustrated by Viewshed 3 above, a portion of the Seaside Park, south of University Avenue, between Broad and Main Streets would be regraded and the landscaped. A portion of the Soundview Drive that currently connects to University Avenue in the north would be removed and landscaped, and the remaining Soundview Drive connecting to Main Street at the southern end is proposed to be closed off to vehicles. These proposed enhancements would provide additional open space, in addition to protecting the area from future coastal storm surges. The regraded portion of Seaside Park may include new landscaping features such as benches, trees, new lighting, and water features. As illustrated, the proposed elevation of the park would not result in the obstruction of existing waterfront views to the south, and would improve the overall aesthetic of the area.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 4: Looking north on Main Street, south of University Avenue at the Seaside Park Entrance to the left

Viewshed 4 shows the raised Main Street, south of University Avenue along the eastern edge of Seaside Park. As shown Main Street and a portion of the park would be regraded to meet the approximate height of 10-11 feet at University Avenue. As illustrated, the proposed grade would not obstruct existing views to the residences to the right of Main Street farther north within the Cottage District. The walls along the park are proposed to be approximately 3 feet tall so as not to obstruct physical or visual access to the park. The proposed enhancements at this location would include new trees and lighting along the elevated street, which would improve the overall aesthetic of the area surrounding this intersection, in addition to providing dry egress from future flooding events.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 5 (Dead-End): Looking south on Main Street, between Henry Street and University Avenue

Under the Dead-End Option for the proposed Main Street intersection with the elevated University Avenue, Main Street would remain at its current elevation and dead-end at University Avenue. As shown above, the southern end of Main Street would include an ADA-accessible ramp and a staircase that would provide a pedestrian connection from Main Street to an approximately 10- to 11-foot elevation of University Avenue. Under this option, there would be no vehicular access from Main Street to University Avenue. However, existing access would be maintained to homes along Main Street, north of University Avenue. The proposed enhancements would include landscaped area along Main Street, where practicable. As illustrated by Viewshed 5 (Dead-End), existing views to the park, south of University Avenue, would be slightly obstructed by the raised portion University Avenue, however, the tree canopy within the park would still be visible.

This visualization represents preliminary design. Final site details would be refined during final design.

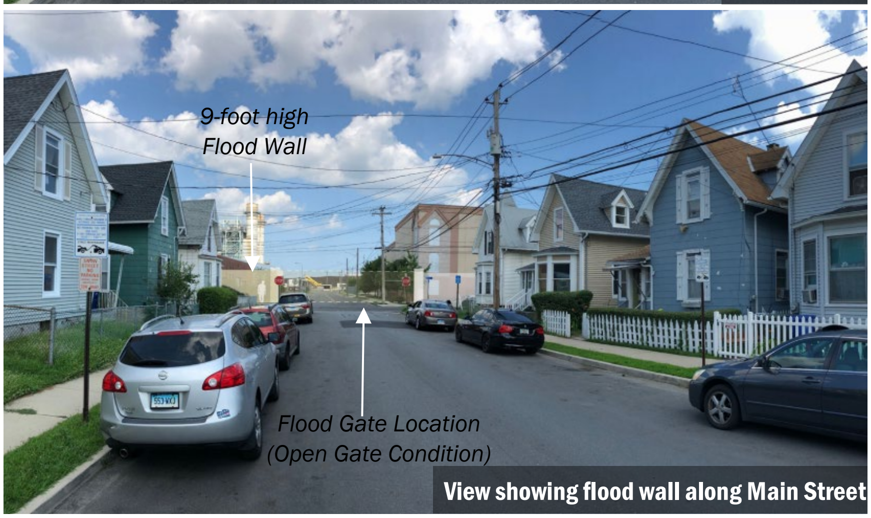
Viewshed 5 (Through Street): Looking south on Main Street, between Henry Street and University Avenue

Under the Through-Street Option, Main Street would be elevated starting at Henry Street to the north to meet the approximately 10- to 11-foot elevation of University Avenue. The proposed elevated street would include one lane for moving traffic in both directions and sidewalks on both sides. In addition, there would be direct pedestrian access to the existing homes to the east of Main Street from the proposed elevated Main Street portion. As illustrated by Viewshed 5 (Through Street), existing views to the park, south of University Avenue would be slightly obstructed by the raised portion University Avenue, however, the tree canopy within the park would still be visible.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 6: Looking south on Broad Street, between Atlantic Street and University Avenue

As shown, Broad Street would be elevated starting south of Atlantic Avenue to meet the approximately 10- to 12-foot elevation of University Avenue to the south. The proposed elevated street would include one lane for moving traffic in both directions and sidewalks on both sides. As illustrated by Viewshed 6, existing views to Seaside Park, south of University Avenue would be slightly obstructed by the raised portion Broad Street and University Avenue, however, the tree canopy within the park would still be visible. In addition, the visibility of the park would increase as a pedestrian or motorist moves south on Broad Street toward a higher elevation at University Avenue.



This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 7: Looking east on Atlantic Street, at the intersection of Atlantic Street and Broad Street

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 8: Looking south on Main Street, at the intersection of Main Street and Atlantic Street

Viewsheds 7 and 8 show the existing single-family homes along Atlantic Avenue and Main Street, respectively, within the Cottage District. Under the proposed Western Option, an approximately 9-foot flood wall is proposed along Main Street. In addition, as shown, there would be flood gate at every street intersection, which would remain open except during a flood emergency. The proposed flood wall and flood gate would be designed keeping in mind the existing context and visual aesthetic of the project area, in a manner that would allow these features to blend with the surrounding built and natural environments. Such measures may include, but would not be limited to, use of building material that would soften the visual intrusion of the proposed flood wall and flood gate; landscape features, such as green-walls; and use colors that would blend in with the surrounding structures. In addition, the existing building along Main Street to the east does not include any operable windows at the first-floor level; therefore, the proposed flood wall would not result in obstruction of views from the building. Based on this, it is anticipated that the proposed flood wall alignment would not result in adverse visual impact to the surrounding uses, and because the flood wall would be along an existing roadway, it is not anticipated to obstruct existing views to visual resources within the project area.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 9: Looking southeast at the intersection of Main Street and Whiting Street

Viewshed 9 shows an approximately 9-foot flood wall proposed along Main Street and Whiting Street, adjacent to an existing warehouse building. The existing building at this location does not have any operable windows at the first-floor level; therefore, the proposed flood wall would not result in obstruction of views from the building. In addition, as described earlier, the proposed flood wall would be designed keeping in mind the existing context and visual aesthetic of the project area, in a manner that would allow these features to blend with the surrounding built and natural environments. Based on this, it is anticipated that the proposed flood wall alignment would not result in adverse visual impact to the surrounding uses, and because the flood wall would be along an existing roadway, it is not anticipated to obstruct existing views to visual resources within the project area.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 10: Looking south at the Freeman Houses on Main Street at the intersection of Main Street and Kiefer Street

Viewshed 10 shows an approximately 9-foot-high flood wall proposed along Main Street that turns east along Whiting Street, adjacent to an existing warehouse building. As shown, the Freeman Houses to the east along Main Street, north of the intersection with Whiting Street, would not be affected by the proposed flood wall.

This visualization represents preliminary design. Final site details would be refined during final design.

Viewshed 11: Looking east on Ferry Access Road, at the intersection of Ferry Access Road and Main Street

Viewshed 11 shows the connection of the proposed, approximately 8-foot-high flood wall to the existing rail viaduct to the north along Ferry Access Road. There is a flood gate proposed at this intersection, which would remain open at all times, except during flood emergencies, and would provide continued access to the eastern portion of the study area via the Ferry Access Road. As described earlier, the proposed flood wall and flood gate would be designed—keeping in mind the existing context and visual aesthetic of the project area—in a manner that would allow these features to blend with the surrounding built and natural environments. In addition, there are no visual resources in this part of the project area; therefore, the proposed flood wall would not obstruct key views. Based on this, it is anticipated that the proposed flood wall alignment would not result in adverse visual impact to the surrounding uses, and because the flood wall would be along an existing roadway, it is not anticipated to obstruct existing views to visual resources within the project area.

Viewshed 12: Looking south on Singer Street, between Kiefer Street and Whiting Street

Viewshed 12 shows an approximately 7- to 8-foot-high flood wall proposed along Singer Street, turning west at Whiting Street farther south. The existing uses along this portion of the project area include industrial uses, with a metal-mesh fence along Singer Street; therefore, the proposed flood wall would not obstruct significant views from the adjacent structures. In addition, there are no visual resources within this portion of the project area. Based on this, it is anticipated that the proposed flood wall alignment would not result in adverse visual impact to the surrounding uses, and because the flood wall would be along an existing roadway, it is not anticipated to obstruct existing views to visual resources within the project area.

Resilience Center

The Resilience Center would include elements that would serve the South End community in its ongoing commitment to increase resiliency in the study area, by providing information to the community on coastal resiliency and assisting in future recovery efforts, and tie in to the local history. The project elements would include funding to rehabilitate the Freeman Houses to serve as a community center for the South End and to install design elements at the entrance of Seaside Park at University Avenue for community activities related to coastal resiliency. The Resilience Center project elements would be integrated with the existing built and social environment within the South End neighborhood. Rehabilitating the Freeman Houses would improve the viewshed toward that important resource. Other elements of the project such as streetscape interventions, pedestrian amenities, and information kiosks would be located within the public right-of-way; therefore, the proposed elements would enhance the visual and aesthetic quality of the neighborhood and are not anticipated to result in adverse visual impacts.

4.5 CULTURAL RESOURCES

The discussion of cultural resources is divided into two sections – Historic /Architectural Resources and Archaeological Resources. Appendix C, Historic and Archaeological Resources Evaluation Report, presents the detailed results of documentary research, field inspection and evaluation of historic properties that may be affected by the Proposed Action.

4.5.1 Regulatory Context

Because it receives federal funding, the Proposed Action is required to comply with NEPA and Section 106 of the National Historic Preservation Act of 1966, as amended (including 24 CFR 58.5(a). These federal laws and their implementing regulations require consultation with the Connecticut State Historic Preservation Office (CTSHPO) and Tribal Historic Preservation Officers (THPO) regarding possible project-related effects to historic and archaeological resources listed in or eligible for listing in the National Register of Historic Places (NRHP). Historic properties are defined as above-ground resources such as buildings, structures, objects, districts, and landscapes, and archaeological (below-ground) sites that meet the criteria for listing in the NRHP.

CEPA states that actions undertaken by state agencies must be evaluated in regard to their impacts on historic, sacred, and archaeological sites of state or national importance. The State Register of Historic Places (SRHP) is Connecticut's list of historic properties deemed worthy of preservation by the CTSHPO.

4.5.2 Historic/Architectural Resources

4.5.2.1 Methodology

To establish an overall historical context and identify historic (i.e., above-ground) resources, general published histories of Bridgeport as well as standard works on New England railroad history were consulted. Additional research was undertaken to establish the historical contexts for evaluating resources in the project vicinity, including materials in the CTSHPO inventory files, the records and photograph collections of the Bridgeport History Center at the Bridgeport Public Library, and the Connecticut Historical Society's digital collection.

Previous historic resource survey information in the Connecticut Historic Preservation Collection and railroad company records at the Dodd Research Center, University of Connecticut, Storrs, were also consulted, including the intensive-level surveys of historic resources and industrial historic resources in Bridgeport.

A series of historical maps and images of the project area was assembled (see Appendix C) and existing NRHP forms for individual properties and districts were reviewed. Representatives from the Fairfield Garden Club were consulted regarding their research on Seaside Park, and the March 14, 2018, scoping meeting was attended to speak with other parties with interest in historic properties.

4.5.2.2 Affected Environment

Many historic resources within or adjacent to the area of potential effects (APE) are listed in the NRHP and the SRHP.[4] Other resources identified by the project historians were evaluated for their potential eligibility for listing in the NRHP by applying the National Register criteria of significance.

The APE has a rich, complex history and retains many historical-period resources (defined as at least 50 years old). (Refer to Appendix C for the South End's history and review of these resources.) The South End includes the following:

- One known pre-Revolutionary War-period house
- Two extant mid-19th-century houses and a church from Little Liberia, a settlement of free people of color
- A variety of working-class, middle-class, and high-style housing from the mid-19th through the mid-20th centuries
- Churches, schools, and small mixed-use and commercial buildings
- A waterfront park and two lighthouses
- A railroad viaduct with bridges and catenary structures
- Factories and warehouse buildings
- 20th-century university buildings
- A major power-generating complex

Within the APE, most properties are over 50 years of age (with few exceptions, the minimum age to qualify for NRHP eligibility). There are dozens of houses, churches, former factories, and commercial buildings dating primarily from the mid-19th to the early 20th centuries. The consultant noted NRHP-listed historic properties and districts, as well as potentially eligible historic resources that may be affected, directly or indirectly, by the proposed project. A review of their historic status is included in Appendix C, along with recommendations regarding NRHP eligibility. Table 1 in Appendix C provides the status of historic resources relative to NRHP and SRHP criteria. All NRHP-listed resources are automatically in the SRHP.

The historic resources most likely to be affected by the Proposed Action include the following:

- NRHP-listed:
  - Seaside Park
  - The Freeman Houses
  - The William D. Bishop Cottage Development Historic District
- Potentially NRHP-eligible:
  - Bridgeport Storage Warehouse Company
  - New York, New Haven & Hartford Railroad
  - University of Bridgeport's Carstensen Hall.

[4] The area of potential effects is delineated in Appendix C as roughly bounded by Railroad and South Avenues to the north, Bridgeport Harbor and Long Island Sound to the east and south, and Iranistan Avenue, Atlantic Street, and the west side of Seaside Village to the west.

Seaside Park is roughly bounded by Waldemere and Iranistan avenues and Atlantic Street, including the peninsula formed by Cedar Creek and Fayerweather Island (except the peninsula's landfill) (Appendix C, Images 4 to 6; Photographs 34 to 42). The entire park is listed as an individual property in the NRHP. The eastern section was designed by Frederick Law Olmsted and Calvert Vaux. In the NRHP registration form, the park meets Criterion B[5] for its association with P. T. Barnum, who was involved with the park until his death in 1891, purchasing additional land and donating it to the city for use as parkland. It also meets Criterion C[6] as a significant 19th-century civil engineering project. Some alterations (e.g., sports fields and parking areas) have been made to the park's original Olmsted and Vaux design that affect its historical integrity. According to members of the Fairfield Garden Club who have studied early plans of the park, the most intact portions of the Olmsted and Vaux section are the park entrance at Broad and Main Streets and the long tree allées[7] south of the entrance, along with remnants of the long green and carriage concourse, and a section of woods north of the Civil War monument. Other alterations and additions (e.g., monuments, some drives and paths, park buildings, and specimen trees) made through the early 20th century have acquired their own historical significance.

The Freeman Houses at 352-54 and 358-60 Main Street, north of Whiting Street, were built for Mary and Eliza Freeman in 1848 (Appendix C, Photograph 2). They are the last remaining dwellings of Little Liberia and together are individually listed in the NRHP under Criterion A[8]. They are also included on the Connecticut Freedom Trail.

The William D. Bishop Cottage Development Historic District is roughly bounded by Broad, Whiting, Main, and Henry Streets (Appendix C, Photographs 3 to 5). It includes approximately 35 wood-frame worker cottages (built 1880-1881) that are attributed to local architects George and Charles Palliser, pioneers of mail-order architecture in America. It also includes several adjacent late 19th-century buildings. The district is listed in the NRHP under Criteria B and C.

Several buildings on the block bounded by Main, Whiting, and Kiefer Streets and Singer Avenue were owned by the Bridgeport Storage Warehouse Company (Appendix C, Photographs 19 to 22). The warehouses at 376 Main Street were connected to the nine-story warehouse (1917) at 10 Whiting Street and shared a railroad siding, comprising a single operation at least as early as 1939 (Appendix C, Map 17). The surviving buildings are on the parcel listed at 376 Main Street, and Singer Avenue retains remnants of stone paving and tracks from the company's siding. The property was recommended for individual NRHP listing in the 1984 survey of Bridgeport industrial sites; it is recommended that the property be considered NRHP-eligible under Criteria A and C.

The former New York, New Haven and Hartford Railroad line within the APE represents a potential historic linear district that would include railroad viaduct retaining walls, catenary structures, and bridges at Park and Myrtle Avenues and Warren, Lafayette, and Broad Streets, as well as the under-grade railroad bridge (known as Bridge 43.21) on the east side of Webster Bank Arena at 600 Main Street (Appendix C, Photographs 18 and 59 to 65). It is recommended that the railroad be considered a NRHP-eligible linear historic district under Criteria A and C; CTSHPO has found similar railroad sections in Stamford and Norwalk to be NRHP-eligible.

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5 Criterion B is for properties that are historically associated with significant persons.
6 Criterion C is for properties that represent a significant designer or style, period, or construction method.
7 A walk or path between two rows of formally planted trees or shrubs that are at least twice as high as the width of the walk or path
8 Criterion A is for properties that are associated with broad patterns in American history.

Carstensen Hall at 174 University Avenue was historically known as the G. C. Edwards House (Appendix C, Photograph 10). Built ca. 1900, this fine Colonial Revival house retains its original windows and many fine details, despite the vinyl siding. It is owned by the University of Bridgeport and serves as office space; inside, the hall and stairway retain much historical integrity. It is recommended that the property be considered NRHP-eligible as an individual property under Criteria A and C.

4.5.2.3 Environmental Consequences

No Action Alternative

The No Action Alternative will have no immediate effect on historic architectural resources within the APE. However, this coastal area has a history of stormwater flooding. As described in the report prepared by CTSHPO, *Prepare, Withstand, Recover, Adapt: Historic Resource Resiliency Planning in Connecticut During Climate Change* (November 2018), hazards associated with coastal storms and the contribution of climate change to the progressive and increased severity of those hazards, as well as sea level rise; pose a significant threat to historic resources, particularly in the coastal communities of Connecticut. Sea level rise has the potential to directly threaten almost 9 percent of the state's historic properties based on Connecticut's 2016 data for National Register listings. Additional climate-change-related risks to historic resources include increased precipitation (water penetration), temperature change (thermal expansion of materials that can stress building systems), sea level rise (potential for flooding and introduction of salts to building materials), and additional ultraviolet light (destructive agent to organic materials). Given the probability of sea rise and repeated coastal flooding events, it is highly likely that the No Action Alternative will have a long-term adverse effect through increased flooding, resulting in water damage. Without investment in the Freeman Houses as part of the proposed Resilience Center, these buildings would continue to deteriorate. Additionally, without the coastal flood defense system, altering the Freeman Houses to protect them from flooding would be extremely difficult, if not impossible, while maintaining their historic integrity.

Proposed Action

RBD Pilot Project

The RBD Pilot Project's stormwater facility and Johnson Street extension would be designed to enable the redevelopment of the former Marina Village site by reducing its flood risks in acute and chronic flooding events. The site is bounded by Park Avenue on the east, Iranistan Avenue on the west, Ridge Avenue on the south, and South Avenue along the northern edge.

The former Marina Village site is a World War II housing development built in 1941 by the U.S. Housing Authority (Appendix C, Photograph 29). In the context of the proposed redevelopment of the site, the former Marina Village complex itself was determined ineligible for the NRHP by CTSHPO.

Adjacent to the proposed RBD Pilot site are the NRHP-listed Seaside Village to the west and the New York, New Haven & Hartford Railroad viaduct to the north, which is potentially NRHP-eligible as a linear historic district. When Seaside Village was completed in 1920, the Marina Village site between South and Ridge Avenues was an undeveloped block between Iranistan Avenue and Walnut Street (not extant). East of Walnut Street, houses lined the north side of Ridge Avenue. Behind the houses was the sprawling Bridgeport Malleable Iron Company. Its foundry buildings extended north across South Avenue, forming part of the industrial context of the New York, New Haven & Hartford Railroad in the South End. By 1939, the Bridgeport Malleable Iron Company had been demolished and the Ridge Street houses were gone shortly thereafter. When Marina Village was completed in 1941, the historic context in this area for the railroad and on Seaside Village's east side had vanished. As designed, the RBD Pilot Project would not appear to have an adverse effect on Seaside Village's setting.

The 30 percent drawing set for the RBD Pilot Project depict a design that is not visually intrusive (see Chapter 1, "Introduction", Figure 1-5). The tallest structure, the proposed pump station at the southeast corner of Iranistan and South Avenues, would have a relatively low profile and does not appear to overwhelm the neighborhood or adjacent historic resources. Similarly, proposed street improvements on Iranistan Avenue do not appear to pose a negative impact.

The 30 percent design drawings indicate that the houses at 109-111 and 119-123 Johnson Street would be removed (119-123 has already been demolished). Built in 1887, 109-111 Johnson Street has been altered with incompatible additions and does not appear to be NRHP-eligible. Other properties on Johnson Street would keep existing pedestrian and vehicular access points, and their sites would be re-graded as needed to have positive draining; no properties on Johnson Street appear to be NRHP-eligible. Proposed re-grading of Columbia Street near the proposed Johnson Street extension intersection would not appear to affect any potentially eligible NRHP-eligible properties. See Table 4.4-1 for a summary of potential effects.

Flood Risk Reduction Project

The Flood Risk Reduction Project includes several elements (see Chapter 1, "Introduction", Figure 1-6):

- **Elevation of University Avenue.** The elevated University Avenue segment would involve raised infrastructure to form a line of protection, which would connect to a current high point east of Park Avenue, and terminate at the vacant 60 Main Street site, providing dry egress for its future development (see Viewsheds 1 and 2). The elevation of University Avenue is not expected to have an adverse effect on historic resources. The potentially NRHP-eligible Carstensen Hall at 174 University Avenue is located near the west end of the elevated street, but it has already lost its historic setting, as new University of Bridgeport buildings gradually replaced neighborhood houses in the second half of the 20th century.
- **Elevation of Seaside Park's entrance between Broad and Main Streets.** The entrance to Seaside Park would be redesigned to accommodate the increased elevation, providing views of Long Island Sound and new pedestrian amenities (see Viewsheds 3 and 4). The south ends of Broad Street and Main Street would be elevated (see Viewsheds 5 and 6). This segment would have an adverse effect on the historic entrance of the park.
- **Sheet-piling through the 60 Main Street redevelopment site** (see Chapter 1, "Introduction", Figure 1-6 for location). No adverse effects on historic architectural resources are anticipated.

Table 4.4-1. RBD Pilot Project: Potential Effects on Historic/Architectural Resources

PROPERTY NAME	NR LISTED (INDIV.)	NR LISTED (DISTRICT)	NR POT. ELIG. (INDIV.)	NR POT. ELIG. (DISTRICT)	SR LISTED ONLY	LHD	POTENTIAL EFFECTS
Seaside Park	X						No adverse effect
Tongue Point Lighthouse	X						
Freeman Houses	X						
Seaside Institute	X						
Park Apartments	X						
William D. Bishop Cottages Development Historic District		X					
Barnum/Palliser Historic District		X				X	
Marina Park Historic District		X				X	
Seaside Village Historic District		X					
Walters Memorial AME Zion Church			X		X		
Bridgeport Storage Warehouse Company			X				
Crown Corset & Crown Paper Box Company Factories			X				
D. M. Read Company Warehouse			X				
Carstensen Hall			X				
Ingleside Hall			X				
Waldemere Hall			X				
Wisteria Hall			X				
247 Atlantic Street			X				
337-341 Broad Street			X				
Seagrove Cottage			X				
Housing on Park Avenue & Atlantic & Gregory Streets (24 houses)				X			
Myrtle Avenue Housing (7 houses)				X			
New York, New Haven & Hartford Railroad				X			
Bassick Company Factory				X			
Warner Brothers Company Factory				X			

NR = National Register; SR = State Register; LHD = Local Historic District

- **North-to-south coastal flood defense system that would run from University Avenue to the railroad viaduct on the north side of Ferry Access Road.** This alignment has several options. The Western Option would run along the east side Main Street for two blocks, as well as other public streets. The Eastern Option would run through the PSEG power plant property. A third possibility is an alignment located somewhere in between the Western and Eastern Options.
  - **Western Option:** This alignment would run along the east side of Main Street (see Viewsheds 7 to 10), the south side of Whiting Street, the east side of Singer Street (see Viewshed 12), and tie into the railroad viaduct on the north side of Ferry Access Road (see Viewshed 11). This alignment would not have a direct adverse effect on the William D. Bishop Cottage Development Historic District. Its historic context on Main Street is already gone; the cottages face large power company buildings between Whiting and Atlantic Streets (see Viewsheds 8 and 9). Similarly, the historic setting of the Freeman Houses is gone, and the alignment would be far enough away from the houses to have little effect on their setting. A greater potential adverse effect on the Freeman Houses is damage from vibration (from excavation and construction) since both buildings are extremely fragile. The proposed alignment would run along Singer Street adjacent to the nine-story Bridgeport Storage Warehouse Company, where remnants of Singer Street's stone paving and tracks from the company's railroad siding contribute to the historic setting of the warehouse. The Flood Risk Reduction Project's effects on Singer Street's paving are unknown but would not likely rise to the level of an adverse effect on the warehouse's setting. The north end of the alignment would tie into the railroad viaduct (see Viewshed 11). The Western Option would likely tie into a modern section, where the railroad bridge over Main Street has already been removed and infilled with modern masonry (Table 4.5-2). The effect of the alignment's tie-in to the viaduct does not appear to rise to the level of an adverse effect.
  - **Eastern Option:** No adverse effects on above-ground historic resources are anticipated. This alignment would not affect the under-grade railroad Bridge 43.21 (Table 4.5-3). The effect of the alignment's tie-in to the viaduct does not appear to rise to the level of an adverse effect.

  Similarly, alignments that fall between the Western and Eastern Options are not expected to have adverse effects on above-ground resources.

Resilience Center

The Resilience Center is in the very early stages of conceptualization, with no design drawings available. At this point, the concept involves financial contributions to the restoration and rehabilitation of the Freeman Houses at 352-54 and 358-60 Main Street and utilizing a portion of their space. The Resilience Center is also likely to involve some minor public infrastructure to provide resilience education and history in the South End neighborhood.

The Freeman Houses are the last remaining dwellings of Little Liberia and together are individually listed in the NRHP under Criterion A. They are also included on the Connecticut Freedom Trail. In June 2018, the houses received national recognition of their historical significance from the National Trust for Historic Preservation, which designated them one of "America's Most Endangered Historic Places." The effects of the proposed adaptive re-use of a portion of one or both buildings cannot be determined at this preliminary stage.

Table 4.5-2. Flood Risk Reduction Project (Western Option) – Potential Effects on Historic/Architectural Resources

PROPERTY NAME	NR LISTED (INDIV.)	NR LISTED (DISTRICT)	NR POT. ELIG. (INDIV.)	NR POT. ELIG. (DISTRICT)	SR LISTED ONLY	LHD	POTENTIAL EFFECTS
Seaside Park	X						Direct effect
Tongue Point Lighthouse	X						No adverse effect
Freeman Houses	X						Possible Direct (vibration)
Seaside Institute	X						No adverse effect
Park Apartments	X						
William D. Bishop Cottages Development Historic District		X					
Barnum/Palliser Historic District		X				X	
Marina Park Historic District		X				X	
Seaside Village Historic District		X					
Walters Memorial AME Zion Church			X		X		
Bridgeport Storage Warehouse Company			X				
Crown Corset & Crown Paper Box Company Factories			X				
D. M. Read Company Warehouse			X				
Carstensen Hall			X				
Ingleside Hall			X				
Waldemere Hall			X				
Wisteria Hall			X				
247 Atlantic Street			X				
337-341 Broad Street			X				
Seagrove Cottage			X				
Housing on Park Avenue & Atlantic & Gregory Streets (24 houses)				X			
Myrtle Avenue Housing (7 houses)				X			
New York, New Haven & Hartford Railroad				X			
Bassick Company Factory				X			
Warner Brothers Company Factory				X			

NR = National Register; SR = State Register; LHD = Local Historic District

Table 4.5-3. Flood Risk Reduction Project (Eastern Option) – Potential Effects on Historic/Architectural Resources

PROPERTY NAME	NR LISTED (INDIV.)	NR LISTED (DISTRICT)	NR POT. ELIG. (INDIV.)	NR POT. ELIG. (DISTRICT)	SR LISTED ONLY	LHD	POTENTIAL EFFECTS
Seaside Park	X						Direct effect
Tongue Point Lighthouse	X						No adverse effect
Freeman Houses	X						No adverse effect
Seaside Institute	X						No adverse effect
Park Apartments	X						No adverse effect
William D. Bishop Cottages Development Historic District		X					No adverse effect
Barnum/Palliser Historic District		X				X	No adverse effect
Marina Park Historic District		X				X	No adverse effect
Seaside Village Historic District		X					No adverse effect
Walters Memorial AME Zion Church			X		X		No adverse effect
Bridgeport Storage Warehouse Company			X				No adverse effect
Crown Corset & Crown Paper Box Company Factories			X				No adverse effect
D. M. Read Company Warehouse			X				No adverse effect
Carstensen Hall			X				No adverse effect
Ingleside Hall			X				No adverse effect
Waldemere Hall			X				No adverse effect
Wisteria Hall			X				No adverse effect
247 Atlantic Street			X				No adverse effect
337-341 Broad Street			X				No adverse effect
Seagrove Cottage			X				No adverse effect
Housing on Park Avenue & Atlantic & Gregory Streets (24 houses)				X			No adverse effect
Myrtle Avenue Housing (7 houses)				X			No adverse effect
New York, New Haven & Hartford Railroad				X			No adverse effect
Bassick Company Factory				X			No adverse effect
Warner Brothers Company Factory				X			No adverse effect

NR = National Register; SR = State Register; LHD = Local Historic District

4.5.3 Archaeological Resources

4.5.3.1 *Methodology*

Files of recorded archaeological sites were researched at the Office of State Archaeology and CTSHPO. Relevant cultural resource management reports and archaeological publications were reviewed to help develop a pre-colonial Native American and historical-period context in preparation of assessing the potential for significant buried archaeological sites to be present in the APE. Environmental sources on hydrology, geology, and soils were reviewed to establish an understanding of the natural environment that existed prior to urbanization and to also help understand the level of disturbance in the APE.

Historical maps, local histories, and primary documents were researched to establish a historical-period context and aid in identifying archaeologically sensitive areas in the APE parcels. Aerial photographs and a windshield survey helped refine the assessment of archaeological sensitivity.[9] Geotechnical boring data provided by project engineers was also incorporated into this assessment.

4.5.3.2 *Affected Environment*

The APE is located on the Connecticut coast, near the mouth of the Pequonnock River, which was historically a rich outwash plain of this river. It is situated to the west of Black Rock Harbor, a natural harbor at the mouth of Cedar Creek. The APE would have provided rich soils amenable to Late Woodland Period agriculture and later European farmers, although today the soils in the APE are primarily represented by Urban Land, Udorthents or Udorthent-Urban Land complex soils. These soils are found on excavated and filled lands, generally in areas where the original soil has been covered with impervious surfaces like asphalt or concrete. Urban land soils can also refer to areas where the natural soils have been cut away or covered with fill deposits. In areas with these designations, natural soil sequences may sometimes be found in vacant lots, lawns, wooded areas, parks, and other undeveloped areas interspersed between roads and buildings, and some are capped by roads, sidewalks, etc. Therefore, the Urban Land or Udorthent complex designation does not necessarily indicate pervasive disturbance. The potential for intact archaeological resources remains in undeveloped areas and beneath developed areas.

Historically, the APE contained an abundance of hard and soft woods such as oak, chestnut, hickory, maple, hemlock, and elm. The surrounding forests contained plentiful game animals and coastal areas and associated wetlands provided a profusion of important plant and terrestrial and marine animal resources. Numerous pre-colonial Native American camp, village, and shell-midden sites have been identified in the vicinity of the APE, illustrating the importance of the local environment to the past human inhabitants of coastal Connecticut.

The files of previously documented archaeological sites were reviewed in the site files of the Office of State Archaeology and CTSHPO. Several archaeological assessment surveys have been conducted within or near the APE—one previously recorded pre-colonial archaeological site is located within the APE and another eight pre-colonial sites are recorded within one mile of the APE. (Appendix C includes a review and discussion of those sites.) Sites reported in the general vicinity of the APE are clustered along the shore and on either side of waterways, which would have provided an ideal place for Native American subsistence and settlement, adjacent to abundant fish, shellfish, and coastal resources, and freshwater rivers. The sites include numerous large shell

[9] No subsurface testing in the form of hand-powered soil cores or shovel-test pits was conducted in the APE as part of the assessment survey since access issues, time constraints, buried utilities, and the preponderance of paved areas within the APE made testing impractical.

heaps and burial grounds, the majority of which are dated to the Late Woodland period. In fact, an early, Revolutionary War-era map of the APE identifies the modern Bridgeport Harbor as "Indian Harbor". However, due to the massive disturbances from urban development and early excavation dates, none of these archaeological sites are thought to be preserved or eligible for listing in the NRHP.

One previously identified historical-period archaeological site has been recorded within the APE, and five historical archaeological sites have been reported within one mile of the APE. Site 15-22—the Freeman Houses properties at 352-54 and 358-60 Main Street—are within the APE and listed on the NRHP under Criterion A. Constructed in the 1848, these houses represent the oldest houses constructed by African-Americans in Connecticut, and the last remaining houses of Little Liberia, a community of free African American and Native peoples that was centered around maritime activities. In 2008, then State Archaeologist Nicholas Bellantoni and Natural Resource Conservation Service Soil Scientist Deborah Surabian performed electromagnetic induction survey of the front yard portions of the houses, identifying several possible buried features, and concluding that a ground-penetrating radar survey should be performed to further delineate features (Surabian 2008). A remnant stone-paved street is exposed on Singer Avenue, located one block behind the Freeman Houses, underscoring the sensitivity of this area relative to preserved fragments of Little Liberia, and possibly earlier, intact soil sequences below the stone-paved street (Figures 4.2-29 and 4.2-30); Appendix C, Photograph 22).

4.5.3.3 Environmental Consequences

Two previously identified archaeological sites are located within the APE, but this low number is likely artificial and representative of the lack of archaeological survey and reporting, and pervasive disturbances associated with the industrial and urban development of this area over the 19th and 20th centuries. However, the presence of burials within the APE, and the documentation of numerous burials adjacent to the APE (Orcutt 1886), indicates that the entire APE is likely sensitive for Late Woodland and Contact period archaeological sites, including burial and village remnants. Urbanization should not be assumed to have unilaterally destroyed archaeological sites; rather, it is entirely possible that sites are buried deeply under fill or that there are lots on which buildings were never constructed. As per Connecticut General Statutes, Sections 10-388 and 19a-295-319 (statutes that apply to human burials), the integrity of subsurface deposits with human remains is not necessary for state protection; human remains or associated materials found in disturbed contexts are protected under these statutes. The stone-paved street preserved on Singer Avenue, paired with the standing Freeman Houses, indicates that intact portions of Little Liberia could be found within the APE. Overall, the APE is very sensitive for archaeological resources, although the integrity of these may have been compromised by later historical period urban and industrial development. Only Phase IB testing in the form of ground-penetrating radar, Geoprobe borings, shovel-test pits, and/or machine testing can ascertain whether sites are present in the APE.

No Action Alternative

The No Action Alternative will have no immediate effect on archaeological resources within the APE. However, given the prevalence for repeated flooding events, it is possible that the No Action Alternative could have a cumulative adverse effect on archaeological resources through increased flooding, coastal erosion, storm surge, and higher water-table levels (CTSHPO, 2018).

Proposed Action

RBD Pilot Project

The 30 percent drawings for the RBD Pilot Project depict ground disturbance associated with the project. The APE of this project area is characterized by pervasive disturbance from industrial and urban development. In such settings, intact archaeological resources are rarely encountered at the current ground surface, although they could be preserved underneath industrial and urban fill deposits. Previous geotechnical borings in the project area indicate a complicated pattern of historic fill deposits, most likely associated with the industrial development of the project area, but possibly related to earlier historical-period occupations (Freeman Companies, LLC 2016). Intact soils could be preserved beneath fill deposits; layers of brown, tan, and beige silt and sand soils are intercalated (bedded intermittently), possibly indicating alluvial or glacial deposition (Freeman Companies, LLC 2016).

The general project vicinity of the RBD Pilot Project APE was clearly an important area for pre-colonial peoples, particularly during the Late Woodland period; Contact-era Native Americans (the Pequonnocks) also lived here. Several Native American burial grounds have been found adjacent to the APE, and the nearby presence of the Freeman Houses is a testament to the importance of the APE to people of color during the 19th century. Any ground disturbance could affect intact archaeological resources and human remains. Once design has been refined, and in advance of construction activities, additional National Historic Preservation Act Section 106 review should include investigation of soil sequences within the project area by a system of geotechnical investigations (e.g., geoprobes, augers) to further explore the complicated soil sequences in this area. Ground disturbances should also be monitored by an archaeologist to limit any possible impacts to human remains that could be buried within the APE.

Flood Risk Reduction Project

The Flood Risk Reduction Project APE is characterized by pervasive disturbance from urban and industrial development, as with the RBD Pilot Project area. Again, although archaeological resources are rarely preserved at the ground surface, they could be preserved underneath fill soils. This APE is also clearly an important area for Native Americans, particularly during the Late Woodland and Contact periods. Native American burial grounds are (or were in the 19th century) preserved within the project APE and in the vicinity, indicating high potential to encounter burying grounds during development. The presence of the Freeman Houses and the stone-paved street within this APE indicates that other archaeological deposits related to Little Liberia may also be preserved within the project APE. The Flood Risk Reduction Project includes several complementary elements:

- **Elevation of University Avenue.** The elevation of University Avenue would involve ground disturbances as well as significant compaction from filling. Two geotechnical borings have been sampled in this area, indicating a complicated pattern of historical fill, and possibly alluvial or intact soil sequences preserved beneath the historical fill layers (WSP 2018). As with the RBD Pilot Project, because of the archaeological sensitivity of the project area, a system of geotechnical investigations should be undertaken in advance of construction activities. Any ground disturbance should also be monitored by an archaeologist, due to the high potential for intact or disturbed human remains within the project area.
- **Elevation of Seaside Park's entrance between Broad and Main Streets.** The entrance to Seaside Park would be redesigned and the south ends of Broad Street and Main Street would be elevated. Ground disturbances would be associated with this development as well, and one geotechnical boring has been

completed at the entrance to Seaside Park (WSP 2018). The project area for this development has the highest probability to affect areas where intact soils are preserved at the surface, or at relatively shallow depths beneath the current ground surface, particularly at the entrance to Seaside Park. Due to the high archaeological potential of the area, any ground disturbance should be preceded by an archaeological survey, to include either a system of geotechnical investigations or traditional shovel testing. Moreover, because of the unique preservation of open spaces associated with Seaside Park, efforts should be made to identify any human burials within the project area, preferably with a ground-penetrating radar survey. Any construction in the project area should be monitored by an archaeologist due to the high potential for intact or disturbed human remains to be preserved in the APE.

- **Sheet-piling through the 60 Main Street redevelopment site**. This area was not included in the previous geotechnical survey (WSP 2018). Due to the high potential for archaeological resources in the project area, this area should be subjected to a geotechnical survey to explore soil integrity. Any construction in the project area should be monitored by an archaeologist due to the high potential to encounter intact or disturbed human remains.
- **North-to-south coastal flood defense system that would run from University Avenue to the railroad viaduct on the north side of Ferry Access Road.** This alignment has several options.
  - **Western Option:** This alignment would run along the east side of Main Street, the south side of Whiting Street, the east side of Singer Street, joining the railroad viaduct on the north side of Ferry Access Road. This alignment would also involve significant ground disturbances in the project area. Due to the proximity to the Freeman Houses, and the preservation of the stone pavement on Singer Street, this alignment could affect significant historic resources. Furthermore, a geotechnical boring was sampled near the Freeman Houses, at the intersection of Main and Whiting Streets; the logs from this boring indicate historical-period (likely industrial, but possibly earlier) fill sediments preserved near the ground surface (WSP 2018). Based on the proximity to the Freeman Houses, preservation of the stone pavement, and the boring log, there is a high potential for intact deposits associated with Little Liberia to be preserved within this alignment. Any construction should be preceded by a systematic geotechnical investigation, such as a geoprobe survey. If the stone pavement on Singer Street must be destroyed or removed for the project, an archaeological shovel-test pit survey should be carried out, once the stone pavement has been removed. Due to the high potential for intact human remains within the greater project area, any ground disturbance should be monitored by an archaeologist.
  - **Eastern Option:** This proposed alignment would run through an area of made land, which was filled in by the construction of the railroad yard and for the power plant facilities. Although this alignment would also involve significant ground disturbances, it is highly unlikely that this alignment would affect any archaeological resources; remnant rail line features may be preserved within the alignment area, but it is unlikely that these are eligible for listing in the NRHP.

  Alignments that fall between the Western and Eastern Options should be assessed separately for archaeological effects. If they are deemed to have a potential effect, geotechnical investigations or shovel-test pitting may be necessary.

Resilience Center

The Resilience Center is in the very early stages of conceptualization, with no design drawings available. At this point, the concept involves contributing to the restoration and rehabilitation of the Freeman Houses and utilizing a portion of their space. The Resilience Center is also likely to involve some minor public infrastructure to provide resilience education and history in the South End neighborhood. Any construction in or near the Freeman Houses should be preceded by a ground-penetrating radar survey, as recommended (Surabian 2008), and a Phase IB archaeological survey, to assess the historical deposits that are preserved at the Freeman Houses. These archaeological deposits, unless pervasively disturbed, represent critical information that could yield important contributions to the history of the Freeman Houses and Little Liberia, which represent a unique architectural and archaeological resource in Connecticut and the greater United States. Any other ground disturbances associated with this project should be reviewed to assess their potential impact to archaeological resources.

4.5.4 Mitigation Measures

Adverse effects to above-ground resources would be mitigated through measures agreed upon during ongoing agency and stakeholder consultation. Stakeholder groups involved in consultation include: the Mary and Eliza Freeman Center for History and Community, the Barnum Museum, Fairfield Garden Club (for Seaside Park), and University of Bridgeport, as well as the THPO of the Delaware Tribe of Indians, Delaware Nation of Oklahoma, Mashantucket Pequot Tribal Nation, the Mohegan Tribal Nation, and the Narragansett Indian Tribe. The agreed upon mitigation would likely be memorialized in a programmatic agreement between CTDOH and the consulting parties that would be finalized prior to the FEIS.

Based upon mitigation measures that were developed and approved for similar projects in the past, appropriate mitigation measures for this project could include the following:

- Pre-construction documentation of historic resources that would be significantly altered, such as –.
  - A new National Register nomination for Seaside Park as a cultural landscape, and/or documentation of Seaside Park in the Historic American Landscape program.
  - A historic structures report for the Freeman Houses preparatory to its rehabilitation.
- Designs for new elements that will be visually compatible with adjacent historic properties.
- Relocation and rehabilitation of the Henry Bergh monument in Seaside Park, restoring its fountain to working order.
- Interpretive installations in Seaside Park for the public and other educational programs, focusing on the park's history, changing uses, engineering projects, and resiliency.

For archaeological resources, mitigation measures will be refined once the types and significance of archaeological resources in the APE are known and the project impacts to those resources are defined. Typical mitigation measures include terrestrial and/or underwater archaeological data recovery programs, public education, and paleoenvironmental reconstruction using geoprobe, vibracore, and manual soil core data.

Archaeological data recovery programs, comprising the removal of all or part of a site, would be appropriate in areas where significant archaeological sites will be impacted, if those areas are accessible and safe to excavate (i.e., not contaminated). All data recovery programs would be prepared in consultation with CTDOH, CTSHPO, and the interested THPOs.

Mitigation in the form of a public education program could include information about the history, archaeology, and environment of the project area disseminated to the public through websites, museum exhibits, and public presentations.

4.6 HAZARDOUS MATERIALS

Federal actions require consideration of hazardous materials impacts in NEPA documentation. Project development should consider the hazardous nature of any materials or wastes to be used, generated, or disturbed by this Proposed Action and incorporate pollution prevention considerations into this Proposed Action.

4.6.1 Methodology and Regulatory Context

4.6.1.1 Methodology

To effectively characterize the risk of hazardous materials impacts within the portion of the study area that encompasses the RBD Pilot Project, the following resources were consulted:

- A Phase I Environmental Site Assessment (ESA) completed by Fuss & O'Neill, Inc. in 2013
- A follow-up Phase I ESA completed by Freeman Companies LLC in 2016
- An Environmental Evaluation Assessment (EEA) and Materials Management Report, including environmental sampling results, prepared by Freeman Companies LLC in 2016
- An update to the Phase I ESA focused only on the RBD Pilot Project limits completed by WSP in December 2018 (see Appendix D)

The Phase I ESAs were conducted to identify Recognized Environmental Conditions (RECs) resulting from past or present activities at the former Marina Village housing development site and to determine if any surrounding properties may affect the environmental integrity of the site. A follow-up Phase I ESA was prepared in December 2018 to confirm that the conditions identified in the prior ESAs have remain unchanged with regard to RECs. The prior assessments involved performing a field reconnaissance of accessible areas, and reviewing available sources to determine current/former uses of the site and adjoining parcels. Sanborn maps, aerial photographs, topographic maps, city directories, and files on record were reviewed at relevant City of Bridgeport offices. Additionally, interviews were conducted with City of Bridgeport personnel, and Environmental Data Resources, Inc. (EDR) compiled a comprehensive report to identify properties listed on state and federal environmental databases. The Freeman Companies' EEA, which involved both soil and groundwater sampling activities, was conducted to determine the extent of environmental impacts across a portion of the former Marina Village site in preparation for site redevelopment. The ESAs and EEA were conducted in a manner consistent with relevant regulations/industry standards, including American Society for Testing and Materials (ASTM) E1527-13 Standard Practice for ESAs.

For the Flood Risk Reduction and Resilience Center project area, a Task 110: Corridor Land Use Evaluation (Task 110 Evaluation) was conducted in June 2018 following guidance provided by the Connecticut Department of Transportation (CTDOT) Division of Environmental Compliance 2010 Task Based Contaminated Soil/Groundwater Scopes (see Appendix D). A Task 110 Evaluation is used to determine potential environmental risks associated with current and former land uses across a designated project site. It provides similar information to a Phase I ESA. The information gathered in this process helps to determine the likelihood that soil or groundwater contamination will be encountered during construction of a proposed project. The Task 110 Evaluation performed for the Flood Risk Reduction and Resilience Center project area, included a corridor windshield survey, as well as review of available sources to determine current and former uses of each parcel within the project footprint. Those sources included Sanborn maps, aerial photographs, topographic maps, city directories, and information from the municipal assessor's records and state and federal environmental databases. Based on the information gathered, each parcel was assigned a relative environmental risk of low, moderate, or high, reflecting the likelihood of environmental impacts to soil and/or groundwater being encountered during project activities.

4.6.1.2 Regulatory Context

Regulated hazardous substances are identified through several federal and state laws and regulations. Table 4.6-1 presents a summary of the potentially applicable laws and regulations for the Proposed Action that govern the investigation, remediation, handling, reuse/disposal, and release of hazardous materials, hazardous substances, hazardous wastes and contaminated materials.

Table 4.6-1. Hazardous Materials: Federal and State Laws and Regulations

Law / Regulation	Project Context
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 USC 9601 et seq.)	Provides a federal "Superfund" to fund and oversee cleanup of uncontrolled or abandoned hazardous waste sites.
Superfund Amendments and Reauthorization Act (SARA; 42 USC 9601 et seq.)	Reauthorized CERCLA to continue hazardous waste site cleanup activities. SARA Title III authorized the Emergency Planning and Community Right-to-Know Act
Resource Conservation and Recovery Act (42 USC 6901 et seq.)	Establishes "cradle-to-grave" requirements for hazardous waste from its generation through transportation, treatment, storage and disposal
Toxic Substances Control Act (15 USC 2601 et seq.)	Addresses the production, importation, use and disposal of specific chemicals, including polychlorinated biphenyls (PCBs), asbestos, radon and lead-based paint
Site Contamination (24 CFR 50.3(i) and 24 CFR 58.5(i)(2))	Establishes requirements for properties used in U.S. Department of Housing and Urban Development (HUD) programs regarding hazardous materials, contamination, toxic chemicals and gases, and radioactive substances, including if those properties are located within 3,000 feet of a toxic or solid waste landfill
Identification of Explosive and Flammable Operations (24 CFR 51C)	Establishes an Acceptable Separation Distance that must be calculated for HUD-funded projects "from specific, stationary, hazardous operations that store, handle, or process hazardous substances" and have the potential to be an explosive or combustible hazard, such as aboveground storage tanks.
Remediation Standard Regulations (Regulations of Connecticut State Agencies [RCSA] 22a-133k-1 through 133k-3)	Apply to any action taken to remediate polluted soil, surface water, or a groundwater plume at or emanating from a release area (includes soil, groundwater and soil vapor numerical cleanup criterion).
Water Quality Standards (RCSA 22a-426-1 through 22a-426-9)	CT Water Quality Standards designate use goals and set the overall policy for management of surface and groundwater quality necessary to protect and restore water quality. Includes standards, criteria and a series of Classification Maps.
Licensed Environmental Professionals (LEP) Regulations (RCSA 22a-133v-1 through 22a-133v-8)	Establishes LEP program, the licensing board, application/examination procedures, and Rules of Conduct.
Significant Environmental Hazard Regulations (RCSA 22a-6u)	Establishes requirement to report certain significant environmental hazards and to implement initial actions to prevent short-term risk.

Table 4.6-1. Hazardous Materials: Federal and State Laws and Regulations (continued)

Law / Regulation	Project Context
Hazardous Waste Management Regulations (RCSA 22a-449 (c) -100 through 119)	Incorporates federal hazardous waste regulations 40 CFR 124, 260-265, and 266-279
Solid Waste Management [RCSA Section 22a-228(b)]	Connecticut has formally adopted an integrated waste management hierarchy as a guiding framework for solid waste management efforts. Connecticut's system adheres to this hierarchy by emphasizing source reduction, recycling, composting, and energy recovery from solid waste, while relying on landfill disposal and incineration as a last resort.
CT Transfer Act – Property Transfer Law (RCSA 22a-134 through 22a-134e)	Requires the disclosure of environmental conditions when certain real properties and/or businesses ("establishments") are transferred. When transferring an establishment where there has been a release of a hazardous waste or a hazardous substance, the parties negotiate who will sign the Property Transfer Form as the Certifying Party to investigate the parcel and remediate pollution caused by any release of a hazardous waste or hazardous substance from the establishment.
Voluntary Remediation Program (RCSA 22a-133x and 22a-133y)	Ensures an elective process for property owners who wish to expedite the remediation of polluted property, thus enabling them the advantage of a remediated site should they ever decide to sell the property. Provides a program for expedited closure.
Underground Storage Tank (UST) Regulations (RCSA 22a-449(d)-1 through 22a-449(d)-101 through 113)	The regulations are designed to prevent releases by closely monitoring petroleum and chemical storage and by imposing deadlines for removal of older USTs (and UST components) before they fail. Specifies registration, operation, design, construction, installation, permitting, closures, etc.
Spill Reporting (RCSA Chapter 446k, Section 22a-450)	Documents when and how notification of a release to the regulatory authority is required. Note that the threshold reportable quantities referenced in the regulations have not been adopted yet.

In addition to the above laws and regulations, ASTM E1527-13, *Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process*, establishes the standard industry practice for assessing the environmental conditions of a property. The specific reporting requirements for all appropriate inquiries, which include the evaluation of a property's environmental condition and the assessment of the likelihood of any contamination, are established under 40 CFR 312.20-312.31, Standards and Practices for All Appropriate Inquiries, and ASTM E 1527-13.

4.6.2 Affected Environment

4.6.2.1 RBD Pilot Project

Based on the information obtained from the Phase I ESAs, the RBD Pilot Project area has a long history of heavy industrial and manufacturing operations prior to establishment of the Marina Village multifamily housing development, which was constructed in the late 1940s. The Fuss & O'Neill, Inc. Phase 1 ESA (2013) identified nine RECs in connection with the former Marina Village property. All identified RECs reflect past activities—industrial, commercial, or residential—that occurred at the corresponding locations. For some locations, a degree of remedial action has already been completed, but the potential for unknown contamination still exists. The following nine ESA-identified RECs and one supplementary REC (REC-10) were identified in preparing this Draft Environmental Impact Statement:

- REC-1: Historic Foundry Operation
- REC-2: Historic Metal Pickling Operations
- REC-3: Historic Manufacturing Operations
- REC-4: Historic Japanning Operations
- REC-5: Historic Steel Drum Reconditioning
- REC-6: Historic Coal Storage (at two separate locations)
- REC-7: Historic Urban Fill
- REC-8: #2 Fuel Oil Release
- REC-9: Fuel Oil Underground Storage Tanks (USTs)
- REC-10 Nunes Auto Repair[10]

Figure 4.6-1 presents the locations of the RECs within the general RBD Pilot Project area, and Table 4.6-2 summarizes the potential contamination associated with each REC.

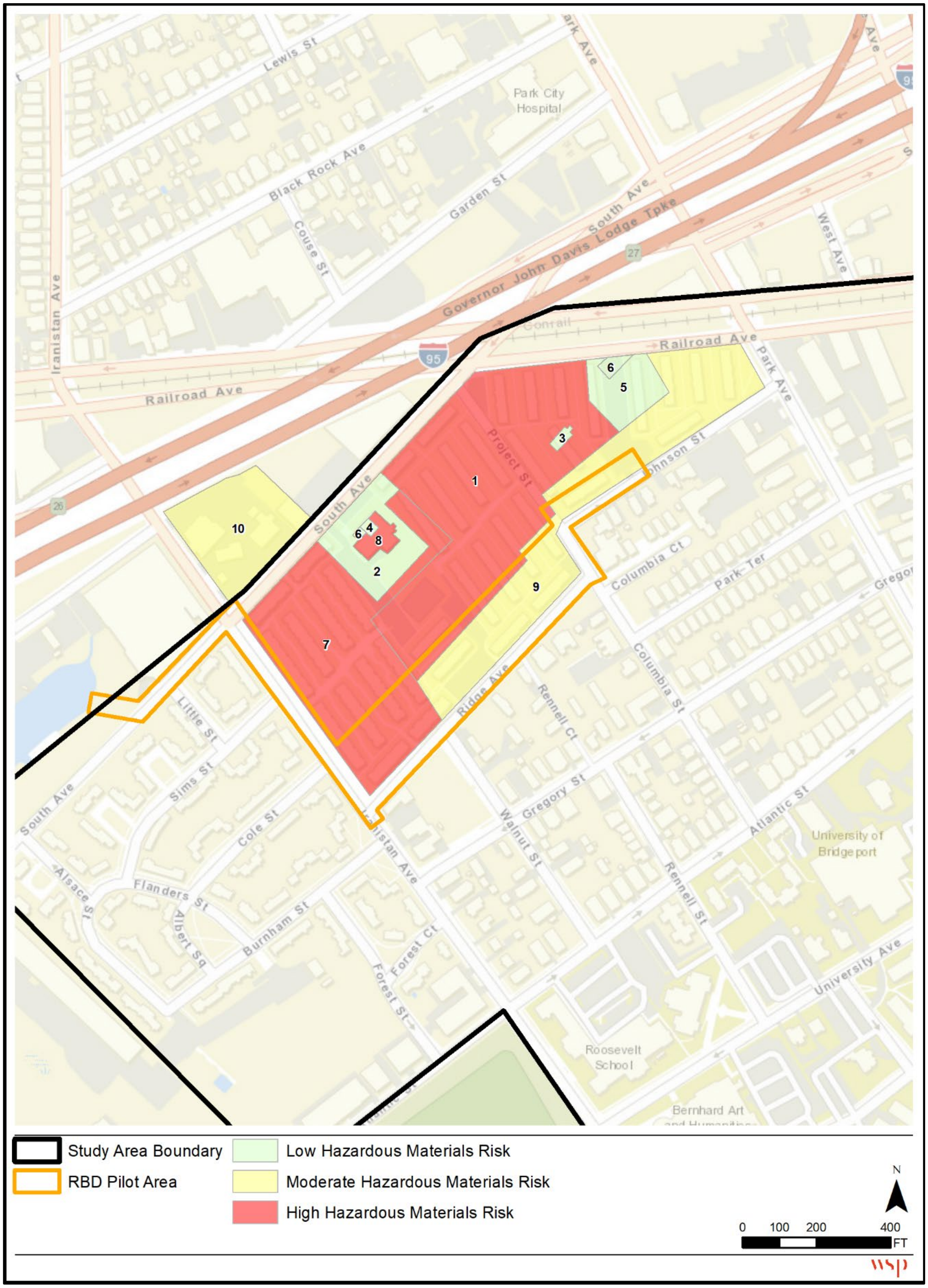
Table 4.6-2. RBD Pilot Project Area: Description of Identified Recognized Environmental Condition

REC ID / Map ID	Property Details	Contaminants of Concern	Risk Rating
REC-1 / 1	Historic Foundry Operations	Volatile organic compounds (VOCs), metals, polycyclic aromatic hydrocarbons (PAHs)	High
REC-2 / 2	Historic Metal Pickling Operations	VOCs, metals, PAHs	Low
REC-3 / 3	Historic Manufacturing Operations	VOCs, metals, PAHs, petroleum products	Low
REC-4 / 4	Historic Japanning Operations	Petroleum products	Low
REC-5 / 5	Historic Steel Drum Reconditioning	VOCs, metals, PAHs, petroleum products	Low
REC-6 / 6	Historic Coal Storage	Coal	Low
REC-7 / 7	Historic Urban Fill	Ash, coal, asphalt, manufacturing by-products	High
REC-8 / 8	#2 Fuel Oil Release	#2 Fuel Oil (1999 release of 4,500 gal.)	High
REC-9 / 9	Underground Storage Tanks (USTs)	Fuel oil (approximately 30 locations with potential for fuel oil USTs abandoned in place)	Moderate
REC-10 / 10	Nunes Auto Repair	VOCs, semivolatile organic compound, metals (3 active gasoline USTs; 3 USTs removed)	Moderate

Source: Phase I ESAs Fuss & O'Neill, Inc. (2013) and Freeman Companies LLC (2016)

[10] REC-10 has been identified as Nunes Auto Repair, an active general auto repair and gasoline station located at 478 Iranistan Avenue. The station maintains three active gasoline USTs (installed in 2009), and three formerly-active gasoline USTs (installed in 1992) that have been removed from the property. The Nunes Auto Repair site has been added to the REC list primarily as a result of its location—directly upgradient from proposed RBD Pilot excavation work.

Figure 4.6-1. RBD Pilot Project Area: Identified Recognized Environmental Conditions



Source: Phase I ESAs Fuss & O'Neill, Inc. (2013) and Freeman Companies LLC (2016)

REC-7, REC-9, and a small portion of REC-1 fall within the boundaries of the proposed RBD Pilot Project area (represented on Figure 4.6-1 by a solid orange line). The area encompassed by REC-1 was occupied by Bridgeport Malleable Iron Works, a metal foundry that produced malleable gray iron castings, from before 1884 to the mid-1930s. Various operations were performed at the foundry, including annealing, trimming, core making, tumbling, and molding, and these operations were primarily fueled by coal. As a result, the REC-1 area poses a high risk of encountering petroleum products or other contaminants—volatile organic compounds (VOCs), assorted metals, coal ash—associated with historic foundry work. Across the RBD Pilot Project area, there is also a high risk of encountering historic urban fill (REC-7), which generally contains ash, coal, asphalt fragments, and/or manufacturing by-products. Finally, within the REC-9 area, there is moderate potential for encountering subsurface concentrations of fuel oil. As indicated by the Phase I ESAs, approximately 30 former homes, storefronts, and apartment buildings were previously located on (or near to) the RBD Site, and several fuel oil USTs may have been abandoned in place.

The remainder of identified RECs are located adjacent to, but not directly within, the footprint of the RBD Pilot Project area. REC-2 to REC-6, inclusive, are associated with a relatively low risk of encountering hazardous material. Potential contaminants present in these areas include petroleum-based products (REC-3 to REC-5); compounds such as VOCs and metals related to manufacturing/industrial processes (REC-2, REC-3, & REC-5); coal (REC-6); and assorted urban fill substances (all RECs). Additionally, REC-8 (located to the north of the Project area) is associated with a release of approximately 4,500 gallons of No. 2 fuel oil, which occurred on December 9, 1999. Although the status of the related spill report is "closed," no confirmatory sample results indicating completed remediation are available for review. Consequently, REC-8 is presumed to be a high-risk area, characterized by significant potential for encountering No. 2 fuel oil.

As part of the EEA completed by Freeman Companies LLC (2016), both soil and groundwater samples were collected within the area of the former Marina Village immediately adjacent to the proposed RBD Pilot Project area. Three of the 10 soil samples were found to have polycyclic aromatic hydrocarbons (PAHs) and/or extractable total petroleum hydrocarbons (ETPH) at levels exceeding the Residential Direct Exposure Criteria and/or the relevant Pollutant Mobility Criteria. However, the soil sample collected nearest to the proposed RBD Pilot Project area did not contain contaminants at levels exceeding regulatory criteria. Of the collected groundwater samples, two samples were found to have PAHs exceeding the default Surface Water Protection Criteria, and three samples contained metals (arsenic, copper, lead, and zinc) at concentrations exceeding the default Surface Water Protection Criteria.

4.6.2.2 Flood Risk Reduction Project

The Flood Risk Reduction Project would be located primarily within the eastern portion of Bridgeport's South End. It would encompass the two proposed flood risk reduction alignments—the Western and Eastern Options—and would extend outward from each. **Figure 4.6-2** provides a visual depiction of the boundaries of the project area (represented by a solid red line) and the two alignment options.

The Task 110 Evaluation completed for the Flood Risk Reduction Project area assessed 73 properties (see Section 4.6.1.1, Methodology, for details). Of the 73 assessed properties, 27 were designated low risk, 23 were designated moderate risk, and 23 were designated high risk. As indicated on Figure 4.6-2, high-risk properties account for the largest physical area and are primarily situated to the east, where industrial activity is—and, historically, has been—the most concentrated. Presently, critical utilities (e.g., PSEG, United Illuminating, Bridgeport Energy LLC, etc.) occupy the majority of identified high-risk sites. The western-most segment of the Flood Risk Reduction project area (just north of Linden Avenue and Seaside Park) contains a combination of moderate-risk and low-risk properties. Common establishments within this section of relatively reduced risk include private residential homes, educational facilities (e.g., University of Bridgeport buildings), and City of Bridgeport offices (e.g., City of Bridgeport Parks Department and the Housing Authority of the City of Bridgeport). Table 4.6-3 provides a summary of all evaluated properties—low risk, moderate risk, and high risk—within the Flood Risk Reduction Project area and identifies associated contaminants of concern (COCs).

4.6.3 Environmental Consequences

4.6.3.1 No Action Alternative

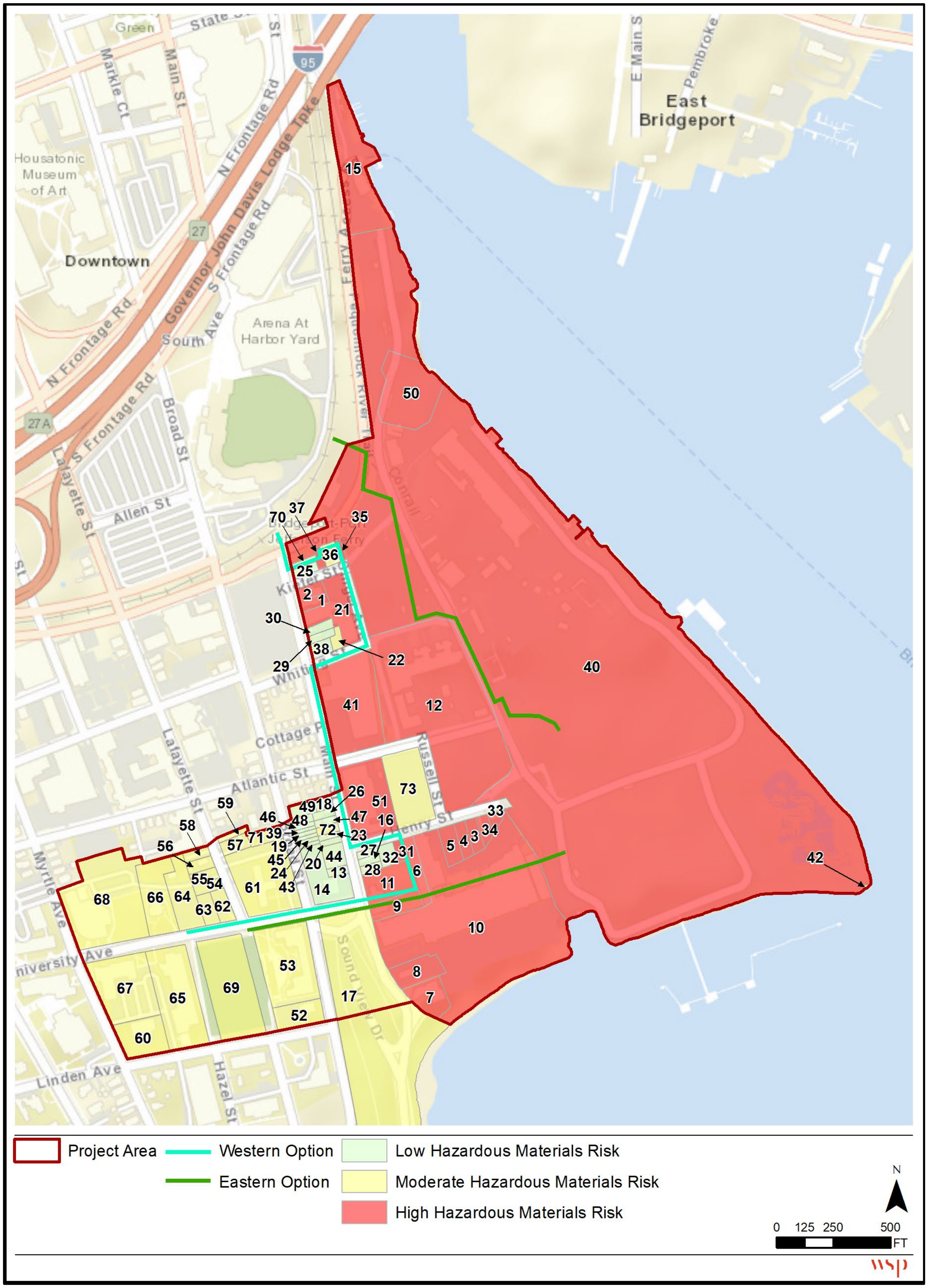
Under the No Action Alternative, the Proposed Action will not be constructed, and no changes attributable to the Proposed Action will affect hazardous materials within the study area. There will be no removal or regrading of soils to facilitate project implementation and, thus, there will be no related health risks to construction workers. Any contaminants present within the study area will continue to be managed under existing regulatory programs. Any soil/groundwater disturbance associated with construction of projects that would occur with or without the Proposed Action—such as the Water Pollution Control Authority's Area H Project or the Windward Development on the former Marina Village site—will also be managed under existing regulatory programs. However, continued flooding in the study area under the No Action Alternative could result in potentially significant releases of hazardous materials from disturbed soils, adversely affecting both public and environmental health.

4.6.3.2 Proposed Action

RBD Pilot Project

All the proposed RBD Pilot Project elements would involve similar land disturbances (e.g., excavation, dewatering of excavated areas when groundwater is encountered, regrading of soils, etc.) and thus are discussed as one element. Risks resulting from necessary land disturbances are expected to vary, primarily depending upon the properties and concentrations of contaminants present at disturbed areas.

Figure 4.6-2. Flood Risk Reduction Project Area: Task 110 Evaluation Parcel Risk Assessment Results



Source: WSP Task 110 Corridor Land Use Evaluation Report (2018)

Table 4.6-3. Flood Risk Reduction Project Area: Task 110 Parcel Risk Assessment Details

Map ID	Property Owner: Current	Property Owner: Historic	Contaminants of Concern	Risk Rating
1	388 Main Street LLC	Josephson Bag & Canvas Company	Extractable total petroleum hydrocarbons (ETPHs), polycyclic aromatic hydrocarbons (PAHs), metals, volatile organic compounds (VOCs)	High
2			ETPH, PAHs, metals, VOCs	
3	60 Main Street LLC et al	Adelman Hiram et al. Remington Products Company	ETPH, PAHs, metals, polychlorinated biphenyls (PCBs), VOCs	High
4			ETPH, PAHs, metals, PCBs, VOCs	
5			ETPH, PAHs, metals, PCBs, VOCs	
6			ETPH, PAHs, metals, PCBs, VOCs	
7			ETPH, PAHs, metals, PCBs, VOCs	
8			ETPH, PAHs, metals, PCBs, VOCs	
9			ETPH, PAHs, metals, PCBs, VOCs	
10		H & B CT LLC Adelman Hiram et al. Remington Products Company	ETPH, PAHs, metals, PCBs, VOCs	
11		Adelman Hiram et al. Remington Products Company	ETPH, PAHs, metals, PCBs, VOCs	
12	Bridgeport Energy LLC	Main Atlantic Associates	ETPH, PAHs, metals	High
13	Bridgeport Ocean View LLC	Taffee Place LLC Seaside Waterview LLC	ETPH, PAHs, metals	Low
14			ETPH, PAHs, metals	Low
15	Bridgeport Port Authority	United Illuminating City of Bridgeport	ETPH, PAHs, metals	High
16	Bush Chrystal	–	ETPH, PAHs, metals	Low
17	City of Bridgeport Park Dept.	–	ETPH, PAHs, metals	Moderate
18	Connecticut Light & Power	–	ETPH, PAHs, metals	Low
19	De Tuya III Oscar C	–	ETPH, PAHs, metals	Low
20	Dewitt-Smith William S & Janet	–	ETPH, PAHs, metals	Low
21	ESM Holdings LLC	PJ Murphy Mov & Stor Co	ETPH, PAHs, metals	High
22		–	ETPH, PAHs, metals	Moderate
23	Housing Authority of City of Bridgeport	–	ETPH, PAHs, metals	Low
24	Hyer Charles W	–	ETPH, PAHs, metals	Low
25	Kiefer Main Incorporated	–	ETPH, PAHs, metals	Low
26	Kong Simon Tatchee	Secretary of Housing and Urban	ETPH, PAHs, metals	Low
27	Malinowski Joann L	–	ETPH, PAHs, metals	Low
28	Martin Robert F & Florence	–	ETPH, PAHs, metals	Low
29	Mary & Eliza Freeman Cntr for History	City of Bridgeport ABCD Inc	ETPH, PAHs, metals	Low
30			ETPH, PAHs, metals	Low

Table 4.6-3. Task 110 Parcel Risk Assessment Details, Flood Risk Reduction Area (continued)

Map ID	Property Owner: Current	Property Owner: Historic	Contaminants of Concern	Risk Rating
31	Mason Charles J & Joseph L	–	ETPH, PAHs, metals	High
32	Mason Joseph L Jr & Louise	–	ETPH, PAHs, metals	Low
33	Mauzerall Michael	–	ETPH, PAHs, metals	High
34		–	ETPH, PAHs, metals	High
35	O'Hara's LLC	Cavalleri Marie R	ETPH, PAHs, metals	High
36			ETPH, PAHs, metals	Moderate
37			ETPH, PAHs, metals	High
38	Parkside Properties LLC	Polanco Rene & Margarita Mechanics & Farmers Savings Burr Jonathan	ETPH, PAHs, metals	Low
39	Plotkin Nathaniel W	–	ETPH, PAHs, metals	Low
40	PSEG Power Connecticut LLC	–	ETPH, PAHs, metals, PCBs, VOCs	High
41		United Illuminating Company Main Atlantic Associates	ETPH, PAHs, metals, PCBs	
42	Sampaio Maria	Federal Deposit Insurance Corp Southend Development Corp	ETPH, PAHs, metals	Low
43	Siljkovic Saban	Alleyne Wayne A Sanjo Really LLC Celli Joseph et al Meyers Richard J A/K/A	ETPH, PAHs, metals	Low
44	Seaside Waterview LLC	Lacont Laurence J Laconte Clara	ETPH, PAHs, metals	Low
45	Stepanova Tatyana	–	ETPH, PAHs, metals	Low
46			ETPH, PAHs, metals	Low
47	Teng Wan Ling et al	St Raymond Stephen C St Raymond Raymond Murphy William S Murphy Vernon S Est	ETPH, PAHs, metals	Low
48	Teo Puay Lam et al	Davis Thomas S Davis Carolyn H Estate	ETPH, PAHs, metals	Low
49	Connecticut Light & Power	Davis Carolyn H Trustee et al Davis Carolyn Murphy William S & Murphy Vernon S Est	ETPH, PAHs, metals, PCBs	Low
50	United Illuminating Company	–	ETPH, PAHs, metals, PCBs, VOCs	High
51		PSEG Power Development LLC United Illuminating Co	ETPH, PAHs, metals, PCBs, VOCs	High

Table 4.6-3. Task 110 Parcel Risk Assessment Details, Flood Risk Reduction Area (continued)

Map ID	Property Owner: Current	Property Owner: Historic	Contaminants of Concern	Risk Rating
52	University of Bridgeport	Lee Jung Sook Noh	ETPH, PAHs, metals	Moderate
53		–	ETPH, PAHs, metals, VOCs	
54			ETPH, PAHs, metals	
55			ETPH, PAHs, metals, VOCs	
56			ETPH, PAHs, metals	
57			ETPH, PAHs, metals	
58			ETPH, PAHs, metals	
59			ETPH, PAHs, metals	
60			ETPH, PAHs, metals	
61			ETPH, PAHs, metals, VOCs	
62			ETPH, PAHs, metals	
63			ETPH, PAHs, metals	
64			ETPH, PAHs, metals	
65			ETPH, PAHs, metals, VOCs	
66			ETPH, PAHs, metals	
67			ETPH, PAHs, metals	
68			ETPH, PAHs, metals, VOCs	
69			ETPH, PAHs, metals	
70	Vukaj Aleksander	–	ETPH, PAHs, metals	Low
71	Zambon Karl L & Katharina T	Wells Fargo Bank NA Choi Chung Woo Yasutake Yohio Paul et al	ETPH, PAHs, metals	Moderate
72	Zambon Michael et al	Song Zhitao	ETPH, PAHs, metals	Low
73	--	–	ETPH, PAHs, metals, PCBs, VOCs	Moderate

Source: WSP Task 110 Corridor Land Use Evaluation Report (2018)

During construction, excavation of contaminated soils and dewatering of contaminated groundwater from excavation areas could expose both onsite workers and nearby public to temporary health risks. Direct exposure of construction workers to contaminants may occur via physical contact, inhalation, or ingestion of contaminated soil or groundwater. Soils that would be stockpiled and/or moved from the RBD Pilot Project area to a disposal facility could be transported off-site via wind or stormwater runoff, increasing the potential for acute contaminant exposure. To reduce possible health and environmental risks, a comprehensive soil/groundwater Sampling Analysis and Monitoring Plan (SAMP) would be developed and implemented to effectively address contamination prior to the start of any construction activities. Based on the results of environmental sampling, a site-specific Health and Safety Plan (HASP) would be implemented, further minimizing exposure risks associated with construction activities. A Material Management Plan (MMP) would also be developed to address the relocation and/or off-site disposal of contaminants identified in soil and groundwater. The above-mentioned plans would include provisions for minimizing risk not only to workers, but also to surrounding businesses, residential properties, and the general public, in both the short- and long-term.

The following additional best management practices (BMPs) would likely be employed to reduce health and environmental risks associated with hazardous material presence:

- Use of comprehensive dust control measures
- Air monitoring for VOCs
- Use of liners and covers to prevent/sufficiently minimize erosion of stockpiled soils
- Proper marking and identification of work zones
- Establishment of thorough decontamination procedures and associated facilities
- Use/supply of appropriate personal protective equipment
- Documentation of backfill depth and location via scaled drawings

In the long-term, during operation of the RBD Pilot Project stormwater facility, no significant direct or indirect impacts related to hazardous materials are anticipated. However, there is some potential for indirect benefits to public health from the removal and disposal of contaminated materials encountered during construction, reducing the risk of visitors being exposed to contaminants in the future.

Flood Risk Reduction Project

The Flood Risk Reduction Project would reside primarily within the urban fabric of the South End community. Under either option of the coastal flood defense system, the east-west segment of the system would intersect primarily with moderate-risk properties situated along University Avenue. As indicated by Table 4.6-3, potential COCs in this area include ETPH, PAHs, and various metals. Additional contaminants, including lead and asbestos, may be encountered during any potential demolition and/or relocation of underground utilities as part of the Flood Risk Reduction Project. Moreover, general contamination associated with urban fill is likely to be encountered at numerous properties throughout the Flood Risk Reduction project area.

Western Option

The north-south segment of the Western Option of the proposed coastal flood defense system would primarily intersect with high-risk parcels belonging to major utilities, but some moderate-risk sites (e.g., Parcel No. 36, currently occupied by O'Hara's LLC) would also be encountered. Potential COCs in this area include ETPH, PAHs, and various metals, as well PCBs and VOCs. Overall, despite the significant potential for encountering contamination, it is expected that the fewest high-risk parcels would be disturbed under the Western Alignment, as compared to alignments farther east.

As previously discussed, various construction activities (e.g., excavation, dewatering, regrading of soils, demolition or relocation of structures, and utilities etc.) pose the risk of direct contaminant exposure via physical contact, inhalation, or ingestion. Thus, it is possible that construction of the Western Option could expose onsite workers and the nearby public to COCs, such as PAHs and metals, identified along the alignment route. Moreover, contaminants contained in stockpiled materials could be transported off-site by wind or stormwater runoff, and VOCs could rapidly spread through the air.

As with the RBD Pilot Project, several comprehensive plans/procedures—SAMP, HASP, MMP—would be implemented to sufficiently minimize both health and environmental impacts. Additionally, a range of BMPs would likely be employed to further reduce potential risk, such as use of dust control measures, air monitoring for VOCs, and utilization of appropriate personal protective equipment. As part of upcoming project design phases in 2019, a Task 210: Subsurface Site Investigation will also be performed in the areas of anticipated intrusive construction activities and/or right-of-way activities. The investigation will include low- to high-risk parcels, with a greater density of sampling occurring in rights-of-way adjacent to moderate- and high-risk parcels. This process will help to verify the presence and locations of subsurface contamination and facilitate a more detailed assessment of potential pollutant impacts.

Due to the above measures, it is unlikely that workers or the general public would be exposed to harmful levels of contaminants as a result of construction activities. In addition, further steps would be taken to prevent long-term impacts, such as chronic contaminant exposure or continued degradation of identified sites/resources. For example, all disturbed soil would be appropriately analyzed and classified to avoid the possibility of recontamination via reuse.

Eastern Option

The Eastern Option of the coastal flood defense system would be located primarily on private industrial/utility property. Under this alignment, the proposed flood wall system would connect with protection measures at PSEG Harbor Unit 5 (currently under construction) before turning north. The system would then continue along PSEG, Emera, and United Illuminating sites, eventually crossing Ferry Access Road and tying into the existing railroad viaduct.

Under current design plans, the Eastern Option of the coastal flood defense system would intersect with the following types of parcels: (1) to the west of Main Street, the system would primarily intersect with moderate-risk parcels situated along University Avenue and (2) to the east of Main Street, the system would solely intersect with high-risk properties (where the likelihood of encountering contamination is greatest).

Potential COCs in this area include ETPH, PAHs, and various metals. East of Main Street, however, the proposed flood wall system would intersect solely with high-risk parcels, where additional contamination (from PCBs, VOCs, etc.) would likely be encountered (see Figure 4.6-2 for details). Due to Eastern Option's increased intersection with/disturbance of high-risk parcels, the potential for adverse health and environmental impacts from hazardous material presence is expected to be greater than with the Western Option. Additional contaminants, such as lead and asbestos, may be exposed during work involving underground utilities, and general contamination associated with urban fill is also likely to be encountered.

As with the other potential alignments, several measures would be taken to mitigate risk and reduce potential impacts, including the following:

- Completion of a follow-up Task 210 Subsurface Site Investigation
- Development of site-specific plans/procedures (e.g., HASPs, SAMPs, etc.)
- Implementation of carefully selected BMPs (e.g., use of dust control measures, use of stockpile liners, etc.)
- Adherence to regulations regarding proper handling, management, storage, and transport of hazardous substances.

Due to these measures, it is unlikely that workers or the general public would be exposed to harmful levels of contaminants as a result of construction activities. In addition, further steps would be taken to prevent long-term impacts, such as chronic contaminant exposure or continued degradation of polluted sites/resources. For example, disturbed soil would be appropriately analyzed and classified to avoid the possibility of recontamination via reuse.

Resilience Center

Under current design plans, the proposed footprint of the Resilience Center would overlap with portions of the Flood Risk Reduction project area. Since no additional (previously unidentified) sites are expected to be disturbed via Resilience Center construction or operation, no further impacts related to hazardous materials are anticipated. Moreover, the construction of the proposed Resilience Center is expected to necessitate only limited ground/soil disturbance.

4.6.4 Mitigation and Best Management Practices

Several measures would be taken to mitigate risk and reduce potential impacts, including the following:

- Completion of a follow-up Task 210: Subsurface Site Investigation (or equivalent Phase II sampling), as appropriate
- Development of site-specific plans/procedures (e.g., HASPs, SAMPs, etc.)
- Implementation of carefully selected BMPs (e.g., use of dust control measures, use of stockpile liners, etc.)
- Adherence to regulations regarding proper handling, management, storage, and transport of hazardous substances.

To reduce possible health and environmental risks from hazardous materials, a comprehensive soil/groundwater SAMP would be developed and implemented to effectively address contamination prior to the start of any construction activities. Based on the results of environmental sampling, a site-specific HASP would be implemented, further minimizing exposure risks associated with construction activities. An MMP would also be developed to address the relocation and/or off-site disposal of contaminants identified in soil and groundwater.

The following additional BMPs would likely be employed to reduce health and environmental risks associated with hazardous material presence:

- Use of comprehensive dust control measures
- Air monitoring for VOCs
- Use of liners and covers to prevent/sufficiently minimize erosion of stockpiled soils
- Proper marking and identification of work zones
- Establishment of thorough decontamination procedures and associated facilities
- Use/supply of appropriate personal protective equipment
- Documentation of backfill depth and location via scaled drawings

In addition, further steps would be taken to prevent long-term impacts, such as chronic contaminant exposure or continued degradation of identified sites/resources. For example, all disturbed soil would be appropriately analyzed and classified to avoid the possibility of recontamination via reuse.

4.7 NOISE AND VIBRATION

4.7.1 Methodology and Regulatory Context

Environmental noise is a result of everyday occurrences such as transportation systems, industrial processes, construction, building air handling and power generation systems, wind, human activities, etc. Noise can be quantified in many different manners depending on its temporal (time), tonal (frequency), or magnitudinal (loudness) characteristics.

Noise magnitude is expressed in units of *decibels (dB),* which is a logarithmic quantity comparing fluctuating air pressure to that of a standardized reference air pressure of 20 micro-pascals (i.e., dB re: 20 µPa). For this reason, the noise levels that humans hear are called *sound pressure levels*. Noise is expressed as a logarithmic quantity because humans are sensitive to relative changes in noise levels. To illustrate, humans can start to perceive a change in noise levels of +/- 3 dB, can easily perceive a change of +/- 5 dB, and will generally perceive a change of +/- 10 dB as a doubling or halving in noise levels.

The numeric decibel level measured by a sound-level meter is dependent on its time response setting, or the time it takes a meter to respond to 95 percent of the level of a perfect step function (i.e., the electrical time constant). For standardization and comparison of results, three response times have been defined for use: "slow" with a time constant of 1 second, "fast" with a time constant of 0.125 second, and "impulse" with a time constant of 0.035 second. Each time response setting has its intended purpose; however, the time response must match that called for in applicable criteria in order to properly evaluate compliance with limits.

With respect to tonal qualities, the frequency of sound is measured in units of *Hertz (Hz)*, meaning the number of fluctuating waves occurring within one second. A frequency weighting adjustment has been standardized to account for the human auditory response over the audible frequency range of approximately 20 Hz to 20,000 Hz. Humans are less capable of hearing low frequency noise, exhibit a maximum sensitivity to tones in mid-frequency ranges, and are somewhat less sensitive to high frequency sound as well. This frequency weighted adjustment is referred to as "A-weighting", with results expressed as *A-weighted decibels, or dBA.*

Numerous metrics and indices have been developed to quantify the temporal characteristics (changes over time) of environmental noise include the following:

Lmax and Lmin, or the Maximum and Minimum Sound Levels, respectively, are metrics for the highest and lowest sound levels that occurred during a measurement session. The Lmax and Lmin are expressed in dBA.

Leq, or Equivalent Sound Level, is the energy-averaged single noise level that represents the same (equivalent) acoustic energy that was contained in the fluctuating noise level over a period of time. The Leq is useful for describing the "average" noise level over time, and is expressed in dBA. The noise metric used in traffic noise analyses is the peak hour equivalent sound level, or Leq(h), which represents the loudest hour due to traffic conditions. The Leq(h) is an energy-averaged noise level that represents the constant noise level containing the same acoustical energy as the actual fluctuating noise level over the same hour. The results are expressed in A-weighted decibels (dBA) referenced to 20 micro-Pascals.

Ln, or Percentile Level, is a statistical representation of changing noise levels indicating that the fluctuating noise level was equal to, or greater than, the stated level for "n" percent of the time. For example, the L10, L33, L50, and L90 represent the noise levels exceeded 10, 33, 50, and 90 percent of the time. The L10 is often used to identify impacts of transportation or construction noise sources, while the L90 is considered to represent steady background noise levels. Ln percentile levels are expressed in dBA.

Environmental vibration can be generated by transportation systems such as trains, subways, trucks, automobiles; construction activities such as heavy earth moving equipment, blasting, pile driving; power generation or other large mechanical systems; or by natural seismic motion. While vibration can be generated in all directions, only the vertical component is typically evaluated. Vibration in the vertical direction typically contains more energy than either the longitudinal or latitudinal directions.

The motion of a vibrating object can be described by its surface acceleration, velocity or displacement about an equilibrium position. Due to human perception of vibration, ease of quantifiable measurement, and greater energy content, the velocity component within the third-octave band frequency range of 1 Hz to 100 Hz has been standardized for evaluating vibration impacts on human beings and structures. Vibration velocity can be expressed in linear units of inches per second. However, due to the large range over which vibration energy can be found, and how humans tend to perceive vibration, a more convenient logarithmic decibel scale has also been adopted.

For assessment of human annoyance, the maximum *Vibration Velocity Level, or VdBmax*, expressed in logarithmic decibels relative to 1 micro-inch/second (i.e., VdB re: 1µ-inch/sec) is typically measured using a Root Mean Square (RMS) mathematical approach. The RMS level is proportional to the cumulative energy generated by a vibrating surface and has been found to correlate better with human reaction to vibration. The equivalent energy-averaged vibration velocity level, or VdBeq, can also be of interest.

Excessive vibration can also potentially cause physical damage to buildings and structures. Effects could range from minor (cosmetic) issues to major (structural) damages. The Peak Particle Velocity, or PPV, is the metric typically used to evaluate potential physical damage because it represents the highest instantaneous vibration magnitude that occurred at any moment. The PPV is expressed in linear units of inches/second.

Excessive noise from the Proposed Action could occur during the operational phase but are more likely to occur during the construction phase of the project. End-state noise sources might include traffic, water pumps, generators and emergency egress traffic; however, noise impacts in the community will not be the prime concern if those noise sources are required to operate. Moreover, they would be temporary inconveniences that are exempt from regulatory requirements due to their emergency nature.

In general, the technical approach and methodologies to perform these assessments involved the following:

1. The measurement and modeling of existing (year 2018) noise levels at selected receptor locations throughout the study area;
2. The development of predictive models to estimate future (year 2038) noise and vibration levels affecting the community;
3. An evaluation to determine if the expected future noise and vibration levels comply with or exceed applicable criteria limits;
4. If the latter, the development of candidate noise and vibration mitigation options for consideration and implementation.

Existing ambient noise levels were measured simultaneously at four representative community noise receptor locations (N-1 through N-4) during October 2018. The noise measurements were performed using Larson Davis Model 720 long-term automated noise monitors for a period of one week (October 15 to 22, 2018). The meters were calibrated with a Brüel & Kjær Model 4231 calibrator prior to deployment. The noise monitors complied with calibration and accuracy requirements contained in American National Standards Institute Standard S1.4, and were programmed to measure and digitally store noise data including Leq, Lmax, Lmin, L1, L10, L50, L90, and Ldn metrics in hourly intervals expressed in A-weighted decibels (dBA). The results of the ambient noise monitoring exercise were used to establish appropriate traffic, operational and construction noise criteria limits at the representative receptor locations.

4.7.1.1 Traffic Noise Methodology

The traffic noise study was performed in accordance with Federal Highway Administration (FHWA) requirements contained in 23 CFR Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise) in conjunction with the CTDOT Highway Traffic Noise Abatement Policy dated May 2017.

Ten representative receptor locations (N-5 through N-14) were selected throughout the project area in order to predict and evaluate potential traffic noise consequences created by the project. The receptors represented residences, academic/institutional buildings and recreational park area. For traffic noise assessments, the preferred noise metric to evaluate is the loudest-hour Leq levels expressed in dBA.

Traffic noise levels in the community attributable to the end-state of the Proposed Action were then predicted (modeled) at the representative receptor locations. The Cadna-A noise model, augmented with its Traffic Noise Model (TNM) module that mimics the FHWA's TNM, was used to model Existing Year (2018) and Build Year (2038) traffic noise levels throughout the affected community. Cadna-A is a sophisticated, three-dimensional, ray-tracing acoustical model that applies ISO Standard 9613 recommended practices for the prediction and propagation of outdoor sound levels.

Input data for Cadna-A's TNM module included the hourly fleet mix of automobiles, medium trucks and heavy trucks expected to drive on the affected roadway segments (as vehicles per hour), their speeds (mph) and their directions of travel. This information was taken from the traffic analysis performed for the RBD Pilot Project area and the Flood Risk Reduction Project area (see Section 4.13.3 and Appendix G). Per FHWA guidelines, traffic noise predictions were performed to assess the worst-case, or loudest, hour of time, with the results expressed as Leq sound levels in A-weighted decibels (dBA Leq(h)). The results of the traffic noise modeling were then evaluated for compliance or exceedance with traffic noise criteria limits promulgated by FHWA and CTDOT (described in Section 4.7.1.5).

4.7.1.2 Construction Noise Methodology

The construction noise study was performed in accordance with FHWA requirements contained in 23 CFR Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise) in conjunction with the CTDOT Highway Traffic Noise Abatement Policy dated May 2017.

The same ten representative receptor locations (N-5 through N-14) were selected throughout the project area in order to predict and evaluate potential construction noise consequences created by the project. The receptors represented residences, academic/institutional buildings and recreational park area. For construction noise assessments the preferred noise metrics to evaluate are the L10 percentile levels for continuous construction noise and the Lmax for impulsive construction noise, both expressed in dBA.

Noise levels in the community associated with construction of the project were predicted (modeled) at the ten representative receptor locations. The Cadna-A model, augmented with the construction equipment noise emission database from the FHWA's Roadway Construction Noise Model, was used to predict construction noise levels in the community.

Input data for Cadna-A's Roadway Construction Noise Model module included the types of heavy construction equipment expected to be necessary to perform the various aspects of project and the work zones where they will be operating. Heavy equipment included vibratory pile drivers, cranes, front end loaders, backhoes, bulldozers, graders, compactors, rollers, pavers, concrete trucks, dump trucks and delivery trucks.

Per FHWA guidelines, construction noise predictions were performed to assess the worst-case, or loudest, hour of time, with the results expressed statistically as L10 sound levels in A-weighted decibels (dBA L10). The results of the construction noise modeling were then evaluated for compliance or exceedance with construction noise criteria limits promulgated by FHWA and CTDOT (described in Section 4.7.1.6).

4.7.1.3 Construction Vibration Methodology

The Proposed Action project does not include improvements that would cause operational vibration concerns. However, due to the heavy, though short-term, construction activities related to reconstruction within the study area, a construction-related vibration analysis was performed in accordance with guidelines contained in the Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment Manual (2018).

Two thresholds of vibration impact were considered the first being potential human annoyance due to building vibration, and the second being potential physical damage to buildings due to excessively high vibration levels. Vibration criteria for human annoyance are provided in decibel units of vertical vibration velocity (VdB), while criteria for potential building damage is provided in units of inches/second for the peak particle velocity.

It should be noted that FTA's vibration criteria are not dependent on ambient vibration levels. Consequently, ambient vibration levels were not measured in this case.

Vibration levels in the community associated with construction of the project were predicted (modeled) at the same ten representative receptor locations (N-5 through N-14). WSP's proprietary construction vibration model was used to predict construction vibration levels in the community. The model takes into account the types and locations of heavy equipment to be used, the ground conditions between the vibration sources and the receptors, the land-use sensitivity and structural integrity of the receptors, and the receptors' coupling efficiency with the ground. The results of the construction vibration modeling were then evaluated for compliance or exceedance with construction vibration criteria limits promulgated by FTA for human annoyance and building damage (described in Section 4.7.1.7).

4.7.1.4 Regulatory Context

Potential community noise and vibration conditions were assessed for construction and final operation of the Proposed Action. Where the U.S. Department of Housing and Urban Development does not have relevant noise or vibration guidelines for these types of situations, the methodology and applicable criteria were taken from FHWA and FTA guidelines. FHWA methods were used to assess potential future traffic noise impacts, and FHWA and FTA methods were used to assess potential noise and vibration impacts associated with construction of the project.

In general, community noise and vibration criteria are based on long-term studies of human reaction to such unwanted annoyances. The original landmark studies performed by the U.S. Environmental Protection Agency date back several decades and have been updated and refined over the years as more studies and information became available. It is important to note that people can react to noise and vibration very differently from one another, and that criteria limits are not intended to completely avoid noise or vibration from being generated. Rather, the criteria represent an unbiased, scientific best effort to establish reasonable limits that will allow the project to proceed and operate for the common good while simultaneously ensuring that the vast majority of people will not be annoyed from exposure of excessive noise and vibrations levels. Noise and vibration levels generated by traffic and construction do not rise to the level of concern for adversely affecting human health.

4.7.1.5 Traffic Noise Criteria

The traffic noise study was performed in accordance with FHWA requirements contained in 23 CFR Part 772 in conjunction with the CTDOT Highway Traffic Noise Abatement Policy dated May 2017.

Two kinds of noise criteria were considered: absolute noise limits and relative increase limits. The FHWA's absolute noise abatement criteria limits are shown in Table 4.7-1 for various receptor activity land-uses. The various state highway departments are then allowed to define the remaining aspects of highway noise impact and consideration of noise mitigation measures. CTDOT's policy states that a noise receptor will be considered impacted by future traffic noise levels if the absolute noise level approaches within 1 decibel or exceeds the FHWA's limits, or if the future traffic noise level "substantially exceeds" the existing level by 15 decibels or more.

Table 4.7-1. Traffic Noise Abatement Criteria (Federal Highway Administration/Connecticut Department of Transportation)

ACTIVITY CATEGORY	PEAK HOUR LEQ(H) DBA	EVALUATION LOCATION	LAND-USE ACTIVITY DESCRIPTION
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67	Exterior	Residential
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, schools, television studios, trails, and trail crossings
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	–	–	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	–	–	Undeveloped lands that are not permitted (without building permits)

Source: Federal Highway Administration, 23 CFR Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise)

4.7.1.6 Construction Noise Criteria

The construction noise criteria recommended by FHWA are contained as default criteria in their Roadway Construction Noise Model and Construction Noise Handbook. FHWA's suggested noise criteria take into account the sensitivity of three receptor land-uses; namely residential, commercial and industrial. The criteria also separate the time of day into daytime (7 a.m. to 6 p.m.), evening (6 p.m. to 10 p.m.), and nighttime (10 p.m. to 7 a.m.), with concern for nighttime noise being most important. As shown in Table 4.7-2, the criteria generally allow the contractor to produce up to 5 decibels more noise than existed prior to construction when measured on an L10 percentile basis, subject to certain minimum allowable L10 thresholds that include 75 dBA L10 for residences, 80 dBA L10 for businesses, and 85 dBA L10 for industrial receptors during daytime hours. To that end, baseline/background noise levels must be measured in the absence of construction noise and average background L10 levels must be established for each period.

Table 4.7-2. Community Receptor Construction Noise Criteria (Federal Highway Administration)

NOISE RECEPTOR LOCATIONS (LAND-USES)	FHWA* RECEPTOR PROPERTY LINE CONSTRUCTION NOISE CRITERIA LIMITS, DBA SLOW					
	DAYTIME (7 AM - 6 PM)		EVENING (6 PM - 10 PM)		NIGHTTIME (10 PM - 7 AM)	
	L10	LMAX	L10	LMAX	L10	LMAX
Noise-Sensitive Locations: (Residences, Institutions, Hospitals, Hotels, etc.)	75 or Baseline+5 *(whichever is louder)*	85 90 (impact)	Baseline+5	85	Baseline+5 *(if Baseline < 70)* Baseline+3 *(if Baseline ≥ 70)*	80 80
Commercial Areas: (Businesses, Offices, Stores, etc.)	80 or Baseline+5 *(whichever is louder)*	None	None	None	None	None
Industrial Areas: (Factories, Plants, etc.)	85 or Baseline+5 *(whichever is louder)*	None	None	None	None	None

* Default criteria in FHWA Roadway Construction Noise Model (FHWA Roadway Construction Noise Model, 2006)

Source: Federal Highway Administration

4.7.1.7 Construction Vibration Criteria

Community vibration criteria for construction projects have been identified by FTA for the assessment and avoidance of two separate vibration-related concerns: human annoyance inside buildings, and potential physical damages to buildings. The criteria shown in Table 4.7-3 are intended to avoid human annoyance, and the criteria for avoidance of structural damages are shown in Table 4.7-4.

Table 4.7-3. Construction Vibration Human Annoyance Criteria (Federal Transit Administration)

RECEPTOR LAND-USE CATEGORY	GROUND-BORNE VIBRATION IMPACT LIMITS (VDB RE 1 MICRO-INCH/SEC)		
	FREQUENT EVENTS	OCCASIONA L EVENTS	INFREQUENT EVENTS
Category 1. Buildings where vibration would interfere with interior operations.	65 VdB	65 VdB	65 VdB
Category 2. Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3. Institutional land-uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Source: Federal Transit Administration

Table 4.7-4. Construction Vibration Structural Damage Criteria (Federal Transit Administration)

BUILDING STRUCTURAL CATEGORY	PEAK PARTICLE VELOCITY LIMIT (INCHES/SECOND)	
	TRANSIENT VIBRATION	CONTINUOUS VIBRATION
Category I. Reinforced-concrete, steel or timber (no plaster). Buildings with competent foundations, reinforced-concrete, steel or timber framing, and no plaster finish.	1.20	0.50
Category II. Engineered concrete and masonry (no plaster). Buildings with concrete or masonry foundations, any framing, and no plaster finish.	0.70	0.30
Category III. Non-engineered timber and masonry buildings. Buildings with less competent masonry foundations, horizontal timber framing, and any interior finish.	0.50	0.20
Category IV. Buildings extremely susceptible to vibration damage. Buildings that are extremely susceptible to damage from vibration.	0.30	0.12

Source: Federal Transit Administration

Human vibration annoyance guidelines are based on root-mean-squared vertical vibration velocity levels expressed in decibel units of VdB relative to one micro-inch per second (VdB re: 1 micro-inch/second). The vibration criteria limits are absolute levels, not relative increases above existing conditions, and thus do not require ambient vibration levels to be measured.

FTA's vibration annoyance limits vary based on a receptor's categorized land-use and frequency of vibration events. Residential receptors are considered to be Category 2 receptors, while institutional land-uses are placed in Category 3. Most general purpose business and commercial buildings are not included in any category. "Frequent" events are defined as more than 70 vibration events per day, "Occasional" events range from 30 to 70 per day, and "Infrequent" events are defined as fewer than 30 per day.

It is important to note that FTA's vibration criteria are intended to be applied and evaluated on the interior of the receiving structure. This requires that the transference of ground-borne vibration from outside to inside the structure (known as building coupling) be measured or estimated based on the structural competence of the building's foundation.

FTA criteria limits for building damage avoidance are based on the peak particle velocity vibration level expressed in arithmetic units of inches per second (inch/sec). Unless otherwise stated, the limits apply to vibration affecting the property in the vertical direction because the magnitude of vibration is generally most severe in that direction.

As can be seen in Table 4.7-4, the vibration criteria limits vary for Building Categories I, II, III, IV, based on the structure's physical integrity and susceptibility to damage. FTA adopted these criteria limits based on the seminal work that led to Swiss Standard SN 640-312 published originally in 1978.

4.7.1.8 City of Bridgeport Noise Ordinance

The City of Bridgeport has an enforceable noise ordinance in place that can be found in Chapter 8.80: Noise Control Regulations. The ordinance sets acceptable noise levels created within the city based on the land-use of the noise producer and the land-use noise-sensitivity of the receptor. The noise limits contained in the ordinance apply to stationary noise sources; thus, traffic noise is exempt. Moreover, the ordinance would not apply to construction noise in the case of the Proposed Action providing the construction work is performed during the daytime (7:00 a.m. to 6:00 p.m.) due to the following exemptions in Section 8.80.040.E, Items 6 and 7:

> 6. Noise created by vehicles owned by or being utilized under a contract with a governmental entity providing that best practical noise control measures have been implemented.
>
> 7. Noise generated by any construction equipment which is operated during daytime hours

4.7.2 Affected Environment

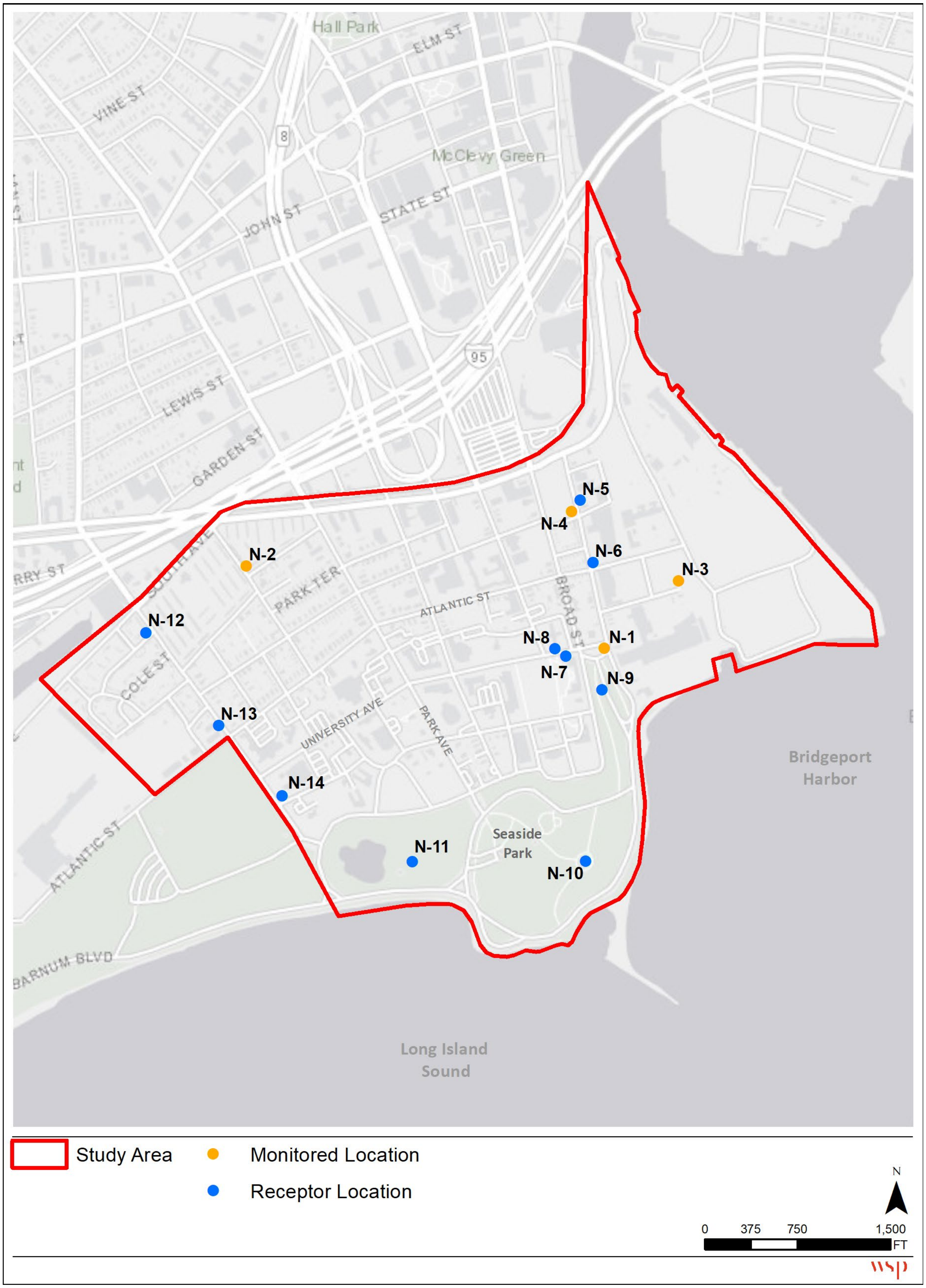
Ten noise and vibration measurement and analysis sites (N-5 through N-14) were selected throughout the affected community at representative receptor locations (Figure 4.7-1). The sites included residential, academic/institutional, and recreational park space receptors located along Main Street, University Avenue, Johnson Street and Iranistan Avenue. Receptor sites were selected to assess worst-case traffic, operational, and construction project-generated noise and vibration levels.

Ambient noise measurements were completed at four locations (N-1 through N-4) for one week in order to document existing noise conditions in the community surrounding the project, and in turn, to aid in the development of appropriate noise criteria limits for project-related traffic, operational and construction noise. Field observations were also performed to note existing sources of community noise and vibration. Existing noise levels were measured, and future noise and vibration levels were predicted at the exterior of each receptor location per FHWA and FTA procedures.

The four ambient noise monitor locations are described below:

- **Site N-1: Intersection of University Avenue and Main Street** (monitor deployed at 12:10 p.m. on October 15, 2018) – The primary observed noise sources at this location included local traffic, distant industrial hum, wind in trees, pedestrians, building HVAC equipment, and construction vehicles.
- **Site N-2: Open field at Johnson Street and Columbia Street** (monitor deployed at 1:25 p.m. on October 15, 2018) – The primary observed noise sources at this location included traffic on I-95, trains on the CTDOT New Haven Line, construction/demolition at the former Marina Village site, local traffic, wind in trees, birds, and aircraft overflights.
- **Site N-3: The end of Henry Street** (monitor deployed at 1:50 p.m. on October 15, 2018) – The primary observed noise sources at this location included wind in trees, industrial plant hum, construction vehicles, distant train horns, and local traffic entering and exiting the PSEG plant.
- **Site N-4: Intersection of Whiting Street and Main Street** (monitor deployed at 1:30 p.m. on October 15, 2018) – The primary observed noise sources at this location included traffic on I-95, trains on the CTDOT New Haven Line, local traffic, wind in trees, pedestrians, and distant sirens.

Figure 4.7-1. Noise Monitoring and Assessment Receptors



Source: WSP, 2018

Table 4.7-5 presents the average 24-hour ambient noise levels at each monitor location.

Table 4.7-5. Average Ambient Noise Levels at Monitoring Locations

SITE NO.	NOISE RECEPTOR DESCRIPTION	LDN DBA	LEQ DBA	L1 DBA	L10 DBA	L50 DBA	L90 DBA	LMAX DBA	LMIN DBA
N-1	Main Street & University Avenue	63	58	67	60	56	53	76	51
N-2	Johnson Street & Columbia Street	66	60	66	62	60	57	73	55
N-3	End of Henry Street	67	61	67	63	60	58	75	57
N-4	Main Street & Whiting Street	68	63	70	65	61	59	79	57

Source: WSP, 2018

Based upon the measured ambient noise levels, applicable noise limits were developed for each of the measurement locations. Table 4.7-6 presents the applicable noise criteria for traffic noise, and Table 4.7-7 presents the applicable noise criteria for construction noise. The noise analysis utilized these criteria in order to determine if project-generated noise levels exceed or comply with them. If these criteria limits were exceeded, then the receptor was considered to be "impacted" by project-generated noise and was therefore eligible for consideration of noise mitigation measures.

Table 4.7-6. Traffic Noise Criteria

SITE NO.	RECEPTOR DESCRIPTION	FHWA LAND-USE CATEGORY	EXISTING LOUDEST HOUR LEQ DBA	FHWA ABSOLUTE LIMIT LEQ DBA	CTDOT RELATIVE INCREMENTAL LIMIT LEQ DBA	APPLICABLE LIMIT LEQ DBA
N-5	Residential	B	65	66	80	66
N-6	Residential	B	65	66	80	66
N-7	Academic Institutional	C	63	66	78	66
N-8	Academic Institutional	C	63	66	78	66
N-9	Recreation Park	C	63	66	78	66
N-10	Recreation Park	C	63	66	78	66
N-11	Recreation Park	C	63	66	78	66
N-12	Residential	B	63	66	78	66
N-13	Residential	B	63	66	78	66
N-14	Academic Institutional	C	63	66	78	66

Source: WSP and Connecticut Department of Transportation

Notes: Federal Highway Administration 23 CFR 772 for a Category B residential receptor = 66 Leq dBA
Connecticut Department of Transportation Noise Policy 2017 allowable relative increase =15 Leq dBA

Table 4.7-7. Construction Noise Criteria

SITE NO.	RECEPTOR DESCRIPTION	FHWA LAND-USE CATEGORY	BACKGROUND DAYTIME L10 DBA	FHWA ABSOLUTE LIMIT L10 DBA	FHWA RELATIVE INCREMENTAL LIMIT L10 DBA	APPLICABLE LIMIT L10 DBA
N-5	Residential	1	66	75	71	75
N-6	Residential	1	66	75	71	75
N-7	Academic Institutional	1	62	75	67	75
N-8	Academic Institutional	1	62	75	67	75
N-9	Recreation Park	2	62	80	67	80
N-10	Recreation Park	2	62	80	67	80
N-11	Recreation Park	2	62	80	67	80
N-12	Residential	1	63	75	68	75
N-13	Residential	1	62	75	67	75
N-14	Academic Institutional	2	62	80	67	80

Source: Federal Highway Administration and WSP, 2018

Notes: Federal Highway Administration 23 CFR 772 for a Category B residential receptor = 75 or Background +5 L10 dBA

4.7.3 Environmental Consequences

This section describes the results of the noise and vibration assessment and determines if impact conditions are expected in the community as a result of the construction and/or operation of the project. The term "impact" has a quantitative definition, as described in Section 4.7.2, which occurs when applicable criteria limits are exceeded. Simply because project-related noise can be heard, or vibration can be felt, does not necessarily mean that the levels are significant enough to cause impact. Moreover, if noise or vibration impacts are expected to occur, it means that people might experience annoyance or interruption from it, i.e. it is not a concern from a human health perspective.

4.7.3.1 No Action Alternative

In the No Action Alternative, noise and vibration levels are expected to remain very similar to what they are today. There will be neighborhood upgrades, improvements and new developments by the year 2038. However, given the relatively light vehicular activity of the area, future noise and vibration levels are not expected to approach or exceed impact limit definitions.

FHWA traffic noise analyses are not reliant on quantifying the No Action Alternative noise levels. The more important comparison for determining impact is made between Existing and Future Build traffic noise conditions. In this case the project is not anticipated to directly generate any new volume of traffic, however the project would reroute and redirect traffic to new and alternative locations. Consequently, the traffic noise assessment performed for this project can be viewed as a worst-case combination of the traffic noise caused by the project and reasonably foreseeable projects in the vicinity.

RBD Pilot Project

Monitored location N-2 (Johnson Street and Columbia Street) and the modeled location N-12 (Iranistan Avenue and Sims Street) represent the noise area of the RBD Pilot Project. In the No Action Alternative, there will be no change to the roadway configuration in this area but the Windward Development will be constructed and traffic will be generated from the mixed-used development. As discussed in the traffic report for the RBD Pilot Project (Appendix G), the traffic volumes will not change considerably from existing since the number of units on the site will be similar. As shown in Table 4.7-1, the traffic noise in the peak hour at N-12 is expected to be 51 Leq dBA.

Flood Risk Reduction Project

Monitored locations N-1 (Main Street and University Avenue) and N-3 (near PSEG property at the eastern end of Henry Street) and the modeled locations N-6 (Cottage District), N-7 (University Avenue), N-8 (University Avenue and Broad Street), and N-9 (entrance to Seaside Park at University Avenue) represent the noise area of the Flood Risk Reduction Project. In the No Action Alternative, there will be no change to the roadway configuration in this area but the 60 Main Street development is expected to be constructed, and traffic will be generated from the residential development. As discussed in the traffic report for the Flood Risk Reduction Project (Appendix G), the traffic volumes will increase from background growth and new development but will not significantly impact traffic conditions in the area between Broad and Main Streets at University Avenue. As shown in Table 4.7-1, the traffic noise in the peak hour at N-6, N-7 and N-8 is expected to be between 20 and 42 Leq dBA.

Resilience Center

Monitored location N-4 (Freeman Houses) and modeled location N-5 represent the noise area of the Resilience Center. In the future condition, there will be no change to the roadway configuration in this area. UI's Pequonnock Substation will be relocated closer to the area but will not result in a substantive change in traffic. As shown in Table 4.7-1, the traffic noise in the peak hour at N-5 is expected to be only 17 Leq dBA.

4.7.3.2 Proposed Action

The Proposed Action projects were assessed for traffic and operational noise consequences, as well as construction impacts.

Traffic Noise

Traffic noise levels at each of the representative receptor locations were computed based on the traffic analyses performed for the RBD Pilot Project and Flood Risk Reduction Project areas (see Appendix G) and using the Cadna-A/TNM module (Table 4.7-8). As can be seen, future traffic volumes with the Proposed Action are expected to cause negligible increases in community noise relative to existing conditions. None of the receptors are expected to be exposed to future traffic noise levels that would be considered excessive, and thus traffic noise impacts are not anticipated with these projects.

For the RBD Pilot, represented by the modeled location N-12, the addition of the Johnson Street extension would not result in an increase in traffic noise over the Existing condition. The traffic noise in the peak hour at N-12 is expected to remain at 51 Leq dBA.

For the Flood Risk Reduction Project, represented by the modeled locations N-6, N-7, N-8, and N-9, elevation of University Avenue and reconfiguration of the intersection at Main Street and University Avenue would increase traffic noise compared with the Existing condition. There would be a minor increase near the Cottage District (N-6; 25 Leq dBA compared to 20 Leq dBA), and negligible to no change on University Avenue (N-7 would increase to 42 Leq dBA from 40 Leq dBA and N-8 would remain at 42 Leq dBA). The entrance to

Seaside Park at University Avenue (N-9) would experience the largest increase in traffic noise (35 Leq dBA from 26 Leq dBA).

The Resilience Center would include funding toward the restoration of the Freeman Houses, represented by modeled location N-5. Although no change in the roadway configuration in this area, the background growth and traffic from planned future development at 60 Main Street would increase noise slightly from 17 Leq dBA to 20 Leq dBA.

Table 4.7-8. Proposed Action Traffic Noise (2038)

SITE NO.	RECEPTOR DESCRIPTION	FHWA LAND-USE CATEGORY	APPLICABLE LIMIT LEQ DBA	2018 EXISTING TRAFFIC NOISE PEAK HOUR LEQ DBA	2038 PROPOSED ACTION TRAFFIC NOISE PEAK HOUR LEQ DBA	TRAFFIC NOISE COMPLIANCE OR EXCEEDANCE
N-5	Residential	B	66	17	20	Complies
N-6	Residential	B	66	20	25	Complies
N-7	Academic Institutional	C	66	40	42	Complies
N-8	Academic Institutional	C	66	42	42	Complies
N-9	Recreation Park	C	66	26	35	Complies
N-10	Recreation Park	C	66	15	18	Complies
N-11	Recreation Park	C	66	17	19	Complies
N-12	Residential	B	66	51	51	Complies
N-13	Residential	B	66	27	28	Complies
N-14	Academic Institutional	C	66	22	23	Complies

Source: WSP 2018

Pump House Noise

Besides traffic, the only potential noise associated with the operation of the Proposed Action would be from the new water pumps, for both the RBD Pilot Project and the Flood Risk Reduction Project. Use of the pumps would be temporary and limited to extreme flooding events.

The applicable noise criteria for the pump operations would be from the CTDEEP Regulation Title 22a-69, Control of Noise, and City of Bridgeport ordinance. In brief, for a Class A receiver (such as a residence), the more restrictive noise limit at night would be 45 dBA; and for a Class B receptor (such as institutional buildings and outdoor parks), the noise limit would be 62 dBA. The regulation also has a provision for situations involving elevated background noise conditions (Bkgd L90 + 5 dBA), but none of the receptors in this case would meet that definition.

The representative noise from pump operations was computed using the Cadna-A model, for the proposed pump house for the RBD Pilot Project, to be located at the corner of Iranistan Avenue and South Avenue. The results show that the pump noise would exceed CTDEEP's criteria for residential receivers (modeled as 60 Leq dBA at the nearby N-12 location). However, noise mitigation measures would likely not be justifiable in this case due to the extremely limited time and dire circumstances under which the pump house would be operating.

In addition, the pump and generator would be tested weekly to ensure proper function. This testing would be performed during daytime hours and last for approximately 10 minutes each week.

Construction Noise

Construction noise levels at each of the representative receptor locations were computed using the Cadna-A/RCNM module (Table 4.7-10). As shown, construction noise levels are expected to comply with FHWA guidelines at the majority of community receptors except for sites N-6, N-7 and N-8, which are located along Main Street and University Avenue.

Table 4.7-9. Construction Noise

SITE NO.	RECEPTOR DESCRIPTION	FHWA LAND-USE CATEGORY	CONSTRUCTION NOISE PILES / OTHER L10 DBA	APPLICABLE LIMIT L10 DBA	CONSTRUCTION NOISE COMPLIANCE OR EXCEEDANCE
N-5	Residential	1	74 / 65	75	Complies
N-6	Residential	1	81 / 72	75	Exceeds
N-7	Academic Institutional	1	82 / 73	75	Exceeds
N-8	Academic Institutional	1	93 / 84	75	Exceeds
N-9	Recreation Park	2	68 / 59	80	Complies
N-10	Recreation Park	2	57 / 49	80	Complies
N-11	Recreation Park	2	55 / 48	80	Complies
N-12	Residential	1	68 / 68	75	Complies
N-13	Residential	1	57 / 55	75	Complies
N-14	Academic Institutional	1	55 / 51	75	Complies

Source: WSP, 2018

The piece of construction equipment that would cause excessive noise at sites N-6, N-7 and N-8 would be the vibratory pile driver. In fact, without the use of the pile driver, construction noise levels from the other equipment would likely comply at all receptor locations except at site N-8, which is exceptionally close to University Avenue. The noise impacts would be temporary and intermittent. As construction along the entire coastal flood defense system would occur in phases, no single location would experience excessive noise for a prolonged period of time. However, noise mitigation measures to reduce the loudness of pile driving, particularly near these three receptors, would be developed and implemented as appropriate to minimize the impact (see Section 4.7.4).

Construction Vibration

Construction vibration levels at each of the representative receptor locations were computed using WSP's proprietary vibration model. Table 4.7-11 shows the results for potential human annoyance from vibration, and Table 4.7-12 shows the results for potential building structural damages.

As shown in the tables, construction vibration levels are expected to exceed FTA's human annoyance guidelines at essentially every receptor location. Again, this is primarily due to the intended use of vibratory pile drivers, but annoyance exceedances are also expected at several receptors from the use of other construction equipment as well. The only receptor to be concerned about with respect to potential building damages would be at site N-5, which represents two historic houses in poor condition (the Freeman Houses). These houses were categorized as Category IV structures due to their particularly fragile conditions. Consequently, mitigation measures to reduce construction-induced vibration, particularly from the pile drivers, would be developed and implemented (see Section 4.7.4).

Table 4.7-10. Construction Vibration Annoyance

SITE NO.	RECEPTOR DESCRIPTION	FTA LAND-USE CATEGORY	CONSTRUCTION VIBRATION PILES / OTHER VDB	APPLICABLE LIMIT VDB	CONSTRUCTION VIBRATION COMPLIANCE OR EXCEEDANCE
N-5	Residential	2	86 / 80	72	Exceeds
N-6	Residential	2	86 / 80	72	Exceeds
N-7	Academic Institutional	3	81 / 75	75	Exceeds
N-8	Academic Institutional	3	78 / 72	75	Exceeds
N-9	Recreation Park	3	N/A	N/A	N/A
N-10	Recreation Park	3	N/A	N/A	N/A
N-11	Recreation Park	3	N/A	N/A	N/A
N-12	Residential	2	84 / 78	72	Exceeds
N-13	Residential	2	81 / 75	72	Exceeds
N-14	Academic Institutional	3	78 / 72	75	Exceeds

Source: WSP, 2018

Table 4.7-11. Construction Vibration Damages

SITE NO.	RECEPTOR DESCRIPTION	FTA BUILDING CATEGORY	CONSTRUCTION VIBRATION PILES / OTHER PPV	APPLICABLE LIMIT PPV	CONSTRUCTION VIBRATION COMPLIANCE OR EXCEEDANCE
N-5	Residential	IV	0.17 / 0.03	0.12	Exceeds
N-6	Residential	III	0.17 / 0.03	0.20	Complies
N-7	Academic Institutional	II	0.10 / 0.02	0.30	Complies
N-8	Academic Institutional	II	0.07 / 0.01	0.30	Complies
N-9	Recreation Park	N/A	N/A	N/A	N/A
N-10	Recreation Park	N/A	N/A	N/A	N/A
N-11	Recreation Park	N/A	N/A	N/A	N/A
N-12	Residential	III	0.14 / 0.02	0.20	Complies
N-13	Residential	II	0.10 / 0.02	0.30	Complies
N-14	Academic Institutional	II	0.07 / 0.01	0.30	Complies

Source: WSP, 2018

4.7.4 Mitigation Measures

Since potential noise or vibration impact conditions were identified during construction, mitigation measures will be implemented during construction, as appropriate. The potential effectiveness and cost of each mitigation measure would need to be assessed during the Proposed Action's final design.

The main source of concern from a construction noise and vibration perspective would be the use of pile drivers. Consequently, the following potential mitigation measures focus on reducing noise and vibration emissions from pile driving. Mitigation measures will vary depending on proximity to sensitive receptors as well as to existing structures and infrastructure, and could include the following:

- Use noise barriers along the edges of work zones.
- Use an alternative pile driving method such as hydraulic pile pushing system in specific locations.
- Use drilled caissons or slurry walls instead of piles in specific locations.
- Wrap the pile with noise curtains or bellow that collapse as the pile is driven in specific locations.
- Pre-trench the holes with a long-arm backhoe when work is close to tunnels, utilities, or other sensitive structures.
- Include a Noise Specification and a Vibration Specification in the contractor's bid documents.
- Require the contractor to develop a Noise and Vibration Control and Mitigation Plan based on proposed equipment and methods to document expected noise levels and noise control measures that would be implemented.
- Perform noise and vibration monitoring during construction to ensure the contractor is complying with specified thresholds.

4.8 NATURAL RESOURCES

Natural resources include vegetation, wildlife and wetlands. Although the Proposed Action would be constructed within an urban environment, the area is surrounded by water and includes large upland open spaces that provide potential habitat for plant and wildlife.

4.8.1 Methodology and Regulatory Context

4.8.1.1 Methodology

The general study area for the Proposed Action was used as the study area for this natural resources assessment. This section involved the following tasks:

- Collection and review of relevant data, reports, and documents
- Completion of site visits aimed at characterizing ecological communities and wildlife within the study area
- Consultation with federal and state agencies to identify protected species and habitats potentially affected by project activities.

The information was used in assessing possible impacts, both beneficial and adverse, that would be generated by the Proposed Action.

A combination of government and non-government literature was utilized to build this section. Documents produced by CTDEEP, including wildlife factsheets, marine fishery studies, watershed reports, and regulatory publications, were used to characterize existing conditions in the study area. Materials from the Connecticut Department of Agriculture, the United States Fish and Wildlife Service (USFWS), the Yale Peabody Museum of Natural History, available environmental reviews and assessments, and available permit documents were also used to provide a thorough depiction of the affected environment.

To obtain additional information about the ecology of the study area and to validate existing data, a team of certified scientists performed a comprehensive site visit/field survey. As a result of this effort, a number of ecological communities within the South End of Bridgeport were observed and described, and several types of wildlife were identified. All relevant findings were compiled in the project's Design Strategies Report (published February 28, 2018), which served as a critical reference to develop this section.

Additional fieldwork completed by BL Companies was utilized to develop Section 4.8.4, Wetlands. Specifically, BL Companies characterized any existing wetland resources, including tidal vegetation, and submerged aquatic vegetation near the study area outfalls (see Wetlands Letter Report in Appendix F).

Both USFWS and the National Marine Fisheries Service (NMFS) were consulted to identify federally listed threatened and endangered species that could potentially be affected by the Proposed Action. Additionally, CTDEEP was contacted for information on state-listed threatened and endangered species that could occur within the study area. Any correspondence received from these agencies was thoroughly reviewed, and harm avoidance or mitigation recommendations were addressed as part of this section.

For the environmental consequences analysis, the following types of direct and indirect impacts of the No Action Alternative and Proposed Action were identified:

- Direct impacts:
  - Removal of vegetation from riparian or upland habitats
  - Alteration of terrestrial or aquatic habitats, including wetlands
  - Fragmentation or isolation of terrestrial or wetland habitat
  - Interruption of migratory corridors
  - Impediment to flow or aquatic organism movement in tidal or non-tidal waterways
  - Displacement or degradation of aquatic resources, including Essential Fish Habitat (EFH) or intertidal or subtidal benthic communities/habitats
  - Effects to special status species and their habitats
- Indirect impacts:
  - Result in the introduction or proliferation of invasive species
  - Result in a downstream increase in turbidity, sedimentation, or nutrient/contaminant inputs
  - Induce any further changes that would adversely affect biological resources

4.8.1.2 Regulatory Context

Natural resources that occur within the boundaries of the study area are regulated under several state and federal statutes. Relevant federal statutes include the Endangered Species Act, the Fish and Wildlife Coordination Act, the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, the Magnuson-Stevens Act, and Executive Order 11990 ("Protection of Wetlands"). Relevant state regulations include the Connecticut Endangered Species Act, the Connecticut Tidal Wetlands Act, the Connecticut Coastal Management Act, and several sections of the Connecticut General Statutes related to natural resource protection and preservation.

Federal Regulations

- Endangered Species Act of 1973 (16 USC §§ 1531 TO 1544) provides for the conservation of ecosystems that endangered and threatened species depend upon. The act authorizes the acquisition of land and the establishment of programs for the purpose of protecting critical habitats and proposed listed wildlife and plants. The act also prohibits unauthorized actions against listed wildlife and plants, including illegal possession, sale, transport, taking, importation, and exportation.
- Fish and Wildlife Coordination Act (16 USC 661-667e) requires that wildlife conservation be given the same consideration and coordination as other water resources development programs. The act necessitates consultation with USFWS, as well as with state fish and wildlife agencies, when water bodies are to be "impounded, diverted, or otherwise controlled or modified" under a federal permit or license. This consultation serves to protect wildlife resources, such as animals, plants, and nesting areas, against loss or damage.
- Migratory Bird Treaty Act of 1918 (50 CFR 10, 20, 21, EO 13186) was established following a 1916 convention between the United States and Great Britain, on behalf of Canada, for the protection of migratory birds. Subsequent amendments to the Act implemented treaties between the United States and Mexico, the United States and Japan, and the United States and the former Soviet Union. The act makes it illegal to pursue, take, capture, hunt, kill, transport, sell, or otherwise harm a migratory bird except under the terms of a valid permit. The act extends protections not only to living birds, but also to deceased birds, parts of birds (e.g., feathers), eggs, and nests. More than 800 species are currently protected under the act.

- Bald and Golden Eagle Protection Act (16 USC 668-668c) prohibits the taking of bald and golden eagles without a valid permit issued by the Secretary of the Interior. The act applies to both living and deceased eagles and to their parts, eggs, and nests. Under the act, "take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."
- Magnuson-Stevens Fishery Conservation and Management Act (16 USC §§ 1801 to 1891) is the primary law governing marine fisheries management in federally-regulated U.S. waters. Section 305(b)(2)-(4) of the act requires federal agencies to consult with the NMFS regarding any action they are funding, authorizing, or undertaking that could adversely affect EFH, which is defined as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC §1802(10)). Adverse impacts to EFH include direct impacts (e.g., contamination) indirect impacts (e.g., reduction in prey or offspring numbers), and site-specific or habitat-wide impacts (e.g., cumulative/synergetic consequences) of an action.
- Clean Water Act, Section 404 (33 USC Section 1344) requires that any discharge of material into an inland wetland or watercourse warrants a permit from the U.S. Army Corps of Engineers (OLR Research Report, *https://www.cga.ct.gov/2012/rpt/2012-R-0155.htm*).
- EO 11990, "Protection of Wetlands" states that federal agencies must avoid funding, authorizing, undertaking, or otherwise supporting new construction in wetlands, unless no practicable alternative to said construction exists. If construction is deemed unavoidable, the federal agency must develop its proposed action to incorporate all practicable measures of minimizing harm to the wetland.

State Regulations

- Connecticut Endangered Species Act of 1989 (Public Act 89-224) establishes provisions for the "conservation, protection, and enhancement" of the state's threatened and endangered species and their habitats. The act forbids unauthorized taking of threatened and endangered species with the intent to possess, collect, sell, transport, export, harm, or otherwise disturb said species. The act also prohibits state agencies from adversely affecting designated essential habitats without a valid permit or exemption.
- Connecticut Tidal Wetlands Act (Connecticut General Statutes Sections 22a-28 through 22a-35) requires that CTDEEP's Office of Long Island Sound Programs authorize all construction activities (and associated work) that is proposed to occur in tidal wetlands and/or waterward of the high tide line. The act defines tidal wetlands as "areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action."
- Connecticut General Statutes Sections 22a-359 through 22a-363f govern the placement of structures, dredging, and fill in tidal, coastal, and navigable waters. These statute sections call for the protection of tidal wetlands against "despoliation or destruction" and, as such, require the CT Commissioner of Energy and Environmental Protection to consider several factors (e.g., impacts to native aquatic life, to shoreline erosion, to coastal flooding) when assessing proposed activities.
- Connecticut Coastal Management Act (Public Act 78-152), enacted in 1980, prohibits the development, preservation, or use of land and water resources within the state's coastal area in a manner that significantly disrupts either the natural environment or sound economic growth. Adverse impacts to coastal wetlands, coastal waterbodies, and other natural features are defined and regulated under this act, which is addressed in greater detail in Section 4.12 Coastal Zone Management.

4.8.2 Affected Environment

Terrestrial and Aquatic Ecology

The study area is characterized by heavy development and dense urbanization. Greater than 82 percent of land use in Bridgeport is mapped as developed, and much of the upland terrestrial landscape (greater than 20 percent) is covered by impervious surface (University of Connecticut, 2010). The area contains regional transportation systems, critical regional wastewater and energy infrastructure, industrial facilities, residential neighborhoods, low-income housing developments, and educational institutions. Due to these land use conditions, the natural ecosystems of Bridgeport have been significantly altered, fragmented, and degraded. For example, the city's shorelines—spaces historically populated by undisturbed open water habitats, creeks, and wetlands—have been modified to support industrial growth.

A comprehensive field survey performed by certified ecologists identified nine distinct habitat types within the waterfront and inland portions of the study area. These nine habitat types (Table 4.8-1) are described in more detail in Appendix E, Supplemental Natural Resources Information, are ruderal uplands, urban forest, freshwater wetlands, beaches and dunes (Figure 4.8-1), hardened shoreline, intertidal wetlands, intertidal flats, oyster reefs/shellfish beds, and subtidal bottom (Waggonner & Ball and Arcadis, 2018). Each identified habitat offers a set of ecosystem services (i.e., benefits, both direct and indirect, that are derived from natural environments). Examples include provisioning services such as food and shelter; regulating services such as disease control; cultural services such as recreation; and supporting services such as nutrient cycling (Millennium Ecosystem Assessment, 2005). In their present state, several of the study area's habitats provide only limited ecosystem services.

Figure 4.8-1. Remnant Beach with Small Dune Plant Community in Front of Hardened Riprap (Seaside Park)

Source: Waggonner & Ball Architecture/Environment and Arcadis. Resilient Bridgeport: Ecology. Design Strategies Report 2E. (2018)

Table 4.8-1. Ecological Communities of the Study Area

Habitat	Ecosystem Services	Presence in Study Area
Ruderal Uplands	Limited habitat potential for passerine birds, opportunistic mammals, and some insects	Throughout the study area, particularly within developed center; vacant lots and brownfields are common examples
Urban Forest	Wave attenuation; critical stopover point for migratory birds; habitat for opportunistic mammals and resident birds	Patches throughout residential neighborhoods; Seaside Park
Freshwater Wetlands	Water source and foraging space for migratory and resident birds; restricted services in current condition	Limited freshwater emergent wetlands near Tongue Point
Beaches and Dunes	Shoreline stabilization; wave attenuation; critical habitat for crustaceans, seabirds, shorebirds, and wading birds; recreation; overall scope of services restricted by shoreline hardening	Along the southern coast of the study area; most prevalent along Seaside Park
Hardened Shoreline	Shoreline stabilization and wave attenuation; provides only minimal habitat opportunity, primarily for sessile invertebrates	Hardened structures (e.g., bulkheads, riprap, revetments) replace or abut natural shoreline along much of the study area
Intertidal Wetlands	Shoreline stabilization; wave attenuation; water filtration; erosion control; habitat for various terrestrial and aquatic species, especially birds; restricted services in current condition	Small remnant patches along Bridgeport shoreline; more extensive intertidal wetlands exist at nearby Ash Creek and Lewis Gut
Intertidal Flats	Shoreline stabilization; wave attenuation; water filtration; habitat for benthic invertebrates, which serve as a critical food sources for fish, birds, and crustaceans	Along Bridgeport shoreline, primarily due to historic wetland loss/modified sediment transport; concentrated along southwestern edge of the study area
Oyster Reefs/ Shellfish Beds	Aquatic habitat structure; wave attenuation; water filtration; nursery habitat for finfish and crustaceans; avian feeding habitat	Throughout Bridgeport Estuary; Connecticut has classified most of Bridgeport's shellfish beds as "Restricted" or "Prohibited," which prevents harvesting for sale or consumption
Subtidal Bottom	Avian foraging habitat; finfish foraging habitat; shallower areas support eel grass beds, which provide critical habitat and aid in water quality maintenance	Represents significant portion of Bridgeport Estuary within/adjacent to the study area

Source: Waggonner & Ball Architecture/Environment and Arcadis. Resilient Bridgeport: Ecology. Design Strategies Report 2E. (2018)

Terrestrial and Aquatic Wildlife

Widespread urban development has resulted in an absence of undisturbed habitats within the study area. Wildlife is largely confined to residential yards, tree-lined roadways, public parks and beaches, and impaired nearshore waters characterized by varying degrees of anthropogenic interference. Opportunistic, disturbance-tolerant species are common, especially in heavily populated inland areas. However, portions of the coastline provide refuge for some less tolerant species.

Birds

According to available data from the eBird network—a publicly accessible, online database of bird observations jointly coordinated by the Cornell Lab of Ornithology and the National Audubon Society—over 350 avian species have been identified in Fairfield County, CT, with many occurring in locations along Long Island Sound. Some bird species are year-round (permanent) residents, while others spend only the winter or their breeding months in the region. Certain birds, such as Philadelphia vireo (*Vireo philadelphicus*), pass through while migrating but do not nest or overwinter in the area.

The Connecticut coastline provides important resources for a myriad of bird species. Habitats such as intertidal mudflats, intertidal wetlands, and beaches serve as critical spaces for foraging and nesting. Within the South End of Bridgeport, these environments are sparse and considerably degraded by human activity. A 1991 report from USFWS does not identify any significant breeding or overwintering grounds for migratory waterfowl in the confines of the study area, although such spaces have been identified at nearby Ash Creek and Great Meadows (CTDEEP, "Migratory Waterfowl Concentration Areas," 1999).

Remaining patches of ecologically valuable habitat within the study area do support resident bird populations and offer some transient migrants the opportunity to refuel (i.e., catch up on rest and nutrition). For instance, the shoreline of Seaside Park functions as a refueling stop for a limited range of migratory waterfowl, seabirds, shorebirds, and wading birds (Waggonner & Ball and Arcadis, 2018). Commonly observed water-dependent species include herring gull (*Larus argentatus*), ring-billed gull (*Larus delawarensis*), great black-backed gull (*Larus marinus*), American black duck (*Anas rubripes*), long-tailed duck (*Clangula hyemalis*), mallard (*Anas platyrhynchos*), Canada goose *(Branta canadensis*), double-crested cormorant (*Phalacrocorax auritus*), great egret (*Ardea alba*), and osprey (*Pandion haliaetus*) (eBird database, 2018).

Additional types of bird, including passerine species, woodpeckers, and hawks, are known to occur in upland sections of the study area. Many of these birds are adapted to the high level of anthropogenic activity associated with city environments. Examples include mourning dove (*Zenaida macroura*), rock pigeon (*Columba livia*), downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), black-capped chickadee (*Poecile atricapillus*), northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*) (eBird database, 2018). Red-tailed hawks (*Buteo jamaicensis*) and Cooper's hawks (*Accipiter cooperiiare*) are among the more common woodland raptors observed in the South End of Bridgeport (eBird database 2018). Additional avian species identified as confirmed breeders within the study area are listed in Appendix E, Supplemental Natural Resources Information.

Mammals

Terrestrial mammals that occur within the study area are primarily habitat generalists capable of managing urban conditions. Examples include gray squirrel (*Sciurus carolinensis*), house mouse (*Mus musculus*), white-footed mouse (*Peromyscus leucopus*), Norway rat (*Rattus norvegicus*), common raccoon (*Procyon lotor*), eastern striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis virginianus*), woodchuck (*Marmota monax*), and eastern cottontail (*Sylvilagus floridanus*). Muskrats (*Ondatra zibethicus*) could inhabit freshwater bodies, such as the remaining patchwork of freshwater wetlands near Tongue Point. Bobcats (*Lynx rufus*), black bears (*Ursus americanus*), and coyotes (*Canis latrans*) are also known to occur in Connecticut; however, they are concentrated in the northwestern region of the state and are not likely inhabitants of the densely populated, urbanized study area. (CTDEEP "Wildlife Fact Sheets," 1999/2018)

Eight (8) bat species are known to occur within Connecticut: little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), eastern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Pipistrellus subflavus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), red bat (*Lasiurus borealis*), and Indiana bat (*Myotis sodalist*). The little brown bat and big brown bat are the two most common bats in Connecticut and could be found in the study area, particularly in spaces with high tree cover. Six bat species are less common and are seldom observed within the state. Thus, it is unlikely they would be displaced, disturbed, or otherwise affected by the Proposed Action. (CTDEEP "Bats Informational Series," 1999)

Reptiles and Amphibians

Both the Yale Peabody Museum of Natural History and CTDEEP have collected data on Connecticut's reptile and amphibian populations. According to these sources, 27 native reptile species and 23 native amphibian species occur in the state. This includes 8 freshwater or terrestrial turtle species, 4 sea turtle species, 14 snake species, 1 lizard species, 12 salamander species, and 11 frog and toad species. Non-native reptiles and amphibians have also been documented in the state of Connecticut, including rough green snakes (*Opheodrys aestivus*), red-eared sliders (*Trachemys scripta elegans*), Italian wall lizards (*Podarcis sicula*), and mink frogs (*Rana septentrionalis*). (Peabody Museum, 2015 and CTDEEP "Amphibians & Reptiles in Connecticut," 2000)

Many of Connecticut's native reptile and amphibian species are sensitive to ecosystem disturbance and habitat fragmentation. For example, northern dusky salamanders (*Desmognathus fuscus*) have become scarce in urban areas due to increasing impervious surface cover and subsequent stream scouring. Other native species—including gray tree frog (*Hyla versicolor*), northern black racer (*Coluber c. constrictor*), and spotted turtle (*Clemmys guttata*)—are declining due to a combination of forest loss, wetland conversion and draining, road kills, and pollution. As a result of such vulnerabilities, it is unlikely that a large quantity of native reptiles and amphibians occur in the highly developed study area. Potential inhabitants of the study area include bullfrogs (*Rana catesbeiana*), green frogs (*Rana clamitans melanota*), redback salamanders (*Plethodon cinereus*), eastern milk snakes (*Lampropeltis t. triangulum*), red-eared sliders (*Trachemys scripta elegans*), Italian wall lizards (*Rana septentrionalis*), and other adaptable species. (CTDEEP "Amphibians & Reptiles in Connecticut," 2000)

Finfish

In 2016, the CTDEEP conducted an estuarine seine survey to assess the relative abundance of finfish and invertebrate species at eight recreational fisheries along the coastline. The results of this survey, presented in *A Study of Marine Recreational Fisheries in Connecticut* (CTDEEP, 2016), indicate that prominent fish species of coastal waters include tautog/blackfish (*Tautoga onitis*), porgy/scup (*Stenotomus chrysops*), striped bass (*Morone saxatilis*), bluefish (*Pomatomus saltatrix*), winter flounder (*Pseudopleuronectes americanus*), summer flounder (*Paralichthys dentatus*), black sea bass (*Centropristis striata*), Atlantic butterfish (*Peprilus triacanthus*), northern pipefish (*Syngnathus fuscus*), northern kingfish (*Menticirrhus saxatilis*), northern puffer (*Sphoeroides maculatus*), and striped searobin (*Prionotus evolans*). Nearshore shellfish beds, eelgrass beds, and open water habitats also support an assortment of forage fish – small pelagic fish that serve as a key food source for larger organisms. Among the more common forage fish species are Atlantic silverside (*Menidia menidia*), mummichog (*Fundulus heteroclitus*), striped killifish (*Fundulus majalis*), and sheepshead minnow (*Cyprinodon variegatus*). Of the eight fishery locations sampled during the survey, the location nearest to the study area saw the lowest overall finfish diversity with comparatively high catches of Atlantic silverside.

ESSENTIAL FISH HABITAT

NMFS has identified EFH along coastal Connecticut within Long Island Sound. As discussed under Section 4.8.1, Regulatory Context, EFH is defined as waters and substrates that are critical to fish for the performance of vital biological functions – namely spawning, breeding, feeding, or growth to maturity. In accordance with the Magnuson-Stevens Fishery Conservation and Management Act (16 USC §§ 1801 to 1891), consultation with NMFS was initiated in May 2018 to evaluate possible adverse effects of the Proposed Action on EFH. Preliminary efforts to identify managed species with EFH near the study area were completed using Essential

Fish Habitat Mapper, an online tool maintained by NMFS. Table 4.9-2 displays the species likely to have EFH in the Bridgeport Estuary as indicated by available mapping, as well as the life stages of each species that could be present.

Table 4.8-2. Potential Essential Fish Habitat of the Bridgeport Estuary

Region	Potential Species	Potential Life Stages Present
New England	Windowpane Flounder	All
	Winter Flounder	All
	Red Hake	All
	Silver Hake	Juvenile, Adult
	Little Skate	Juvenile, Adult
	Winter Skate	Juvenile, Adult
	Atlantic Herring	Juvenile, Adult
	Pollock	Juvenile, Adult
Mid-Atlantic	Atlantic Butterfish	All
	Scup	All
	Longfin Inshore Squid	Eggs, Juvenile, Adult
	Bluefish	Juvenile, Adult
	Summer Flounder	Juvenile, Adult
	Atlantic Mackerel	Juvenile
	Black Sea Bass	Juvenile
Highly Migratory	Smoothhound Shark	All
	Sand Tiger Shark	Neonate, Juvenile

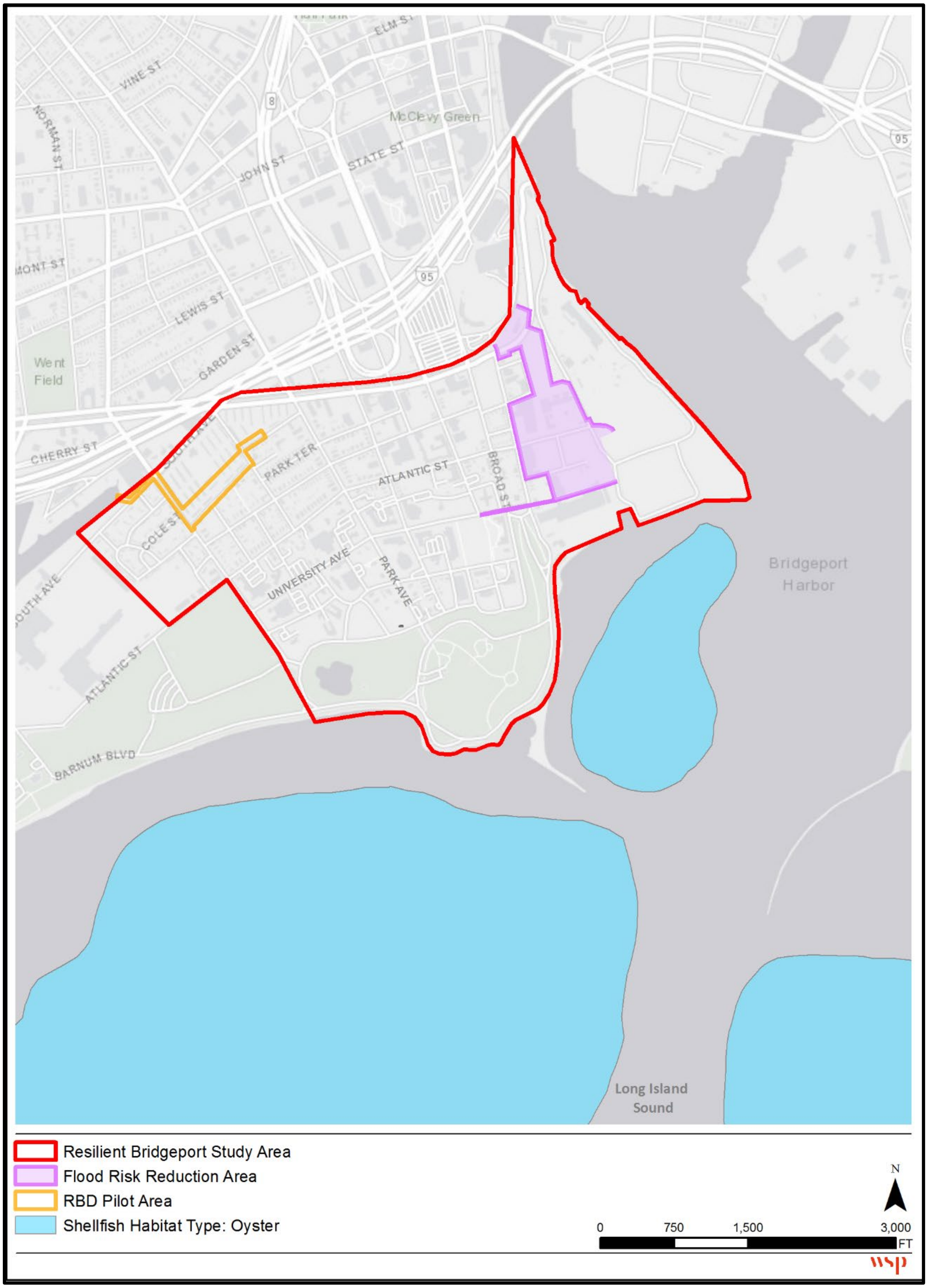
Source: National Marine Fisheries Service Essential Fish Habitat Mapper (2018)

AQUATIC INVERTEBRATES

The CTDEEP estuarine seine survey and corresponding publication, *A Study of Marine Recreational Fisheries in Connecticut* (CTDEEP 2016), also provided data on macroinvertebrates that inhabit Connecticut's coastal waters. Across the eight seining locations, there were significant catches (i.e., greater than 200 individuals) of the following species: flat claw hermit crab (*Pagurus pollicaris*), green crab (*Carcinus maenas*), mud crab (*Scylla serrata*), sand shrimp (*Crago septemspinosus*), common shore shrimp (*Palaemonetes vulgaris*), mud snail (*Nassarius obsoletus*), and northern comb jelly (*Bolinopsis infundibulum*). Additional invertebrate species, such as Atlantic blue crab (*Callinectes sapidus*) and Japanese spider crab (*Macrocheira kaempferi*), were present but less abundant in the samples (i.e., 20 or fewer total individuals).

Other aquatic invertebrates that occur near the study area include the oysters, hard-shell clams, and soft-shell clams of reefs and shellfish beds (Figure 4.8-2). These communities, as well as the riprap that spans much of the study area's coastline, provide habitat for an assortment of smaller sessile/encrusting invertebrates (e.g., barnacles, sea squirts, marine mussels, etc.). Furthermore, Atlantic horseshoe crabs (*Limulus polyphemus*) can be found along beaches and in shallow littoral zone waters across coastal Connecticut. Although shoreline development has dramatically reduced Atlantic horseshoe crab numbers in urbanized areas, the eggs of the species still serve as a critical food source for various fish and migratory birds. Overall, aquatic invertebrates represent a key component of coastal ecosystems both within and around the study area, performing valuable functions such as water filtration and increasing substrate complexity. (Waggonner & Ball and Arcadis, 2018)

Figure 4.8-2. Shellfish Populations Offshore of Study Area



Source: CTDEEP Website. Shellfish (Hard Clam, Soft Clam, Oysters) Digital Data. CTDEEP: Hartford, CT (1997)

Threatened and Endangered Species

The December 13, 2018, USFWS Information for Planning and Consultation (IPaC) Trust Resource Report and Official Species List indicates that two federally listed threatened or endangered species could occur in the study area. One identified species is the red knot *(Calidris canutus*), a migratory shorebird federally listed as threatened. The other identified species is the roseate tern (*Sterna dougallii*), a migratory seabird federally listed as endangered. No designated critical habitats are identified within the bounds of the study area. A brief description of the species, including their distributions and habitat preferences, is provided in Appendix E, Supplemental Natural Resources Information.

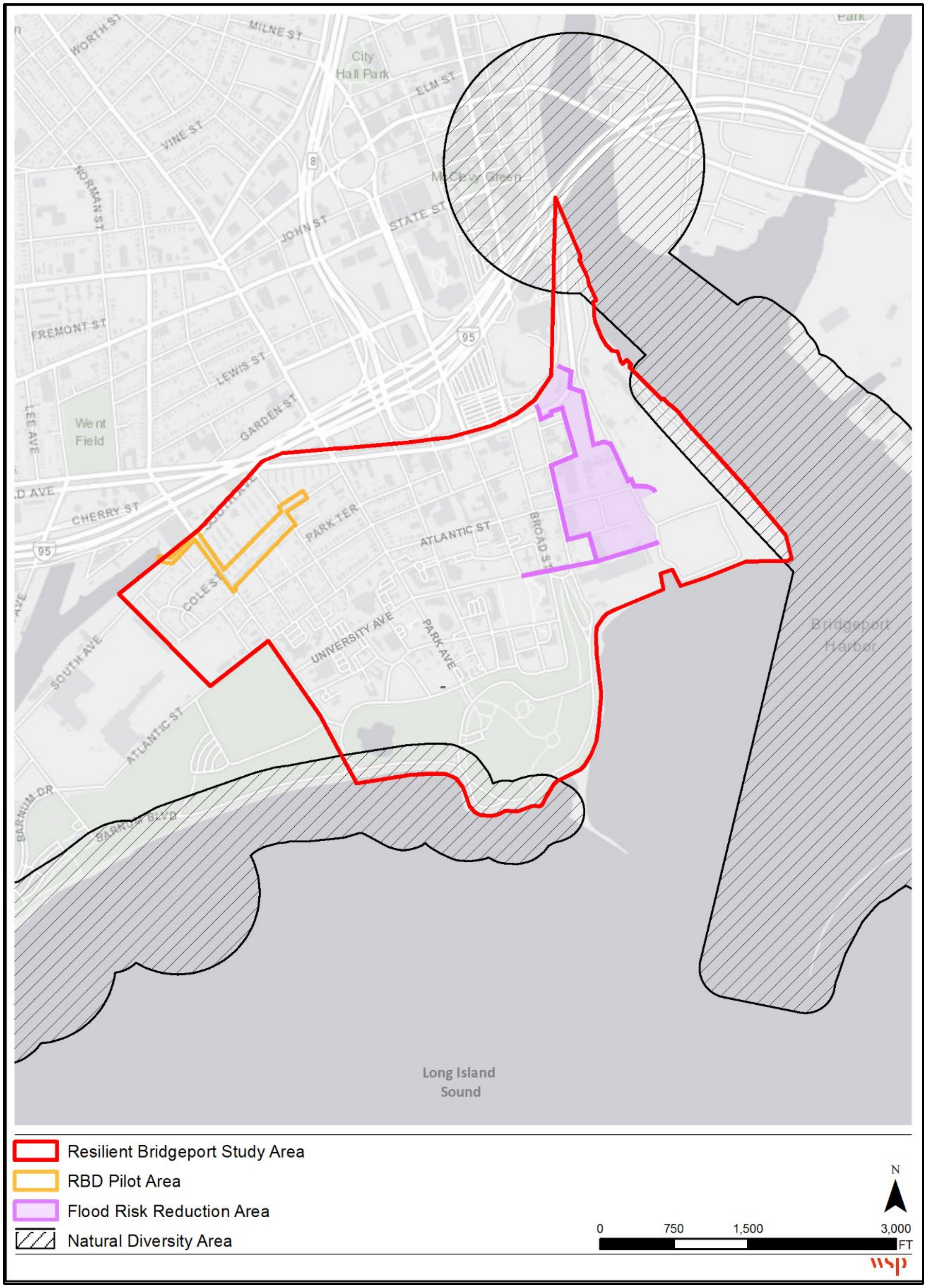
The December 13, 2018, IPaC report also indicates that 29 migratory bird species found on the USFWS Birds of Conservation Concern (BCC) list could occur within the study area. An additional 29 migratory bird species are identified as "non-BCC vulnerable" for the study area. Birds are reported as "non-BCC vulnerable" if they are 1) potentially susceptible to offshore impacts associated with project activities or 2) protected by the Bald and Golden Eagle Protection Act. Examples include common tern (*Sterna hirundo*), ring-billed gull (*Larus delawarensis*), bald eagle (*Haliaeetus leucocephalus*), and golden eagle (*Aquila chrysaetos*). The project sponsors are required to prevent any harm or taking of these species—and of migratory birds in general—under the Migratory Bird Treaty Act. Appendix A, Agency Consultation, contains a copy of the IPaC Trust Resource Report and Official Species List (dated December 13, 2018).

Correspondence from NMFS, received June 13, 2018, indicates that four federally listed sea turtle species could occur in the vicinity of the study area. Two species of federally listed sturgeon—Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*)—could also occur in coastal waters near to the study area. A brief description of each listed species (e.g., distributions, habitat preferences, etc.) is provided in Appendix E, Supplemental Natural Resources Information, and a copy of the June 13, 2018, correspondence is included in Appendix A, Agency Consultation.

NMFS correspondence (2018) indicates that five distinct population segments of Atlantic sturgeon could occur in Long Island Sound and its adjacent bays and tributaries. This includes the federally endangered New York Bight, Chesapeake Bay, South Atlantic, and Carolina distinct population segments, as well as the federally threatened Gulf of Maine Distinct Population Segment. Both adult and subadult Atlantic sturgeon originating from any of the above groups could be present in close proximity to the study area. CTDEEP reports that Long Island Sound could provide important feeding or resting habitat for sturgeon on the way to and from spawning grounds (CTDEEP "Atlantic Sturgeon Fact Sheet," 1999).

CTDEEP maintains and shares information on state-listed endangered, threatened, and special concern species through their Natural Diversity Data Base program. A request for state-listed species review from the database was submitted in May 2018 to determine the presence and status of listed species within the study area. Figure 4.8-3 displays "Natural Diversity Data Base Areas" sites where CTDEEP anticipates the occurrence of endangered, threatened, and/or special concern species (as well as otherwise significant natural communities) based on biological research and inventory.

Figure 4.8-3. Mapped Natural Diversity Data Base Areas



Source: CTDEEP website. Natural Diversity Data Base Areas Digital Data. December 2017

<u>Wetlands</u>

Many of Bridgeport's historic wetland communities have been lost to development. Consequently, few examples of relatively undisturbed tidal or inland wetland remain near the study area. The National Wetlands Inventory Mapper—an interactive, online mapping tool maintained by USFWS that displays the type and extent of possible wetland resources for locations across the United States—was used to identify potential wetland areas prior to more extensive fieldwork. The results of this effort, depicted in Figure 4.8-4, indicate the following:

- Stretches of estuarine and marine wetland likely occur along the study area's coastline.
- A small amount of freshwater resources could also be present.

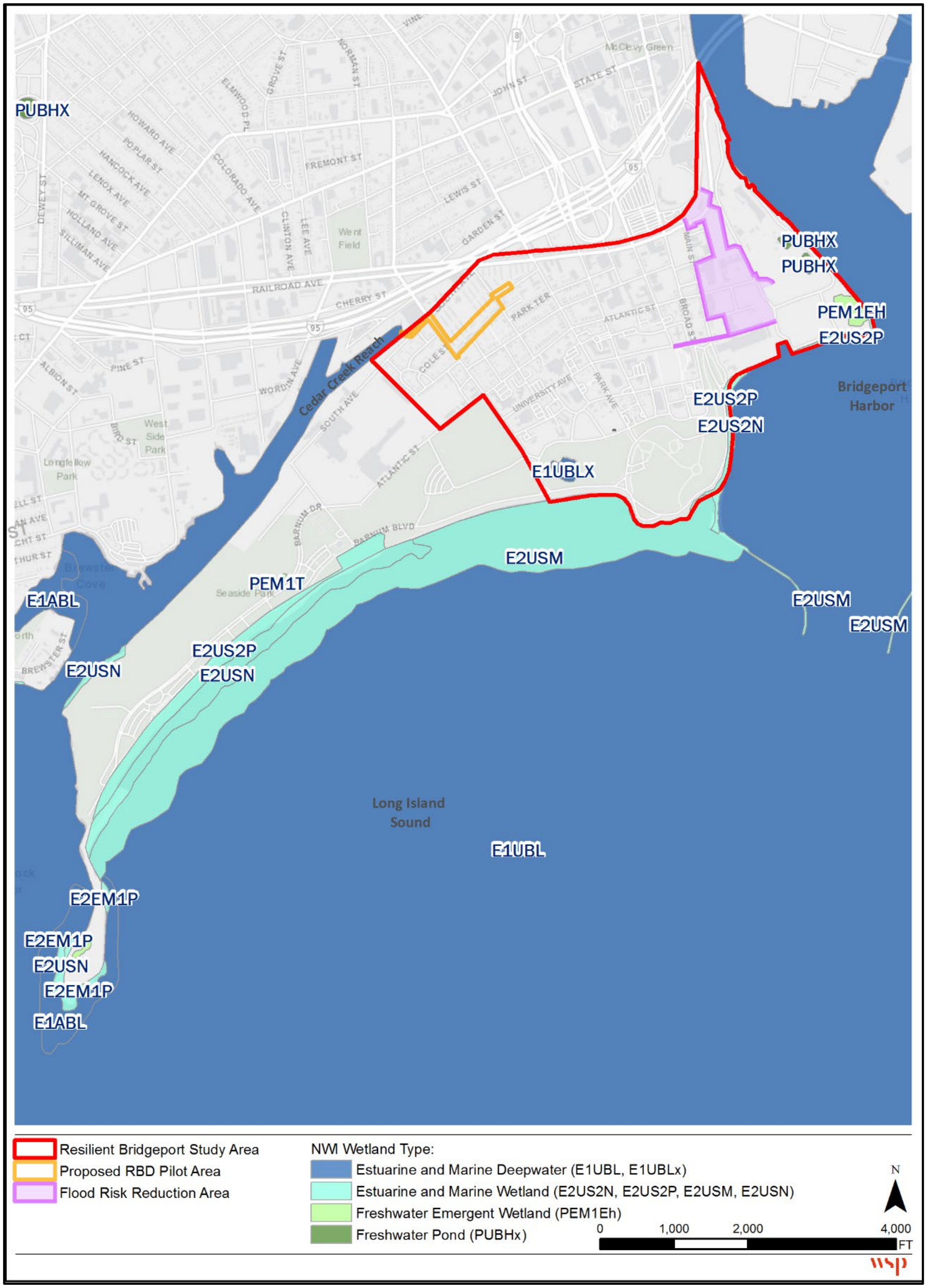
From June 2018 through July 2018, a team of certified wetland scientists surveyed the study area to determine the presence of wetland vegetation and submerged aquatic vegetation within the affected environment at, and in the immediate vicinity of, several outfalls (identified in Section 4.11, Water Resources) that could be used to discharge stormwater under the Proposed Action. During the field survey, the results of which are included in Appendix F, Wetlands Letter Report, a small community of tidal wetland vegetation was identified near Outfall E. Identified species of this community include smooth cordgrass (*Spartina alteniflora*), hightide bush (*Iva frutescens*), and groundsel bush (*Baccharis halmifolia*). Additionally, a small patch of smooth cordgrass was observed on the public beach along Seaside Park, approximately 350 feet to the south of Outfall A. Several non-tidal plant species—beach grass (*Ammophila breviligulata*), northern catalpa (*Catalpa speciosa*), and others—were noted near to Outfall B, but no wetland communities were identified. Finally, no tidal vegetation, submerged aquatic vegetation, or other potential wetland resources were observed in the areas around Outfall C or Outfall D. (Hyland, 2018)

4.8.3 Environmental Consequences

4.8.3.1 No Action Alternative

Under the No Action Alternative, the RBD Pilot Project, Flood Risk Reduction measures, and Resilience Center will not be constructed. No direct impacts to terrestrial and aquatic ecology or wildlife, threatened and endangered species or wetlands—tidal or inland—are expected to result under the No Action Alternative. There would be no removal of street tress or other vegetation and no temporary disturbance of aquatic environments during outfall repair. However, without the Proposed Action, there would be no beneficial impacts to terrestrial habitats from the planting of trees as part of the stormwater facility and green infrastructure and no long-term enhancement of aquatic habitats through improvements to water quality.

Figure 4.8-4. National Wetlands Inventory Mapping



Source: U.S. Fish and Wildlife Service. National Wetlands Inventory Website. 2018

4.8.3.2 Proposed Action

RBD Pilot Project

The RBD Pilot Project would be expected to have a relatively small footprint, primarily affecting ecological communities of the former Marina Village public housing development and nearshore Cedar Creek Reach. In general, ecological communities within the footprint of the RBD Pilot Project are characterized by active disturbance, and further significant degradation of these areas would not be anticipated to result from construction or operation of the proposed stormwater facility. Rather, the RBD Pilot Project would be expected to produce several long-term benefits, including expansion of the study area's urban forest canopy and reduction of the pollutant load entering aquatic environments.

The former Marina Village site currently offers few ecosystem services and is characterized by relatively low plant diversity and limited habitat opportunity. Construction of the stormwater facility would necessitate clearing and grubbing[11] 2.5 acres of the site, leading to a temporary decrease in vegetative cover within the study area. However, under current design plans, both existing street trees along South Avenue and an existing American sycamore grove at Marina Village would be preserved. Protective measures would be taken to ensure that these trees are safeguarded against adverse impacts associated with the construction process. For instance, the contractor would be required to station possible hazards (e.g., heavy equipment, vehicles, etc.) away from intact root systems. The contractor would also be responsible for effectively mitigating any damage to existing trees that would occur as a result of construction activities. Overall, it is anticipated that such preservation and protection efforts would prevent significant loss of urban forest habitat during the construction of RBD Pilot Project elements (Waggoner & Ball, 2018).

Ultimately, creation of the proposed stormwater facility would be expected to enhance the study area's existing urban forest canopy through (1) addition of new upland trees and new lowland trees and (2) expansion of vegetative groundcover. Elm trees (*Ulmus* spp.) and willow oaks (*Quercus Phellos*) would be planted in elevated sections of the facility, particularly along sidewalks, walkways, and other raised paths (Waggonner & Ball, 2018). Low-lying areas, such as infiltration basins, would receive London planetrees (*Platanus x acerifolia*) and a combination of grasses adapted to wet soil conditions (Waggonner & Ball, 2018). The site would also employ green stormwater control measures (e.g., vegetated embankments, bioswales) as alternatives to traditional gray infrastructure measures where feasible. This would include installation of a rain garden soft edge at strategic locations along the perimeter of the facility (Waggonner & Ball, 2018). It is anticipated that upwards of 100 trees would be planted across the site, creating ample habitat opportunity for resident birds, bats, and other wildlife, and substantially increasing native vegetation cover. The presence of rain gardens and other green features would diversify the habitats in the area and attract additional wildlife, such as sensitive insect species.

It is anticipated that minor adverse impacts to ecological communities in the area of Cedar Creek Reach could result from repair and recommissioning work at Outfall E. The outfall has deteriorated significantly from a lack of routine maintenance, and debris has accumulated within the unused piping because the water flow has stopped. To restore the structure to a useable condition, damaged sections would need to be reconstructed, and built-up sediments would need to be flushed/cleared. This process would temporarily disturb shorefront and nearshore communities in the immediate vicinity of the outfall, and a small quantity of vegetation (likely invasive) could be damaged or otherwise affected by construction activities. Moreover, the discharge of debris

[11] Grubbing or clearing denotes the removal of trees, shrubs, stumps, and rubbish from a site, often from the site on which a road or power line, an edifice, or a garden is to be constructed.

into Cedar Creek Reach would likely generate a brief influx of potential contaminants (e.g., sewage pathogens, sludge) to downstream subtidal bottom habitats. However, it is expected that any contaminant releases would be minimal in range and impact, especially relative to periodic combined sewer overflow (CSO) events that occur at other outfall locations along Cedar Creek Reach. There would be no pile driving or other activities that could affect underwater noise levels. For the duration of planned construction work, relevant federal and state regulations would be followed to ensure that significant consequences to ecological communities are avoided or suitably mitigated. There would be no effect to the four federally listed sea turtle species and two species of federally listed sturgeon that could occur in the vicinity of the study area and no potential for impacts to EFH. Further consultation with NMFS is not required.

Operation of the recommissioned outfall is projected to improve ambient water quality in Cedar Creek Reach by reducing the occurrence of CSO events. Once in service, Outfall E would accept accumulated runoff from the proposed stormwater facility, effectively diverting substantial volumes of water from the area's existing combined sewer system. This would, in turn, decrease the likelihood of wet weather flows exceeding treatment plant capacity and triggering combined sewer discharges at Cedar Creek Reach. Ultimately, it is anticipated that separation of stormwater and sanitary sewer systems within the RBD Pilot Project footprint would enhance the fitness and productivity of the Cedar Creek Reach's ecological communities by lowering pollutant load. Some additional reductions in pollutant load are expected to result from strategic design choices (e.g., use of green features, use of permeable asphalt, etc.) at the stormwater facility.

The ecological communities that occur within the proposed RBD Pilot Project area are in an impaired state and, as such, support only a limited range of wildlife. Given existing habitat degradation and the relatively small scope of affected environments, no threatened or endangered species would be affected by the RBD Pilot Project. During construction, machinery would produce a relatively high level of noise and general environmental disturbance, likely driving temporary relocation of wildlife from the immediate area. Wildlife species would be expected to return to the area following construction. If necessary, strategic planning and scheduling of vegetation removal would be implemented during construction to limit impacts to the breeding/nesting/roosting patterns of local bats and birds. Overall, it is projected that construction work would have minor, temporary adverse effects on wildlife at the former Marina Village, but no significant impacts at the individual or population level would result.

Following the cessation of construction activities, fauna would begin to benefit from substantial increases in vegetation at the RBD Pilot Project site. The new plantings proposed for the area would create additional breeding and foraging opportunity for an array of wildlife. For example, the elms, willow oaks, and London planetrees planned for the stormwater facility would provide suitable nesting space to various small mammals and bird species. Moreover, the seeds produced by these trees would serve as a valuable food source for a range of animals, including squirrels, chipmunks, and songbirds. The grasses of low-lying, moisture-retaining basins would likely offer refuge to some amphibians (e.g., frogs, salamanders, etc.), and the site's rain gardens would attract butterflies, bees, and other beneficial insects. Ultimately, it is expected that the stormwater facility—with all its associated elements—would support a greater diversity and abundance of wildlife than the existing site in its current ecological condition.

It is not anticipated that wildlife inhabiting Cedar Creek Reach would be significantly harmed by construction or operation of the proposed stormwater facility. Construction activities at Outfall E would likely trigger brief relocation of small mammals and birds that utilize shoreline habitats near to the outfall. Similarly, aquatic organisms near in-water activities would likely seek alternate habitats away from the zone of disturbance.

However, given the small footprint of planned outfall work, is it highly improbable that (1) substantial quantities of wildlife would be affected or (2) comparable habitats along Cedar Creek Reach would lack the means to support temporarily displaced animals. In addition, it is expected that different types of aquatic wildlife (e.g., finfish, crustaceans, mollusks, etc.) would ultimately benefit from the repurposing of Outfall E. Anticipated improvements to water quality would likely reduce instances of anoxia, eutrophication, toxin accumulation, and other harmful conditions, thus enhancing the growth and survival of existing populations. Over time, operation of the RBD Pilot Project could create a more suitable environment for pollution-sensitive aquatic fauna that cannot tolerate poor water conditions.

Implementation of the RBD Pilot Project is not anticipated to have any adverse impacts on wetland vegetation, since there does not appear to be any wetland vegetation at and in the immediate vicinity of Outfall E.

A summary of anticipated beneficial and adverse impacts on both ecological communities and wildlife from the RBD Pilot Project is provided below.

- Direct Impacts:
  - Limited removal of native terrestrial vegetation at the former Marina Village site to enable construction of the proposed stormwater facility
  - Limited, temporary disturbance of terrestrial and nearshore aquatic environments from construction work (e.g. excavation, land grubbing, outfall repair, etc.) and fill placement
  - Limited, temporary displacement of aquatic fauna, specifically benthic organisms, due to proposed work at Outfall E
  - Limited, temporary displacement of terrestrial mammals and land birds
  - Expansion of native vegetation cover/urban forest canopy following construction through strategic plantings of almost 100 trees and addition of green infrastructure
  - In the long-term, beneficial expansion of available shelter and terrestrial foraging, nesting, and breeding habitat for an assortment of wildlife – mammals, birds, insects, etc. – through plantings and green infrastructure
- Indirect Impacts:
  - Limited, temporary exposure of downstream aquatic wildlife and ecological communities to pollutant inputs from repair/flushing of Outfall E
  - In the long-term, enhancement of Cedar Creek Reach's aquatic habitats through long-term improvements to water quality
  - Increased potential for establishment of pollutant-sensitive wildlife within Cedar Creek Reach following construction
  - Reduced likelihood of invasive species proliferation in the long-term due to establishment of native plant communities and upkeep/preservation measures at the proposed stormwater facility

Flood Risk Reduction Project

The Flood Risk Reduction Project would be located primarily within the urban fabric of the South End community. Due to the location, both adverse impacts (minor to moderate) and benefits to the study area's natural resources, including ecological communities and wildlife, are anticipated.

WESTERN OPTION

The Western Option would primarily intersect with areas of low ecological value. The proposed coastal flood defense system would run along public roadways, primarily causing disturbance to impervious surfaces and ruderal upland spaces. Vulnerable ecological communities, including wetlands, intertidal mudflats, and subtidal bottom habitats, would remain largely unharmed by the Western Option. However, some adverse impacts to natural communities would likely result from construction activities. As illustrated by Figure 4.8-5, there are a number of street trees along the Western Option, and several could be removed or have their root zone disturbed to facilitate building of the coastal flood defense system and other structures (e.g., pump stations). Additionally, work along University Avenue would necessitate ground disturbance and limited vegetation clearing at the northeastern boundary of Seaside Park. These actions would ultimately reduce urban forest canopy within the study area. To minimize anticipated impacts, seasonal tree-cutting restrictions would be developed based on avian breeding seasons, and additional mitigation measures (e.g., restoring affected landscapes, replacing uprooted trees, shielding undisturbed vegetation) near the project site would be implemented as necessary.

As with the RBD Pilot Project, noise increases from construction would likely exacerbate relocation of wildlife from within the immediate project area. There would be no construction activities that could affect underwater noise levels. Given the siting of the Western Option's major components (namely the coastal flood defense system and associated flood gates) along public roadways, it is anticipated that upland populations of urban wildlife—comprising opportunistic terrestrial mammals, adaptable land birds, etc.—would be the most intensely affected. Aquatic organisms and those that populate the coastline (e.g., finfish, crustaceans, shorebirds, seabirds) are expected to experience few impacts due to the limited scope of planned in-water/shorefront work. This includes identified threatened and endangered species such as roseate tern, red knot, loggerhead sea turtle, Atlantic sturgeon, and others that were described in Section 4.8.2. There would be no effect to the threatened and endangered species that could occur in the vicinity of the study area and no potential for impacts to EFH. Further consultation with USFWS and NMFS is not required.

Additional minor impacts to ecological communities are expected to result from sewer system improvements within the study area. For example, the installation of tide gates on outfalls that discharge to Bridgeport Harbor, if deemed necessary, would generate temporary ground disturbance along the shoreline. Furthermore, any proposed outfall maintenance (e.g., debris clearing, grate repair) could involve limited disturbance of nearshore aquatic environments, depending upon the nature and extent of required activities. Given the location of existing outfalls, it is likely that impacts to tidal vegetation could be avoided, and very little (if any) in-water work would need to be performed. Appropriate protective strategies, such as use of temporary erosion control fencing and storage of construction equipment away from the shoreline, would be implemented to preserve ecological communities (e.g., beach-dune complexes) potentially affected by proposed sewer system modifications.

The Western Option would produce long-term benefits to ecological communities and aquatic species. As presented in greater detail in Section 4.11, Water Quality and Water Resources, the proposed combination of drainage modifications would improve water quality and, as such, ultimately enhance the quality of aquatic communities (e.g., littoral zone environments, shellfish beds, etc.) near to the study area. Subsequently, it is anticipated that a range of organisms – the mollusks of shellfish beds, seabirds that feed on aquatic invertebrates, etc. – would be exposed to increasingly lower levels of both stormwater runoff pollution and CSO contamination. Moreover, the proposed coastal flood defense system would fortify interior natural resources against the destruction of coastal flooding events, and new green infrastructure (e.g., bioretention features) would introduce additional habitat opportunity (e.g., for birds, small mammals, insect species) where feasible.

A small community of tidal vegetation was observed approximately 350 feet south Outfall A, which could be subject to modification work (e.g., grate repair, tide gate installation) under the scope of the Western Option. In addition, a small patch of poison ivy (a tidal species) was noted in a sloped boulder embankment approximately 45 feet north of Outfall A. Given the considerable distance between Outfall A and identified tidal communities, no significant adverse impacts are anticipated from construction or operation of the Western Option. Although construction could occur at the outfall as part of proposed sewer work, it is not anticipated that removal of tidal vegetation would be required, or that any general wetland disturbance would occur. Moreover, neither the proposed coastal flood defense system nor its associated elements (e.g., flood gates, pump stations) would intersect with identified resources, and drainage improvements would ultimately minimize long-term exposure of tidal communities to CSO contaminants (e.g., bacteria, oils).

Since no potential wetland resources (i.e., tidal vegetation, submerged aquatic vegetation, freshwater marsh flora) were noted near Outfall B, C, and D within the footprint of the Western Option, it is anticipated that any construction work at these locations would not have adverse impacts to wetlands.

A summary of anticipated beneficial and adverse impacts on both ecological communities and wildlife from the Flood Risk Reduction Project – Western Option is provided below:

- Direct Impacts:
  - Removal of street trees and parkland vegetation along the alignment to enable construction of the proposed coastal flood defense system
  - Limited, temporary ground disturbance within terrestrial and nearshore aquatic environments from construction work (e.g. excavation, coastal flood defense system construction, tide gate installation, etc.)
  - Limited, temporary displacement of aquatic fauna, specifically benthic organisms, in the event that in-water outfall work is required
  - Limited displacement of terrestrial mammals and land birds due to proposed work/tree impacts along the alignment
  - In the long-term, expansion of vegetation cover/terrestrial habitat opportunity within the study area through incorporation of green infrastructure
- Indirect Impacts:
  - Limited, temporary exposure of downstream aquatic communities to pollutant inputs in the event that outfall flushing is required and cannot be conducted from an upland location

- Long-term enhancement of Bridgeport Harbor habitats through improvements to water quality
- Increased potential for establishment of pollutant-sensitive wildlife within Bridgeport Harbor in the long-term
- Increased fortification of interior ecological communities against the destruction from future coastal flooding events

EASTERN OPTION

The Eastern Option would be located primarily on private industrial / utility property. Under this option, the proposed coastal flood defense system would connect with protection measures at PSEG Harbor Unit 5 (currently under construction) before turning north. The Eastern Option shares many features with the Western Option, including sewer system improvements (i.e., pipe upsizing, regulator addition, potential tide gate installation) and elevation of University Avenue. Therefore, the Eastern Option is expected to have the following similar adverse impacts as the Western Option:

- Limited (potentially short-term) displacement of urban wildlife from construction activities
- Limited, temporary displacement of aquatic organisms (e.g., benthic invertebrates) from any necessary in-water work
- Limited, temporary exposure of downstream aquatic communities to pollutant inputs in the event of outfall flushing
- A degree of short-term ground disturbance within both interior and shorefront ecological communities
- Removal of street trees along the proposed alignment (see Figure 4.8-5)
- Removal of parkland vegetation along Seaside Park's northern border

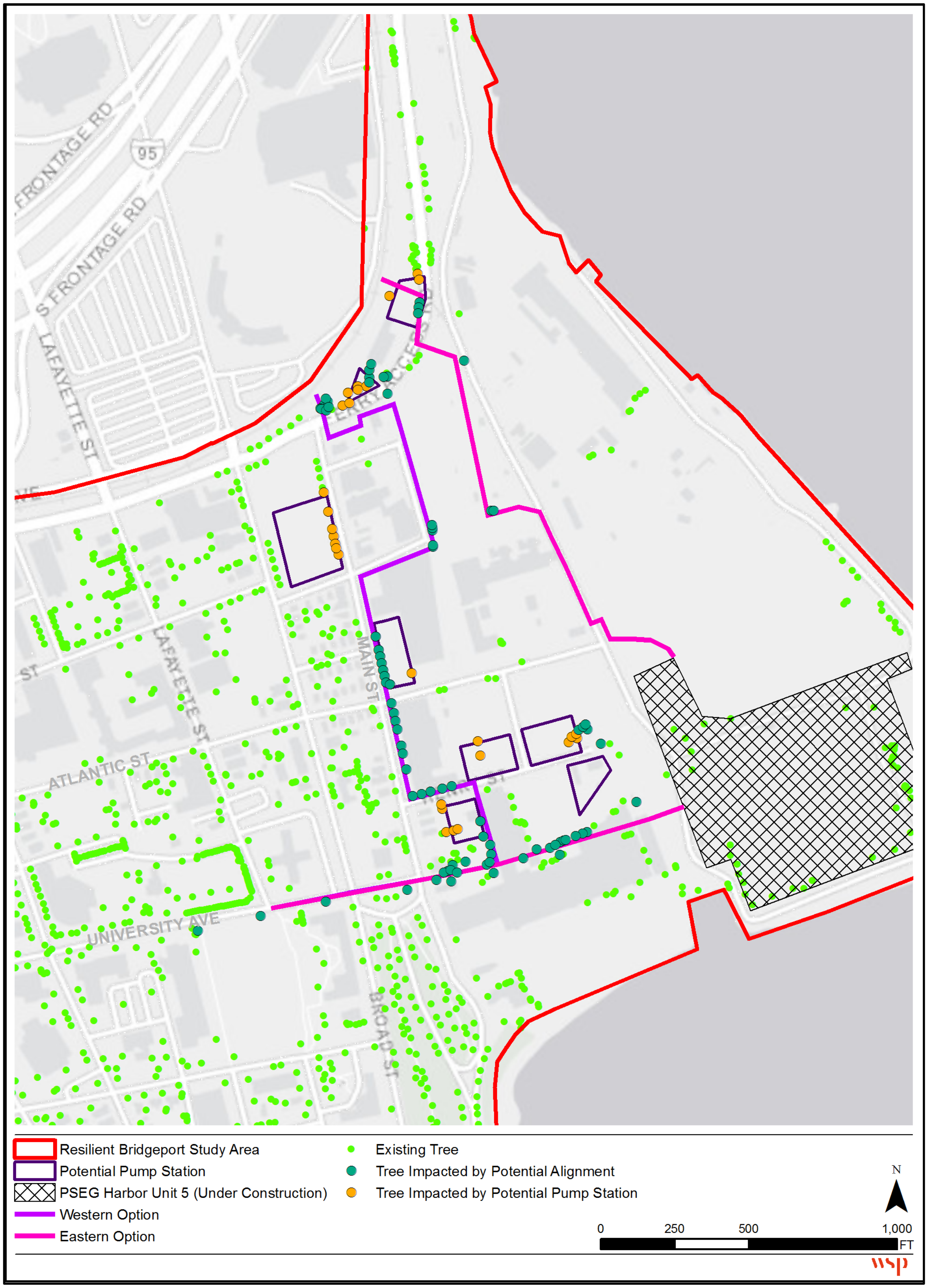
Anticipated long-term benefits include the following:

- Enhanced quality of surface water habitats
- Increased potential for establishment of pollutant-sensitive aquatic life
- Fortification of interior communities against coastal flooding damage.

Since the Eastern Option would run almost entirely along PSEG property, it is expected to have the lowest impact on street trees, with the fewest number of trees being removed or otherwise disturbed. Additionally, the Eastern Option of the coastal flood defense system would offer the greatest fortification against coastal flooding events, which can harm natural resources in a multitude of ways (e.g., uprooting or damaging of vegetation, displacement of wildlife, amplified erosion of valuable habitats).

Since the Eastern Option would involve the same type and extent of outfall work as the Western Option, impacts to wetlands are anticipated to be similar. Specifically, under current design plans, no removal of wetland vegetation (tidal or freshwater) would be required, and general wetland disturbance is not expected to occur. Neither the Eastern Option of the coastal flood defense system nor other elements of the Flood Risk Reduction Project (e.g., flood gates, pump stations) would intersect with identified wetland resources, and proposed drainage improvements would ultimately minimize long-term exposure of tidal communities to CSO contaminants (e.g., bacteria, oils).

Figure 4.8-5. Flood Risk Reduction Project: Street Trees Affected by Western/Eastern Options



Source: WSP USA and Arcadis. Resilient Bridgeport National Disaster Resilience Preliminary Engineering (10% Design). (2018)

Resilience Center

Under current design plans, the Resilience Center involve rehabilitation of existing building or construction along the public right-of-way and is expected to have a relatively small physical footprint. Due to these factors, as well as the Resilience Center being located primarily within the heavily developed, urbanized portion of the study area, no significant adverse impacts to ecological communities are anticipated. Some urban wildlife, such as opportunistic mammals and bird species, could be temporarily displaced during construction due to increases in noise and machinery/vehicle traffic. However, given the considerable acreage of suitable alternative habitat that exists throughout the study area, it is unlikely that displaced wildlife would have difficulty relocating nearby. Moreover, practicable measures would be taken to avoid or sufficiently minimize disturbances to nests (or other breeding sites) discovered near proposed Resilience Center features. Overall, no significant short-term or long-term negative impacts to natural resources (i.e., ecological communities, wildlife, etc.) are projected to result from the Resilience Center. As part of the Resilience Center design process, opportunities such as green infrastructure, landscaping and other amenities beneficial to natural resources will be explored.

Due to the location and small physical footprint of the Resilience Center, it is highly unlikely that any wetland environments would be affected by its implementation. Under current design plans, the Resilience Center site would not intersect with identified communities of tidal vegetation, mapped freshwater resources (including inland wetlands), or littoral zone habitats recognized as supporting submerged aquatic vegetation.

4.8.4 Mitigation Measures and Best Management Practices

While direct and indirect construction impacts are possible, they are anticipated to be manageable and mitigated by existing regulatory permits and controls and the use of best management practices.

For the duration of planned construction work on outfalls, relevant federal and state regulations would be followed to ensure that significant consequences to ecological communities are avoided or suitably mitigated. As added protection for the threatened and endangered aquatic species in the vicinity of the study area (i.e., sea turtles and sturgeon), recommendations provided by NOAA Fisheries regarding harm mitigation measures, such as use of silt management and soil erosion best practices, would be applied during any in-water work or during any activities that could affect water resources (see email dated June 13, 2018 in Appendix A). In addition, during the maintenance of existing outfalls, appropriate protective strategies, such as use of temporary erosion control fencing and storage of construction equipment away from the shoreline, would be implemented to preserve ecological communities (e.g., beach-dune complexes) potentially affected by proposed sewer system modifications.

To minimize anticipated impacts, seasonal tree-cutting restrictions would be developed based on avian breeding seasons, and additional mitigation measures (e.g., restoring affected landscapes, replacing uprooted trees, shielding undisturbed vegetation) near the project site would be implemented as necessary. In addition, protective measures would be taken to ensure that trees are safeguarded against adverse impacts associated with the construction process. For instance, the contractor would be required to station possible hazards (e.g., heavy equipment, vehicles) away from intact root systems. The contractor would also be responsible for effectively mitigating any damage to existing trees that would occur as a result of construction activities.

4.9 GEOLOGY AND SOILS

Geological resources consist of surface and subsurface materials and their properties. This section provides an overview of the soils, geology and topography within the study area and the potential impacts from the Proposed Action.

4.9.1 Methodology and Regulatory Context

4.9.1.1 Methodology

Information on soil types and topography within the study area was collected from CTDEEP. Soil types were mapped to identify the variations in relation to the Proposed Action. Four different types of soil were identified within the study area. Descriptions of the soil types found in the study area were taken from the Soil Survey of Fairfield County conducted by the U.S. Department of Agriculture Soil Conservation Service in conjunction with the Connecticut Agricultural Experiment Station and Storrs Agricultural Experiment Station (U.S. Department of Agriculture, Soil Conservation Service February 1981). CTDEEP's dataset on farmland soils interpretation of soil survey geographic database was consulted to determine if there was any agricultural, prime farmland, or farmland of statewide or local importance within the study area.

Information regarding geology types in the study area was researched using the CTDEEP, ESRI, and University of Connecticut databases. Geology formation types for Bridgeport were identified; however, a large portion of the city, including the study area, is unmapped. Geology formations surrounding the study area were examined for reference. Geology formations for the remainder of Bridgeport were mapped, and 12 formation types were identified within the city. Three formation types were found to border the study area.

The information is based on desktop analysis findings and has not been validated through field reconnaissance.

4.9.1.2 Regulatory Context

Farmland Protection Policy Act of 1984 (as amended). Administered by the Natural Resources Conservation Service, the act regulates actions with the potential to convert existing important farmlands to a nonagricultural use. Projects are subject to this act's requirements if they could irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency. The Natural Resources Conservation Service uses a land evaluation and site assessment system to establish a farmland conversion impact rating score on proposed sites of federally funded and assisted projects. This score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level.

For the purposes of the National Environmental Policy Act, "farmlands" are those agricultural areas considered important and protected by federal, state, and local regulations. They include pasturelands, croplands, and forests considered to be prime, unique, or of statewide or local importance.

4.9.2 Affected Environment

4.9.2.1 Soils

Figure 4.10-1 presents the soils within the study area and includes Udorthents-Urban Land, Udorthents-smoothed, Beaches, and Urban Land, all of which have slopes of 8 percent or less. CTDEEP's dataset on farmland soils interpretation of soil survey geographic database was analyzed and no prime farmland soil or statewide important farmland soil was identified within or near the study area.

Beaches-Udipsamments complex coastal is an excessively drained soil, Udorthents-Urban Land Complex is a well-drained soil, Udorthents-smoothed is a moderately well-drained soil, and Urban Land is not rated for a drainage type. The Beaches-Udipsamments complex coastal is located at the water's edge. Udorthents-Urban Land Complex and Udorthents-smoothed soil types are located slightly inland just past the Beaches soil, or adjacent to the harbor. Urban Land is located farther inland and does not border any water.

Udorthents-Urban Land

Udorthents-Urban Land usually has 2 or more feet of its upper original soil removed or more than 2 feet of fill on top of its original soil to support urban development. Urban development with impervious surfaces typically covers 85 percent of the area with roads, parking lots, or industrial parks. This soil type could be found in areas ranging from vacant lots, lawns and parks, and wooded or other undeveloped areas, which indicates that urban land and the Udorthent Complex does not necessarily indicate persistent disturbance.

Udorthents-Smoothed

Udorthents-Smoothed typically consists of rectangular areas of about 5–100 acres that have been altered by cutting or filling. The material in these areas is mostly loamy. The filled areas are more than 20 inches thick, and are sometimes located on floodplains, in tidal marshes, or on areas with poor drainage. Some soil exists in urbanized areas, and some contain materials such as logs, tree stumps, concrete, industrial waste, and exposed bedrock. Since the properties and characteristics of this unit are wide-ranging, the area requires onsite investigation to determine the appropriate uses on this soil.

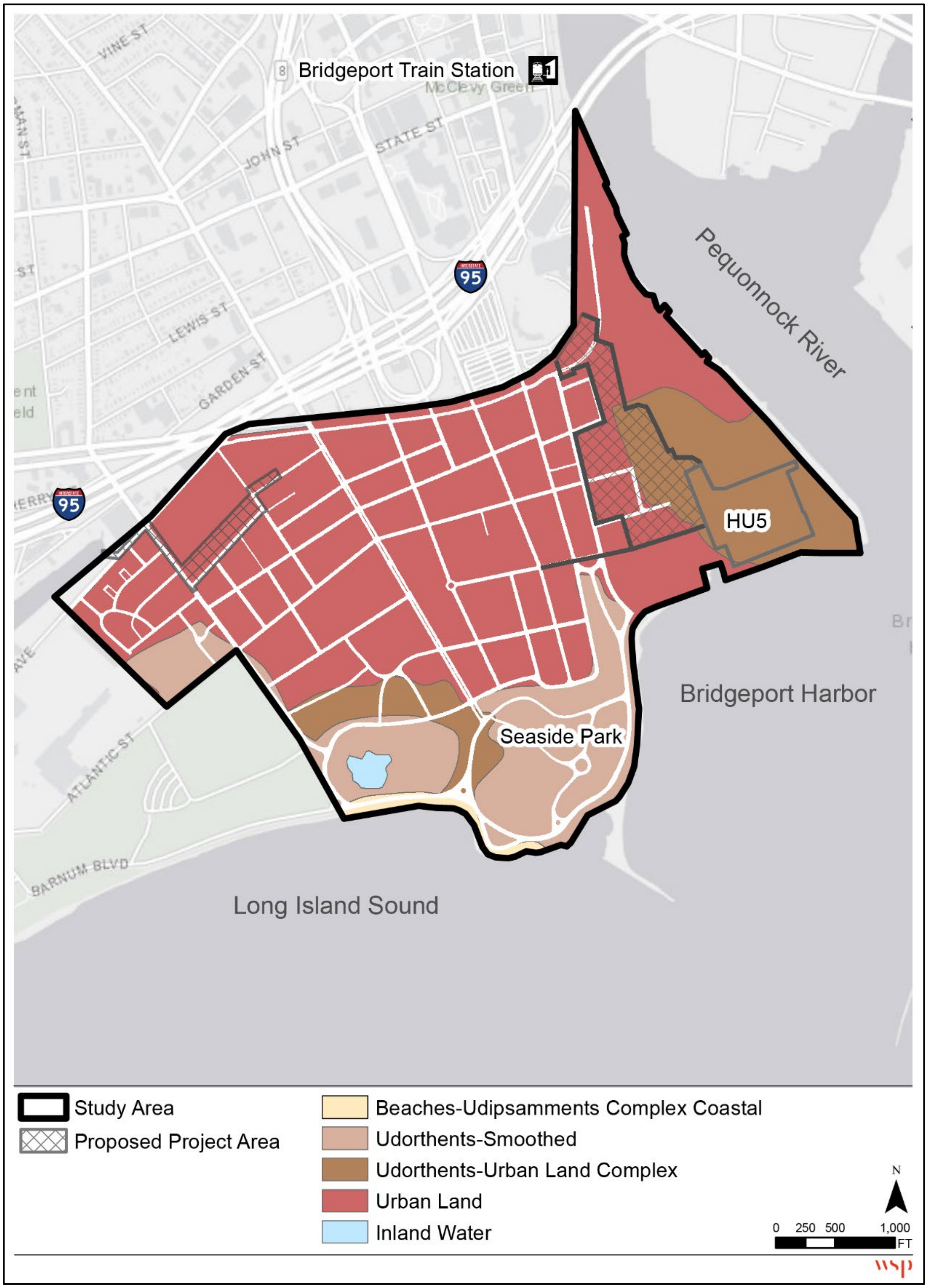
Beaches

The beaches along the Long Island Sound typically range in area between 3 and 35 acres, though most are less than 300 feet wide. Small areas of sand dunes, areas with poorly drained Westbrook soils, areas of Udorthents, urbanized areas, and a few areas of exposed bedrock are typically included in the beach areas. Beaches soil is permeable and is often devoid of vegetation except for some strands of salt-tolerant and drought-resistant grasses. Beaches are not suited for most uses other than recreation.

Urban Land

Urban Land generally consists of areas with urban structures that cover over 85 percent of the surface. Structures could include roads, parking lots, shopping and business centers, and industrial parks. This area typically contains excessively drained Hinckley soils, somewhat excessively drained Hollis soils, well-drained Agawam, Charlton, and Paxton soils, and moderately well-drained Ninigret and Sutton soils. Onsite investigation is needed to evaluate the appropriate uses.

Figure 4.9-1. Soil Types in Study Area



Source: Connecticut Department of Energy and Environmental Protection

4.9.2.2 Geology

Bridgeport lies within the volcanic belt of Connecticut (one of three belts: carbonate, clastic, and volcanic). The volcanic belt is composed of metamorphic schists and granites that formed during the Ordovician period, between 500 and 400 million years ago.

Approximately 21,000 years ago, Connecticut and Long Island Sound were covered with glacial ice that was about a mile thick. The glacial ice continually moved south, picking up loose material on the ground surface. As the glacier melted, the material it had collected was re-deposited, creating a long east-west moraine. As the climate warmed, the glacier retreated to the north. About 17,500 years ago, a temporary cooling of the climate caused the ice front to cease its northward movement. The ice front halted along a line that ran off shore from the Bridgeport project area, forming the Captain Islands - Norwalk Islands moraine.

The water released from the melting glacier washed large quantities of finer-grained sediments into low-lying areas, resulting in sand and gravel deposits in the Connecticut valleys. In higher and flatter areas, the glacier deposited till, a mixture of variously-sized sediments. As the glacier retreated, it left behind a series of outwash features, including drumlins, eskers, and kettle lakes and kames. Most of the study area is overlain in fine-grained outwash sediments of finely bedded sand layers indicative of former deltaic deposits, and artificial fill deposits.

Geology formation types for Bridgeport were identified, although a large portion of the city, including the study area, is unmapped. While geology information for the study area was not available, geology formations surrounding the study area were examined for reference. Geology formations for the remainder of Bridgeport were mapped, and 12 formation types were identified within the city (Figure 4.9-2). Three formation types were found to border the study area—Pumpkin Ground Member of Harrison Gneiss, Beardsley Member of Harrison Gneiss, and Golden Hill Schist— and are located on Iapetos (oceanic) terrane/Connecticut Valley Synclinorium.

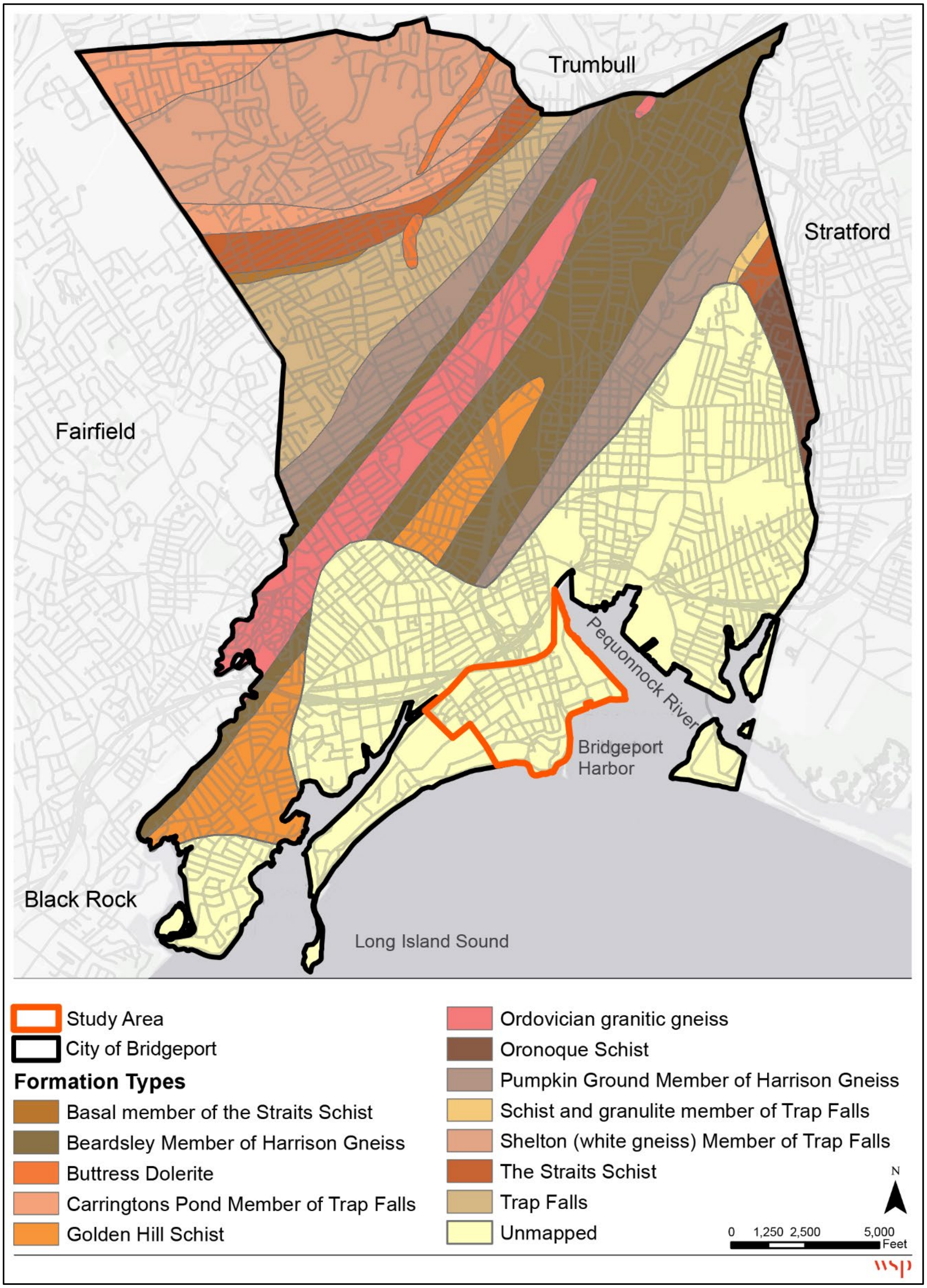
Pumpkin Ground Member of Harrison Gneiss and Beardsley Member of Harrison Gneiss

The Pumpkin Ground Member of Harrison Gneiss and Beardsley Member of Harrison Gneiss are part of the Central Lowlands. The U.S. Geological Survey recognizes these formations as juxtaposed metaplutonic units and considers them "Beardsley and Pumpkin Ground orthogneisses". This formation is composed of oligoclase, microcline, quartz, and biotite. Some layers have many megacrysts of one to five cm across, some have hornblende, and there are minor layers of garnetiferous schist and gneiss. Its geologic age is Middle Ordovician. The Pumpkin Ground dates back to the Early Silurian age, and the Beardsley dates back to the Late Ordovician age. The primary rock type is gneiss, and its secondary rock type is schist (U.S. Geological Survey n.d.).

Golden Hill Schist

Golden Hill Schist is also a part of the Central Lowlands. This formation is generally layered schist and granofels and is composed of quartz, muscovite, biotite, plagioclase, and garnet. Its geologic age is Lower Ordovician. The primary rock type is schist, and its secondary rock type is granofels (U.S. Geological Survey n.d.).

Figure 4.9-2. Geology Formation Types in South End, Bridgeport



Source: Connecticut Department of Energy and Environmental Protection

4.9.2.3 Topography

The study area is in the Coastal Slope region of Connecticut ((Bell 1985). The Coastal Slope commences about 12 miles north of the coast, where the topography begins to drop steeply (about 50 feet per mile) to the coast. The Coastal Slope represents a portion of southern New England that was once covered by loose sediments from the former Coastal Plain. Those sediments protected the bedrock from eroding as quickly as surrounding areas. Erosion eventually washed these sediments away, but this period of protection spared the bedrock of the Coastal Slope from the deep erosion that occurred farther inland. This process resulted in a gentler topography, which increased the agricultural potential of the Coastal Slope relative to upland areas and contributed to the intensive Woodland period (agricultural) and early European settlement of the Connecticut coast.

Figure 4.9-3 illustrates the topography of the study area, which ranges in elevation approximately 2–32 above mean sea level (amsl). Elevations are generally lowest along the waterfront portions of the study area, and in the far western and central eastern edges (ranging 2–8 feet amsl). Within the central portion of the study area, the geography associated with Park Avenue exhibits the highest elevations within the study area (ranging 10–32 amsl). The higher elevations include the western end of the University of Bridgeport campus and the eastern part of the former Marina Village parcels. The study area's eastern coastal portion contains a waterfront area with elevations ranging 10–28 feet amsl. These higher elevations are associated with the PSEG utility operation and reflect a manmade coal mound.

4.9.3 Environmental Consequences

4.9.3.1 No Action Alternative

Under No Action Alternative, the Proposed Action will not be implemented and no direct impacts from the construction or operation of the Proposed Action will occur to the existing soils and geologic resources within the study area since there will be no ground disturbance. However, as flooding continues and occurrences of coastal storm events increase in the study area, there could be an indirect adverse impact on soil resources due to increased turbidity and sedimentation due to soil erosion.

4.9.3.2 Proposed Action

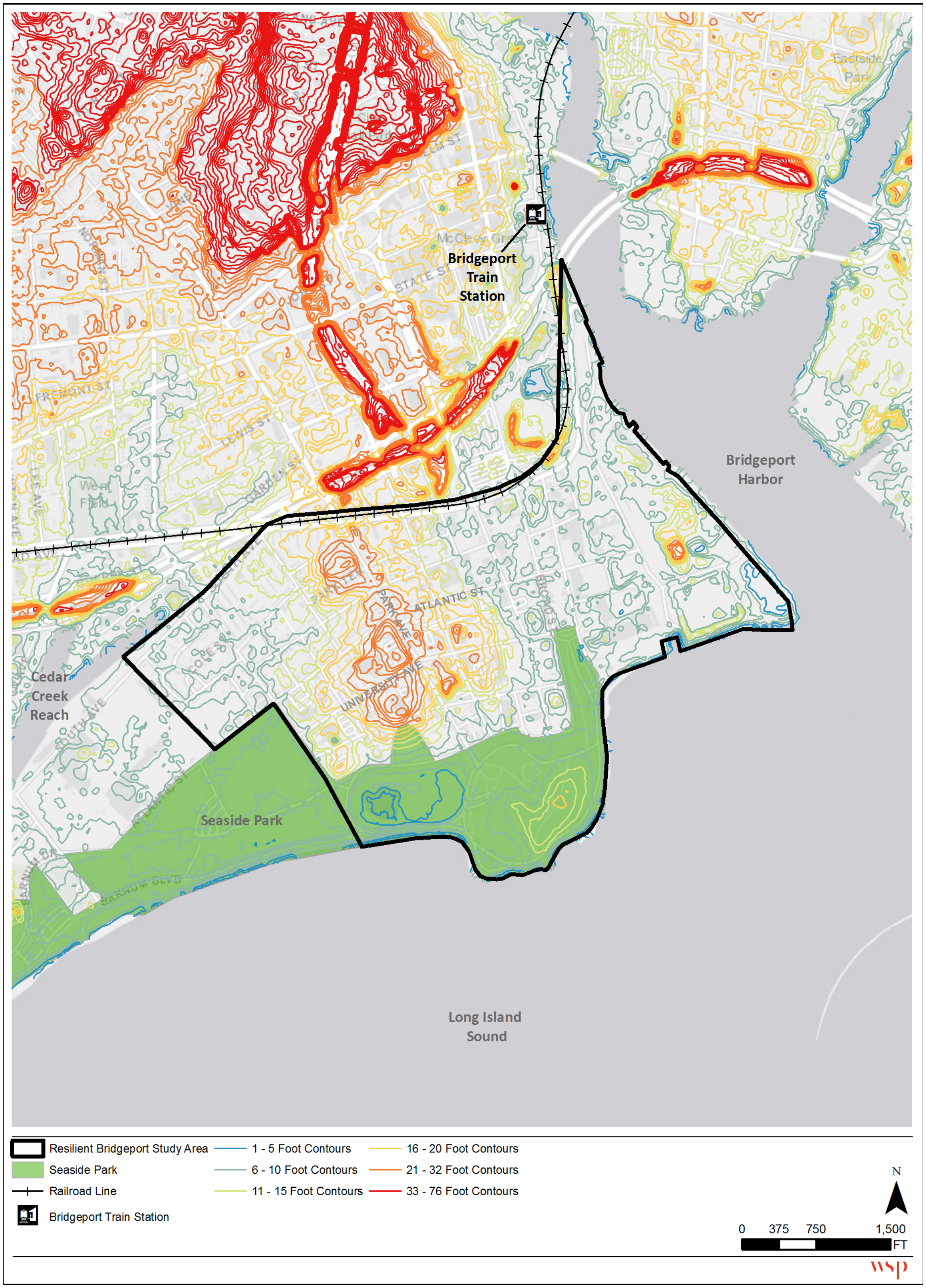
There are no prime farmland soil or statewide important farmland soil identified within or near the study area. Therefore, there would be no impacts to farmland or agricultural land in the study area and the Proposed Action would comply with the Farmland Protection Policy Act.

<u>RBD Pilot Project</u>

The former Marina Village site is located on urban land. During construction, there would be less-than-significant adverse direct impacts to soils and geology from excavation and filling for the construction of the Johnson Street extension and stormwater facility, and installation of the gravity storm drain. Impacts from soil erosion would be temporary and would be controlled through best management practices.

In the long-term, the topography of the area would be altered slightly with the elevated Johnson Street extension. Following construction, there would be a net decrease in impervious surface and an increase in vegetated area (2.5 acres due to the stormwater facility), resulting in a reduction in erosion and sediment runoff. In addition, the reduced flooding from the stormwater improvements would lead to decreased runoff and turbidity and a beneficial indirect impact to soils and geology.

Figure 4.9-3. Topography in Study Area



Source: Connecticut Department of Energy and Environmental Protection

Flood Risk Reduction Project

Soils in the Western Option area of the coastal flood defense system would be almost entirely Urban Land, with some Urdorthents-Smoothed at the entrance of Seaside Park at University Avenue. The Eastern Option of the coastal flood defense system would affect a combination of Udorthents-Urban Land and Urban Land.

Construction of the Flood Risk Reduction Project (for either option) would require activities such as excavation, filling, grading and pile driving for the elevation of University Avenue, construction of the coastal flood defense system, and installation of the stormwater improvements. There would be less-than-significant adverse direct impacts to soils and geology from these activities and impacts from soil erosion would be controlled through best management practices.

In the long-term, the topography of the area would be altered slightly with the elevation of University Avenue and the entrance of Seaside Park. The project would not significantly change the amount of impervious surface in the study area. There would be no long-term direct impacts to soils or geology. However, the flood risk reduction and coastal storm surge protection from the Flood Risk Reduction Project would indirectly have beneficial impacts that would stabilize geologic conditions and soils.

Resilience Center

The Resilience Center itself would have a relatively small footprint, with very limited soil disturbance. There would be no increase in impervious surface or change in topography. As a result, no direct or indirect impacts to geology and soils are anticipated.

4.10 HYDROLOGY AND FLOODING

4.10.1 Methodology and Regulatory Context

4.10.1.1 Methodology

This section examines the potential impacts on hydrology and floodplains from the proposed RBD Pilot, Flood Risk Reduction, and Resilience Center projects (the Proposed Action). The Proposed Action and the No Action Alternative were evaluated to determine the potential for changes in hydrology and flooding within each of these project areas. To conduct this analysis, each project was evaluated by comparing existing flooding conditions under various event frequencies with the proposed improved or changed flooding condition. Where appropriate, this analysis evaluated downstream and adjacent areas for any potentially induced flooding impacts. To fully analyze the impacts of hydrology and flooding within the study area, a comprehensive assessment of the following was completed:

- The regulatory programs that protect floodplains and stormwater management within the study area
- The current condition of floodplains and stormwater systems within the study area
- The floodplains and stormwater system conditions in the future without the implementation of the Proposed Action (the No Action Alternative)
- The potential impacts of the alternatives on the floodplain, stormwater management systems, and infrastructure.

For the RBD Pilot Project area, a preliminary conceptual modeling effort was conducted to understand existing conditions and design parameters, such as peak runoff rates and contributing volumes from different tributary areas. Further analyses and information is still required to better understand system functionality (e.g., post-development hydrographs and component capacities). These analyses and further model refinements will be completed as part of the 60 percent design effort.

For the Flood Risk Reduction Project area, preliminary stormwater modeling and analysis was completed as part of the preliminary design effort, which included development of existing conditions and preliminary alignment models. The existing conditions model was used to understand the performance of existing sewer systems (i.e., combined, sanitary, and stormwater) within this project area, as well as to conduct exercises to understand the mechanisms and extent of flooding. The preliminary alignment model was used to understand how two coastal flood defense system options would affect interior drainage and the degree to which pumping would be needed to manage water from rainfall, seepage of water under the flood wall/barrier, and overtopping of the wall by water from wave action during a major coastal storm event.

To understand the mechanisms and extent of flooding for a variety of current and future (i.e., with sea level rise) design scenarios, preliminary conceptual stormwater modeling was completed using the City of Bridgeport's combined sewer overflow (CSO) drainage model. Within the study area, the combined sewer model was refined from a citywide scale to a neighborhood scale. A model of the combined sewer system for the west side of Bridgeport was available in the Storm Water Management Model, a dynamic rainfall–runoff–subsurface runoff simulation model maintained by the U.S. Environmental Protection Agency (EPA). This model was developed by the Bridgeport Water Pollution Control Authority (WPCA) and was georeferenced and calibrated as part of the WPCA's Combined Sewer Overflow Long-Term Control Plan in 2010. For the RBD Pilot Project's baseline models of the existing combined sewer system, only the rainfall intensity and duration at the combined sewer outfall locations were modified in the Storm Water Management Model.

4.10.1.2 Regulatory Context

Federal Regulations

Development in floodplains is defined by the Federal Emergency Management Agency (FEMA) floodplain mapping and is regulated at the federal level by Executive Order (EO) 11988, Floodplain Management, as revised by EO 13690, and by the National Flood Insurance Act of 1968 (44 CFR 59). EO 11988 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

Title 24, Subtitle A Part 55 of the Code of Federal Regulations (24 CFR 55) contains the U.S. Department of Housing and Urban Development's (HUD) regulations implementing the requirements of EO 11988 and EO 11990, Protection of Wetlands, and the eight-step decision-making process for determining compliance with these two executive orders.

State and City Regulations

Under Title 25 Water Resources. Flood and Erosion Control Chapter 476a Flood Management of the Connecticut General Statutes, all state agencies are to ensure that the use of state lands, and the siting, construction, administration, and disposition of state-owned and state-financed projects involving any change to improved or unimproved real estate are conducted in ways that would minimize flood hazards and losses. Projects are to consider alternative sites on which the project could be located outside the 100-year floodplain. Projects to be located within the floodplain are to be designed and constructed consistent with the need to minimize flood damage within the 100-year floodplain and include adequate drainage to reduce exposure to flood hazards. All public utilities and facilities associated with the project are to be located and constructed to minimize or eliminate flood damage.

CTDEEP has also stated that per the state's Flood Management Certification program, preventing flood hazards to human life or health is interpreted by the state as, among other factors, providing dry egress from the 100-year or 500-year floodplain, dependent upon the criticality of the asset constructed in the floodplain. CTDEEP referred the Resilient Bridgeport engineering team to the Association of State Floodplain Managers' (ASFPM) *A Guide for Higher Standards in Floodplain Management*" (Section II, "Access (Ingress-Egress)" and Section IV, "Critical Development Protection"). The rationale documented by ASFPM in Section II is "ensuring that building sites are relatively accessible during floods decreases the likelihood of stranded residents, reduces the need for water rescues which places emergency personnel at risk, and increases public safely [sic]." Similarly, if the development provides critical services or is deemed critical (examples include jails, hospitals, schools, daycare facilities, public electric utilities, fire stations, emergency operation centers, police facilities, nursing homes, wastewater treatment facilities, water plants, gas/oil/propane storage facilities, and other public equipment storage facilities), "should be protected to an even higher standard than other development. Failure to provide flood protection to these types of critical facilities creates severe and unacceptable public safety risk" (ASFPM 2010). New development and significant rehabilitation projects may be seriously affected if FEMA accreditation and related FIRM map revision are not achieved. Use of state and federal funds for developing new projects may be restricted within the flood zones, and continued implementation of the City of

Bridgeport's floodplain regulations may apply. Both conditions provide significant impetus to achieving FEMA accreditation.

In June 2018, Public Act 18-82, An Act Concerning Climate Change Planning and Resiliency, was signed into law. The act includes updating current statutory references to sea level rise to reflect the most recent sea level change scenario based upon the sea level change scenarios published by the National Oceanic and Atmospheric in Technical Report OAR CPO-1 and other available scientific data necessary to create a scenario applicable to the state coastline. The act defines floodproofing as ".. any combination of structural or nonstructural additions, changes or adjustments which reduce or eliminate flood damage to real estate or improved real property, to water and sanitary facilities, and to structures and their contents, including, but not limited to, for properties within the coastal boundary, as established pursuant to subsection (b) of section 22a-94, not less than an additional two feet of freeboard above base flood and any additional freeboard necessary to account for the most recent sea level change scenario updated pursuant to subsection (b) of section 25-68o, as amended by this act."

The City of Bridgeport joined the National Flood Insurance Program (NFIP) in the late 1970s and as such is required to adopt floodplain management regulations that meet the NFIP minimum standards. These floodplain management regulations are identified within the Flood Damage Prevention Ordinance (FDPO) and set the requirements and procedures associated with development activities within the floodplain. It is important to note that the City of Bridgeport has chosen to exceed the NFIP's minimum standards by implementing more comprehensive floodplain management regulations, or "higher standards," to achieve greater resilience to coastal storms and flooding. Higher standards are any floodplain management regulations adopted by a community or state that are more restrictive than the criteria set forth in the NFIP's minimum standards. These higher standards include the following:

- **Cumulative Substantial Damag**e – The Bridgeport FDPO defines cumulative substantial damage as "flood-related damages sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred." If the cumulative substantial damage percentage is exceeded, the structure is required to be brought up to code to meet all the requirements of the FDPO or be demolished and rebuilt outside of the floodplain.
- **Nonresidential Construction Freeboard Floodproofing Requirement** – The FDPO implements this requirement in "A" flood zones as follows: "New construction and substantial improvement of an commercial, industrial, or other nonresidential structure shall either have the lowest floor, including basement, elevated to the level of the base flood elevation, or, together with the attendant utility and sanitary facilities, shall: a) Be floodproofed so that below an elevation of one foot above the base flood level the structure is watertight with walls substantially impermeable to the passage of water; and, b) Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy."
- **Equal Conveyance** – The FDPO defines "equal conveyance" as "Within the floodplain, except in those areas which are tidally influenced, as designated on the flood insurance rate map (FIRM) for the community, encroachments resulting from filling, new construction or substantial improvements involving an increase in footprint of the structure, are prohibited unless the applicant provides certification by a registered professional engineer demonstrating, with supporting hydrologic and hydraulic analyses performed in accordance with standard engineering practice, that such encroachments shall not result in

any (0.00 feet) increase in flood levels (base flood elevation). Work within the floodplain and the land adjacent to the floodplain, including work to provide compensatory storage shall not be constructed in such a way to cause an increase in flood stage or flood velocity."

- **Compensatory Storage** – The FDPO requires this higher standard pertaining to water storage standards: "The water holding capacity of the floodplain, except those areas which are tidally influenced, shall not be reduced. Any reduction caused by new filling, new construction or substantial improvements involving an increase in footprint to a structure, shall be compensated for by deepening and/or widening of the floodplain. Storage shall be provided on site, unless easements have been gained from adjacent property owners."

Hydraulic design criteria—including storm drain design, pumping station capacity, stormwater infrastructure, and detention/retention requirements—is based upon the *City of Bridgeport Storm Water Management Manual* and the CTDEEP *2004 Connecticut Stormwater Quality Manual*. The *City of Bridgeport Storm Water Management Manual* requires that the minimum conveyance allowance for storm drains and pumping stations must be equivalent to the 25-year storm event. Additionally, stormwater velocity in the drainage system must maintain a minimum of 3 feet per second and a maximum of 15 feet per second with a minimum grade of 0.5 percent. The manual also specifies that the minimum amount of cover above the stormwater pipes must be either 2 feet (Class IV RCP) or 1 foot (Class V RCP)—depending on the piping class—and must maintain a minimum pipe size of 15 inches (if contained in the city right-of-way) or 12 inches (if placed on private property).

The City of Bridgeport stormwater regulations specify that the first 1 inch of precipitation over Directly Connected Impervious Areas are to be infiltrated or, if infiltration is not possible, to be treated for water quality. The main goals of this requirement are to 1) recharge the groundwater table and increase stream base flows; and 2) reduce contaminated runoff from the site as well as to improve water quality discharge into the Long Island Sound. In addition to water quality requirements, the City of Bridgeport also specifies water quantity requirements aimed at reducing overall runoff volume and peak rates. Detention and retention requirements are defined by the CTDEEP *2004 Connecticut Stormwater Quality Manual* with water quality requirements including a reduction of peak rate and total volume of runoff by 10 percent from pre-development to post-development conditions. For developments in multifamily residential districts, the requirement applies to 24-hour rainfall events with 2year (3.3 inches), 10-year (5.0 inches), and 25-year (5.7 inches) recurrence intervals.

4.10.2 Affected Environment

Bridgeport is a coastal city built on peninsulas with a significant amount of development placed on historic streambeds and marshes. In Connecticut, the major pattern of development is along the water's edge with approximately 62 percent of the state's population living in coastal communities. Located on a peninsula, surrounded by the Pequonnock River to the east, Long Island Sound to the south, and Cedar Creek/Black Rock Harbor to the west and north, the South End is one of the most vulnerable communities in Bridgeport, which is at risk of flooding from both coastal storm surge and regular (interior) rainfall events.

The peninsula and the Proposed Action areas are exposed to storm surge from coastal storms, and the risk of such events is increasing due to sea level rise. Over the next 50 years, sea levels are expected to rise by over 2.5 feet (30 inches), which will further compound existing flood risks in Bridgeport's South End. Much of the critical infrastructure in the area lies within the coastal floodplain, including electricity generation, transmission, and distribution facilities and low-lying stormwater and wastewater pipes, and will face increasing risk as sea levels rise.

The low-lying geography of the area, in addition to the aging combined sewer and stormwater system, results in flooding from interior rainfall or tidal inundation on a regular basis. Furthering the issues, areas such as the marshes along the east side of the South End were filled in, coastal edges hardened, and natural watercourses modified, increasing the volume and velocity of surface runoff. Over time, larger impervious surface footprints—such as buildings, parking lots, and roadways—have amplified flooding.

4.10.2.1 Floodplains

Two sources of water level information exist for the Bridgeport area. The FEMA Flood Insurance Study (FIS) and the U.S. Army Corps of Engineers "North Atlantic Coast Comprehensive Study" (NACCS) provide statistical extreme values. The most recent FEMA FIS for Fairfield County was released in October 2013 and provides information regarding potential flood elevations of Bridgeport's South End. The FIS indicates Stillwater Elevations at the transects affecting the targeted project areas. The National Oceanic and Atmospheric Administration (NOAA) maintains an active tide gage in Bridgeport Harbor (Gage No. 8467150) that provides hourly water level readings from 1970 to present. Table 4.11-1 provides a comparison of water levels provided by the FEMA FIS and NACCS studies. The FEMA stillwater elevations values are used for extreme high-water level conditions during a 100-year flooding event, while the NACCS are used to provide a sensitivity analysis of stillwater elevation depths.

Table 4.10-1. FEMA Stillwater Elevations

RETURN PERIOD	FEMA (FEET)	NACCS (FEET)
10 years	7.7	8.8
50 years	9.3	10.7
100 years	10.0	11.7

Source: FEMA Flood Insurance Study (2013) and North Atlantic Coastal Comprehensive Study (2015)

The FEMA FIS identifies four transects along the Bridgeport Long Island Sound shoreline (Table 4.11-2). Transects 44, 45, 46, and 47 are nearest the study area and indicate a stillwater elevations of approximately 10 feet North American Vertical Datum of 1988 (NAVD88).

Table 4.10-2. FEMA Flood Insurance Study Transect Descriptions

TRANSECT NUMBER	DESCRIPTION
44	At the shoreline of Long Island Sound, in the city of Bridgeport, from the west bank of Ash Creek to Black Rock Harbor
45	At the shoreline of Long Island Sound, in the city of Bridgeport, from Black Rock Harbor to Iranistan Avenue
46	At the shoreline of Long Island Sound, in the city of Bridgeport, at the eastern side of Seaside Park, from Iranistan Avenue to Monument Drive
47	At the shoreline of Long Island Sound, in the city of Bridgeport, at Bridgeport Harbor, from Monument Drive to Pleasure Beach

Source: FEMA Flood Insurance Study (2013)

FEMA released Flood Insurance Rate Maps (FIRMs) for the study area on July 8, 2013, which were formally adopted by the City of Bridgeport. Based on the best available information provided by these FIRMs, most of the study area, including nearly all the RBD Pilot and Flood Risk Reduction Project areas, is within the 1 percent annual chance storm event, or 100-year floodplain (Figure 4.10-1). Areas susceptible to flooding within the study area are identified as coastal "AE" zones, which means that a base flood elevation has been determined and the area is affected by waves less than 3 feet in height. Coastal "AE" zones are typically more inland areas where the potential for breaking waves is smaller or limited by systems such as a coastal defense system (as discussed in Section 4.10.3.2, Proposed Action, "Coastal Flooding"). Coastal floodplains are influenced by astronomical tide and meteorological forces (e.g., nor'easters and hurricanes) rather than local flooding caused by precipitation (FEMA 2013). The coastal "AE" flood elevations (i.e., base flood elevations) range 12 to 14 feet NAVD88 with the south and southeast portions of the South End exposed to the highest potential flood elevations. Only a small portion of the southern tip of the South End is within the Limit of Moderate Wave Action, and no structures are within this flood zone.[12] It is important to note that the area just offshore of the study area is within a mapped coastal "VE" zone, indicating these coastal high hazard areas are subject to high velocity wave action that can exceed 3 feet in height. Special floodplain management requirements apply in "VE" zones, including the requirement that all buildings be elevated on piles or columns.

4.10.2.2 Interior Stormwater Flooding

Before designing any changes to the existing combined sewer system, baseline scenarios were run using the Storm Water Management Model to understand how and where flooding occurs in the study area (see Figure 4.10-2). Two general mechanisms for flooding were prevalent: (1) Downstream Dominated, and (2) Capacity Dominated (aka "chokepoint"), as discussed below.

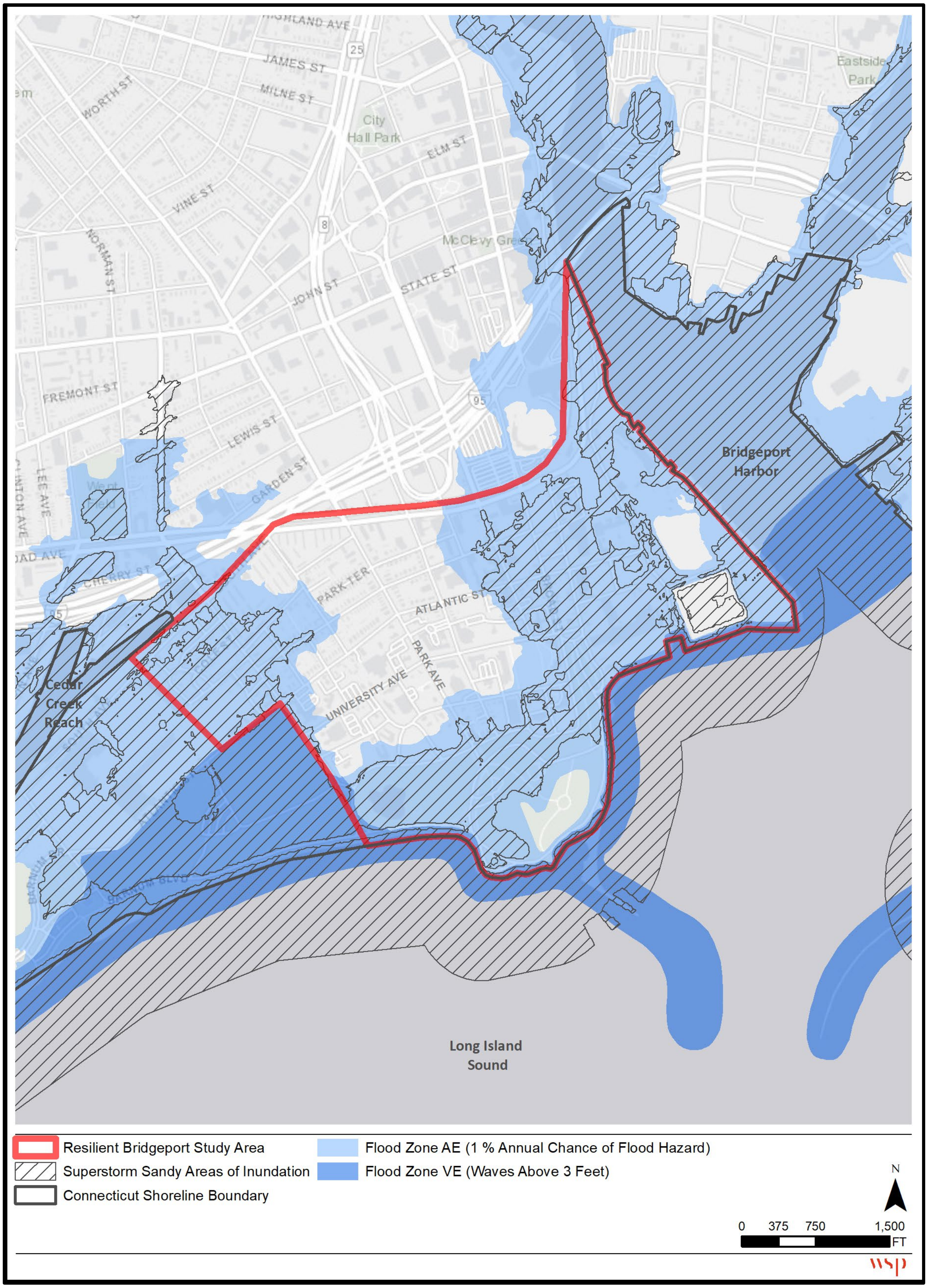
Downstream Dominated focuses on the topography of the project area. The hydraulic grade line (i.e., the profile of water elevation) for the RBD Pilot Project area is at the downstream regulator—just before the combined sewer outfall—below the street elevation of upstream nodes. This indicates that the flooding is primarily controlled by downstream conditions (e.g., outfall conditions, treatment plant capacity).

It is also clear that the RBD Pilot Project area is affected by a number of chokepoints. The hydraulic grade line can increase sharply at certain nodes (e.g., at the intersection of Iranistan Avenue and Atlantic Street), beyond the nearest downstream nodes hydraulic grade line, and intersects the street surface. This indicates that the upstream flow rate to the node (i.e., volume of water entering the system over a given time) exceeds the capacity of the sewer system. In this case, the inadequate pipe capacity works in tandem with, but is not mainly caused by, the downstream grade of the hydraulic system.

One of the initial issues identified during the modeling analysis for the Flood Risk Reduction Project area was the number of undersized pipes within this project area. In particular, several "hot spot" areas were identified due to the low-lying topography, total runoff, and extent of impervious surfaces contained within this project area.

[12] The Limit of Moderate Wave Action is the portion of the 1 percent annual chance coastal flood hazard area referenced by building codes and standards, where base flood wave heights are between 1.5 and 3 feet, and where wave characteristics are deemed sufficient to damage National Flood Insurance Program compliant structures on shallow or solid wall foundations.

Figure 4.10-1. FEMA Flood Insurance Rate Map and Project Areas



Source: Federal Emergency Management Agency Flood Insurance Rate Map, FEMA Map Service Center (2013)

Figure 4.10-2. Zones of Primary Mechanisms of Flooding

Source: Bridgeport Coastal and Stormwater Modeling Report, 2018

4.10.3 Environmental Consequences

4.10.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action will not be completed, and, as such, the coastal zone-regulated areas and interior stormwater systems will not be altered by construction or operational activities associated with the Proposed Action. However, sea level rise and more intense rainfall over time from climate change could have direct and potentially significant adverse impacts on hydrology and flooding in the study area. It should be noted that the No Action Alternative assumes that the WPCA Area H sewer separation project will be constructed. Under the No Action Alternative, the study area could be affected by the following:

- **Localized flooding from rainfall** – The potential for more frequent and intense rainfall events caused by climate change will continue and potentially worsen. In the east side of the South End during rainfall events, the WPCA Area H sewer separation project is assumed to provide some level of risk reduction.
- **Coastal storm events** – The risk of flooding from coastal storm events will continue and likely worsen due to climate change and sea level rise.

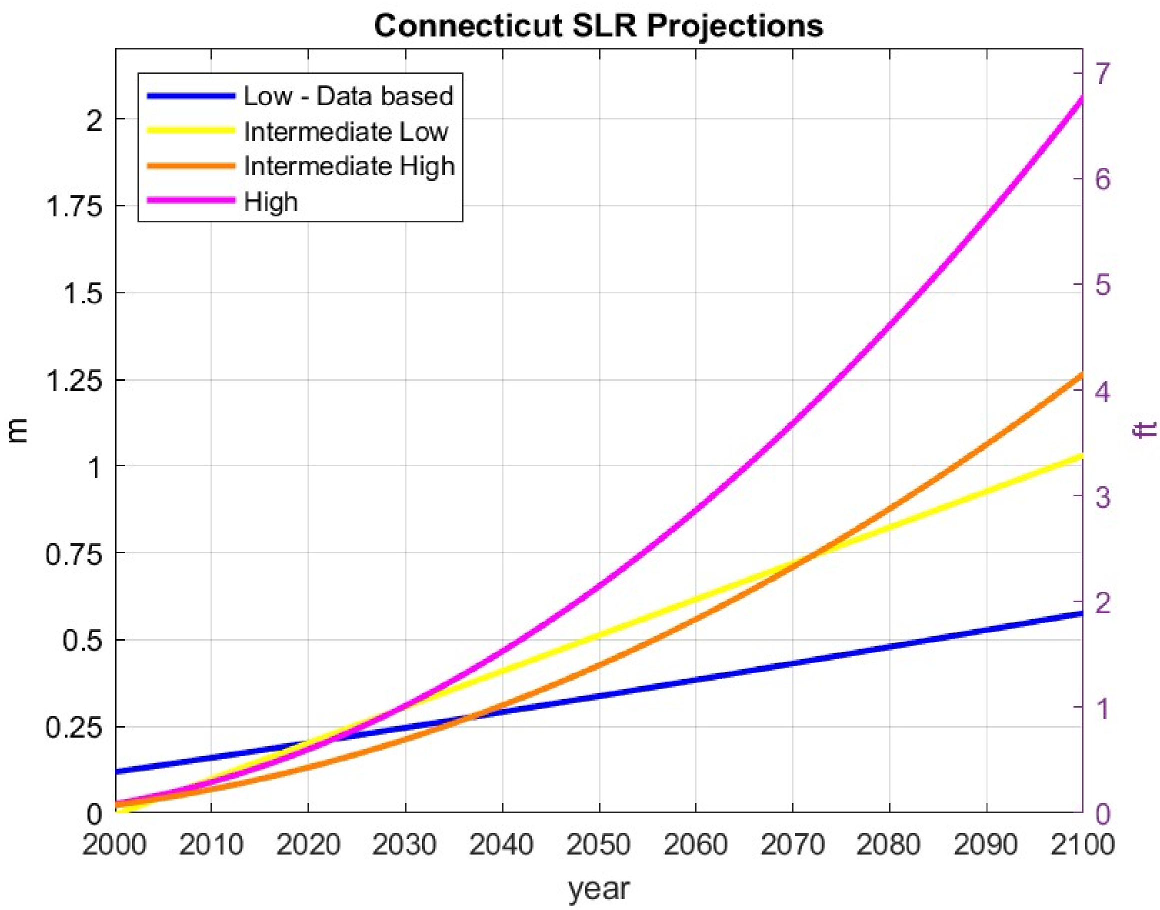
Coastal Flooding

It is probable, based on sea level rise projections, that storm surge flooding will continue to worsen under the No Action Alternative. Increased coastal flooding in the study area will result in significant adverse impacts to Bridgeport and to the South End community. NOAA Technical Report OAR CPO-1, *Global Sea Level Rise Scenarios for the United States National Climate Assessment* bases global sea level rise by 2100 on four estimates of that reflect different degrees of ocean warming and ice sheet loss, resulting in four scenarios: "lowest", "intermediate low", "intermediate high" and "highest". Projected sea level rise worldwide is approximately 0.66 feet to 6.6 feet by 2100.

To narrow this estimate, CTDEEP is responsible for implementing Public Act (PA) 13-179, An Act Concerning the Permitting of Certain Coastal Structures, which requires sea level rise to be considered for certain decisions and plans for conservation, development, and emergency preparedness. PA 13-179 also charges the University of Connecticut Department of Marine Science to update the NOAA projections every 10 years, and, specifically the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) with determining sea level rise statistics for the state of Connecticut. In June 2018, Public Act 18-82, An Act Concerning Climate Change Planning and Resiliency, was signed into law. The act includes updating current statutory references to sea level rise to reflect the most recent sea level change based upon the sea level change scenarios published by the National Oceanic and Atmospheric in Technical Report OAR CPO-1 and other available scientific data necessary to create a scenario applicable to the state coastline.

In October 2018, CIRCA released their report, *Sea Level Rise and Coastal Flood Risk in Connecticut: An Overview,* which provides Connecticut with specific projections for several sea level rise scenarios along with recommendations, now in effect, for specific scenarios. CIRCA utilized projections from other sources and adjusted the projections based on local oceanographic and land motion conditions. Figure 4.11-3 indicates sea level rise in the approximate range of 1.9 feet to 6.6 feet in 2100.

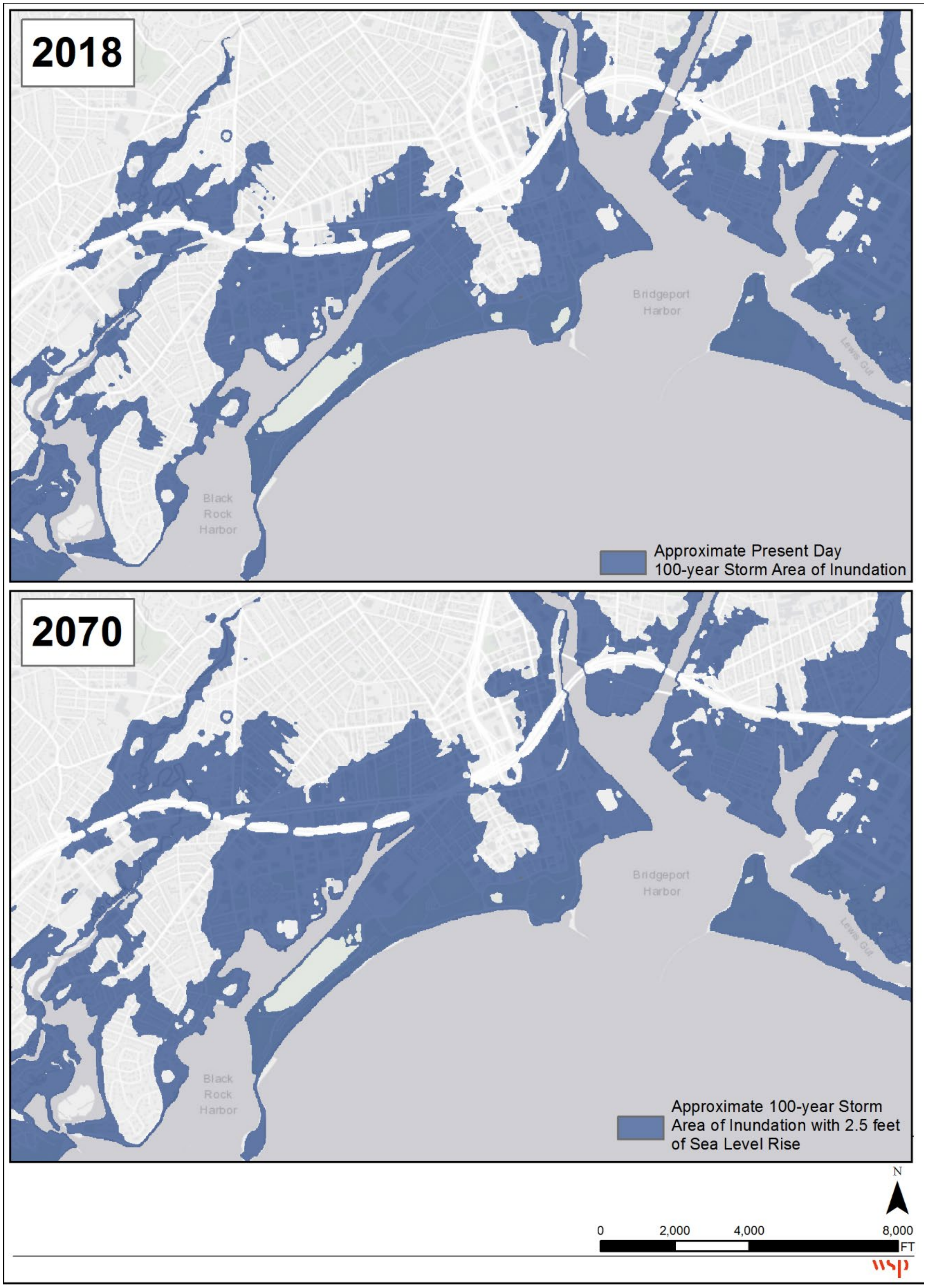
Figure 4.10-3. Connecticut Sea Level Rise Projections



Source: Connecticut Institute for Resilience and Climate Adaptation, *Sea Level Rise and Coastal Flood Risk in Connecticut: An Overview,* Report (December 2018)

For the analyzed study area, the CIRCA sea level rise projections are the best available information since they incorporate the latest global sea level rise research and adjust for local conditions. As part of CIRCA's analysis, it was recommended: "…that planning anticipates that sea level will be 0.5 m (1 feet 8 inches) higher than the national tidal datum in Long Island Sound by 2050. Further, we recommend that planners be made aware that it is likely that sea level will continue to increase to 1.0 m (3 feet 3 inches) by 2100." With the recent public hearing on the CIRCA sea level rise projections, the sea level change scenario is now final. Based on this information, under the No Action Alternative and assuming a 50-year project service life for the study area, it is clear that the Bridgeport study area will experience significant sea level rise impacts if left unmitigated (see Figure 4.10-4).

Figure 4.10-4. Modeled 100-Year Storm with Anticipated Sea Level Rise Projections



Source: Framework for Resilience Report, Resilient Bridgeport

During less frequent coastal storm events, under the No Action Alternative, community members may become stranded and be unable to evacuate to higher ground without dry egress.

Interior Stormwater Flooding

Under the No Action Alternative, changes in precipitation patterns will also be expected to have potentially significant adverse impacts on the study area. In the interior of the study area, flooding problems associated with inadequate stormwater drainage systems will continue and likely become worse as the intensity and frequency of rainfall events increase. Increases to peak discharge rates in the study area's waterways could further result in various hazards, including increased water levels and velocity in channels that can affect other resources in the study area from increased risks of flooding to adjacent areas. Sea level rise also has the potential to negatively affect rainfall flooding by increasing groundwater levels.

With this stated, it is important to note that the proposed WPCA Area H sewer separation project could provide some benefits for rainfall-based flooding by effectively increasing the drainage capacity in the eastern South End.

4.10.3.2 Proposed Action

The design life of the Proposed Action is assumed to be 50 years based on standard values for infrastructure projects. Although certain options proposed as a part of the RBD Pilot and Flood Risk Reduction Projects are expected to last in perpetuity, it is likely that these options would require eventual maintenance and replacement. Therefore, sea level rise projections of 2.5 feet in 2070 are based on the typical project useful life of these options and are considered the best estimates for this analysis.

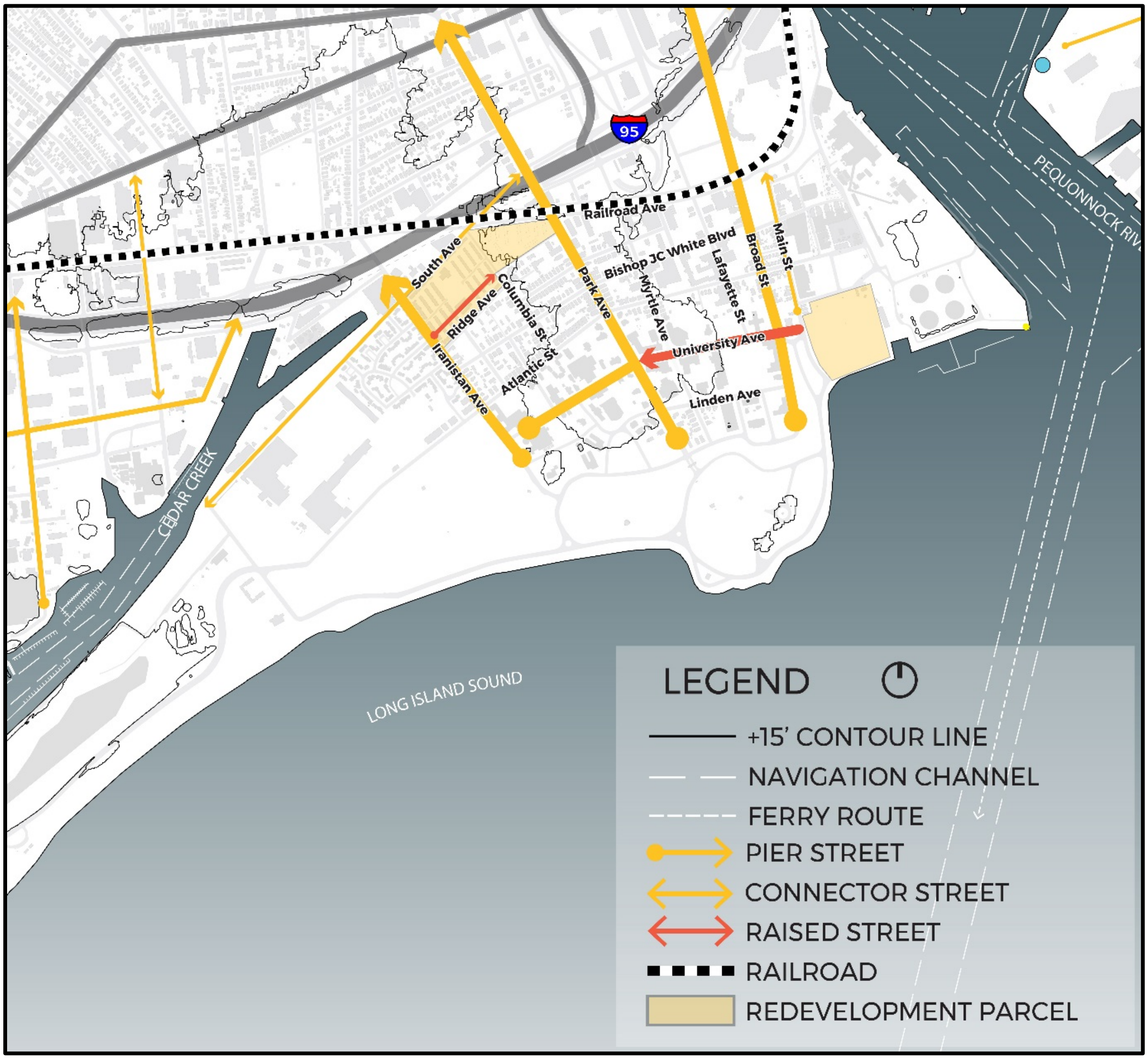
There are no practicable alternatives that would avoid impacts to the floodplain, since the individual projects would affect the floodplain at some level. To comply with the National Flood Insurance Act, Executive Order 11988, and all state and regional flood regulations, the Proposed Action has been designed to have a beneficial impact on the floodplain where practicable by minimizing impacts to the greatest extent possible and adequately mitigating unavoidable impacts. This will be documented as part of the 8-step decision-making process for EO 11988, as part of the notice of availability of the FEIS. Each of the proposed projects would include measures (e.g., stormwater facility, floodwalls, gates, berms, green infrastructure, pump stations) that would reduce flooding risk in various portions of the study area during a 100-year coastal storm and a 25-year precipitation event.

Coastal Flooding

RBD Pilot Project

A raised egress corridor (Figure 4.11-5) linking the mixed-income future redevelopment of the former Marina Village site with adjacent high ground on Johnston Street would provide an evacuation route and facilitate emergency access during a coastal flooding event (designed for the current 500-year base flood elevation plus 2.5 feet of sea level rise). Running along the northern edge of the proposed stormwater facility between the facility and the future Windward Development, a new raised green street—an extension of Johnson Street (between Columbia Street and Iranistan Avenue)—would improve east-west neighborhood connectivity and provide dry egress to upland areas, thus enhancing the resilience of the site and adjacent parcels during acute storm events and meeting the state Floodplain Management Certification regulatory requirements.

Figure 4.10-5. RBD Pilot Project: Raised Egress Corridor Design Strategy



Source: Design Strategies Report, Resilient Bridgeport, 2017

The raised roadway would allow residents to safely exit the area within the 500-year floodplain, and allow access for emergency service vehicles into the floodplain during storm events. By designing to an elevation of 15 feet NAVD88, the RBD Pilot Project targets an elevation above the FEMA 500-year stillwater elevation (11.3 feet NAVD88) plus 2.5 feet of sea level rise. The sea level rise increment of 2.5 feet used for this phase of design was selected in accordance with guidance from the CIRCA and CTDEEP, which references the NOAA CPO-1, *Global Sea Level Rise Scenarios for the United States National Climate Assessment* as discussed previously.

Flood Risk Reduction Project

WESTERN OPTION

The Western Option of the coastal flood defense system would be set primarily within the urban fabric of the South End community. As shown in Figure 4.10-7, a large portion of the Flood Risk Reduction Project area at risk of flood during a severe coastal event would be substantially reduced under the Western Option compared to the No Action Alternative. During a severe coastal surge event, it is anticipated that the Western Option would decrease the area at risk of flooding by approximately 39 acres.

While this alignment option would include coastal defense and flood risk reduction for the South End community north of University Avenue and west of Main Street, critical utility providers would be located outside the line of defense and would likely be affected by future coastal floods, unless they provide their own coastal defense structures. This option is considered the least protective in terms of flood risk reduction since these utilities would remain exposed.

By reducing the coastal risk for portions of the community, there is the potential for the coastal flood defense system to increase flood risks for adjacent areas. Due to the location of this project immediately adjacent to Long Island Sound, the volume of water displaced within the alignment would be very small compared to the volume of water in the adjacent area. Any impacts to adjacent areas would be determined through numerical modeling efforts in future design phases; however, any such impact is assumed to be insignificant based on the relatively small volume of water displaced. Coastal flood defense structures also have the potential to redirect wave energy to adjacent properties. Due to the shallow slope and soft surface treatments of the University Avenue raised roadway, wave reflection is anticipated to be insignificant. The north / south portion of the Western Option would be located inland, and in an existing urban environment that is not conducive to wave propagation. Initial wave modeling efforts indicate that waves would be significantly attenuated before reaching the north / south portion of the Western Option. As such, wave reflection to adjacent areas is not anticipated to be significant. Additional numerical wave modeling would be completed in future design phases to quantify any impacts to adjacent areas.

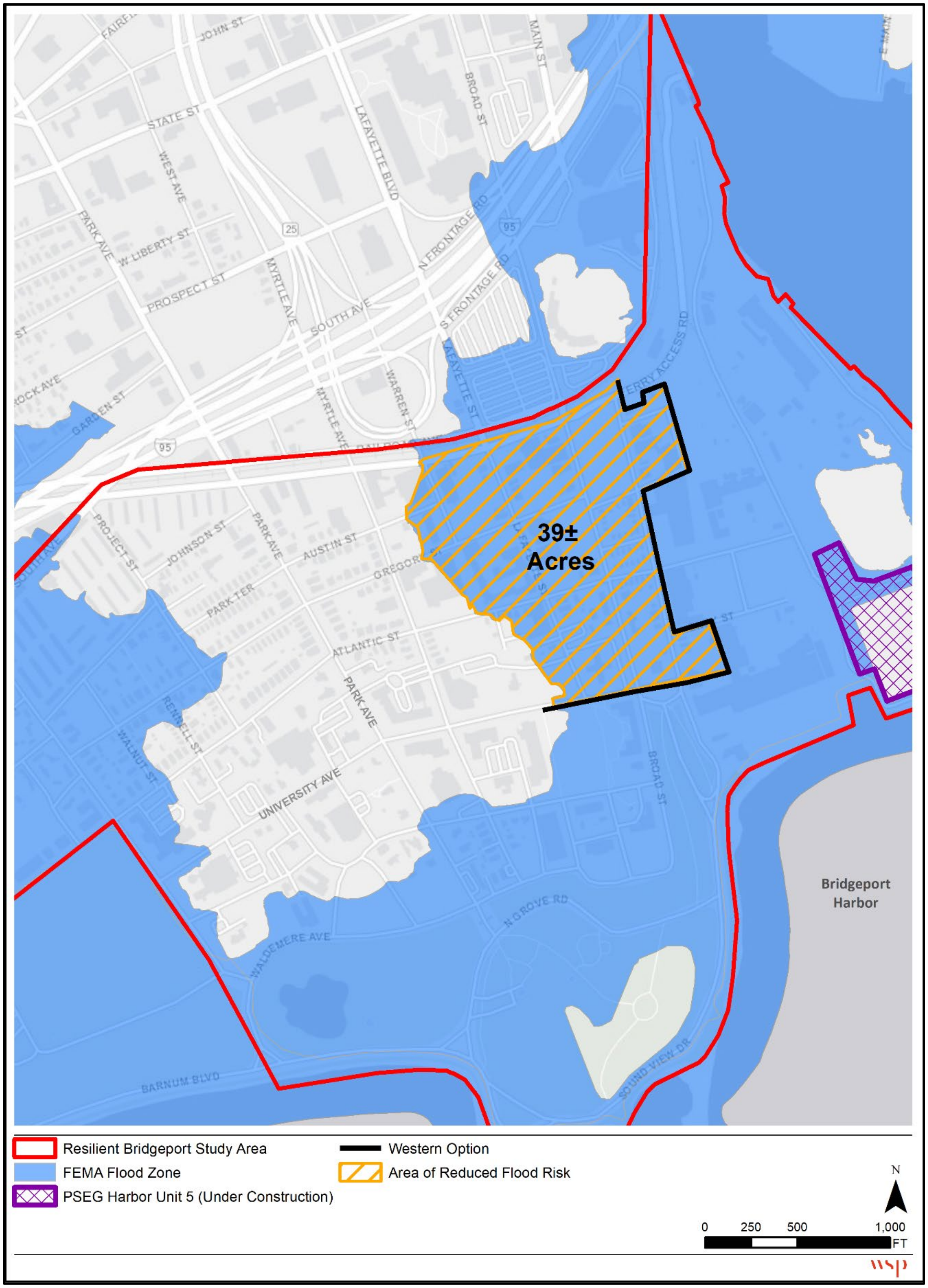
Eastern Option

The Eastern Option (Figure 4.10-7) of the coastal flood defense system would be the same as the Western Option up the eastern border of the 60 Main Street site, where it would cross to the east into PSEG's property and connect to the newly built Harbor Unit 5 perimeter sheet pile wall. Harbor Unit 5 would provide the southeast corner of the coastal flood defense system, which would extend north from the plant's access road ramp on the northwest corner of the perimeter wall. The alignment would connect from the ramp over to Emera's eastern border north of Atlantic Street. This arrangement would provide dry egress to Harbor Unit 5 via Atlantic Street. The alignment would continue along the eastern border of Emera's site until it reaches the Pequonnock Substation relocation site, where it would continue north along the eastern property line of the site across Ferry Access Road with a northern tie-in at the elevated rail road.

The Eastern Option would provide dry egress to Harbor Unit 5 and coastal flood defense to the Emera site and new Pequonnock Substation relocation site. By incorporating these properties behind the coastal flood defense system, the proposed alignment would reduce risk to several critical utility locations and provide a more holistic solution to flooding in the area than the Western Option. This alignment would reduce risk to approximately 64 acres of land within the study area, providing a 39 percent increase from the Western Option.

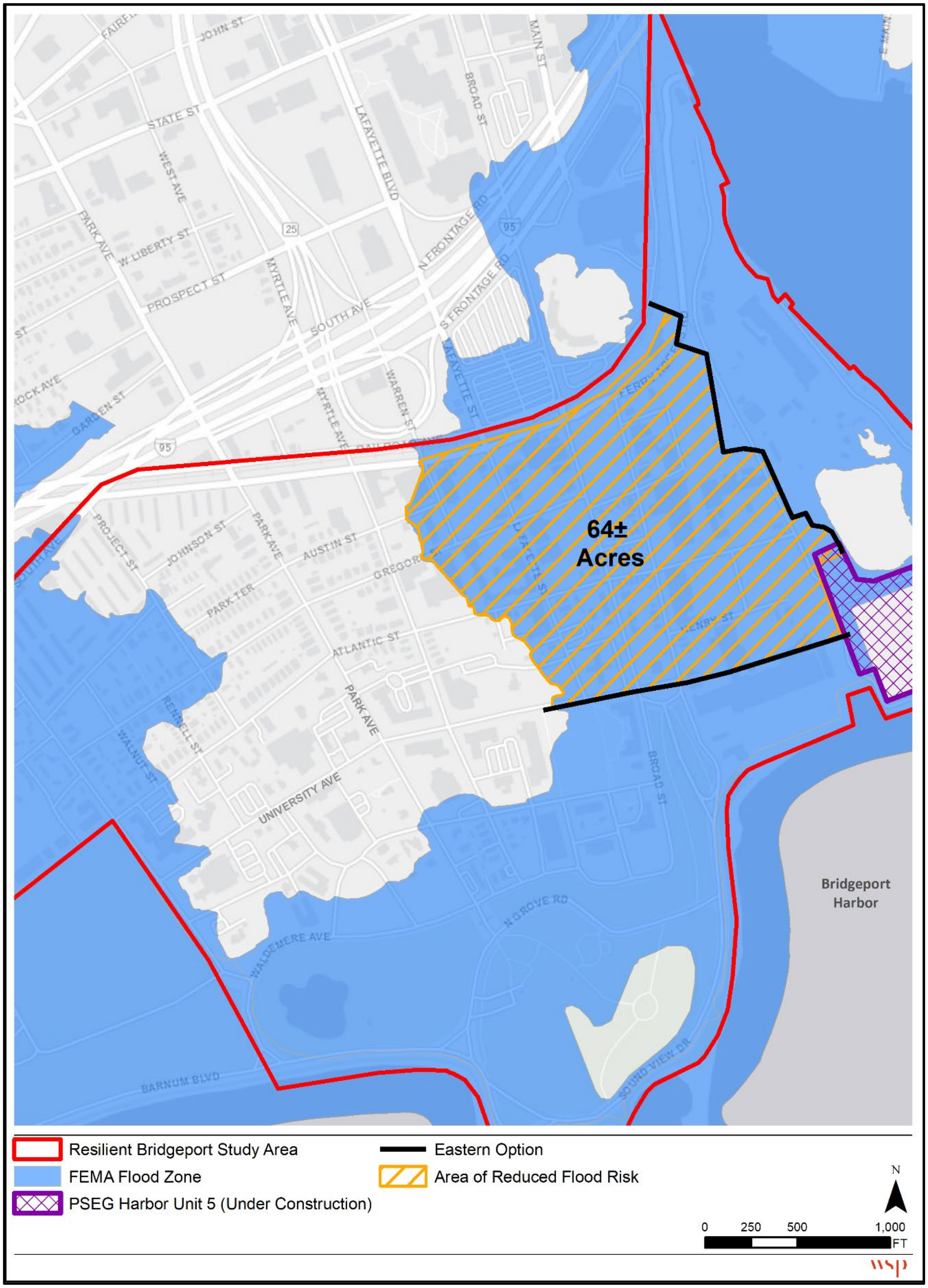
Potential impacts to adjacent areas are anticipated to be similar to the Western Option and insignificant.

Figure 4.10-6. Area of Reduced Flood Risk: Western Option



Source: Arcadis 2018

Figure 4.10-7. Area of Reduced Flood Risk: Eastern Option



Source: Arcadis 2018

Interior Stormwater Flooding

RBD Pilot Project

The RBD Pilot Project is proposed as a combination of natural/green and fortified/gray infrastructure solutions designed to facilitate more resilient forms of inhabitation in the Bridgeport neighborhoods. This project (Figure 4.10-8) would be located in the South End of the city, which experiences chronic flooding challenges as a result of an aged and combined stormwater sewer system, sea level rise, and an aged housing stock.

Designed to be both infrastructure and urban amenity, this project would be composed of a green and gray infrastructure municipal separate storm sewer system (MS4) micro-grid that would reduce chronic stormwater flooding in and around the former Marina Village site. Most stormwater runoff from the first phase of the Windward Development (located between Park Avenue and Columbia Street) and partial runoff from the second phase of the Windward redevelopment (located between Columbia Street and Iranistan Avenue) would be captured and routed to a new 2.5-acre terraced stormwater facility. Additional stormwater runoff would be routed to the new facility from adjacent streets and the neighboring Bridgeport Neighborhood Trust properties near the intersection of Columbia Street and Johnson Street and along Columbia Court. The stormwater facility has been designed to detain and retain, at a minimum, 41,000 cubic feet of stormwater runoff, reducing peak flows from the 25-year Natural Resources Conservation Service storm event, before routing the water to a pump station at the corner of South Avenue and Iranistan Avenue via a gravity pipe. In addition, the extension of Johnson Street would be a "green" street; it would incorporate green infrastructure such as bioswales and rain gardens to enhance the detention capacity of the project site. By enhancing the detention capacity, the MS4 micro-grid system would be able to capture more stormwater runoff while minimizing project costs (e.g., the size needed [and therefore cost] of the stormwater pump described below).

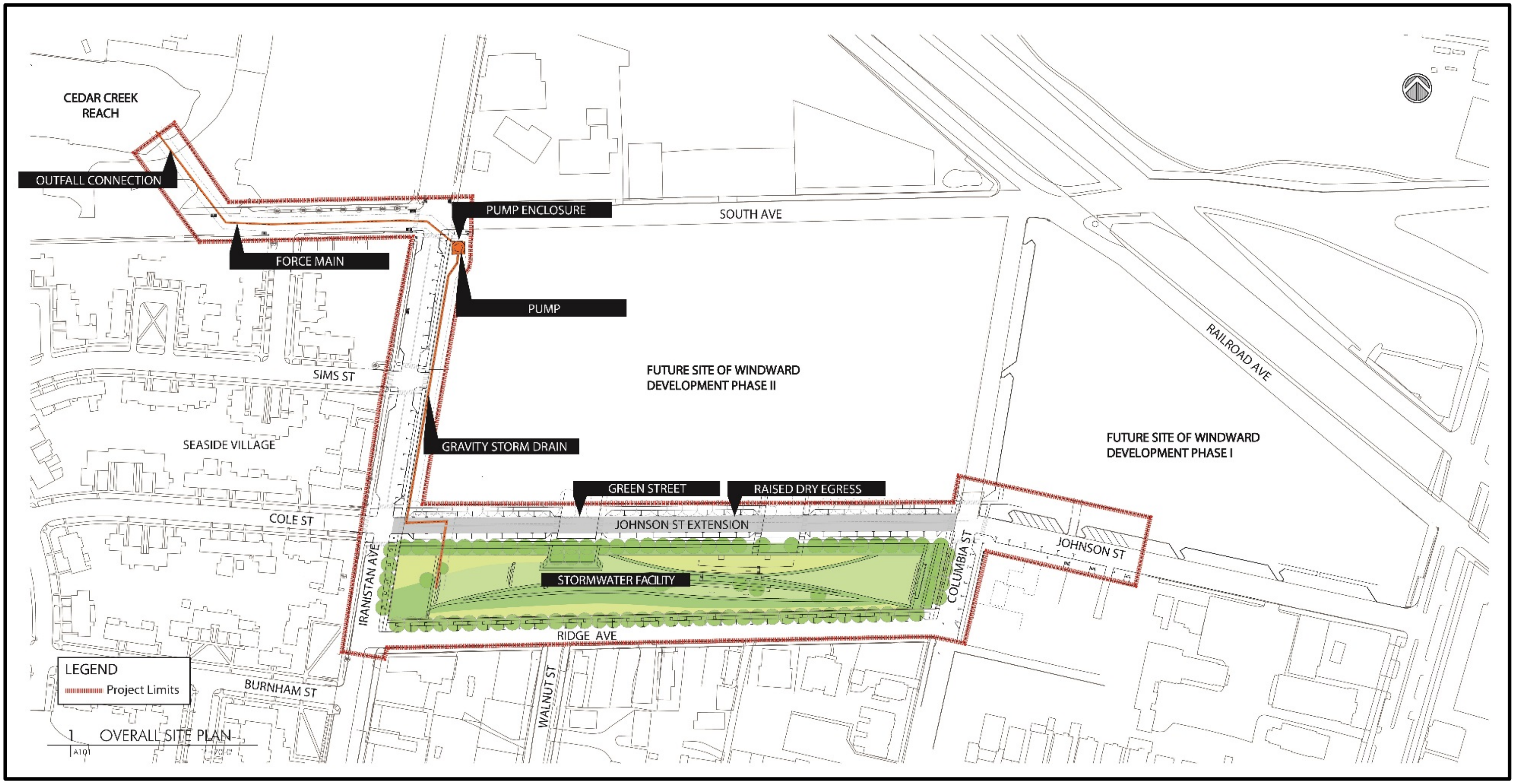
At the pump station, stormwater flows routed through the facility would be joined by the remaining stormwater runoff from the second phase of the Windward Development, which would be routed directly to the pump station. From the pump station, flows would be conveyed through a shallow force main to the existing Little Regulator Outfall along Cedar Creek, which would be repurposed from an abandoned CSO outfall to a new stormwater outfall. Through the intervention described above, Bridgeport would be equipped with the first phase of an MS4 for the South End.

Flood Risk Reduction Project

The integrated approach to the Flood Risk Reduction Project would consider the impacts of not only coastal flooding but also the impacts of interior flooding behind the coastal flood defense system. Specifically, these improvements could include increasing the conveyance capacity of downstream systems (e.g., using relief sewers/interceptors) and installing separate storm sewers and/or pump stations. Improving the existing drainage system is important to minimize internal flooding and to manage stormwater in both high- and low-frequency storm events. Due to the low-lying topography in the area, and predicted sea level rise, installation of stormwater pump stations could be required to address interior flooding and to pump water away from the project area.

In some cases, check valves to prevent backflow could be useful. Additional analysis in later stages of design is still required to test and understand the impact of different gray and green infrastructure improvements.

Figure 4.10-8. RBD Pilot Project: Proposed Green/Gray Infrastructure Measures



Source: Design Strategies Report, Resilient Bridgeport, 2018

Most of the components would remain the same for either of the coastal flood defense system alignment options. However, one component that could change (depending on the selected alignment) is the location of a pump station and the rates of flow that it would need to pump. For the purposes of conceptual analyses, two alignments—one along the coast and one alignment more inland—were tested, and the sensitivities of pump station parameters were evaluated based on model findings. Once a preferred alignment is selected, a third model would be developed and analyzed. The results of the modeling would likely modify the pump rates. Moreover, components of the pump station (e.g., the type of pump to be installed) have not yet been selected.

Figure 4.10-9 indicates the potential actions that could be taken to relieve some degree of interior flooding within the Flood Risk Reduction Project area. It should be noted that the measures described below are at a preliminary phase of development and should be considered as potential design strategies rather than firm decisions to be constructed. For example, the intersection of University and Atlantic (Box A) would likely require upsized pipes to alleviate flooding; however, the exact size of the pipes is still to be determined. Similarly, the identified Area B is anticipated to benefit from the construction of a regulator to control the flow entering the CSO system, but further analyses are required to understand how the benefits and results from a functioning system. Lastly, Area C has an existing regulator and the feasibility of a tide gate is currently being evaluated.

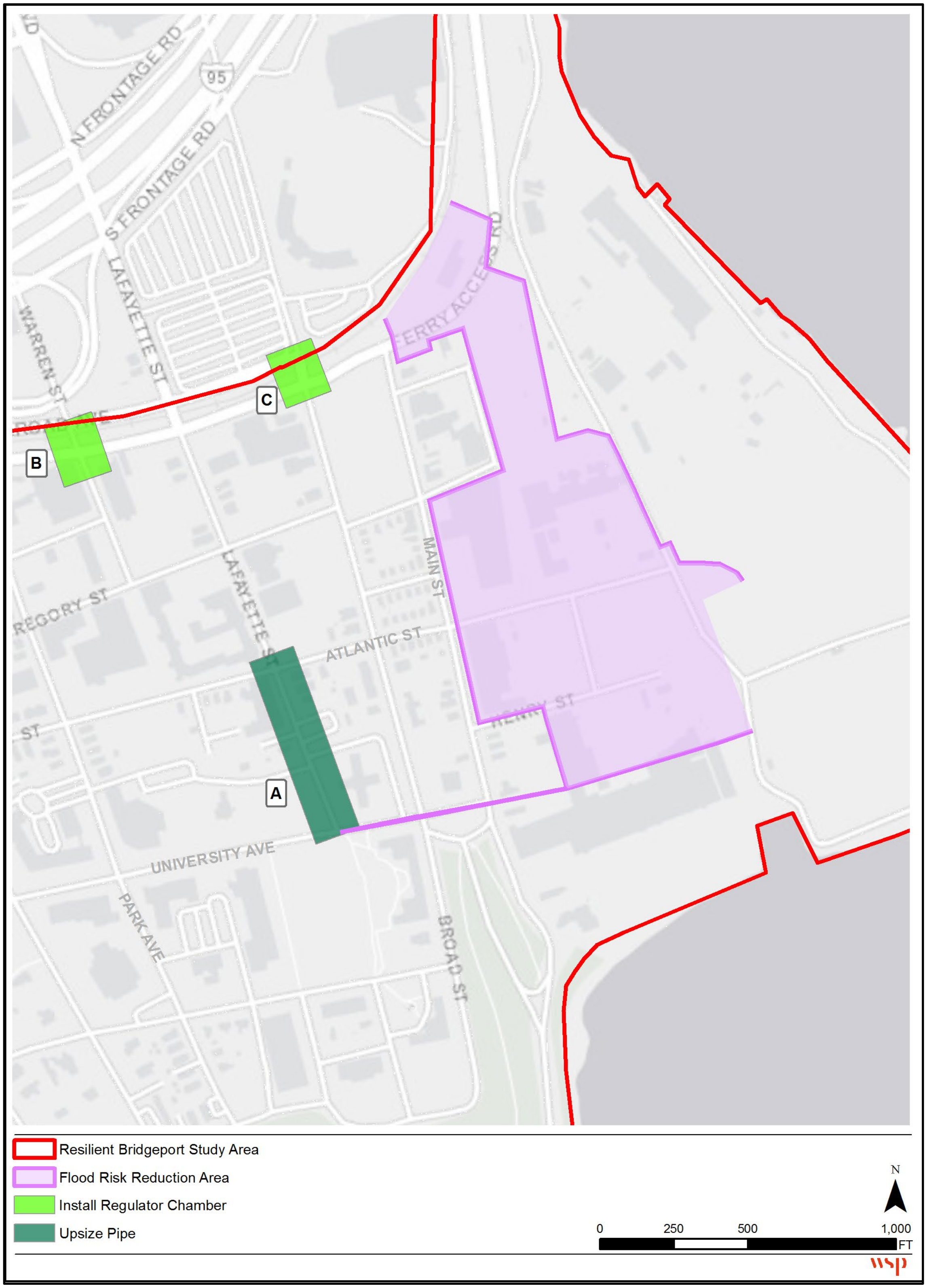
Green infrastructure measures are also being considered for the Flood Risk Reduction Project area. Figure 4.10-10 presents the results of an initial analysis of where certain green infrastructure practices could be feasible due to constraints based on an assumed depth to groundwater. The zone located the farthest east is considered "constrained" in that it is not-feasible for subsurface or surface green infrastructure measures since the ground surface in this area is extremely close to the level of groundwater below the surface. The zone located directly west is "semi-constrained" since it allows for use of very shallow depth green infrastructure practices, while the zone farthest west is "unconstrained", meaning that full-depth green infrastructure practices are feasible. Each of these zones is based on preliminary light detection and ranging (LiDAR) data, and the feasibility of green infrastructure in these zones would be revised and further evaluated when additional information (such as depth to groundwater) are available as a result of groundwater monitoring that is being completed for more detailed design of the Flood Risk Reduction Project.

Resilience Center

Any new structure or structures associated with the Resilience Center would need to comply with the City of Bridgeport's FDPO and follow the minimum requirements of the NFIP. As such, it is anticipated that the structure or structures would have no anticipated impacts to the existing or future floodplain.

It should be noted that the Resilience Center would similarly be required to abide by the *City of Bridgeport Storm Water Management Manual* and the CTDEEP *2004 Connecticut Stormwater Quality Manual*. This would require that a reduction of peak rate and total volume of runoff by 10 percent from pre-development to post-development conditions be captured by the development.

Figure 4.10-9. Flood Risk Reduction Project: Targeted Combined Sewer Overflow System Modifications



Source: Resilient Bridgeport National Disaster Resilience Preliminary Engineering (10% Design), 2018

Figure 4.10-10. Flood Risk Reduction Project: Green Infrastructure Zones (Preliminary Analysis)

Source: Resilient Bridgeport National Disaster Resilience Preliminary Engineering (10% Design), 2018

4.11 WATER RESOURCES AND WATER QUALITY

This section describes the existing water resources and water quality within the study area and potentially affected by the Proposed Action. The study area is highly urbanized with residential, commercial and industrial development; Bridgeport is a highly developed with up to 80 percent of impervious coverage. The water resources in the study area are Bridgeport Harbor, the downstream portion of the Pequonnock River Watershed; Black Rock Harbor, inclusive of Cedar Creek Harbor and Cedar Creek Reach; and Long Island Sound. Both the Bridgeport Harbor and Black Rock Harbor waterbodies discharge into central Long Island Sound. Combined sewer overflows (CSO) and municipal separate storm sewer system (MS4) serve stormwater and collected rainwaters in the study area. The water quality of the study area's water resources is affected by these CSO and MS4 point sources, and non-point-source water and water pollution that is generated from the high level of development and impervious surface in the area.

4.11.1 Methodology and Regulatory Context

4.11.1.1 Methodology

The methodology for the water resources and water quality section involved two major tasks: desktop data collection and review, and assessment of potential impacts. Current conditions and any known trends were identified and are documented in Section 4.12.2, Affected Environment, to provide a baseline from which to assess potential impacts of the identified alternatives that are documented in Section 4.11.3, Environmental Consequences. The direct and indirect impacts to water resources and water quality were qualitatively evaluated and characterized in both the short- and long term, using the criteria identified in Table 4.11-1.

Existing information on surface water and groundwater resources and water quality was identified through a search of literature available from governmental and non-governmental sources; which included documents from prior environmental reviews by others, permits, and studies conducted on the Pequonnock River Watershed and Long Island Sound by CTDEEP, Bridgeport Water Pollution Control Authority (WPCA), U.S. Environmental Protection Agency (EPA), and the U.S. Army Corps of Engineers (USACE), as part of federal and state projects.

For the environmental consequences analysis, the type and magnitude of direct and indirect impacts of the No Action Alternative and Proposed Action were identified. Table 4.11-1 describes the criteria used to determine the significance of impacts.

Table 4.11-1. Impact Significance Criteria and Description for Impacts to Water Resources and Water Quality

IMPACT CHARACTERIZATION	TYPE OF IMPACT	IMPACT CRITERIA
No Impact	Direct Water Resource Change	▪ Would not result in placement of fill, structures, or other discharge in waters of the United States or state-regulated waterbody ▪ Would not mobilize contaminants or sediment into waters of the United States or state-regulated waterbody ▪ Would not change the quality or quantity of surface water, ground water, or regulated water ▪ Would not divert surface water or disrupt groundwater flow ▪ Would not result in temporary or long-term disturbance of freshwaters or tidal wetlands
	Indirect Water Resource Change	▪ Would not mobilize contaminants into waters of the United States or state-regulated waterbody ▪ Would not disrupt hydrology to waters of the United States or state-regulated waterbody ▪ Would not induce activities that could diminish the quality or quantity of surface water, groundwater, or regulated waters ▪ Would not increase tributary or river flows that would result in sediment scouring ▪ Would not increase stormwater runoff volume
	Applies to All Types of Impact	▪ Would not result in discernable changes to water resources in the study area ▪ Would only alter water resources for an indiscernible or negligible period of time
Less-than-Significant	Direct Water Resource Change	▪ Would result in temporary ground disturbance, placement of fill, structures, or other discharge in waters of the United States or state-regulated waterbody ▪ Would mobilize contaminants or sediment into waters of the United States or state-regulated waterbody that would not result in an exceedance of Connecticut Water Quality Standards/Clean Water Act surface water quality standards for a parameter ▪ Would result in a temporary decrease in the quality of surface water, ground water, or regulated water ▪ Would result in a temporary diversion of surface water or temporary disruption of groundwater flow
	Indirect Water Resource Change	▪ Would mobilize contaminants into waters of the United States or state-regulated waterbody offsite from the Proposed Project, would discharge stormwater that would not result in an exceedance of Connecticut Water Quality Standards/Clean Water Act requirements for surface waters ▪ Would minimally disrupt hydrology to waters of the United States or state-regulated waterbody ▪ Would induce activities that could diminish the quality or quantity of surface water, groundwater, or regulated waters ▪ Would increase tributary or river flows that would result in limited sediment scouring ▪ Would install new impervious surfaces, causing slightly increased stormwater runoff volume
	Applies to All Types of Impact	▪ Water resources would only be altered/diminished for a short, finite period of time, but would recover ▪ Temporary impacts would be localized to specific areas and not substantially affect or diminish water resources throughout the study area

Table 4.11-1. Impact Significance Criteria and Description for Impacts to Water Resources and Water Quality (continued)

IMPACT CHARACTERIZATION	TYPE OF IMPACT	IMPACT CRITERIA
Potentially Significant	Direct Water Resource Change	▪ Would result in placement of fill, structures, or other discharge in waters of the United States or state-regulated waterbody ▪ Would dredge or excavate in waters of the United States or state-regulated waterbody, thereby permanently altering the feature ▪ Would mobilize contaminants in waters of the United States or state-regulated waterbody, or would discharge stormwater that could result in an exceedance of Connecticut Water Quality Standards/Clean Water Act requirements for surface waters ▪ Would result in a permanent decrease in the quality of surface water, ground water, or regulated water ▪ Would result in a permanent diversion of surface water or temporary disrupt groundwater flow
	Indirect Water Resource Change	▪ Would mobilize contaminants into waters of the United States or state-regulated waterbody offsite from the Proposed Project, would discharge stormwater that could result in an exceedance of Connecticut Water Quality Standards/Clean Water Act requirements for surface waters ▪ Would disrupt hydrology to a waters of the United States or state-regulated waterbody ▪ Would induce activities that could moderately or substantially diminish the quality or quantity of surface water, groundwater, or regulated waters ▪ Would increase tributary or river flows that would result in substantial sediment scours ▪ Would install new impervious surfaces, causing moderate or substantial increase stormwater runoff volume
	Applies to All Types of Impact	▪ Water resources would be adversely affected for a long-term or permanent period of time ▪ Impacts would substantially affect or diminish water resources throughout the study area
Beneficial	Direct Water Resource Change	▪ Would increase or improve quality or quantity of waters of the United States or state-regulated waterbody ▪ Would improve the quality or quantity of surface waters, ground water, or regulated water ▪ Would improve surface water or groundwater flow ▪ Would directly remove contaminated sediments from waters of the United States or state-regulated waterbody
	Indirect Water Resource Change	▪ Would reduce contaminant mobilization into waters of the United States or state-regulated waterbody offsite ▪ Would improve hydrology to waters of the United States or state-regulated waterbody ▪ Would induce activities that could improve the quality or quantity of surface water, groundwater, or regulated waters ▪ Would decrease the existing rate of sediment scouring ▪ Would reduce impervious surfaces, causing decreased stormwater runoff volume
	Applies to All Types of Impact	▪ Would result in water resource benefits or improvements throughout the study area

4.11.1.2 Regulatory Context

The protection of water resources, both surface and groundwater, set forth by federal, state and local laws and regulation is described in the sub-sections that follow.

Clean Water Act

The USACE administers Section 404 of the Clean Water Act (CWA), which established a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. The objective of the CWA, also known as the Federal Water Pollution Control Act, is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. It regulates point sources of water pollution, such as discharges of municipal sewage, industrial wastewater, and stormwater runoff; the discharge of dredged or fill material into navigable waters and other waters; and non-point-source pollution (e.g., runoff from streets, construction sites) that enter waterbodies from sources other than the end of a pipe. Section 404 of the CWA requires authorization from the Secretary of the Army, acting through the USACE, for the discharge of dredged or fill material into waters of the United States. Activities authorized under Section 404 must comply with Section 401 of the CWA. Under Section 401 of the CWA, any applicant for a federal permit or license for an activity that could result in a discharge to navigable waters must provide to the federal agency issuing a certificate (either from the state where the discharge would occur or from an interstate water pollution control agency) that the discharge would comply with Sections 301, 302, 303, 306, 307, and 316 (b) of the CWA. Applicants for discharges to navigable waters in Connecticut must obtain a Section 401 Water Quality Certificate from the CTDEEP.

National Pollutant Discharge Elimination System

The National Pollutant Discharge Elimination System (NPDES) permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created in 1972 by the CWA, the NPDES permit program is authorized to state governments by the EPA to perform many permitting, administrative, and enforcement aspects of the program.

Rivers and Harbors Act of 1899

With the goal of protecting navigation and navigable channels, Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, via the USACE, for the construction of any structure in or over any navigable waters of the United States. Any structures built in navigable waters up to the mean high-water line would be regulated under this act. The USACE evaluates the probable impacts, including cumulative impacts of the proposed activity on the public interest prior to granting authorization. This regulation would apply to any of the Proposed Action’s -projects that include impacts at or below the mean high-water line, including the construction of tide gates if constructed below the mean high-water line at Outfall C and the potential rehabilitation of Outfall E.

Wild and Scenic Rivers Act of 1968

The Wild and Scenic Rivers Act of 1968 protects selected rivers deemed to be in a free-flowing wild and scenic condition and requires that federal agencies consider the effects of their actions on those qualities of a listed river for which it was designated, including the river’s free-flowing condition, water quality, and outstanding resource values.

Safe Drinking Water Act of 1974

Enacted in 1974, the Safe Drinking Water Act is the main federal law that sets national standards to ensure the quality of Americans' drinking water, protecting Americans from health risks associated with naturally occurring and man-made contaminants. Sole-source aquifers are defined as those aquifers that contribute more than 50 percent of the drinking water to a specific area and contain water that would be impossible to replace if the aquifer were contaminated. Under Section 1424(e) of the Safe Drinking Water Act of 1974 (Public Law 93-523, 42 U.S.C. 300 et seq.), no project is to receive commitment for federal financial assistance if the area has an aquifer that is the sole source of drinking water for that area and if that project may contaminate the aquifer through a recharge zone in such a way that would create a significant hazard to public health. The potential for sole-source aquifers within the study area must be assessed because of the potential impact to groundwater due to construction activities.

Connecticut Water Quality Standards

The Connecticut Water Quality Standards (CT WQS) includes three elements: the Standards, Criteria, and a series of Classification Maps. The Proposed Action would be designed in accordance with the *2004 Connecticut Stormwater Quality Manual*. The CT WQS set an overall policy for management of water quality in accordance with the directive of the Connecticut General Statutes, Section 22a-426. These statutes work in tandem with the federal CWA and underpin the required federal Water Quality Certificate, which is obtained via CTDEEP.

Groundwater in Connecticut is regulated under the Safe Drinking Water Act, as well as under the CT WQS, which are found in Section 22a-426 of the Connecticut General Statutes. Section 22a-426-7 of the Connecticut General Statutes sets out the general groundwater standards and polices based on the class of groundwater that may be affected. It also regulates designated uses and allowable discharges, depending on the class of groundwater that may be affected, which are detailed in the groundwater classification section below.

The study area has numerous CSO and MS4 outfalls located around the shoreline in the South End. Table 4.11-2 presents the standards for the MS4 discharges that are applicable city-wide.

Table 4.11-2. Municipal Separate Storm Sewer System Standards for the City of Bridgeport

PARAMETER	STANDARDS TRIGGERING FURTHER STUDY
Total Nitrogen (mg/l)	>2.5
Total Phosphorus (mg/l)	>0.3
E. coli to Class AA, A and B surface waters (col/100ml)	>235 E. coli for swimming areas >410 for all others
Total Coliform to Class AA, A and B surface waters (col/100ml)	>500
Fecal coliform to Class SA and SB surface waters (col/100ml)	>31 for Class SA >260 for Class SB
Enterococcus to Class SA and SB surface waters (col/100ml)	>104 for swimming areas >500 for all other areas

Source: Connecticut General Statutes, Section 22a-426-7

Stormwater Management

Hydraulic design criteria including storm drain design, pumping station capacity, stormwater infrastructure, and detention/retention requirements, is based upon the *City of Bridgeport Storm Water Management Manual* and the CTDEEP *2004 Connecticut Stormwater Quality Manual*. The *City of Bridgeport Storm Water Management Manual* requires that a minimum conveyance allowance for storm drains and pumping stations must be equivalent to the 25-year storm event. Additionally, stormwater velocity in the drainage system must maintain a minimum of 3 feet per second and a maximum of 15 feet per second with a minimum grade of a half percent (0.5 percent). The manual also specifies that the minimum amount of cover above the stormwater pipes must be 2 feet (Class IV RCP) or 1-foot (Class V RCP), depending on the piping class, and must maintain a minimum pipe size of 15 inches if it is contained in the City of Bridgeport right-of-way (or 12 inches if placed on private property).

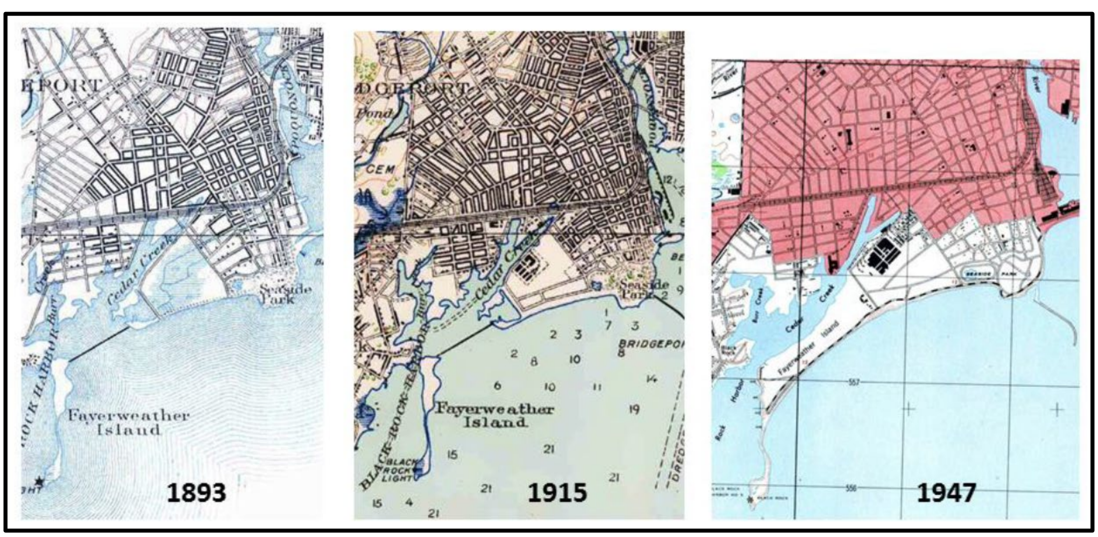
The City of Bridgeport stormwater regulations specify that the first 1 inch of precipitation over Directly Connected Impervious Areas are to be infiltrated or, if infiltration is not possible, to be treated for water quality. The main goals of this requirement are to 1) recharge the groundwater table and increase stream base flows; and 2) reduce contaminated runoff from site as well as to improve water quality discharge into the Long Island Sound. In addition to water quality requirements, the City of Bridgeport also specifies water quantity requirements aimed at reducing overall runoff volume and peak rates. Detention and retention requirements are defined by the CTDEEP *2004 Connecticut Stormwater Quality Manual* with water quality requirements, including a reduction of peak rate and total volume of runoff by 10 percent from pre-development to post-development conditions. For developments in multifamily residential districts, the requirement applies to 24-hour rainfall events with 2-year (3.3 inches), 10-year (5.0 inches), and 25-year (5.7 inches) recurrence intervals.

4.11.2 Affected Environment

This section describes the current conditions of the water resources and water quality in the study area. These current conditions and any known trends are described to provide a baseline for assessment of the environmental consequences of the No Action Alternative and Proposed Action as discussed in Section 0, Environmental Consequences.

U.S. Geological Survey (USGS) historical maps of Bridgeport provide insight into how the land use, morphology and subsurface has changed over time. Figure 4.11-1 shows the land use modifications from 1893 to 1947 that have contributed to the current surface water configuration and water quality conditions.

Figure 4.11-1. Historical Maps of Bridgeport



Source: U.S. Geological Survey

The series of drawings from Figure 4.11-1 shows the following historical conditions:

- The 1893 map shows that Bridgeport's urban area was built on relatively high and dry ground. Specific to the South End, Seaside Park existed in 1893, with its western edge close to a salt marsh area and bordered by Iranistan Avenue. A creek system was also visible within the marshes, and the park was at this time connected to a shallow, open bay. This marsh area was once considered Fayerweather Island and was connected to the South End by a dike.
- The 1915 map indicates that the western portion of the South End salt marsh was filled in with roads and developed. The dike linking Seaside Park and Fayerweather Island remained unchanged from conditions shown on the 1893 map.
- The 1947 map shows that from 1915 to 1947 the western marsh area continued to be filled in. The shallow open water area between Fayerweather Island and Seaside Park was also filled. Ultimately, this area became an official municipal solid waste landfill from 1983 to 1985. The 1947 map also depicts that there was additional fill placed in Burr Creek in the Black Rock Harbor portion of the study area.

The study area for the water resources analysis, the South End, is well developed and highly modified due to existing housing neighborhoods and commercial or industrial uses. Seaside Park is an exception to this development, having less than 25 percent impervious surface cover. The current impervious cover in Bridgeport and the South End ranges from 51 to 100 percent based on the 2011 National Land Cover Database, and consists of residential housing, commercial space, industrial space, and city streets and sidewalks. Currently the study area has an average 80 percent impervious surface coverage of total area.

4.11.2.1 Surface Waters

Surface waters in the study area include the Pequonnock River, Bridgeport Harbor, Long Island Sound, and Black Rock Harbor, which includes Cedar Creek Reach and Cedar Creek Harbor. Surface waters are qualitatively discussed based on the limited water quality data, assessments, and point-source permits available. It is noted that ambient and point-source water quality monitoring is not consistently collected within the study area, although monitoring of discharges complies with state permit regulations. Figure 4.11-2 provides an overview of the surface water resources in the study area, water quality classifications of those surface waters, and the location of known outfalls.

No Wild and Scenic Rivers or Wild and Scenic River Systems—as designated by the U.S. Department of the Interior—are within Fairfield County, CT. The closest designated Wild and Scenic River is the Eight Mile River, approximately 45 miles from the study area. Therefore, the Proposed Action would not affect designated any Wild and Scenic Rivers.

In Connecticut, factors that affect trends in surface water quality include changes in land use and water resources, and trends in streamflow (both natural and man-made) (U.S. Geological Survey 1997). Changes in sampling and analytical methods may also indicate differences in results. USGS cites human use of land and changes to water resources having effect on water quality. These factors include quality and quantity of municipal and industrial wastewater discharges; increased urbanization and associated non-point-source runoff, changes in agricultural practices, and changes in atmospheric distribution of contaminants. Wastewater discharges contribute pollutants such as nitrate, total phosphorus, total organic carbon, ammonia, turbidity, human pathogens and other bacteria to surface waters, and fluctuations in the concentration of dissolved oxygen that could have implications for thresholds for marine life (U.S. Geological Survey 1997).

Figure 4.11-2 Water Resources in the Study Area and Known Locations of Outfalls

Source: CTDEEP

In Connecticut, surface waters are classified based on the type of waterbody, the designated use of the waterbody, and the allowable discharges for each classification. Connecticut coastal and marine surface waters are classified as follows:

- **Class A** waters are designated as habitat for fish and other aquatic life and wildlife, potential drinking water supplies, recreation, navigation, and water supply for industry and agriculture. Discharges into Class A waters are restricted to discharges from public or private drinking water treatments systems, dredging and dewatering, and emergency and clean water discharges.
- **Class SA** waters are designated as habitat for marine fish, shellfish and other wildlife, shellfish harvesting for direct human consumption, recreation, and all other legitimate uses including navigation. Discharges into Class SA waters are restricted to discharges from public or private drinking water treatments systems, dredging and dewatering, and emergency and clean water discharges.
- **Class SB** waters are designated as habitat for marine fish, shellfish and other wildlife, shellfish harvesting for transfer to approved areas for purification prior to human consumption, recreation, industrial and other legitimate uses including navigation. Discharges into Class SB waters are restricted to discharges from public or private drinking water treatments systems, dredging and dewatering, and emergency and clean water discharges as well as cooling waters, discharges from industrial and municipal wastewater treatment facilities (provided best available treatment and best management practices are implemented), and other discharges subject the provisions of Section 22a-430 of the Connecticut General Statutes on water pollution control.
- **Class SC** waters indicate that water quality in the waterbody is impaired. Waters classified as SC are designated for the same uses and discharges are regulated to the same standards as their first order classification with the goal of improving water quality over time.

CT WQS for Class SA and SB waterbodies are provided in Appendix E - Supplemental Natural Resources Information, Table E-2. It should be noted that Class SC waterbodies have the same standards as Class SB. Designated uses of Class SA, SB, and SC waters are provided in Table 4.11-3; these uses designated by CTDEEP have requirements for pathogen/bacterial loads.

Table 4.11-3. Waterbody Classification for the Surface Waters in the Study Area

WATERBODY	CLASSIFICATION	IMPAIRED PER CT WATER QUALITY STANDARDS
Long Island Sound	SA	Not Applicable
Black Rock Harbor, including Cedar Creek Reach	SB	▪ Black Rock Harbor – Yes ▪ Seaside Park Beach Estuary – Yes ▪ Cedar Creek – Not Assessed
Bridgeport Harbor	SB	▪ Inner Bridgeport Harbor – Yes ▪ Outer Bridgeport Harbor – Yes
Pequannock River (south of Route 1)	SB	▪ Inner Bridgeport Harbor – Yes

Source: City of Bridgeport, 2017

Factors that could affect surface water quality include changes in land use, including percentage of impervious cover, and trends in stream flow. Increased impervious area is associated with decreased water quality, due to additional stormwater runoff and contaminants in the stormwater. Typical pollutants in stormwater runoff include suspended solids, bacteria and pathogens, nitrogen and phosphorous, chloride from road salt, heavy metals, pesticides, petroleum products, polychlorinated biphenyls, sediment, and litter and trash. In addition, stormwater runoff can include waters that have decreased levels of dissolved oxygen or elevated temperatures (Natural Resources Defense Council 2011) (Connecticut Department of Energy and Environmental Protection 2018).

Table 4.11-3 identifies the surface water resources in the study area, their classification, and state of impairment per CT WQS, while Table 4.11-4 presents the potential sources of their impairment.

Table 4.11-4. Impaired Waterbodies in Bridgeport

WATER BODY & ID	IMPAIRED USE	POLLUTANT	CAUSE/POTENTIAL SOURCE
LIS WB Inner-Black Rock Harbor CT-W1_002 SB Estuary	▪ Habitat for marine fish, other aquatic life and wildlife	▪ Dissolved oxygen saturation ▪ Estuarine bioassessments ▪ Nutrients/eutrophication biological indicators ▪ Oil and grease ▪ Polychlorinated biphenyls ▪ Polycyclic aromatic hydrocarbons	▪ Potential source industrial point-source discharges, municipal discharges, landfill, illicit discharges, remediation sites, groundwater contamination, on-site treatment systems, combined sewer overflow (CSO) ▪ Potential sources include permitted and non-permitted stormwater, illicit discharge, CSOs and sanitary sewer overflows
LIS WB Shore-Seaside Park Beach CT-W2_003 Estuary	▪ Shellfish harvesting for direct consumption where authorized	▪ Fecal coliform	▪ Potential sources include permitted and non-permitted stormwater, insufficient septic systems, nuisance wildlife/pets
LIS WB Inner-Bridgeport Harbor CT-W1_001-SB Estuary	▪ Habitat for marine fish, other aquatic life and wildlife ▪ Recreation	▪ Dissolved oxygen saturation ▪ Nutrients/eutrophication biological indicators ▪ Polychlorinated biphenyls ▪ Polycyclic aromatic hydrocarbons ▪ Enterococcus	▪ Potential source industrial point-source discharges, municipal discharges, landfill, illicit discharges, remediation sites, groundwater contamination, on-site treatment systems, CSO ▪ Potential sources include permitted and non-permitted stormwater, illicit discharge, CSOs and sanitary sewer overflows, marinas, insufficient septic systems, nuisance wildlife/pets

Source: City of Bridgeport, 2017

Bridgeport Harbor and Pequonnock River

Bridgeport Harbor surrounds the eastern edge of the South End. The waters of the harbor are saline (high salt content) and connect with Long Island Sound. As shown in Table 4.11-3, waters outside the Bridgeport Harbor breakwaters have a water quality goal of Class SA, while waters within the breakwaters have a goal of Class SB (Connecticut Department of Energy and Environmental Protection 2002). The current water quality classification within Bridgeport Harbor is SC and SB for within and outside the breakwaters, respectively (U.S. Army Corps of Engineers 2010). Bridgeport Harbor is where the tidal Long Island Sound meets the Pequonnock River, and there is limited current water quality data specific to Bridgeport Harbor.

The water quality within Bridgeport Harbor is impaired due to point sources, such as MS4 and CSO outfalls, and non-point pollutant sources such as industrial discharges, contaminated sediments, urban and highway runoff, and upstream pollution from the Pequonnock River Watershed (IEP, Inc. Portsmouth & Cambridge Systematics 1995) (Fuss and O'Neill 2010). Five outfalls identified in the study area discharge into Bridgeport

Harbor, with two of these outfalls currently unused. One of these unused outfalls is along the shoreline adjacent to the 60 Main Street property (Outfall B) (Figure 4.11-4). These outfalls are either connected to the MS4 or combined sewer systems that discharge into Bridgeport Harbor, including the MS4 outfall that discharges stormwater collected by the Connecticut Department of Transportation from I-95.

Water quality in approximately 80 percent of the Pequonnock River does not meet the minimum standards for recreation or habitat for fish, other aquatic life and wildlife, and, for the area at the mouth of Bridgeport Harbor, is considered "impaired" and unable to meet standards to support a healthy macroinvertebrate community, commercial shellfish harvesting, recreational uses and habitat (Fuss and O'Neill 2010). Much of this degraded water quality is attributed to upstream sources, including city CSOs and non-point sources (Figure 4.11-2).

Black Rock Harbor

Black Rock Harbor includes Cedar Creek Harbor and Cedar Creek Reach and is bordered by the Black Rock peninsula to the northwest, South End to the southeast, and the central Long Island Sound waterbody to the south. Black Rock Harbor once had historical significance as one of the best and most heavily traveled ports in Connecticut during colonial times (Justinius 1955). Although minimal water quality data is available for this waterbody, it is understood to be heavily polluted due to industrial discharges, urban runoff, sewage discharge, and shipping (Gardener 1991). Black Rock Harbor and Bridgeport Harbor both have sediments with elevated levels of metals and organic compounds. As reported in Table 4.11-3, this waterbody is classified as Class SB.

Rainfall events as small as 0.4 inch can trigger a CSO event, causing the release of coliform bacteria, organic materials, and floatables, thereby reducing water quality (Arcadis, Resilient Bridgeport: Stormwater - Design Strategies Appendix 3B 2017). During these CSO events, stormwater in the western study area is collected and discharged to Cedar Creek Reach rather than going through the Westside Waste Water Treatment Plant for treatment before being discharged into Cedar Creek Reach. Section 4.13, Infrastructure, provides additional detail on these events. During these CSO events, untreated sewage is discharged with the stormwater, contributing to degraded water quality in Cedar Creek Reach, in the form of elevated concentrations of human pathogens. It is also noted that there is an existing, unused CSO outfall located along the southern shoreline of Cedar Creek Reach near its western end and the edge of the RBD Pilot Project limits (Figure 4.11-4).

Long Island Sound

Bridgeport and the study area are bordered to the south by central Long Island Sound. There are no water quality data that is specific to central Long Island Sound, except studies on toxic contaminants.

Long Island Sound is classified as an SA waterbody, and the central portion is expected to follow the general spatial and temporal water quality trends found in Long Island Sound (U.S. .Environmental Protection Agency and U.S. Army Corps of Engineers, New England District 2004). It is expected that in the summer, water clarity is generally higher in central Long Island Sound compared to that of the western basin (U.S. Army Corps of Engineers 2010). Annual average salinity is expected to be higher in central Long Island Sound in comparison to those sites farther to the west, and water temperatures during the summer and fall are expected to be slightly lower. Overall, long-term water temperature trends have indicated an increase in seasonal temperatures over the past few decades (U.S. Environmental Protection Agency 2014).

Sources of pathogens, such as bacteria and viruses, in Long Island Sound include improperly treated or untreated sewage discharges from CSOs, sewage treatment plant breakdowns, stormwater runoff, animal and waterfowl wastes, septic systems, boat sewage discharges, and illegal connections to storm drain systems (U.S. Environmental Protection Agency 1990). In a 1989 study of the sources of fecal coliform bacteria in Long

Island Sound, the predominant sources were 52 percent rivers and upstream sources and 47 percent urban runoff (U.S. Environmental Protection Agency 1990).

The levels of toxic contaminants such as metals, pesticides, polychlorinated biphenyls, and polycyclic aromatic hydrocarbons were measured in the waters of central Long Island Sound and found to be low (U.S. Army Corps of Engineers 2010). Water quality complied with the CTWQS for listed contaminants, including arsenic, cadmium, chromium, copper, mercury, nickel, lead, and zinc (U.S. Army Corps of Engineers 2010).

The primary water quality challenge in Long Island Sound is nutrient loading, in particular nitrogen (U.S. Army Corps of Engineers 2015). Nutrients such as nitrogen and phosphorus enter the waterbody through wastewater discharges, as well as CSOs, non-point sources such as runoff, and atmospheric deposition. The recent efforts to actively reduce the load of nitrogen from wastewater resulted in loading reductions of 50 percent, in comparison to 1990 levels (U.S. Army Corps of Engineers 2015). Despite this reduction, the existing, persistent nitrogen-loads have not resulted in changes to the extent and duration of hypoxic (low dissolved oxygen) events. However, it is noted that hypoxic conditions in the waters of central Long Island Sound are not expected annually, and if hypoxic conditions arise, they are expected later in the season, to be less severe, and last for shorter periods of time in comparison to western Long Island Sound waters (U.S. Army Corps of Engineers 2010).

Stormwater discharge is a major contributor to the reduced water quality of surface waters. Bridgeport comprises 16 square miles; it is estimated that 337 million gallons of stormwater are produced in a 1-inch rainfall event (Arcadis, Resilient Bridgeport: Stormwater - Design Strategies Appendix 3B 2017). As noted previously, rainfall events as small as 0.4 inch can trigger a CSO event.

Outfalls discharge into surface waters such as Bridgeport Harbor, Black Rock Harbor (e.g., Cedar Creek Reach and Cedar Creek Harbor), Johnson Creek, and Ash Creek. These surface waters are linked to Long Island Sound.

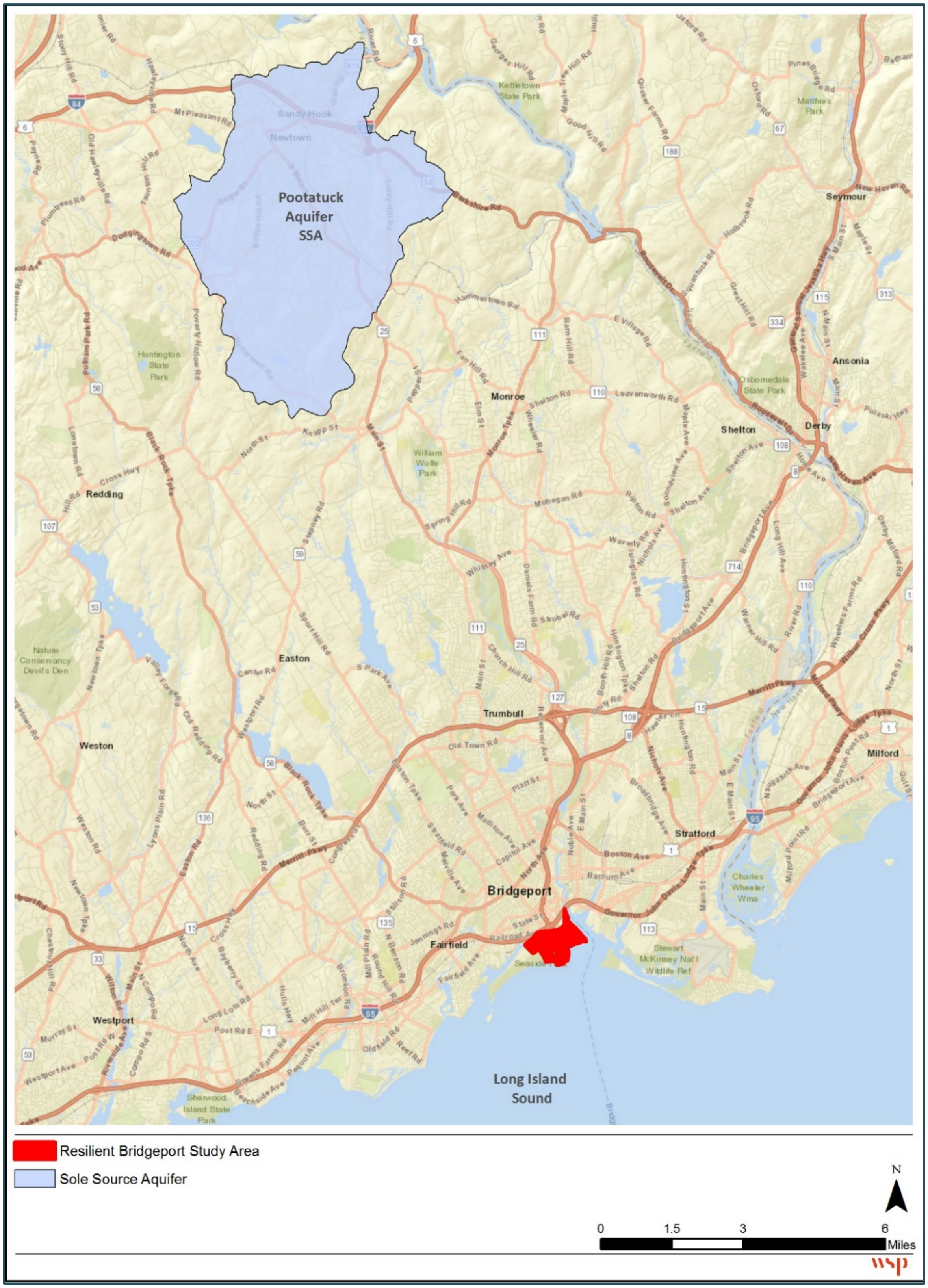
4.11.2.2 Groundwater

In Connecticut, groundwater is classified based on the type of aquifer, the designated use of the aquifer, and the allowable discharges for each classification. There are four groundwater classifications: GAA, GA, GB, and GC. The groundwater present within the study area is **Class GB**, which is designated for use as industrial process water and cooling waters as well as baseflow for hydraulically connected surface waterbodies. Class GB groundwater is presumed not suitable for human consumption without treatment. Discharges into Class GB groundwater are restricted to treated domestic sewage, certain agricultural wastes, certain water treatment wastewaters, discharges from septic treatment facilities subject to stringent treatment and discharge requirements, and other wastes of natural origin that easily biodegrade and present no threat to groundwater.

The study area includes residential and recreational development and a heavily industrialized coastal area (PSEG FOSSIL, LLC 2016). Due to the industrial uses of the area, the proposed projects are not located within or adjacent to a public water supply watershed. Based on a review of sole-source aquifer mapping in Connecticut, it has been determined that the study area is not located within or proximate to a sole-source aquifer. Figure 4.11-3 shows the closest sole-source aquifer—Pootatuck Sole-Source Aquifer, located near Newton, CT (approximately 20 miles away).

Little existing geotechnical information is available about groundwater levels in Bridgeport. The closest USGS groundwater gages are in Newtown and Southbury, CT, both of which are north of Bridgeport. Additionally, Greenwich and Clinton, CT, have groundwater gages closer to the shoreline.

Figure 4.11-3. Sole-Source Aquifer



Source: Connecticut Aquifer Protection Areas, Bureau of Water Protection and Land Reuse, Department of Energy & Environmental Protection, State of Connecticut, March 23, 2018

The following earlier studies provide some insight into current groundwater level conditions:[13]

- The groundwater studies for the 60 Main Street development used a boring log from January 31, 1963 (Johnson 2014). In this 1963 study, 12 test boring samples were taken, and the mean high water and mean low water ranged 2.3 to 5.8 feet below grade and 9.1 to 12.6 feet below grade, respectively.
- Several borings were done in 2014 as part of a geotechnical study at the University of Bridgeport. Those borings ranged from 5 to 25 feet in depth, and none of the borings encountered the water table (Arcadis, Resilient Bridgeport: Stormwater - Design Strategies Appendix 3B 2017).
- In the Pequonnock Substation study at 1 Atlantic Street, groundwater levels varied from 4 to 9 feet below the ground surface for the nine boring samples (Fuss and O'Neill 2017).
- The Geotechnical Data Report for the Bridgeport Green Infrastructure Preliminary Design Implementation Broad Street, Main Street, John Street, and Lafayette Boulevard Downtown Area Bridgeport project (Earth Design Assosciates, Inc. 2014) identified groundwater influences just north of the project area and included the following findings:
  - It is possible that water in the study area was at depths greater than 10 feet below ground during the time of the investigation.
  - Fluctuations in water level of up to 2 feet are not uncommon for the types of natural deposits determined to be in the study area.

A more extensive groundwater monitoring program is being completed to assess groundwater levels within the study area. It is anticipated that results of this monitoring will be available after release of this Draft Environmental Impact Statement and will be included in the Final Environmental Impact Statement.

4.11.3 Environmental Consequences

4.11.3.1 No Action Alternative

As noted in Section 4.11.2, Affected Environment, many of the surface water resources in the study area are impaired, with degraded water quality from point-source discharges and non-point-source runoff. Under the No Action Alternative, impacts on water resources and water quality in the study area will range from less-than-significant to beneficial. The anticipated changes in water quality are broadly attributed to the separation of some sanitary and stormwater lines (WPCA Area H Project). Relating to the significance criteria, the No Action Alternative will at minimum:

- Improve water quality within Bridgeport Harbor through the separation of the existing combined sewer system.
- Reduce entry of untreated stormwater into Bridgeport Harbor and Cedar Creek Reach.

WPCA has ongoing plans to separate the sanitary and stormwater systems in part of the South End of Bridgeport, referred to as the Area H Project. Based upon conversations with the WPCA, the project is

[13] These studies are generally for a single finite period of time, and groundwater conditions can diverge from what was recorded from these past studies. Groundwater levels vary depending on changes in environmental and climactic conditions such as temperature, tides, season, precipitation, or due to man-made or physical factors such as groundwater extraction, stabilization, and construction.

anticipated to be completed in 2021 (WPCA, 2018). In the study area, there are two outfalls that would be affected by the Area H Project that currently discharge to Bridgeport Harbor. Bridgeport Harbor drains into Long Island Sound, so CSO events can also affect the Long Island Sound. These events lead to release of untreated sewage and stormwater, which results in increased concentrations of human pathogens, such as *E. coli*, *enterococcus*, and fecal coliforms; as well as oil and grease, nitrogen, phosphorous, suspended sediment concentration, and other pollutants collected on impervious surfaces that are absorbed by rain waters. The separation of sanitary and storm sewers will result in a separate system that will reduce the number of CSO events, since rainfall will be discharged through a parallel sewer system, alleviating capacity issues that result from wet weather flows entering the combined sewer system. Long-term beneficial impacts to water quality are anticipated, particularly due to a reduction of harmful bacteria discharged into the surface waters of Bridgeport Harbor and Long Island Sound. The WPCA Area H Project will not change the combined sewer system that discharges into Black Rock Harbor and Cedar Creek Reach, and the same environmental conditions are expected to persist.

Ultimately, the No Action Alternative will result in long-term, beneficial impacts to water quality in Bridgeport Harbor as a result of the WPCA sewer separation project in the study area. The No Action Alternative will not permanently affect groundwater flow, quality, or quantity in the study area.

4.11.3.2 Proposed Action

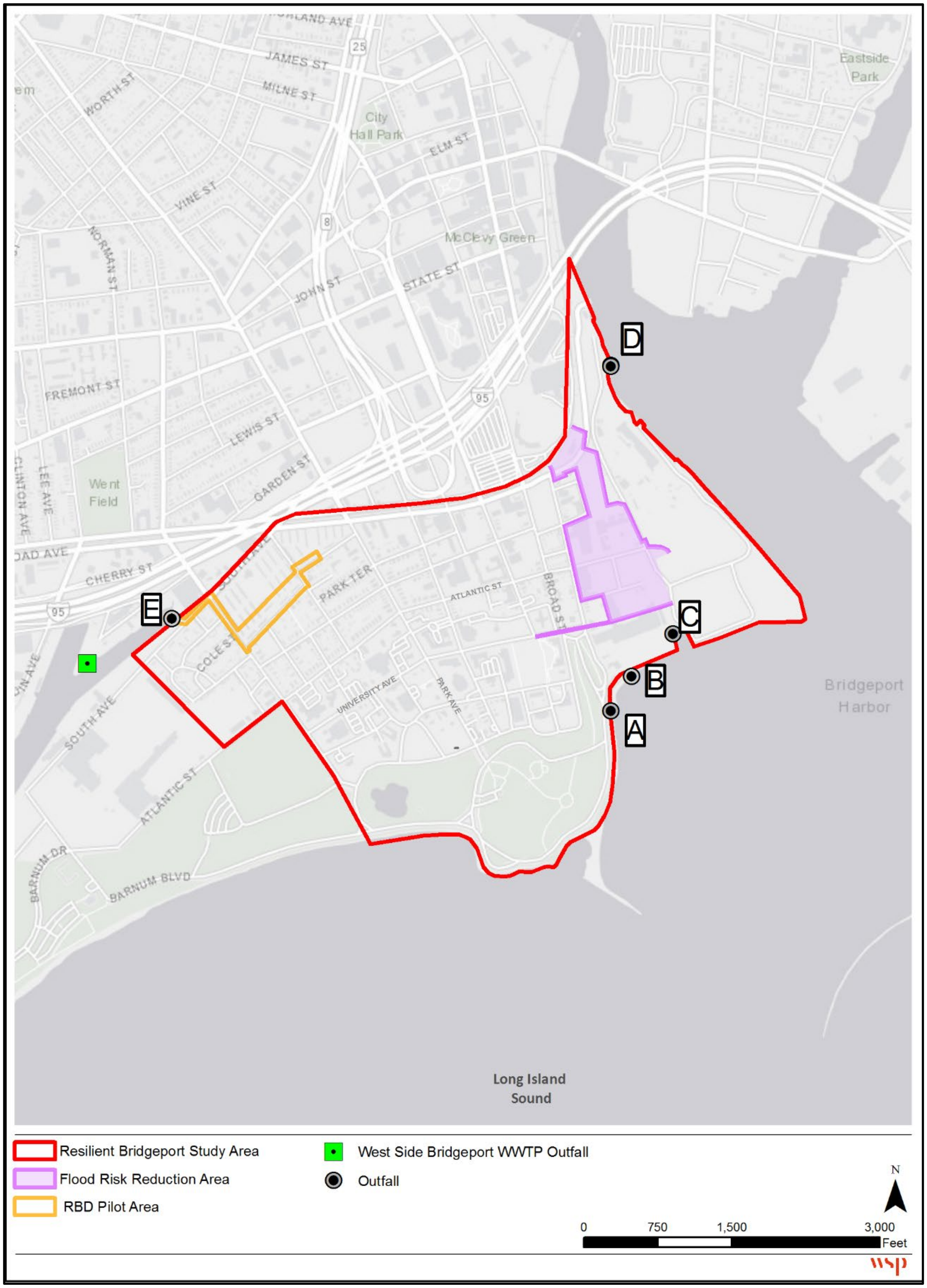
The Proposed Action consists of a series of projects (described in Chapter 1). Each project below references the potential impact to water resources and water quality that may arise during construction:

- **RBD Pilot:** This project would consist of the development of a 2.6-acre stormwater facility and features to support the discharge of collected stormwater, including a pump station, force main, and recommissioning of a currently unused outfall in Cedar Creek Reach (identified as Outfall E). Through this system, stormwater would be discharged into Cedar Creek Reach via an existing but unused outfall.
- **Flood Risk Reduction:** This project would consider internal drainage improvements and green infrastructure elements to accommodate stormwater during coastal storm conditions and to reduce flooding from chronic rainfall events. A likely scenario is that one or more new pump stations would be needed within this system to prevent stormwater flooding on the interior of the system. It is anticipated that the pump stations would collect stormwater runoff and discharge through existing outfalls. Other potential stormwater improvements could include upsizing pipes in regions where capacity of the system causes upland flooding, isolating stormwater systems to prevent backflow from outside of the alignment to interior, and incorporating green infrastructure elements.
- **Resilience Center:** A Resilience Center would not include any elements that are likely to affect water resources or water quality.

Figure 4.11-4 shows the outfalls in the study area that could contribute to changes in water quality of identified water resources.

The Proposed Action would be designed to comply with the Connecticut CT WQS. No intentional use or discharge to groundwater is expected from project work and all necessary best management practices will be implemented to avoid unintentional groundwater use/discharge of untreated waters.

Figure 4.11-4 Existing Outfalls for Potential Discharges Under Proposed Action



Source: CTDEEP; WSP 2018

RBD Pilot Project

Runoff from the RBD Pilot Project, as well as the surrounding area—including Iranistan Avenue, South Avenue, and Johnson Street—would be routed through (detained) in a 2.6-acre stormwater park, then routed via a gravity pipe to a 30–35 cubic feet per second pump, and then directed via force main to the existing unused Outfall E in Cedar Creek Reach. As the stormwater is detained in the stormwater park, it would undergo natural and physical processes to remove sediment, nutrients, and pollutants, and thereby improve water quality in Cedar Creek Reach and Cedar Creek Harbor. For example, separation technology (such as a StormTech Chamber) could be implemented and would remove sediments. A portion of the total nitrogen and total phosphorus would be absorbed into soils in the park. Nutrients that degrade water quality in excess quantities, such as nitrogen and phosphorous, would be removed through natural processes as rainwater seeps through soil and green infrastructure elements (e.g., bioswales, bioretention, and trees filters). Eventually stormwater that has not been absorbed into the green infrastructure or soils would be released through a system of gravity pipes and force mains that ultimately discharge collected waters into Outfall E. Long-term impacts to ambient water quality would benefit water resources and directly beneficial to water quality.

Since Outfall E would be recommissioned to discharge stormwater only, long-term ambient water quality in the Cedar Creek Reach would improve by reducing the volume of stormwater discharged and improving the stormwater quality being discharged from the former Marina Village site, equating to a beneficial impact. Localized impacts at the outfall from the discharge could result in less-than-significant disturbance and sediment scour.

The waterbodies in the study area potentially affected by the RBD Pilot Project include Cedar Creek, Cedar Creek Harbor, and the greater Black Rock Harbor. Depending on the magnitude or persistence of an impact, Long Island Sound could also be affected by water quality changes. Overall, the water quality of surface waters would improve. Construction activities that would have the most impact to water resources and water quality would occur from excavations to construct the RBD Pilot Project. Excavation work could require dewatering of groundwater, depending on the level of groundwater in the area, which may, due to potential for poor water quality of the groundwater, require treatment prior to discharge and could potentially disrupt groundwater flow.

The RBD Pilot Project would result in the following direct and indirect impacts:

- Direct Impacts
  - Localized water discharges from Outfall E would have a less-than-significant impact on water resources in Cedar Creek Reach, and Black Rock Harbor, since the quantity of stormwater reaching Cedar Creek would likely be less than existing conditions since some additional stormwater would be infiltrated and discharged into Cedar Creek Reach. The stormwater park would reduce the amount of impervious area, which would increase infiltration for many storm events. As such, overall stormwater discharges would be reduced in some cases.
  - Water quality would improve in Cedar Creek Reach and Black Rock Harbor from capturing and retaining stormwater runoff and routing it directly to Outfall E, thus reducing the volume of stormwater entering the combined sewer system and not triggering CSO events. A greater amount of sanitary flow would be treated at the Westside Waste Water Treatment Plant prior to discharge.

- Green infrastructure components would have a positive impact on water quality by pretreating stormwater runoff. Any required reconstruction of the existing pipe and/or outfall would temporarily disturb fill within Cedar Creek Reach at Outfall E.
- During construction, mobilization of contaminants or sediment (through removal of sludge and sediment in Outfall E) into waters in Cedar Creek Reach, Cedar Creek Harbor, and Black Rock Harbor could result in temporary exceedance of CT WQS and CWA surface water quality standards.
- Temporary ground disturbance during construction could lead to suspended sediment in Cedar Creek Reach.
- Temporary disruption to groundwater flow through dewatering could be required for construction.

- Indirect Impacts
  - Reducing stormwater and non-point-source discharges when stormwater is routed through the RBD Pilot Project stormwater facility would reduce sediment and pollutant mobilization into Cedar Creek Reach and potentially Black Rock Harbor.
  - An increase in point-source discharge from Outfall E could result in limited sediment scours in Cedar Creek Reach and Cedar Creek Harbor. However, a net reduction in stormwater discharge volume is anticipated.
  - Localized impacts (sediment scour) at Outfall E could occur from the recommissioning of this outfall. These localized potential impacts are expected to range from no impact during normal dry weather conditions, to less-than-significant impact during severe adverse weather events. Potential increased outfall velocities could also cause disturbance to sediments within Cedar Creek Reach near Outfall E, and, therefore, cause a temporary increase in total suspended sediments, and the potential release of sediment-bound pollutants.
  - During construction sediment and pollutant mobilization could increase into Cedar Creek Reach.

Soils exposure could lead to erosion, which would contribute to lessened surface water quality via suspended sediments, although these activities would not be proposed on the shoreline. Impacts to water quality would be minimal to less than significant, since potential impacts would be mitigated through existing regulatory programs and controls and by use of best management practices. Stormwater runoff captured by the RBD Pilot Project would be pretreated by a series of grassed swales and rain gardens prior to discharge.

Surface water quality in Black Rock Harbor could also be affected by the disturbance of sediment during any reconstruction or clean-up of the existing outfall, resulting in increased suspended sediments in the water column and subsequent release of bound-contaminants during construction of the project. Construction impacts could include dispersion of any wastes during the cleaning of the unused Outfall E in the Cedar Creek Reach, as well as disturbances caused by installing protective measures at Outfall E (such as the welded grate and protection of the outfall). Construction impacts for these protective measures would be temporary and less than significant because of the construction methodologies associated with this work. Depending on the removal methods and composition of the sludge in the unused existing outfall, temporary significant negative impacts could be expected; however, these depend on the quality of the sludge and the removal methods.

Flood Risk Reduction Project

For the two potential coastal flood defense system alignments, stormwater collected from inside and outside each alignment would be managed separately. In areas where flooding occurs due to a lack of sufficient capacity of the existing sewer system, the Flood Risk Reduction Project system could resize specific sewers and implement green infrastructure to more effectively retain and/or detain stormwater. The appropriate green infrastructure strategy for each area of interest would depend on the site elevation, the depth to the groundwater table, the soil conditions, and the location of utilities, or other site constraints. More generally, the feasibility of green infrastructure has been separated into three tiers:

- Tier 1 – Entire suite of green infrastructure practices are feasible. where the depth to groundwater allows full-depth practices and soils facilitate high infiltration rates (e.g., bioretention systems)
- Tier 2 – Shallow depth or closed-bottom green infrastructure practices are feasible, where the depth to groundwater or low infiltration soils allow only shallow or non-infiltration subsurface practices (e.g., infiltration basin, detention chamber)
- Tier 3 – Surface green infrastructure practices are feasible, where high groundwater and utility or other siting constraints prevent subsurface systems (e.g., green roof, blue streets)

The north-to-south portion of each alignment option would fall in the Tier 3 site conditions, with the Eastern Option capturing the greatest area of possible Tier 3 Green infrastructure practices. Associated benefits, such as storage of stormwater and improvement to water quality (clean water), of green infrastructure depends on the types of green infrastructure employed Table 4.12-5.

Table 4.11-5. Green Infrastructure Practices and Associated Benefits

GREEN INFRASTRUCTURE PRACTICE	CONTROL OF FLOODING	CLEAN WATER	INFILTRATION	FILTERING	STORAGE	MORE GREEN SPACE	WATER REUSE
Native landscape (Tiers 1–3)	Yes	Yes	Yes	Yes	No	Yes	No
Cistern (Tiers 1–3)	Yes	Yes	No	No	Yes	No	Yes
Rain gardens (Tiers 1–3)	No	Yes	Yes	Yes	No	Yes	No
Infiltration practices (Tier 1)	Yes	Yes	Yes	Yes	Yes	Yes	No
Bioretention (Tier 1)	No	Yes	No	Yes	No	Yes	No
Swales (Tiers 1–3)	No	Yes	Yes	Yes	No	Yes	No
Rainwater planters/tree filters (Tiers 1–2)	No	Yes	No	Yes	No	Yes	Yes
Pervious Pavement (Tiers 1–3)	Yes	Yes	Yes	Yes	Yes	No	No

Source: Adapted from City of Chelsea, 2012

It is anticipated that one or more new pump stations would be needed within the Flood Risk Reduction Project system to prevent stormwater flooding on its interior. It is anticipated that the pump stations would collect stormwater runoff and would discharge through existing outfalls. As such, it is anticipated that the pump stations would have a less-than-significant impact on water quality in Bridgeport Harbor.

For both potential options, the coastal flood defense system would include constructing a seepage barrier to control and mitigate the flow of water underneath the project system from its exterior side. This could result in a potential impact to the flow of groundwater; however, it is anticipated that the system would be designed and implemented to not negatively affect the flow of groundwater. No impacts to groundwater quality are anticipated.

The final option selected for the coastal flood defense system would determine whether the stormwater flow captured would be discharged via an existing outfall that is either currently or not currently in use. If an existing outfall already in use is selected, discharges would likely be regulated under the outfall's existing NPDES permit since the discharge would likely remain within the limits established by the existing permits for Outfalls A, B, and D. However, if Outfall C is selected, then an NPDES permit application would have to be submitted through CTDEEP.

Impacts from the Eastern Option would be similar to the Western Option, although based on proposed types of green infrastructure, overall volume of stormwater discharged into Bridgeport Harbor could be reduced even more. Water quality discharge and construction impacts under the Eastern Option would be similar to the Western Option.

The Flood Risk Reduction Project would separate the internal and externally collected rainwater from storm and surge events. Excavation would be required to implement the foundations and sheet piling of the flood risk reduction measures. Since shallow groundwater is anticipated throughout the study area, construction of the Flood Risk Reduction Project would likely require dewatering of shallow groundwater during construction. Dewatering would likely induce flow toward the excavations. This water would be sampled and handled/disposed of appropriately, in accordance with state and federal requirements. These activities would depress the local groundwater, but the effects would be short term and localized, and would not extend significantly beyond the project boundaries. Moreover, flow control structures (e.g., tide gates) are anticipated at the outfalls, although details on outfalls to be modified and types of measures are not yet known. Additional potential stormwater improvements, including green and gray infrastructure, and development of any subsurface pump station installations, would be expected to result in exposed soils and possible dewatering during construction.

Additionally, exposed soils from construction activities at any outfall that needs modification along the shoreline could lead to short-term, potentially significant impacts to water quality through increased total suspended sediments in Bridgeport Harbor. For any outfalls that need cleaning or recommissioning for use, impacts could arise from any sediments or sludge that has accrued in an under-used pipe. The quantity and quality of the sediment is unknown, as well as the removal methods; however, short-term impacts could arise from the removal of this material.

While the listed direct and indirect construction impacts are possible, they are anticipated to be manageable and mitigated by existing regulatory permits and controls and the use of best management practices.

The Flood Risk Reduction Project would result in the following direct and indirect impacts:

- Direct Impacts
  - Localized water would be discharged to one or more of Outfall A, B and C, but there would be no substantial impact on water resources in Bridgeport Harbor since it is a redistribution of existing conditions

- Green infrastructure and sewer system improvements would likely improve quality and reduce discharged water quantity of stormwater into Bridgeport Harbor since the frequency of CSO discharges would be reduced.
- Bridgeport Harbor at Outfalls A, B and C would be temporarily disturbed through installation of the flow control measures in the Bridgeport Harbor waterbody.
- Mobilization of contaminants or sediment into waters in Bridgeport Harbor during construction that could result in an exceedance of CT WQS/CWA surface water quality standards for one or several parameters through the removal of sludge in any of the outfalls, if required
- During construction, temporary ground disturbance and exposed earths/soils could lead to suspended sediment in Bridgeport Harbor.

- Indirect Impacts
  - Sediment and pollutant mobilization would be reduced into Bridgeport Harbor and thus the Long Island Sound.
  - During construction, Sediment and pollutant mobilization would be temporarily increased into Bridgeport Harbor and thus Long Island Sound.

The Flood Risk Reduction Project system, including Green infrastructure, Gray infrastructure improvements, and pumps, are being coordinated with the WPCA and its Area H CSO separation project. To the greatest extent possible, the Flood Risk Reduction Project system would build upon the Area H sanitary and storm sewer separation plans and route only stormwater, rather than combined sewer flow, to the pump stations prior to discharge to into Bridgeport Harbor.

Resilience Center

Any new construction required for the Resilience Center could result in additional impervious surfaces; however, it is anticipated that the new surface would comply with City of Bridgeport stormwater regulations, mitigating any negative impacts due to the potential to increase stormwater runoff volume

Overall, under the various potential configurations of the Resilience Center, there would be no significant increase in impervious area, compared to existing conditions, that would significantly affect ground or surface waters. Therefore, the Resilience Center would have no short-term (during construction) or long-term impacts on the water quality of groundwater and surface waters.

There is a potential for erosion to occur with any exposed soils or foundations for any new construction for the Resilience Center. Runoff and any potential sedimentation would ultimately have minimal to less-than-significant short-term negative impacts to surface waters.

4.11.4 Mitigation Measures

While direct and indirect construction impacts are possible, they are anticipated to be manageable and mitigated by existing regulatory permits and controls and the use of best management practices.

The Proposed Action would be designed to comply with the Connecticut CT WQS. No intentional use or discharge to groundwater is expected from project work and all necessary best management practices will be implemented to avoid unintentional groundwater use/discharge of untreated waters.

Water from dewatering would be sampled and handled/disposed of appropriately, in accordance with state and federal requirements.

Impacts to water quality from soil erosion would be mitigated through existing regulatory programs and controls and by use of best management practices. Stormwater runoff captured by the RBD Pilot Project would be pretreated by a series of grassed swales and rain gardens prior to discharge.

During the installation of a StormTech Chamber, or other large-scale subterranean features, erosion and sediment control mitigation measures must be implemented during construction. These measures can include vegetation, temporary sediment barriers such as silt fences, hay bales, fabric-wrapped catch basin grates, and strategic stormwater management. The StormTech Chamber manufacturer recommends the application of pipe plugs on the inlet-pipe until the unit is ready for service.

Connecticut has construction requirements for mitigation and management of stormwater and erosion. Stormwater runoff during the construction resulting from the project would be managed in accordance with the CTDEEP Stormwater Management Regulations.

4.12 COASTAL ZONE MANAGEMENT

4.12.1 Methodology and Regulatory Context

4.12.1.1 Methodology

Compilation of this section involved a number of tasks. The following paragraphs offer a detailed description of each listed task:

- **Collection and review of relevant data, reports, and documents** – A combination of government and non-government literature was reviewed to analyze the impacts to coastal resources. Documents produced by CTDEEP—including marine fishery studies, watershed reports, and regulatory publications—were utilized to characterize existing conditions in the coastal study area. Furthermore, the *Connecticut Coastal Management Manual* was used to identify and describe coastal resources potentially affected by project activities. Materials from the U.S. Fish and Wildlife Service, the Federal Emergency Management Agency (FEMA), and available environmental reviews and assessments were also used to provide an accurate, comprehensive depiction of affected coastal environments.
- **Completion of site visits aimed at characterizing valuable resources within the coastal zone** – As part of the drafting process, a team of certified scientists conducted a thorough site visit to obtain additional information about the study area. Due to this effort, discussed in greater detail in Section 4.8, valuable coastal resources (e.g., ecological communities, recreational shorefront areas, coastal waterbodies, tidal wetlands) were observed and characterized. All relevant findings were compiled in the project's *Design Strategies Report* (published February 28, 2018), which served as a critical reference for development of this section.
- **Consultation with federal and state agencies to identify protected species and habitats potentially affected by project activities within the coastal zone** – Both the U.S. Fish and Wildlife Service and the National Marine Fisheries Service were consulted to identify federally listed threatened and endangered species that could be affected by project activities in the study area. Additionally, CTDEEP was contacted for information on state-listed threatened and endangered species that could occur within study area (coastal) environments. Any correspondence received from these agencies was thoroughly reviewed, and appropriate harm avoidance and mitigation measures were developed.
- **Assessment of possible project impacts, both beneficial and adverse, in accordance with the Connecticut Coastal Management Act and corresponding *Connecticut Coastal Management Manual*** – The assessment of the No Action Alternative and Proposed Action's impacts on coastal resources was evaluated using the most up-to-date materials, including design drawings, construction plans, renderings, and descriptions of the Proposed Action's core components: the RBD Pilot Project, the Flood Risk Reduction Project alignment options, and the Resilience Center. Both beneficial and adverse impacts were considered, and the magnitude of individual impacts was assessed. The assessment evaluates the potential for adverse impacts to coastal resources and water-dependent development opportunities and activities as specifically defined in the Connecticut Coastal Management Act.

4.12.1.2 Regulatory Context

Connecticut Coastal Management Act. The Connecticut Coastal Management Act (CGS 444 § 22a-90 - § 22a-111, inclusive), enacted in 1980, prohibits the development, preservation, or use of the land and water resources of the state's coastal area in a manner that significantly disrupts either the natural environment or sound economic growth. Under the act, any proposed activity that affects coastal functions or resources must be deemed consistent with Connecticut's approved coastal management program. Determinations of consistency are made by the Office of Long Island Sound Programs (a branch of CTDEEP) through a Coastal Consistency Review.

An Act Concerning Climate Change Planning and Resiliency. Public Act 18-82, enacted in June 2018, includes updating current statutory references to sea level rise to reflect the most recent sea level change scenario based upon the sea level change scenarios published by the National Oceanic and Atmospheric in Technical Report OAR CPO-1 and other available scientific data necessary to create a scenario applicable to the state coastline. Any revision to Connecticut's plan of conservation and development after October 1, 2019, will consider risks associated with increased coastal flooding and erosion as anticipated in the most recent sea level change scenario. The act defines floodproofing as the following:

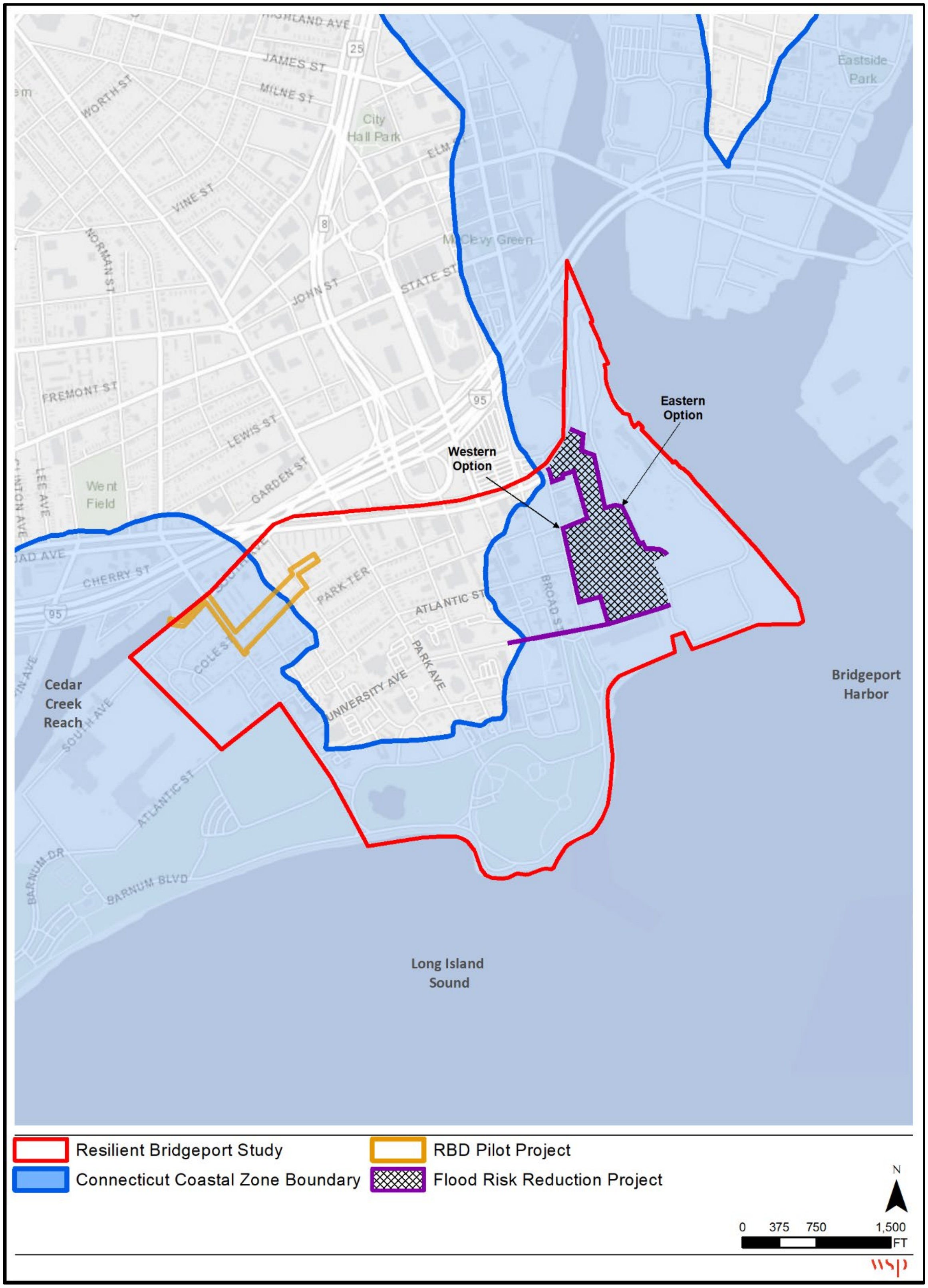
> ".. any combination of structural or nonstructural additions, changes or adjustments which reduce or eliminate flood damage to real estate or improved real property, to water and sanitary facilities, and to structures and their contents, including, but not limited to, for properties within the coastal boundary, as established pursuant to subsection (b) of Section 22a-94, not less than an additional two feet of freeboard above base flood and any additional freeboard necessary to account for the most recent sea level change scenario updated pursuant to subsection (b) of Section 25-68o, as amended by this act."

4.12.2 Affected Environment

The Connecticut coastal area consists of all terrestrial and aquatic spaces that fall within the boundary of the state's jurisdiction in Long Island Sound (CGS 444 § 22a-94(a)). Within the overarching coastal area, there is also a separate coastal boundary: a continuous line delineated by either (1) the interior contour elevation of the 100-year coastal floodplain; (2) a 1,000-foot setback from the mean high water mark in coastal waters; or (3) a 1,000-foot setback from the inland boundary of tidal wetlands – whichever lies farthest inland (CGS 444 § 22a-94(b)). The entirety of the study area occurs within the coastal area, and a significant portion of the study area falls within the coastal boundary. Figure 4.12-1 shows the location of the Connecticut coastal boundary with respect to the study area.

An assemblage of coastal resources, as defined by the Connecticut Coastal Management Act, are present in the confines of the study area. Coastal resources include the coastal waters of the state, their natural resources, associated marine and wildlife habitat, and adjacent shorelands (both developed and undeveloped) that together form an integrated terrestrial and estuarine ecosystem. Bluffs and escarpments, beaches and dunes, intertidal flats, tidal wetlands, coastal freshwater wetlands and watercourses, estuarine embayments, coastal hazard areas, rocky shorefronts, developed shorefronts, islands, nearshore waters, offshore waters, assorted shorelands, and shellfish concentration areas are all types of coastal resources (CGS 444 § 22a-93(7)). Pursuant to the Connecticut Coastal Management Act, the proposed project must avoid or sufficiently minimize adverse impacts to existing resources, as well to future water-dependent development opportunities and activities (Connecticut Department of Environmental Protection 2000).

Figure 4.12-1. Connecticut Coastal Zone Boundary



Source: CTDEEP GIS Data

Section 4.8.2, Natural Resources (Affected Environment), describes several of the study area's prominent coastal resources (terrestrial and aquatic ecology and wetlands). The remnant beach-dune community that runs along Seaside Park is one such resource. The waterbodies that comprise the Bridgeport Estuary—Bridgeport Harbor, Cedar Creek Reach, the lower Pequonnock River, and others detailed in Section 4.11, Water Resources and Water Quality—are also recognized coastal resources that must be treated in accordance with the Connecticut Coastal Management Act. Table 4.12-1 provides a comprehensive listing of coastal resources that are present in the study area and gives a brief description of each.

Table 4.12-1. Coastal Resources within the Study Area

COASTAL RESOURCE	DEFINITION	PRESENCE IN STUDY AREA
Beaches and Dunes	Dynamic areas abutting coastal waters that are characterized by sand, gravel, or cobbles	Occur along the southern coast of the study area (e.g., at Seaside Park)
Coastal Hazard Areas	Land areas inundated during coastal storm events or subject to erosion induced by such events; namely FEMA flood hazard areas with A- or V-zone designation	Account for the portion of the study area that falls within the Connecticut coastal boundary and is subject to significant flooding
Coastal Waters and Estuarine Embayments	Waters of Long Island Sound, including its harbors, embayments, tidal rivers, streams, and creeks, which have a salinity concentration of at least 500 parts per million under the low flow stream conditions	Includes Bridgeport Harbor, the lower Pequonnock River, Cedar Creek Reach, nearshore/offshore Long Island Sound
Developed Shorefronts	Harbor areas that have been highly engineered and developed, resulting in functional impairment or substantial alteration of their natural features/ systems; often contain bulkheads, seawalls, revetments, or other hard structures	Account for a significant portion of the study area's coastline, which is dominated by hardened structures (particularly riprap)
Intertidal Flats	Very gently sloping or flat areas situated between high and low tides and composed of muddy, silty, and fine sandy sediments; generally devoid of vegetation	Stretch from the southwestern corner of the study area along the coastline to Fayweather Island
Shellfish Concentration Areas	Actual, potential, or historic areas in coastal waters where one or more species of shellfish aggregate	Include oyster reefs and shellfish beds within the Bridgeport Estuary
Shorelands	Spaces within the coastal area that are not subject to dynamic coastal processes; located outside of coastal hazard zones and comprised of typical upland features (e.g., bedrock hills, till hills, drumlins)	Account for portions of the upland study area where flood risk is relatively low and, generally, where infrastructure is concentrated
Submerged Aquatic Vegetation	Rooted, vascular, flowering plants that live permanently submerged below the water in coastal, tidal, and navigable waters	May occur within shallow littoral zone habitats near the study area's coastline
Tidal Wetlands	Areas that border or lie beneath tidal waters, including banks, bogs, salt marshes, swamps, meadows, flats, and other low lands subject to tidal action	Present along the study area's coastline
Freshwater Wetlands (Coastal)	Land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, or floodplain; inundated by freshwater but occurring in the Connecticut coastal area and/or boundary.	Present at the southeastern corner of the study area, slightly north of Tongue Point

Source: CTDEEP *Connecticut Coastal Management Manual*: Coastal Resources Fact Sheets (2000/2001); CGS 444 § 22a-93 & § 22a-94; Waggonner & Ball Architecture/Environment and Arcadis Resilient Bridgeport: Ecology, Design Strategies Report, Section 2E (2018)

4.12.3 Environmental Consequences

The potential consequences that an action can have on coastal resources are outlined by Section 2 of the *Connecticut Coastal Management Manual*. Pursuant to that manual, proposed projects must sufficiently address and mitigate the following eight specific types of impacts in order to achieve consistency with the Connecticut Coastal Management Act (Connecticut Department of Environmental Protection 2000):

- Degradation of water quality
- Degradation of existing circulation patterns in coastal waters
- Degradation of natural erosion patterns
- Degradation of natural or existing drainage patterns
- Degradation of visual quality
- Degradation of essential wildlife habitat
- Degradation of natural ecological communities
- Elevation of coastal flooding hazard

Additionally, proposed actions must not detract from a site's water-dependent uses or significantly restrict public access to the waterfront (Connecticut Department of Environmental Protection 2000). The following subsections (organized primarily according to impact category) provide a breakdown of beneficial and adverse effects that the Proposed Action (and all its associated elements) could have on coastal resources.

4.12.3.1 No Action Alternative

Under the No Action Alternative, certain other projects proposed for the South End of Bridgeport will still progress. This includes continued demolition of the former Marina Village housing development and subsequent clearing and grubbing of the land. Without implementation of the RBD Pilot Project, the future Windward Development Phase II site (situated between South Avenue and Ridge Avenue) will remain at high risk of flooding. The Windward Development Phase I site lies outside of the Coastal Hazard Area and redevelopment is planned for the near future. These actions are not expected to adversely affect water quality, visual quality, essential wildlife habitat, or circulation patterns within the study area or exacerbate coastal flooding. Similarly, no natural coastal communities (e.g., beach-dune complexes, tidal wetlands) will be significantly degraded.

The No Action Alternative assumes that the Water Pollution Control Authority (WPCA) Area H sewer separation project will be constructed independent of the Proposed Action. Through this project, WPCA intends to separate the sanitary sewer and stormwater systems across portions of Bridgeport. The Area H project will prevent further combined sewer overflow (CSO) events in the east side of the study area by eliminating sewage crossover at Bridgeport Harbor outfalls. Ultimately, this project will (1) improve surface water quality; (2) enhance coastal ecological communities (e.g., tidal wetlands); and (3) limit exposure of essential wildlife habitats and vulnerable wildlife (e.g., shellfish bed populations) to harmful pollutants. It is not expected that drainage patterns, circulation patterns, or the visual quality of coastal resources will be degraded, and elevation of coastal flooding hazard will not occur.

The No Action Alternative will be consistent with the Connecticut Coastal Management Act.

4.12.3.2 Proposed Action

The RBD Pilot Project, the Flood Risk Reduction Project, and the Resilience Center would all be consistent with the Connecticut Coastal Management Act. Due to the improved coastal flood defense system, the Eastern Option of the coastal flood defense system would provide a slightly more beneficial impact to coastal resources than the Western Option.

<u>RBD Pilot Project</u>

Degradation of Water Quality

Implementation of the RBD Pilot Project is not anticipated to impair water quality within groundwater resources or coastal waterbodies near to the study area. Rather, under current design plans, water quality is expected to improve in Cedar Creek Reach and potentially Black Rock Harbor. As discussed throughout other portions of this Draft Environmental Impact Statement—including Section 4.11, Water Resources and Water Quality, and Section 4.8, Natural Resources—operation of the proposed stormwater facility would reduce the occurrence of CSO events along Cedar Creek Reach and, thus, limit pollutant influxes. The stormwater facility would also improve infiltration rates at the former Marina Village site and effectively remove some contamination from collected rainwaters.

Degradation of Existing Circulation Patterns in Coastal Waters

The RBD Pilot Project would not be expected to adversely affect existing circulation patterns within coastal waters. Degradation of circulation patterns occurs when changes to tidal exchange, flushing rate, freshwater input, basin characteristics, or channel contours disrupt established conditions (Connecticut Department of Environmental Protection 2000). Increased stormwater infiltration at the former Marina Village site would ultimately reduce freshwater inputs to Cedar Creek Reach, but this change would not be so dramatic as to impact circulation or critical water parameters (e.g., salinity). Moreover, no alterations to basin characteristics or channel contours are planned, and both tidal exchange and flushing rate are anticipated to remain unaffected for waterbodies within the RBD Pilot Project footprint.

Degradation of Natural Erosion Patterns

Under current design plans, no long-term, adverse impacts to natural erosion patterns would result from the RBD Pilot Project. As per the *Connecticut Coastal Management Manual*, erosion patterns are degraded when the littoral transport of sediments is significantly altered or disrupted. This can occur when project activities affect deposition patterns or result in a loss of sediment sources, such as dune communities. Neither construction nor operation of RBD Pilot elements is expected to significantly affect the deposition, accumulation, or movement of sediments within the study area. Stormwater discharges at the recommissioned Outfall E could lead to brief periods of intensified erosion, but scour potential would be minimized through strategic design choices and employment of appropriate BMPs.

Degradation of Natural or Existing Drainage Patterns

Implementation of the RBD Pilot Project is not anticipated to adversely affect natural/existing drainage patterns. Degradation of drainage patterns occurs when an action significantly alters groundwater flow, groundwater recharge, runoff volume, or a combination of these factors in a way that is harmful (e.g., to ecosystems, localized environments) (Connecticut Department of Environmental Protection 2000). The conversion of pervious surfaces, such as fields and parks, to impervious surfaces often disrupts a site's established drainage by increasing the runoff generated from storm events. Under current design plans, the

RBD Pilot Project would lead to a decrease in impervious surface cover within the study area. As previously discussed, use of green infrastructure at the proposed stormwater facility would enhance infiltration rates, thereby reducing runoff and improving groundwater recharge. The overall impact to natural/existing draining patterns is expected to be positive.

Degradation of Visual Quality

The RBD Pilot Project is expected to enhance, rather than degrade, the visual quality of coastal resources within the study area. None of the proposed RBD Pilot Project elements would obstruct existing coastal views or alter the features of recognized scenic vistas. Moreover, implementation of the stormwater facility would introduce new aesthetic features (e.g., rain gardens, planted walkways) to the former Marina Village site. Outfall E, once recommissioned, would operate on property owned by the City of Bridgeport and would be largely obscured from public view by the fencing and vegetation that currently surrounds the area.

Degradation of Essential Wildlife Habitat

The RBD Pilot Project is not expected to result in significant degradation or destruction of essential wildlife, finfish, or shellfish habitat. No long-term, adverse impacts to wildlife composition, distribution, breeding patterns, migration patterns, or other population characteristics are anticipated. Furthermore, neither construction nor operation of the RBD Pilot Project would permanently alter the natural characteristics/features of existing habitats within the study area. As discussed in Section 4.8, Natural Resources, localized disturbances generated by construction, such as increased noise, could prompt temporary relocation of wildlife from within the immediate project area. However, implementation of the RBD Pilot Project would ultimately produce additional terrestrial habitat (e.g., through tree plantings, bioswale creation) and curb pollutant influxes to existing aquatic communities (e.g., through reduction of CSO events). Overall, wildlife is anticipated to benefit, and strategic measures (e.g., observation of seasonal tree-cutting restrictions) would be taken to effectively reduce harm during the construction phase.

Degradation of Natural Ecological Communities

The RBD Pilot Project is not expected to lead to degradation of valuable coastal communities, including tidal wetlands, beaches and dunes, rocky shorefronts, and bluffs and escarpments. Neither the natural characteristics nor the functions of such environments would be negatively affected. As discussed in Section 4.8, Natural Resources, the communities that fall within the footprint of the RBD Pilot Project are characterized by significant disturbance and relatively low ecological value. The former Marina Village site contains residential buildings, impervious lots, paved walkways, and other built features that offer limited habitat opportunity. The site of Outfall E along Cedar Creek Reach is characterized by compacted gravel substrate and small herbaceous plants, several of which are invasive. A few examples of tidal wetland vegetation—namely smooth cordgrass (*Spartina alterniflora*), hightide bush (*Iva frutescens*), and groundsel bush (*Baccharis halmifolia*)—are present near the area. However, given the proposed scope of outfall work and the inclusion of appropriate BMPs in project design and construction plans, it is unlikely that this ecological community would be significantly affected.

Elevation of Coastal Flooding Hazard

Neither construction nor operation of the RBD Pilot Project is expected to increase the likelihood of coastal flooding. Project activities would not alter existing shoreline configurations or bathymetry within high-velocity flood zones. Moreover, the proposed stormwater facility would be situated landward of the mean high water level.

Water-Dependent Opportunities and Activities

Under current design plans, the RBD Pilot Project would not have adverse impacts on future water-dependent development opportunities or activities. The former Marina Village site does not support any water-dependent features that would be replaced by the proposed stormwater facility. Additionally, the site does not offer waterfront access and, given its location inland of the mean high water level, is not physically suited for most water-dependent uses (e.g., public beach development). Outfall repair and recommissioning work would take place on restricted-access City of Bridgeport property, and the RBD Pilot Project would not further limit or inhibit public access to marine/tidal waters.

Summary

The RBD Pilot Project would be consistent with the Connecticut Coastal Management Act and result in the following direct and indirect impacts:

- Direct Impacts
  - The stormwater facility would improve infiltration rates at the former Marina Village site and effectively remove some contamination from collected rainwaters.
  - Stormwater discharges at the recommissioned Outfall E could lead to brief periods of intensified erosion, but scour potential would be minimized through strategic design choices and employment of appropriate BMPs.
  - Impervious surface cover would decrease within the study area and use of green infrastructure at the proposed stormwater facility would enhance infiltration rates, thereby reducing runoff and improving groundwater recharge.
  - The stormwater facility would enhance the visual quality of coastal resources within the study area.
- Indirect Impacts
  - Operation of the proposed stormwater facility would reduce the occurrence of CSO events along Cedar Creek Reach and, thus, limit pollutant influxes.
  - The inclusion of appropriate BMPs in project design and construction plans would make it unlikely that the ecological community would be significantly affected.
  - Neither construction nor operation of the RBD Pilot Project is expected to increase the likelihood of coastal flooding.

Flood Risk Reduction Project

Degradation of Water Quality

Neither of the coastal flood defense system alignment options (Western Option or Eastern Option) is expected to degrade the quality of groundwater resources or nearby coastal waterbodies, which include the lower Pequonnock River, Bridgeport Harbor, and nearshore Long Island Sound. As detailed in Section 4.11, Water Resources and Water Quality, the Flood Risk Reduction Project would not introduce a significant quantity of suspended solids, nutrients, toxics, heavy metals, pathogens, or other contaminants into groundwater or surface water resources. Moreover, substantial alteration of key water parameters (e.g., temperature, pH, dissolved oxygen, salinity) would not occur. Proposed changes to the study area's existing drainage system (e.g., targeted resizing of sewers, addition of new pump stations, incorporation of green infrastructure) would reduce the volume and peak flow of discharge to surface waters by at least 10 percent. This would, in turn, curb pollutant influxes and decrease the frequency of CSO events—ultimately enhancing surface water quality. Groundwater quality could also improve based on the nature and extent of green infrastructure employed as part of the Flood Risk Reduction Project.

Degradation of Existing Circulation Patterns in Coastal Waters

The effects of either option of the coastal flood defense system on existing circulation patterns are anticipated to be similar. It is not anticipated that the coastal flood defense system would significantly degrade existing circulation patterns within coastal waters. Specifically, the Flood Risk Reduction Project would not have substantial adverse effects on tidal exchange, flushing rates, freshwater influxes, or basin/channel characteristics and contours. As previously stated, drainage system modifications would ultimately reduce the volume of stormwater discharged to surface waterbodies, but the resulting change in freshwater inputs would not be so drastic as to influence key parameters (e.g., salinity) or disrupt circulation. Moreover, no physical alterations to basins or channels within the study area are expected, since very limited in-water work would be necessary to implement either of the coastal flood defense system options.

Depending upon design specifications, the installation of tide gates (if deemed necessary) could have minor impacts on flushing rates and/or tidal exchange patterns. However, any new tide gates would likely be closed only during severe storm events as a means of coastal flooding control. Therefore, water movement would be disrupted only periodically and for a relatively brief, finite length of time. Overall, existing circulation patterns are expected to remain stable throughout both construction and operation of the proposed Flood Risk Reduction Project.

Degradation of Natural Erosion Patterns

Neither option of the coastal flood defense system would result in the degradation of natural erosion patterns. Specifically, littoral sediment transport would not be altered since there would be no long-term, substantial effects on deposition patterns or key sediment sources. Proposed construction activities (e.g., sewer pipe upsizing, pump station construction, flood wall construction, flood gate installation) would be anticipated to generate some debris and necessitate temporary ground/soil disturbance in the immediate project area. The Eastern Option of the coastal flood defense system would provide the greatest degree of fortification against coastal flooding. Thus, it would involve the most extensive coastal flood defense system and could generate more ground/soil disturbance than the Western Option. Appropriate erosion control measures, including use of removable sediment barriers (e.g., silt fences, hay bales) and planting of stabilizing vegetation, would be applied to sufficiently minimize expected impacts. Moreover, the effects of any potential outfall work, such as sludge clearing or gate installation, would be suitably mitigated through a combination of BMPs and design choices. For example, where feasible, debris clearing would be conducted from an upland access point (e.g., a manhole) to reduce littoral sediment disturbance. In addition, proposed activities would not increase scour potential at any of the study area's outfalls, and all flood barriers/walls would be designed to prevent significant shoreline scouring during coastal flooding events.

Degradation of Natural or Existing Drainage Patterns

It is not anticipated that the Flood Risk Reduction Project would degrade natural or existing drainage patterns. Defects in the study area's current combined sewer system, including insufficient capacity in local sewer pipes and lack of backflow prevention devices, have produced significant drainage issues throughout the South End community (Arcadis 2018). For example, insufficient pipe capacity has exacerbated flooding at Lafayette Street (between Atlantic Street and University Avenue) and at Seaside Park (near the intersection of Park Avenue and Waldemere Avenue) during rainfall events (Arcadis 2018). Proposed sewer system modifications, such as pipe upsizing and regulator installation, are expected to minimize instances of backflow and reduce runoff—ultimately improving drainage within the study area. Design specifications related to proposed sewer system changes would be the same for the Eastern Option of the coastal flood defense system as for the Western Option. Moreover, potential sewer modifications would be thoroughly evaluated, such that their implementation would not negatively affect drainage in parts of Bridgeport outside the project footprint.

The planned coastal flood defense system would pose the risk of interior stormwater retention, as well as seepage and wave overtopping during storm surge events. However, these risks (and others) would be comprehensively addressed through the design process, such that possible adverse impacts to drainage patterns would be appropriately minimized or avoided.

Degradation of Visual Quality

Based on the analysis provided in Section 4.5, Urban Design and Visual Resources, construction of the coastal flood defense system along either of the alignment options is not anticipated to significantly alter the natural features of vistas and viewpoints and therefore would not degrade or have an adverse impact on the visual quality of the coastal environment. The Eastern Option of the coastal flood defense system would be closer to the water than the Western Option but within the boundaries of existing utilities and would not approach the coastal waters edge or affect views of coastal resources such as the beaches and dunes along the edge of Seaside Park.

Degradation of Essential Wildlife Habitat

The Flood Risk Reduction Project is not expected to cause significant degradation or destruction of essential wildlife, finfish, or shellfish habitat. Specifically, no long-term, adverse impacts to wildlife composition, distribution, breeding patterns, migration patterns, or other population characteristics are anticipated. As discussed in Section 4.8, Natural Resources, construction of the project could result in the following:

- Displacement of urban wildlife from construction activities/street tree removal
- Limited, temporary displacement of aquatic organisms in the immediate vicinity of any necessary in-water work
- Limited, temporary exposure of nearshore aquatic communities to pollutant inputs in the event of outfall flushing

However, there would also be several benefits to wildlife, including enhanced water quality within surface water habitats from proposed drainage improvements, which would ultimately increase survivorship and facilitate establishment of pollutant-sensitive aquatic species. Moreover, the proposed coastal flood defense system would fortify interior wildlife communities against the destruction of coastal flooding events, and new green infrastructure (e.g., bioretention features) would introduce additional, limited habitat opportunity where feasible. No especially vulnerable populations (e.g., threatened/endangered species, finfish with essential habitat in the region, shellfish bed communities) are expected to be adversely affected by the Flood Risk Reduction Project.

Degradation of Natural Ecological Communities

The Flood Risk Reduction Project would not lead to degradation of valuable coastal communities, such as tidal wetlands and beach-dune complexes. As detailed in Section 4.8, Natural Resources, the proposed coastal flood defense system would intersect primarily with environments of low ecological value, including public roadways, other impervious surfaces, and ruderal upland spaces. Anticipated impacts include the following:

- Removal or root disturbance of street trees along the alignment
- Limited removal of parkland vegetation along the alignment at Seaside Park's northeastern border
- Minor, temporary disturbance of nearshore/shorefront environments immediately proximate to outfall work

Under current design plans, it is not expected that tidal or freshwater wetlands would be affected, or that existing beaches (and associated vegetation and features) would be impaired. Moreover, as discussed in the previous section (Degradation of Essential Wildlife Habitat), surface water quality is anticipated to improve under the Flood Risk Reduction Project.

Elevation of Coastal Flooding Hazard

WESTERN OPTION

The Western Option of the coastal flood defense system would be designed to minimize, rather than alleviate, coastal flooding hazard within the study area. As described in Section 4.10, Hydrology and Flooding, this option alignment would substantially decrease the area at risk of flooding during a severe coastal event, resulting in approximately 39 acres of land with reduced flood risk. However, several critical utility providers (e.g., PSEG, Emera) would remain outside the line of defense and, thus, would likely continue to be affected by coastal floods. Overall, the Western Option is considered the least protective of the Flood Risk Reduction Project alignment options in terms of flood risk reduction since these major utilities would remain exposed.

EASTERN OPTION

As with the Western Option, the Eastern Option of the coastal flood defense system would be designed to minimize (rather than alleviate) coastal flooding hazard within the study area. As described in Section 4.10, Hydrology and Flooding, this alignment would substantially decrease the area at risk of flooding during a severe coastal event, resulting in approximately 64 acres of land with reduced flood risk. Under this alignment option, the greatest amount of property owned by critical utility providers, including a section of facilities belonging to PSEG, would benefit from the coastal flood defense system. The full northern portion of the 60 Main Street site would also be fortified, and overall coastal flood defense would be greatest under this option.

Water-Dependent Opportunities and Activities

Neither of the proposed coastal flood defense system alignments are anticipated to inhibit future water-dependent developments or activities. All flood wall systems would be located inland of the mean high water level, and no existing water-dependent resources (e.g., public beaches) would be replaced or significantly obstructed by the systems. Public access to Seaside Park via its northeastern entranceway could be temporarily limited by construction; however, several alternate access points exist and are expected to remain unaffected for the duration of planned work. Moreover, access to marine/tidal waterbodies would remain unaffected (except in the case of severe coastal flooding), and no waterfront sites would be rendered unsuitable for water-dependent uses.

Summary

The Flood Risk Reduction Project would be consistent with the Connecticut Coastal Management Act and result in the following direct and indirect impacts:

- Direct Impacts
  - Proposed changes to the study area's existing drainage system (e.g., targeted resizing of sewers, addition of new pump stations, incorporation of green infrastructure) would reduce the volume and peak flow of discharge to surface waters by at least 10 percent.
  - Proposed construction activities would be anticipated to generate some debris and necessitate temporary ground/soil disturbance in the immediate project area (the Eastern Option could generate more ground/soil disturbance than the Western Option). Appropriate erosion control measures would be applied to sufficiently minimize expected impacts and the effects of any potential outfall work would be suitably mitigated through a combination of BMPs and design choices.
  - Construction activities could result in temporary displacement of urban wildlife and aquatic organisms and limited temporary exposure of nearshore aquatic communities to pollutant inputs in the event of outfall flushing.
  - Impacts to vegetation such as the removal or root disturbance of street trees along the coastal flood defense system alignment and limited removal of parkland vegetation at Seaside Park's northeastern border.
  - Coastal flooding hazard would be minimized within the study area. The area at risk of flooding during a severe coastal event would be reduced by 39 acres with the Western Option and by 64 acres with the Eastern Option.
  - Public access to Seaside Park via its northeastern entranceway could be temporarily limited by construction.
- Indirect Impacts
  - Proposed sewer system modifications, such as pipe upsizing and regulator installation, are expected to minimize instances of backflow and reduce runoff—ultimately improving drainage within the study area.
  - Changes to the study area's existing drainage system would reduce the volume and peak flow of discharge to surface waters and, in turn, curb pollutant influxes and decrease the frequency of CSO events – ultimately enhancing surface water quality. Groundwater quality could also improve based on the nature and extent of green infrastructure employed as part of the project.
  - Depending upon design specifications, the installation of tide gates (if deemed necessary) could have minor impacts on flushing rates and/or tidal exchange patterns. However, any new tide gates would likely be closed only during severe storm events as a means of coastal flooding control. Therefore, water movement would be disrupted only periodically and for a relatively brief, finite length of time.
  - Proposed drainage improvements could result in several benefits to wildlife, including enhanced water quality within surface water habitats which would ultimately increase survivorship and facilitate establishment of pollutant-sensitive aquatic species. Moreover, the proposed coastal flood defense

system would fortify interior wildlife communities against the destruction of coastal flooding events, and new green infrastructure (e.g., bioretention features) would introduce additional, limited habitat opportunity where feasible.

Resilience Center

Under current design plans, the Resilience Center would include investment in restoring the Freeman Houses and design elements situated along the public right-of-way and is expected to have a relatively small physical footprint. Due to these factors, as well as locating center within the heavily developed, urbanized portion of the study area, no significant impacts to essential wildlife habitat or natural coastal communities are anticipated (see Section 4.8, Natural Resources for greater detail). Moreover, the Resilience Center would not include features, such as large impervious surfaces, with the potential to affect water quality, drainage, or circulation patterns. The project would not degrade visual quality (e.g., through disruption of scenic vistas, obscuring of coastal views), and elevation of coastal flooding hazard would not occur. Finally, no water-dependent features would be replaced or limited, nor would public access to the waterfront be restricted. In summary, the proposed Resilience Center would not degrade existing coastal resources or hinder future water-dependent opportunities within the study area.

4.12.4 Mitigation Measures

Best management practices would be included in project design and construction plans for the RBD Pilot Project to minimize impacts to the tidal wetland vegetation present near Outfall E along Cedar Creek Reach. Similarly, the effects of any potential outfall work as part of the Flood Risk Reduction Project (such as sludge clearing or gate installation) would be suitably mitigated through a combination of BMPs and design choices. For example, where feasible, debris clearing would be conducted from an upland access point (e.g., a manhole) to reduce littoral sediment disturbance.

Appropriate erosion control measures, including use of removable sediment barriers (e.g., silt fences, hay bales) and planting of stabilizing vegetation, would be applied during those construction activities of the Proposed Acton that would require ground/soil disturbance (i.e., sewer pipe upsizing, force main installation, pump station construction, flood wall construction, flood gate installation) to sufficiently minimize expected impacts.

4.13 INFRASTRUCTURE

The analysis in this section describes the potential effects that could result from the Proposed Action on infrastructure both above and below ground within the study area. Infrastructure includes the sanitary sewer system, the stormwater system, other utilities, and transportation systems. The analysis looks at the future without the Proposed Action (No Action Alternative), and the future with the Proposed Action (Build Alternative). Changes to infrastructure could occur directly, indirectly, or temporarily during construction as a result of the project.

4.13.1 Sanitary Sewer and Stormwater

4.13.1.1 Methodology

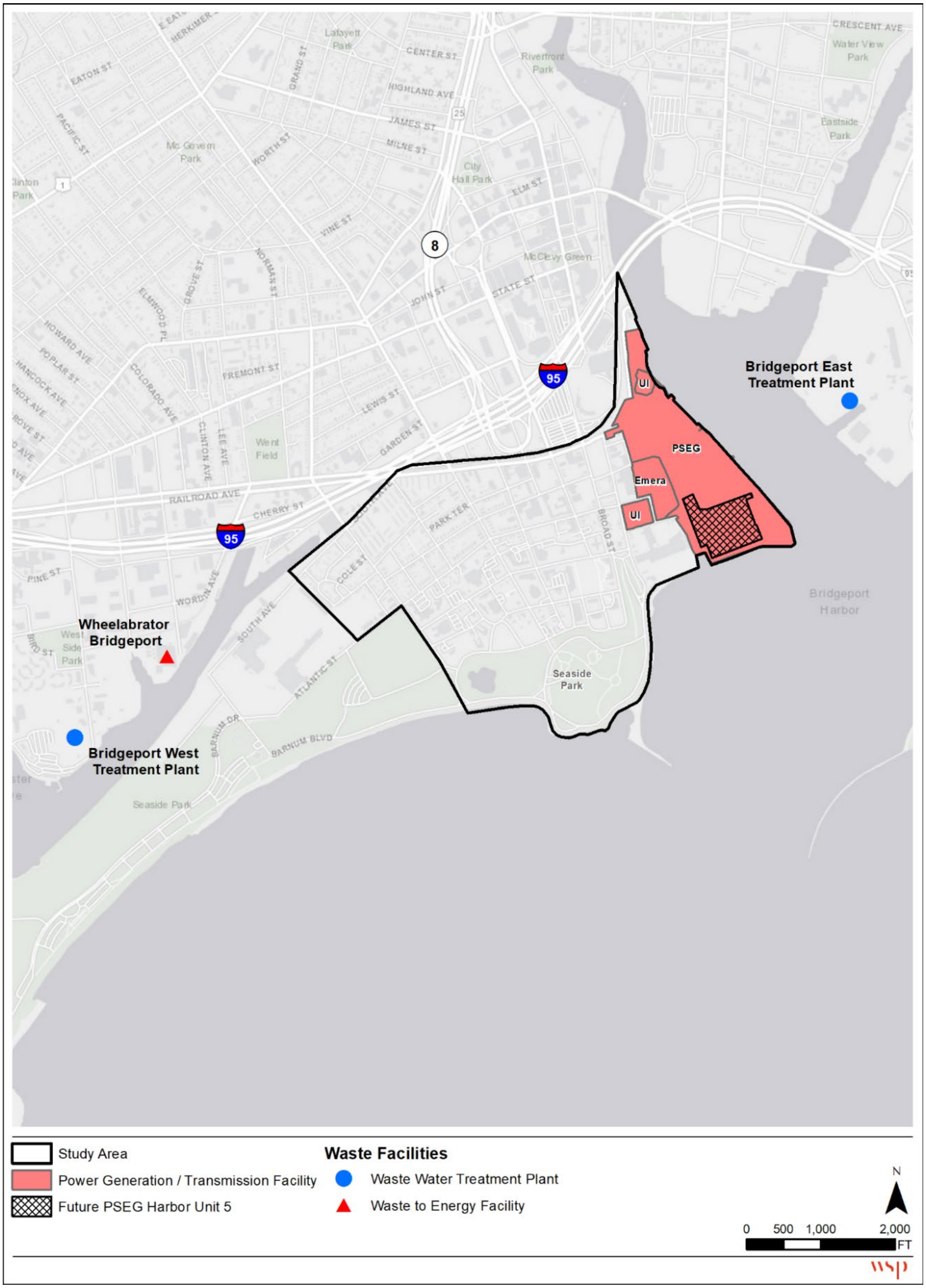
For this section, the approximate boundaries of the study area are the railroad viaduct to the north, the Pequonnock River to the east, Long Island Sound to the south, and Seaside Village to the west (see Figure 4.13-1). Information on the sewer systems (combined, sanitary, and storm) located in the study area was obtained from private and public entities including the Connecticut Department of Transportation, City of Bridgeport Water Pollution Control Authority (WPCA), City of Bridgeport Engineering Department, and the University of Bridgeport (Arcadis U.S., Inc. 2018). Included in this information are the as-built drawings that identify the location of subsurface sewer systems and the attributes of the physical infrastructure. Field verification of the sewer systems was conducted within the immediate study area.

4.13.1.2 Affected Environment

The Bridgeport WPCA operates two wastewater treatment plants (WWTP) located within the City of Bridgeport, the West Side Plant and the East Side Plant (Figure 4.13-1). The West Side Plant; which is located on Bostwick Avenue north of Cedar Creek in the West End section of the City of Bridgeport; has a design capacity of 30 million gallons per day (MGD). The East Side Plant; which is located on Seaview Avenue east of Bridgeport Harbor in the East End section of the City of Bridgeport; has a design capacity of 10 MGD. These facilities employ secondary treatment and serve the City of Bridgeport, small sections of the adjacent towns of Fairfield and Stratford, and the southern section of the Town of Trumbull (City of Bridgeport 2017).

The Bridgeport WPCA maintains the City of Bridgeport's sewer systems. These systems consist primarily of combined sewers but also include separate sanitary and storm sewers, sections of which are over 100 years old (City of Bridgeport Water Pollution Control Authority 2018). There are approximately 170 miles of sanitary sewer lines and 113 miles of combined sewer lines located within the City of Bridgeport (City of Bridgeport 2017). The separate sewer systems (storm and sanitary) transport stormwater runoff and sanitary waste in separate pipe networks. The sanitary sewer system transports only sanitary waste to the City of Bridgeport's wastewater treatment plants for processing while the storm sewer system transports only stormwater runoff to local waterways through storm outfalls. The combined sewer system transports both stormwater runoff and sanitary waste in the same pipe network to the City of Bridgeport's wastewater treatment plants for processing. During storm events, the wastewater treatment plants treat the combined waste stream (stormwater runoff and sanitary waste) until their maximum capacity is reached and then the excess is discharged to the local waterways including Cedar Creek, the Pequonnock River, Bridgeport Harbor and Long Island Sound through combined sewer overflow (CSO) outfalls. During heavy rainfall events, untreated sanitary waste is discharged directly to the local waterways through CSO outfalls to avoid overflowing the wastewater treatment plants. The location of the sewer systems and outfalls in the study area are identified in Figure 4.13-2.

Figure 4.13-1. Utility Provider Map



Source: CTDEEP GIS Data

Figure 4.13-2. Existing Sewer System Map

Source: Water Pollution Control Authority, 2018

Most of the study area is serviced by a combined sewer system that is connected to the City of Bridgeport's West Side Plant. These combined sewer lines run below grade along most of the streets in this section of the City of Bridgeport. Most of the 101 stormwater catch basins located in the study area are connected to this combined sewer system (Arcadis U.S., Inc. 2018).

There are two combined/storm sewer lines located in the study area. These sewer lines are the downstream sections of combined sewer lines connected to CSO outfalls that typically discharge only stormwater runoff to local waterways. However, during some rainfall events both stormwater runoff and sanitary waste are transported through these sewer lines to the CSO outfalls. The northern combined/storm sewer line runs below grade from the intersection of Railroad Avenue and Broad Street to Main Street, south on Main Street to Ferry Access Road, east along the study area, and then discharges to Bridgeport Harbor through a CSO outfall located on the northern section of Public Service Enterprise Group (PSEG) property. There are two branches of the southern combined/storm sewer line. The first branch runs below grade from the intersection of Henry Street and Main Street, east along Henry Street, and then south until it discharges to Long Island Sound through a CSO outfall located on the southwestern section of PSEG property. The second branch runs below grade from the intersection of Atlantic Street and Main Street east to Russell Street where it turns south and ends at its connection to the first branch of the southern combined/storm sewer line on Henry Street.

There are also two storm sewer systems located in the study area. The northern storm sewer system runs below grade south from the Hollow section of the City of Bridgeport to the intersection of Lafayette Street and Ferry Access Road. This sewer line runs below grade east along Ferry Access Road and across the northeastern section of PSEG property where it discharges through an outfall to the Pequonnock River. The southern storm sewer system runs below grade along Waldemere Avenue from just west of its intersection with Myrtle Street and then east across Seaside Park where it discharges through an outfall to Bridgeport Harbor. One branch of this system runs north below grade from the intersection of Waldemere Avenue and Hazel Street, along the western side of Knights Field of the University of Bridgeport and ends at its intersection with University Avenue. Another branch runs north below grade from the intersection of Waldemere Avenue and Lafayette Street to the intersection of Linden Avenue and Lafayette Street. There are two branches of this storm system that run below grade through the eastern section of Seaside Park; one of these branches starts on Waldemere Avenue about midway between Myrtle Street and Hazel Street and runs southwest through the park and the other branch starts from the intersection of Waldemere Avenue and Lafayette Street and runs southeast through the park.

4.13.1.3 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the Proposed Action will not be constructed but other projects, including the WPCA Area H sewer separation project, will be constructed on the eastern portion of the South End, shown on Figure 4.13-3 (between the railroad on the north and Seaside Park on the south and Lafayette on the west and Main Street). Implementation of the WPCA Area H project will have a direct, beneficial impact on infrastructure by reducing the stormwater entering the sewer system and the WWTP and freeing up system capacity to improve overall system performance. However, under the No Action Alternative there will also be significant adverse indirect impacts on the sewer systems. Under this alternative, flooding will continue to occur in this area during rainfall events when the combined sewer systems and the storm sewer systems receive flows in excess of their capacity due to heavy rainfall and/or coastal storm surge. Once Bridgeport's West Side Plant reaches capacity during a storm event, untreated sanitary waste will flow into the local waterways from the combined sewer system located within the study area.

Figure 4.13-3. Combined Sewer Overflow Sewer Separation Project Area

Source: Water Pollution Control Authority, 2018

Proposed Action

RBD Pilot Project

Implementation of the RBD Pilot Project would have long-term beneficial direct impacts on stormwater and indirect impacts on the combined sewer system located in the northwestern section of the study area. The former Marina Village site, which is located east of Iranistan Avenue and south of Railroad Avenue and South Avenue, currently contributes stormwater runoff to the existing combined sewer system during storm events. Following construction of the RBD Pilot Project, stormwater runoff would be diverted through a series of new drains and green infrastructure to a 2.5-acre stormwater facility that would be constructed north of Ridge Avenue (see Figure 4.13-2). Stormwater runoff would be collected at various locations within the facility, and it would be gravity drained to a new storm sewer line constructed below grade along Iranistan Avenue. Stormwater runoff would be transported through this sewer line to a new pump station located at the southeast corner of the intersection of Iranistan Avenue and South Avenue. This flow would then be pumped via a new storm sewer line constructed below grade along South Avenue from its intersection with Iranistan Avenue to the existing outfall at Cedar Creek Reach (Outfall E). The design of the system would ensure that there are no adverse indirect stormwater impacts to the surrounding area from increased flows or flooding due to sheet flow off the newly elevated Johnson Street extension and site. Construction of the RBD Pilot Project elements would divert stormwater runoff from entering the combined sewer line on Iranistan Avenue thereby freeing up capacity in this system. This would have a beneficial indirect impact on the combined sewer system and the West Side Plant by reducing the amount of stormwater that would need to be processed.

Flood Risk Reduction Project

There are two options being considered for the coastal flood defense system component of the Flood Risk Reduction Project. Each option would contain the following elements: a raised section of University Avenue, a 60 Main Street segment, a north-south corridor, and deployable floodgates. The impacts of implementation of any of the two options on the sewer systems located in the study area are discussed below.

The interior drainage component of the Flood Risk Reduction Project would be constructed regardless of the alignment option selected, although details of the final design would vary slightly. The impacts of the interior drainage strategies are discussed below.

There would be minor direct impacts to sanitary sewer with the both the Western and Eastern Options. Relocation of sewer lines would be considered only if other design solution were impractical. Implementing the interior drainage strategies would have a direct beneficial impact on sewer systems in the study area, although the degree of benefits would depend on the final design. The extent of indirect benefits to the combined sewer lines in other sections of Bridgeport would also vary, depending on the final design. Efforts would be made to ensure no adverse indirect impacts on sanitary sewer and stormwater.

WESTERN OPTION

The raised section of University Avenue is the only element that is the same for both options and would have the same impacts on sewer systems in the study area. A section of existing University Avenue would be raised to form a line of coastal flood defense that would connect from an existing high point near Park Avenue and would extend east to the 60 Main Street site. The combined sewer line located below grade along University Avenue would not be impacted by raising the identified section of this street because it is anticipated that this sewer line would have sufficient structural capacity to accommodate the proposed fill. Manholes would have to be replaced along this section of University Avenue in order to access the combined sewer line due to the depth of proposed fill. A new stormwater drainage system would be constructed in the elevated section of University Avenue (WSP, Resilient Bridgeport National Disaster Resilience: Basis of Design 2018).

Under the Western Option, the 60 Main Street segment would extend the coastal defense system from the western section of this property, where the University Avenue segment would end, east across this property and then north to Henry Street at a location approximately midway between Main Street and Russell Street. There are no sewer lines located on the 60 Main Street property because is it currently under development, therefore, construction of this element would not have an impact on sewer systems in the study area.

The north-south corridor for the Western Option would extend the coastal flood defense system from the end of the 60 Main Street segment at Henry Street west to the intersection with Main Street and follow a route along Main, Whiting, and Singer Streets to the existing railroad trestle located north of the intersection of Ferry Access Road and Main Street. This element would be located on streets where either combined sewer lines (Main, Whiting, and Singer Streets) or combined/storm sewer lines (Henry Street) are located. It is anticipated that the design of the coastal flood defense system would minimize any impacts to these existing sewer lines. To the extent practicable, the alignment for the north-south corridor would avoid the existing sewer lines or where necessary, cross the lines perpendicularly to minimize impacts. Where the north-south corridor would cross sewer lines, design accommodations would be implemented (for example hand excavations, use of jet grout seals or use of sleeves) to reduce impacts. Only if other design solutions were impractical would relocation of sewer lines be considered.

Five floodgates are proposed for the Western Option at the following locations: on Henry Street at the location where the 60 Main Street segment would intersect with the north-south corridor, the eastern side of the intersection of Main Street and Atlantic Street, the eastern side of the intersection of Whiting Street and Singer Street, the northern side of the intersection of Singer Street and Kiefer Street, and the eastern side of the intersection of Ferry Access Road and Main Street (see Figure 1-6). The floodgates would be attached to driven pile-supported concrete monoliths. The concrete monoliths would avoid existing sewer lines to the extent practicable or where necessary, design accommodations would be implemented to reduce impacts.

EASTERN OPTION

The impacts identified under the Western Option for the University Avenue element would be the same for the Eastern Option. The 60 Main Street segment would cross the entire redevelopment site to the PSEG property to the east. As identified under the Western Option, this element would divide the 60 Main Street property into northern and southern sections and any future utility routing would need to adapt to the alignment, including any existing or proposed drainage connections to the outfall (WSP, 2018). This element would also have an impact on the combined/storm sewer lines that run along the western boundary of the PSEG property because this element would go across these lines. Design accommodations for crossing of the combined / storm sewer lines currently include utilizing a jet grout seal to avoid disturbing the existing outfalls. The north-south corridor would extend from the western PSEG property and run north along the eastern boundary of the Emera property, across the United Illuminating (UI) Company's Pequonnock Substation site, to the existing railroad trestle located north of Ferry Access Road. Combined sewer lines are located along the eastern boundary of the Emera property, in the norther section of the UI Pequonnock Substation site, and on Ferry Access Road. As identified under the Western Option; the design of the coastal defense system would minimize impacts to these existing sewer lines by avoidance or if not practicable, design accommodations would be implemented to reduce impacts. Six floodgates are proposed to be constructed for the Eastern Option at the following locations: on the western PSEG property boundary where the 60 Main Street element ends, along the eastern boundary of the Emera property, at the northern section of the PSEG property at the boundary with the UI Pequonnock Substation site (see Figure 1-2), and at Ferry Access Road near the northeastern boundary of the UI Pequonnock Substation site (see Figure 1-6). As identified under the Western Option, construction of the driven pile-supported concrete monoliths for these floodgates would avoid existing sewer lines to the extent practicable or where necessary, design accommodations would be implemented to reduce impacts.

Interior Drainage Strategies and Options

Sewer systems located in the study area would be beneficially directly affected by implementing one or more of the interior drainage strategies currently being considered for the flood risk reduction alignments. Under one strategy, targeted modifications would be made to the combined sewer system to reduce flooding during storm events around University Avenue between Broad Street and Main Street, at the intersection of Austin Street and Warren Street, on Lafayette Street between Atlantic Street and University Avenue, and at Seaside Park near the intersection of Park Avenue and Waldemere Avenue. Under one option, the combined sewer line located on Lafayette Street between University Avenue and Gregory Street would be upsized to increase its capacity. This would have minimal indirect impacts on the combined sewer system at this location because this sewer line drains to larger downstream combined sewer lines. Implementing other options would add or make changes to the control mechanisms (regulators) in the combined sewer lines to prevent or reduce backflow in the study area. These options, however, will be studied further to determine if implementation would also have adverse indirect impacts on the combined sewer lines in other sections of Bridgeport.

Under a second strategy, the combined sewer lines located in low-lying sections of the study area, both inside and outside of the proposed coastal flood defense system, would be separated by constructing storm sewer lines at these locations. This strategy would be coordinated with WPCA plans for the Area H project. This would provide a beneficial impact to the combined sewer system because it would provide additional capacity.

Under a third strategy, a new stormwater pumping station and storm sewer line would be constructed in the southeastern section of the study area that would connect to an existing outfall to manage rainfall, wave overtopping, and seepage. A second stormwater pumping station and storm sewer line could also be constructed in the study area's northeastern section. This would provide a direct beneficial impact to the sewer systems by reducing the flow of stormwater runoff to the combined sewer lines in these areas and thereby providing additional capacity. However, additional analysis would need to be completed during the next phase of design to confirm acceptability of any specific pump station location and the use of existing outfalls.

Resilience Center

The Resilience Center would have less than significant direct and indirect impacts on the sewer systems in the study area. Providing funding toward the renovation of the Freeman Houses would not require a new connection to the local sanitary sewer or combined sewer line for sanitary waste disposal. Stormwater runoff from the existing building's roof drains are already being directed to local combined or storm sewer lines, therefore, a new connection would not be required. The other component of the project, a design element near the entrance of Seaside Park at University Avenue, would only minimally increase impervious surfaces. No new bathroom facilities are proposed. Stormwater runoff from any new impervious surface would require connection to the local storm sewer line or combined sewer line. However, it is assumed that the new facility would meet the City of Bridgeport's stormwater regulations and stormwater runoff would be marginally reduced.

4.13.2 Utilities

This section addresses the impact of the Proposed Action and the No Action Alternative on utilities and service systems in and around the project study area. Impacts to these services include water supply and distribution, electricity, natural gas, communication systems (cable, internet, phone services), and solid waste collection.

4.13.2.1 Methodology

The information collected for this analysis is from the City of Bridgeport website, the City of Bridgeport WPCA, and publicly available information from various utility providers. The following utility companies provide services within the study area:

- Water – Aquarion Water Company
- Electricity/Natural Gas – PSEG Power Connecticut LLC & Emera Energy
- Cable/Internet – Frontier Communications & Optimum by Cablevision
- Solid Waste –Bridgeport Sanitation Division

4.13.2.2 Affected Environment

Water

Aquarion Water Company, a subsidiary of Eversource, supplies water to the study area through an extensive underground piping system. Of the total amount of water that Aquarion supplies 95 percent comes from eight reservoirs throughout Southwestern Connecticut (Aseptuck, Easton Lake, Far Mill, Hemlock, Means Brook, Saugatuck, Trap Falls, and West Pequonnock). The remaining amount comes from two well-fields located in Westport and Coleytown, CT. On average, 44 million gallons of water are used daily, serving approximately 373,800 customers throughout the Greater Bridgeport System, which includes Bridgeport, Easton, Fairfield, Monroe, Newtown, Norwalk, Redding, Shelton, Stratford, Trumbull, Westport, Weston, and Wilton, CT.[14][15]

The water that originates from the various reservoirs is filtered at three separate water treatment plants throughout the greater Bridgeport region: The Trap Falls water treatment plant located in Shelton, the Easton Lake plant located in Easton, and the Warner plant located in Fairfield. Aquarion then distributes its water supply throughout the greater Bridgeport region via a vast system of pipes in which the water is either pumped or fed through by gravity.

In 2007, the Connecticut Legislature passed the Water Infrastructure and Conservation Act, which allows approval of a surcharge that covers the replacement of water distribution system pipes and related infrastructure that have either reached the end of their useful life, or are negatively affecting water quality or service reliability. Beginning in April 2009, Aquarion adopted this surcharge and placed it on its customers to pay for essential upgrades throughout its piping system.

Electric and Gas

PSEG Power Connecticut LLC, a subsidiary of PSEG, is the major provider of electricity throughout the greater Bridgeport region in Southwestern Connecticut. PSEG Power Connecticut LLC owns and operates Bridgeport Harbor Station which is located along the Bridgeport Harbor at the mouth of the Pequonnock River

[14] *http://www.aquarion.com/files/pdfs/bridgport_2016.pdf*
[15] *http://www.aquarion.com/CT/about*

in the South End neighborhood. Per the CTDEEP, the facility consists of three electric generating units: a 170-megawatt residual oil-fired cyclone unit, a 410-megawatt dual-fired coal and oil burning unit, and a 22-megawatt combustion turbine. The plant is planned to shut down by 2021 and be replaced by a new natural gas burning facility called Bridgeport Harbor Unit 5 which will produce an additional 485-megawatts of energy and power 500,000 homes throughout the region, including the study area (PSEG Power Connecticut LLC 2018).

Emera Energy, a subsidiary of Emera, provides natural gas and electricity throughout the Northeast United States. Emera energy owns and operates Bridgeport Energy, which is a 520-megawatt combined-cycle natural gas-fired power plant located in the South End neighborhood of Bridgeport, just southwest of the PSEG Power Connecticut LLC Bridgeport Harbor Station. Electricity generated from this plant is used to power the Bridgeport Harbor Station.

The UI, a subsidiary of AVANGRID, Incorporated, provides electricity and related services to approximately 333,000 residential, commercial and industrial customers throughout Southwestern Connecticut. Although UI does not directly supply residences with electricity service within the study area, it owns and operates the Pequonnock Substation, which is located within the study area at 1 Atlantic Street in South End. Due to past flooding and storm damage, this facility is planned to be relocated to 1 Keifer Street starting in late 2019, and is expected to be completed and in-service by the end of 2021. The Connecticut electric grid will be protected from future outages and will undergo several upgrades because of the relocation (United Illuminating 2018).

Each of these facilities are located on the east side of the study area, along the shoreline of the Bridgeport Harbor and the Long Island Sound on low-lying land (see Figure 4.13-1). Due to storm surges, this land is often inflicted with flooding during major storms and regular rainfall events. Following Superstorm Sandy in 2012, this area of South End was hit hard by 7-foot storm surges, leaving many residents throughout the region without power for an extended period of time.

Telecommunications

Throughout Bridgeport, there are 18 internet and cable providers with five offering residential services and 13 offering business services. The study area is served by only the two major telecommunications providers in Bridgeport: Frontier Communications and Optimum by Cablevision. The majority of telecommunications services in the study area are transmitted through overhead lines.

Solid Waste

The City of Bridgeport provides its residents with weekly curbside collection of household and commercial waste, as well as the removal of recyclable materials through the Bridgeport Sanitation Division. After collection, the waste is then transported to Bridgeport's solid waste and recycling facilities. The Bridgeport Transfer Station is owned and operated by the City of Bridgeport and provides its residents with access to solid waste disposal and recycling services. The transfer station is located along Asylum Street in the North Bridgeport neighborhood bordering the East Side neighborhood to the south and the City of Trumbull to the north. Wheelabrator Bridgeport is a waste-to-energy facility located along the west bank of the Cedar Creek Reach in the West End-West Side neighborhood of Bridgeport (see Figure 4.13-1). This facility handles 2,250 tons per day of solid waste from residences and businesses throughout the greater Bridgeport region. There are no solid waste or recycling facilities located within the study area, however, there are planned trash and recycling pick-up routes within the study area that operate on a consistent weekly Monday through Friday schedule.

4.13.2.3 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the Proposed Action will not be constructed and no direct impacts to utilities as a result of the proposed projects will occur. The existing utility infrastructure and the utility services provided to the residents of the study area will not be disrupted during construction of the Proposed Action. Service will continue to be provided to residents and businesses and measures to be implemented directly by the utility providers, such as construction of Harbor Unit 5 on an elevated platform by PSEG and relocation of the Pequonnock Substation by UI[16] will increase protection from coastal storm surge and regular flooding. However, although the PSEG and UI infrastructure will be elevated out of the floodplain, the sites will not have dry egress or access during storm events. In addition, other utilities and transmission lines will not be protected from future coastal storm events and the impacts of local flooding. This could result in future interruptions to service and adverse indirect impacts to utilities.

Proposed Action

RBD Pilot Project

The preliminary design of the RBD Pilot Project considered existing utility infrastructure in order to avoid interactions to the extent possible and prevent the disruption of service to customers during construction. As design continues, avoidance of utility infrastructure is a priority. Relocation of utility infrastructure is not expected from the RBD Pilot Project construction; however, work near certain utility infrastructure could result in a short-term disruption of service. There could be direct, temporary impacts to electricity lines, duct banks, gas mains, water mains, surface-level gas valves, water valves, water meters, fire hydrants, aboveground utility poles, distribution transformers, and telecommunications boxes. The contractor would work with the City of Bridgeport and the appropriate utility provider to minimize impacts to the community. In addition, there could be impacts to several trash and recycling weekly pick-up routes during construction due to temporary road closures.

There would be no long-term adverse or beneficial direct impacts to existing utility infrastructure as a result of the RBD Pilot Project and, following construction, there would be no long-term impact to solid waste. Weekly trash and recycling pick-up would continue the same schedule. There could be minor modifications to the routes to account for the Johnson Street extension. The RBD Pilot Project would not result in a direct increase in residential units or businesses that would increase the solid waste production, although the project would facilitate the Phase II Windward Development construction. The potential increase in development that could occur as a result of the RBD Pilot Project could indirectly affect the utility infrastructure by increasing the need for additional solid waste removal services, and demand for hard infrastructure connections to existing water, natural gas, electricity, and telecommunications services. However, the increase in demand is expected to be within the capacity of the existing services and any infrastructure upgrades would be managed through coordination between the developer, the City of Bridgeport, and individual utility providers

Flood Risk Reduction Project

Selection of this project, particularly the proposed alignment options for the coastal flood defense system, considered existing utility infrastructure in order to avoid interactions to the extent possible and prevent the

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[16] The Connecticut Siting Council approved the Pequonnock substation relocation with the condition of elevating the structures to base flood elevation plus five feet; however, there would be no dry egress or access to the site during flood events.

disruption of service to customers within and outside of the study area. As design continues, avoidance of utility infrastructure is a priority. However, when necessary, some utility infrastructure could be relocated, which would require temporary disruption to service during construction. Even if relocation is not required, work near certain utility infrastructure could result in a short-term disruption of service. There could be direct, temporary impacts to electricity lines, duct banks, gas mains, water mains, surface-level gas valves, water valves, water meters, fire hydrants, aboveground utility poles, distribution transformers, and telecommunications boxes. The contractor would work with the City of Bridgeport and the appropriate utility provider to minimize impacts to the community. In addition, there could be impacts to several trash and recycling weekly pick-up routes during construction due to temporary road closures.

The long-term operations of the existing utility infrastructure would not be directly adversely affected as a result of the Flood Risk Reduction Project. Under the Western Option of the coastal flood defense system, service would continue to be provided to residents and businesses and measures to be implemented directly by the utility providers, such as construction of Harbor Unit 5 on an elevated platform by PSEG and relocation and elevation of the Pequonnock Substation by UI would increase protection from coastal storm surge and regular flooding. However, the PSEG and UI infrastructure would not have dry egress or access during storm events and the Emera site and other UI facility would not be located out of the floodplain or fortified and, therefore, would continue to be vulnerable to coastal storm surge and flooding, with no dry egress or access. In addition, overhead transmission lines in the study area would not be protected from coastal storm events and the impacts of local flooding. The utilities would continue to be vulnerable to disruption from storm events.

Under the Eastern Option of the coastal flood defense system, Emera and UI facilities would be within the area of protection, resulting in reduced risk of impacts from coastal surge and flooding and associated service disruption. In addition, dry egress would be provided to the PSEG Harbor Unit 5 facility. The Eastern Option would result in beneficial direct impacts to utility infrastructure in the long-term.

Following construction, there would be no long-term direct impact to solid waste as a result of the Flood Risk Reduction Project. Weekly trash and recycling pick-up would continue on the same schedule. There could be minor modifications to the routes to account for the potential change to the roadway network at University Avenue and Main Street. The Flood Risk Reduction Project would not result in a direct increase in residential units or businesses that would increase the solid waste production. However, the project would facilitate the redevelopment of 60 Main Street by providing dry egress and the potential increase in development has the potential to indirectly impact the utility infrastructure by increasing the need for additional solid waste removal services, and demand for hard infrastructure connections to existing water, natural gas, electricity, and telecommunications services. However, the increase in demand is expected to be within the capacity of the existing services and any infrastructure upgrades would be coordinated between the developer, The City of Bridgeport and the respective provider.

Resilience Center

The Resilience Center would have less than significant direct and indirect impacts on the utilities in the study area. There would be limited construction activity that would disrupt utility services. Providing funding toward the renovation of the Freeman Houses could require upgraded connections to utility services and the design element near the entrance of Seaside Park at University Avenue could require new electrical and internet connections; however, the Resilience Center would result in a minor draw on those services and would not adversely impact capacity.

4.13.3 Transportation

4.13.3.1 Methodology

Two separate traffic studies were conducted—one for the RBD Pilot Project area and another for the Flood Risk Reduction Project area. The traffic assessment for the RBD Pilot Project evaluated the transportation impacts for the proposed Johnson Street extension, in the area bounded by Railroad Avenue to the north, Ridge Avenue and Johnson Street to the south, Iranistan Avenue to the west and Park Avenue to the East. The traffic assessment for the Flood Risk Reduction Project evaluated the traffic impacts for the proposed closure of University Avenue to vehicular traffic between Lafayette Street and Broad Street, the closure of Soundview Circle to vehicles and dead-ending Main Street just north of University Avenue (one option of the coastal flood defense system alignment). The project study area includes Broad Street from Gregory Street to University Avenue, Lafayette Street from Atlantic Street to University Avenue, and University Avenue from Main Street to Lafayette Street, including Soundview Circle. There would be no other changes to the transportation network under the Proposed Action (see Figure 4.13-7).

Both traffic assessments included the collection and compilation of existing roadway and intersection geometry, the number and width of travel lanes, intersection controls, vehicle speed, pedestrian and bicycle facilities, transit, and other relevant transportation information. Additionally, local condition data were compiled for ten intersections for RBD Pilot Project area and six intersections for Flood Risk Reduction Project area. Local data for the intersections included the following: lane configuration, sight lines (turning and approach), turn restrictions, parking restrictions, bus stops, pedestrian controls, and signing by location and type (regulatory warning, informational, school, and other).

To determine the traffic impacts on the area roadway network by the proposed Johnson Street extension and proposed roadway reconfiguration on University Avenue associated with the future build condition, traffic operational performance measures at the study intersections were evaluated. Daily and peak hour traffic were collected in December 2017 and January 2018 to support the traffic operations analysis. When available, traffic data inventory from the City of Bridgeport, Connecticut Metropolitan Council of Governments, and CTDOT were also gathered. The intersections in the study area were analyzed using the methodology described in the 2000 and 2010 Highway Capacity Manual (HCM), published by the Transportation Research Board and replicated in the Synchro® Version 9 software program.

The existing traffic conditions were determined based on the collected data and Synchro model. A background traffic growth rate of 0.5 percent per year for 20 years was used to develop the background traffic volumes. The growth rate was taken from CTDOT's Bureau of Policy and Planning (October 31, 2017). The 2038 Build Condition was developed using the background traffic volumes and incorporating the traffic generated by the future known developments in the area (Windward Development and 60 Main Street). It was assumed that no additional traffic would be generated by the Proposed Action itself. The Build volumes were then distributed into the proposed roadway network and inputted into the Synchro model to determine the Build traffic operations. A review and comparison of the level of service (LOS) and delays was then performed to identify impacts and any potential mitigation measures to improve traffic conditions. A detailed description of the analysis is found in Appendix G.

LOS is a calculation of control delay for an intersection and an indication of driver discomfort, frustration, fuel consumption, and lost time. LOS is defined by a grading system similar to that in a school with A (free flow) being the best and F (breakdown in flow) the worst.

Signalized intersection analysis is based upon the capacity of each lane group and the correlating control delay associated with the intersection. Capacity is a measurement of the ability of an intersection design to accommodate all movements within the intersection. Delay is the measure of the user quality of service. Capacity is a function of physical geometry and signalization conditions. For unsignalized intersections, delay values apply only to the controlled movements, since the Main Street movements are not restricted. Control delay is the elapsed time for deceleration, queue time, stopped delay, and final acceleration. For Two-Way Stop Controlled intersections, the LOS is characterized by the LOS of the movement with the greatest delay. This is typically the left turn movement from the minor approach to the intersection. If the intersection operates at LOS F a traffic signal warrant analysis could be done to justify installation of a signal. The minimum criteria as set forth in the U.S. Department of Transportation, Federal Highway Administration's Manual on Uniform Traffic Control Devices must be met before the installation of a traffic control signal.

4.13.3.2 Affected Environment

Transportation Network

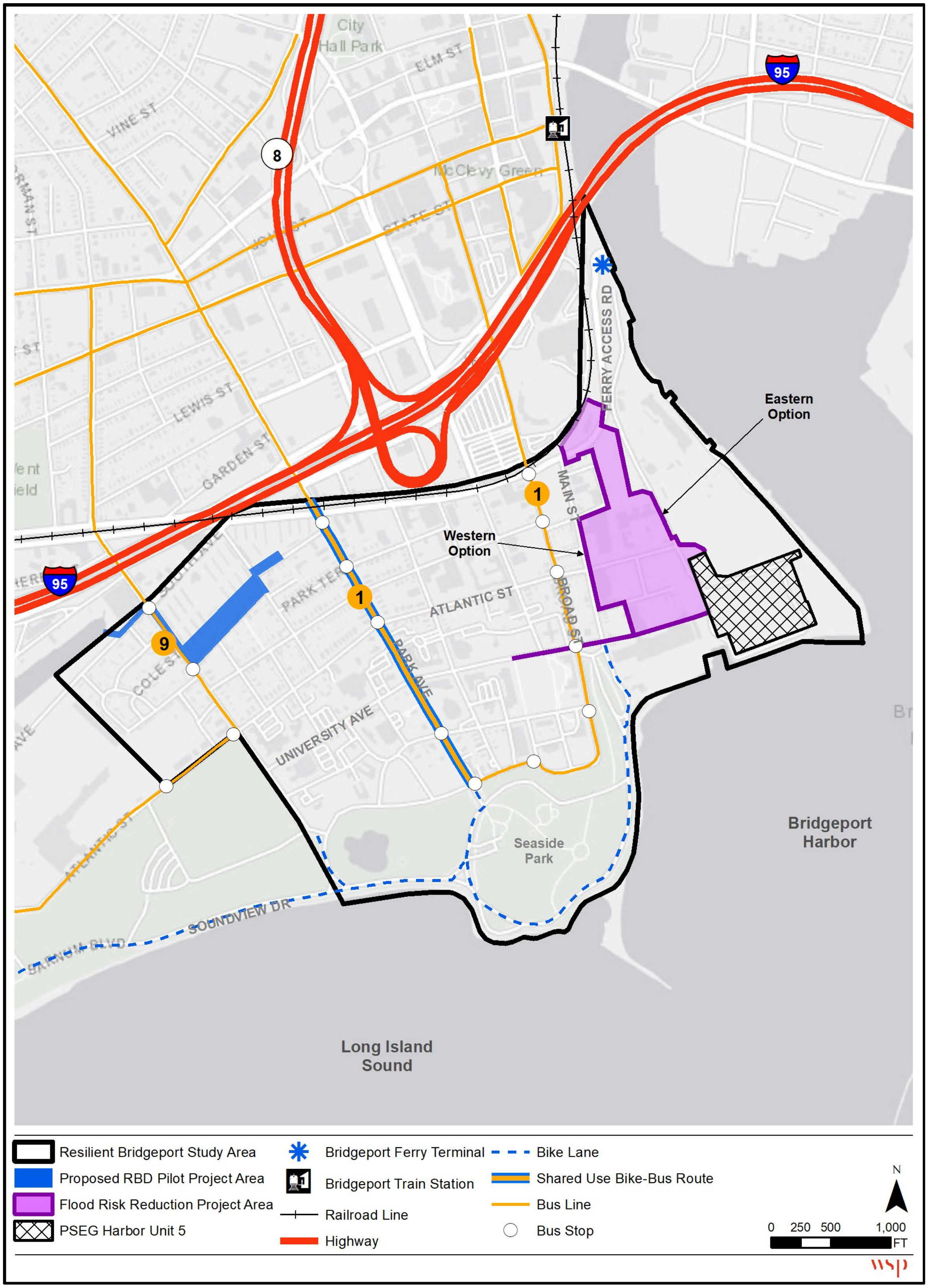
Bridgeport's transportation network includes highway, rail (Metro-North and Amtrak), bus, and ferry (see Figure 4.13-4). The study area lends itself to these transportation options with the Long Island Sound located to the south, the Pequonnock River (Bridgeport Harbor) to the east, and the Metro-North corridor to the north. Bridgeport is in the middle of a confluence of highways—Interstate 95 (I-95), the Merritt Parkway, Route 25, and Route 1 - that connects the City to other parts of the State and the region. The City is transected by two major state-maintained highways—I-95 and Route 8/25. I-95 runs through the southern portion of Bridgeport and Route 8/25 begins at I-95 (exit 27A) and splits into two separate highways north of the city boundary. The City of Bridgeport also owns and operates the Sikorsky Memorial Airport, located east of the study area, which offers charter air service.

Greater Bridgeport Transit (GBT) provides local, regional and express services throughout the Bridgeport region with routes extending from Milford to Norwalk and from Bridgeport to the Naugatuck Valley. GBT operates 18 bus lines, all of which pass through Bridgeport. The following bus routes end at Seaside Park or travel through the South End neighborhood:

- Route 1 travels through the South End via Broad Street, Park Avenue and State Street, connecting to the Dock Shopping Center in Stratford.
- Route 9 travels State Street and Iranistan Avenue to end at Seaside Park. This route also connects to Hawley Lane Mall.

The Norwalk Transit District also provides bus service through Bridgeport. GBT has a 10,000-square foot intermodal transit center in downtown Bridgeport located just north of the study area at 710 Water Street (at the intersection of Water Street and Stratford Avenue). The Bridgeport Intermodal Center provides local bus service in addition to Greyhound bus services and connections to Amtrak and Metro-North (New Haven Line) rail service and the Bridgeport-Port Jefferson Ferry. A pedestrian bridge connects the train station to the ferry terminal and a commuter parking lot that is shared by the Arena at Harbor Yard.

Figure 4.13-4. Transportation Network



Source: CTDEEP GIS Data, Greater Bridgeport Transit

The Bridgeport & Port Jefferson Steamboat Company provides year-round ferry service across Long Island Sound between Bridgeport, Connecticut and Port Jefferson, New York for vehicles, passengers and freight. The ferry terminal is located at the northernmost section of the study area. The Bridgeport and New London ferry services transport nearly two million passengers and more than half of a million cars and trucks annually. These services reduce auto and truck traffic on I-95. The company has proposed relocating its Bridgeport facility across the harbor to vacant land adjacent to the vacant Derecktor Shipyard.

Metro-North Railroad and Amtrak also provide rail service to downtown Bridgeport at the intermodal transit center. A second planned commuter rail train station, Barnum Station, is located on the south side of Barnum Avenue between Seaview Avenue and Pembroke Street on the site of the former Remington Arms factory. Shore Line East also provides rail service to Bridgeport through the Bridgeport Intermodal Center.

Signed bicycle paths are available within Seaside Park and along Park Avenue. Pedestrian activity is accommodated by sidewalks and bar-type pedestrian crosswalks at the intersections. The signalized intersections provide pedestrian pushbuttons and faces.

RBD Pilot Project Area Traffic Conditions

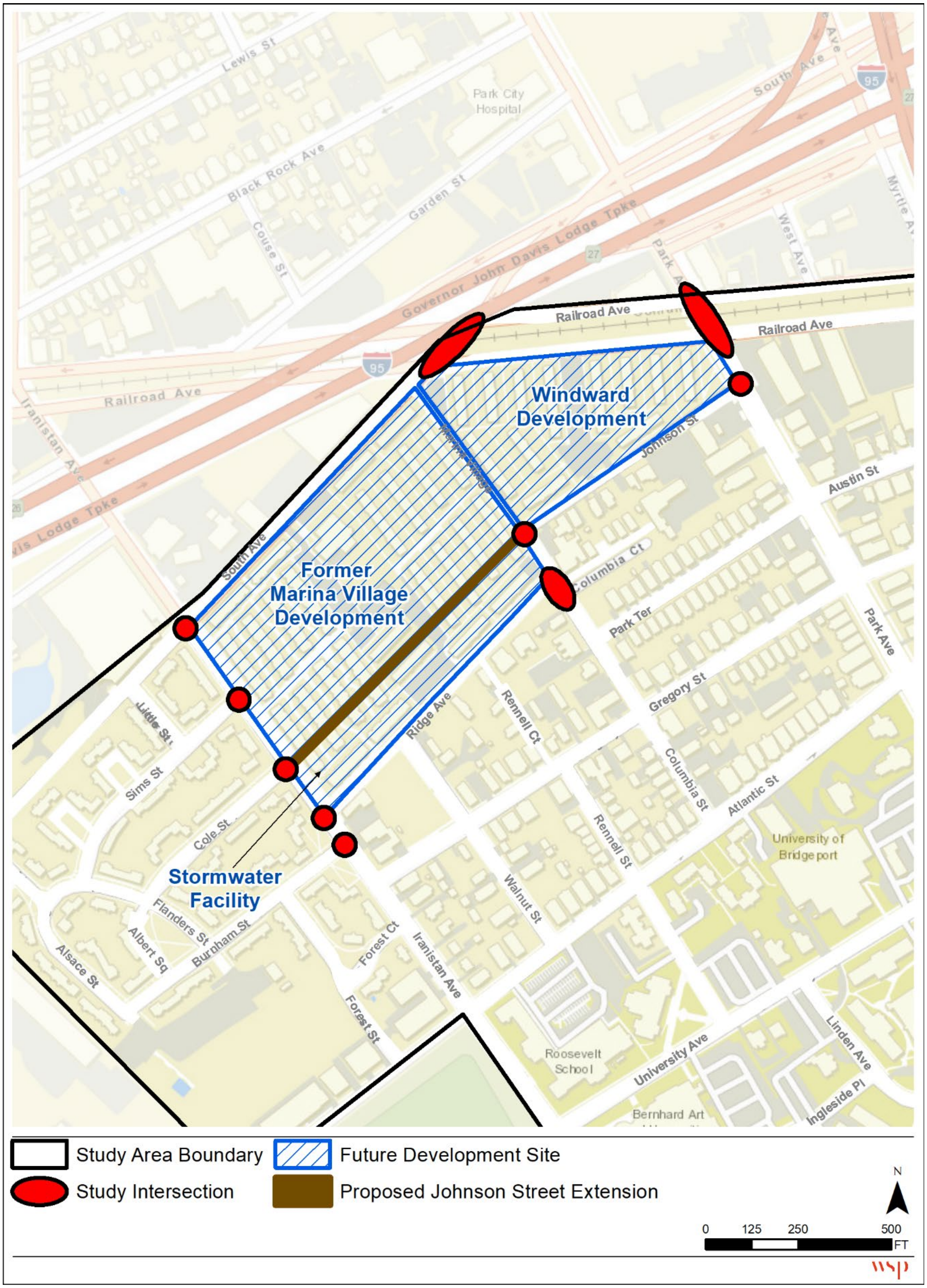
Traffic conditions were evaluated in the project area for the following intersections (see Figure 4.13-5):

- Park Avenue at Railroad Avenue (east- and westbound)-signalized intersection
- Park Avenue at Johnson Road
- Johnson Road at Columbia Street
- South Avenue at Railroad Avenue / Columbia Street – signalized intersection
- Iranistan Avenue at Sims Street
- Iranistan Avenue at Coles Street
- Iranistan Avenue at Burnham Street
- Columbia Street at Ridge Avenue
- Ridge Avenue at Iranistan Avenue

1. Iranistan Avenue at South Avenue – signalized intersection

Turning movement volume/pedestrian and vehicle classification counts were collected at the study intersections. The commuter peak periods for weekdays were identified as between 7:00 AM and 9:00 AM in the morning and 4:00 PM and 6:00 PM in the evening. The existing morning and evening peak hour LOS and delay at each of the study intersections are presented in Table 4.13-1 and Table 4.13-2 (signalized and unsignalized, respectively). All the stop controlled intersections operate at LOS B or better in the existing, scenarios. The intersection of South Avenue at Railroad Avenue operates at LOS D in the AM peak hour in the existing scenario. It should be noted LOS D is considered acceptable in an urban environment.

Figure 4.13-5. RBD Pilot Project Area Intersections and Roadway Network



Source: WSP 2018

Flood Risk Reduction Project Area Traffic Conditions

Traffic conditions were evaluated in the project area for the following intersections (Figure 4.13-6):

- University Avenue at Lafayette Street
- University Avenue at Broad Street
- University Avenue at Main Street (Including Soundview Circle at Main Street)
- Atlantic Street at Lafayette Street
- Atlantic Street at Broad Street
- Gregory Street (Bishop JC White Boulevard) at Broad Street (including Whiting Street approach)

Turning movement volume/pedestrian and vehicle classification counts were collected at the study intersections (see Appendix H). As with the RBD Pilot Project area, the commuter peak periods for weekdays were identified as between 7:00 AM and 9:00 AM in the morning and 4:00 PM and 6:00 PM in the evening. The existing morning and evening peak hour LOS and delay at each of the study intersections are presented in Table 4.13-3. All intersections currently operate at LOS A.

4.13.3.3 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there will be an increase in traffic as the result of background growth and planned development projects. There will be no change in the roadway network within the study area and no change to transit service or pedestrian access within the study area. There will be new one-way shared bicycle lanes added along Broad and Main Street as part of the Pequonnock River Trail Extension. Without the Proposed Action, pedestrian access along University Avenue and at the entrance to Seaside Park will not be improved. There will be no change in traffic volumes or patterns as a result of construction.

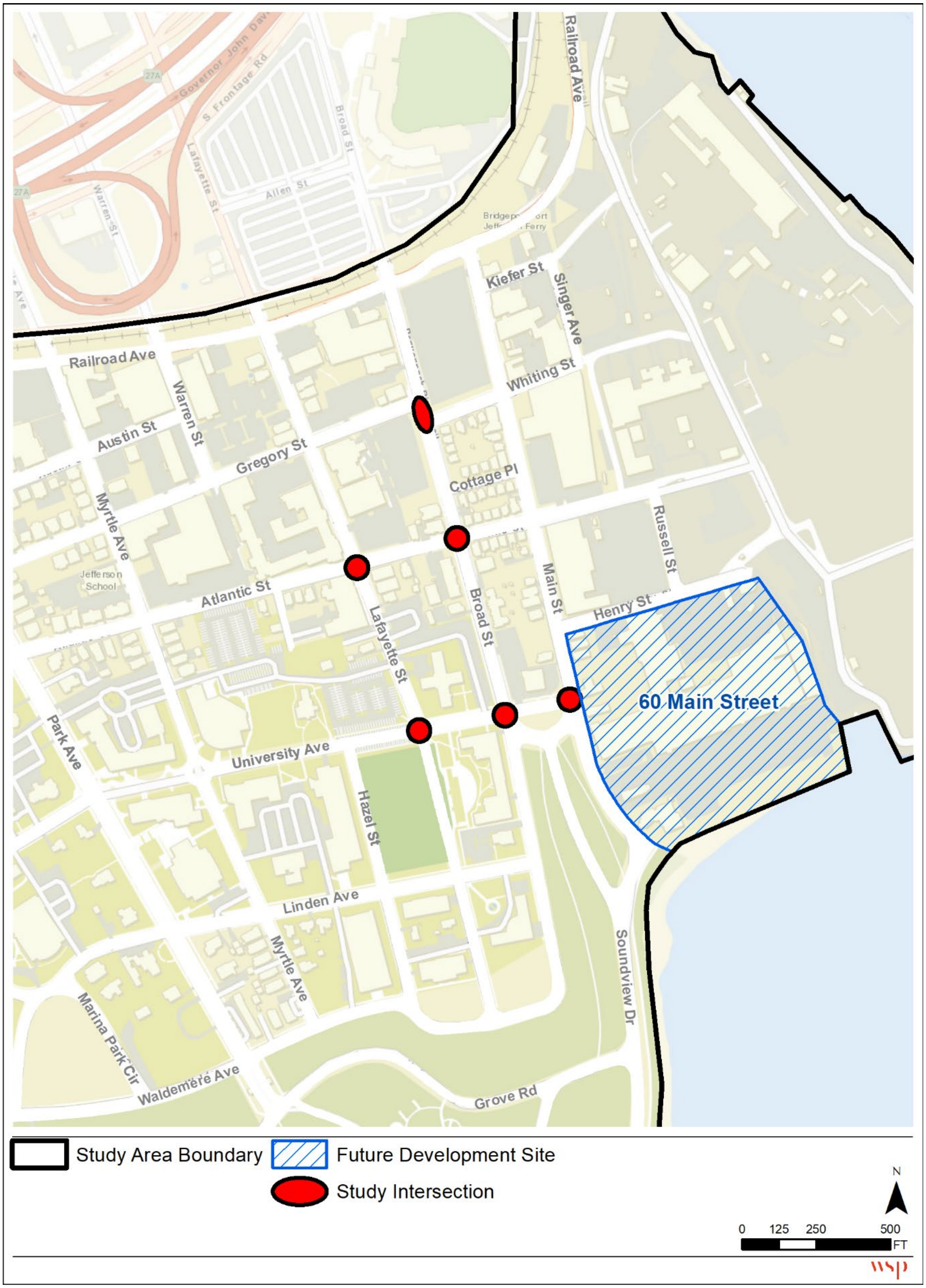
The CTDOT's Bureau of Policy and Planning was contacted to determine the future growth. Their regional forecasting travel model shows very little growth in the study area and recommended the use of between 0.2 – 0.5 percent growth per year. These rates do not include any future developments that could occur. To be conservative, this study considered using the high end, 0.5 percent annual growth rate over 20 years.

Without the Proposed Action there will be no temporary road closures or disruption to bus service during construction.

RBD Pilot Project

Added to the background growth rate volumes were the potential trips generated by the proposed Windward Development. Based on the Fuss & O'Neill letter dated August 4, 2017, addressed to the City of Bridgeport Engineering Department, the Windward Apartments development will have a total of 128 residential units and 7,480 square feet of medical office space. Two full access driveways will be provided onto Railroad Avenue and the existing Johnson Street will become two-way from Park Avenue to Columbia Street. For the analysis of the No-Build traffic condition, the No-Build volumes were then distributed into the roadway network and inputted into the Synchro model to determine the background traffic operations. The 2038 No-Build morning and evening peak hour LOS and delay at each of the study intersections are presented in Tables 4.13-1 and 4.13-2 (signalized and unsignalized, respectively). All the stop controlled intersections operate at LOS B or better in the No-Build scenario. The intersection of South Avenue at Railroad Avenue operates at LOS D in the AM Peak Hour. It should be noted LOS D is considered acceptable in an urban environment.

Figure 4.13-6. Flood Risk Reduction Project Area Intersections and Roadway Network



Source: WSP 2018

Flood Risk Reduction Project

The potential trips generated by the proposed 60 Main Street mixed used development site was added to the background growth rate volumes. Although the details of the future 60 Main Street development are not known at this time, for the purposes of the traffic analysis it is assumed to consist of two buildings, consisting of a shopping center and mid-rise apartment buildings. One of the two apartment buildings would have 177 apartment units and the other building would have 45 apartment units and 12,000 square feet of retail. Full build out of the site was assumed to be conservative. The 2038 No-Build morning and evening peak hour LOS and delay at each of the study intersections are presented in Table 4.13-3. All intersections will operate at LOS A under the future No-Build scenario.

Proposed Action

There would be no increase in traffic directly related to the Proposed Action. The increase in traffic as the result of background growth and planned development projects assumed under the No Action Alternative would be the same under the Proposed Action. The Proposed Action would result in minor changes in the roadway network within the study area with the extension of Johnson Street between Columbia Street and Iranistan Avenue, the closure of University Avenue to vehicular traffic between Lafayette and Broad Streets, the closure of Soundview Circle to vehicular traffic, and dead-ending Main Street north of University Avenue (one potential option for this intersection). There would be no long-term change to transit service or bicycle facilities within the study area. Pedestrian access would be improved along University Avenue and at the head of Seaside Park.

During construction, there would be increased traffic as a result of the construction vehicles and contractor employee vehicles, temporary road closures, and potential delays in local bus service and diversions of school bus routes.

RBD Pilot Project

The traffic 2038 Build Conditions were developed by subtracting the prior existing 280 Marina Village apartment units and adding the Windward Development units. The proposed Windward Development would consist of a 217-unit, 3-story, multibuilding, residential housing complex. This will slightly reduce the Build Site Generated traffic volumes from the background condition. The roadway network would be modified with the extension of Johnson Street, as a two-way street, from Columbia Street to Iranistan Avenue. The build volumes were then distributed into the proposed roadway network and inputted into the Synchro model to determine the build traffic operations. The build trips and distribution are shown in Appendix G. The volumes were inputted into the Synchro model to determine the 2038 Build traffic operations

To ascertain this project's impacts on the area roadway network, an analysis of the key intersections in the study area was performed. The existing, background and build AM and PM peak-hour operating conditions were determined using the Synchro® Version 9 software program that closely replicates the 2000 and 2010 HCM.

Table 4.13-1 and Table 4.13-2 summarize the results of the analysis conducted as part of this study. No changes were made to the signal timing nor phasing for the background condition. Timings were optimized at the signalized intersections for the 2038 Build Condition. All the stop controlled intersections operate at LOS B or better in the existing, background and build scenarios. The intersection of South Avenue at Railroad Avenue operates at LOS D in the AM peak hour in the existing, background and build scenarios. It should be noted LOS D is considered acceptable in an urban environment. All the analysis from Synchro Reports are included in Appendix H.

As shown in Table 4.13-1 and Table 4.13-2, for the 20-year build condition (2038 Build Year) the delays and LOS slightly improve over the 2038 background conditions. It is anticipated that the proposed Johnson Street extension (two-way; one lane each direction) would not have a negative impact on the surrounding roadway network. It would have capacity to accommodate approximately 1,000 peak hour vehicles. The vehicles in the background condition that used Ridge Avenue would use the Johnson Street extension in the build condition. Therefore, the proposed Johnson Street extension, and its conversion to a two-way roadway, would not have any negative impacts on traffic and would provide for the proposed future developments.

The Johnson Street extension would include sidewalks, street lighting, and plantings that would provide a beneficial impact to pedestrians in the area. There would be no change to bicycle facilities in the project area. In the long-term, it is expected that the Route 9 bus service would continue its current route along Iranistan Avenue. There would likely be an indirect impact on the bus service due to an increase in ridership from the future development at the former Marina Village site. GBT would be expected to adjust service to accommodate any increase in ridership.

Flood Risk Reduction Project

The traffic 2038 Build Conditions were developed using the background traffic volume and adding traffic generated by future mixed-use development on the 60 Main Street site. The volume then was distributed on the proposed roadway network. Figure 4.13-7 depicts the proposed roadway network for the Dead-End Option of the Main Street and University Avenue intersection.[17] The volumes were inputted into the Synchro model to determine the 2038 Build traffic operations.

The following traffic generation was calculated using the *Trip Generation Manual, 10th Edition, Volume 2: Data (2017).* The development consists of two buildings, with both a shopping center (Trip Generation Manual Section 820), and mid-rise apartments (Trip Generation Manual Section 221). One of the two buildings are 177 apartment units, and the other building is 45 apartment units, and 12,000 square feet of retail.

The following proposed roadway network were assumed in the development of the future conditions traffic analysis:

- University Avenue would be closed to vehicular traffic between Lafayette Street and Broad Street
- Soundview Circle would be closed to vehicles
- University Avenue between Broad Street and Main Street would be modified to be two-way (currently westbound-only)
- Main Street would dead-end just north of University Avenue. Access to Main Street south of University Avenue would be from University Avenue, and access to Main Street north of University Avenue would not be accessible from University Avenue
- Lafayette Street would retain access to the parking lot north of the University of Bridgeport soccer field
- At the intersection of Main Street and University Avenue there would be an access point to 60 Main Street. It would be a two-way, stop controlled entrance/ exit.
- Broad Street at University Avenue would have stop control on the westbound approach, and Main Street at University Avenue would have stop control on the eastbound and westbound approach.

[17] Since the Dead-End Option would more significantly change the roadway network than the Through-Street Option, it is considered a worst-case scenario with regards to traffic. An analysis of the future build condition for the Through-Street Option was not deemed necessary. Traffic conditions would be the same for the Western and Eastern options of the coastal flood defense system, therefore, a single Build Alternative scenario was modeled.

Table 4.13-1. RBD Pilot Project Traffic Operations Analysis - Signalized Intersections

		AM PEAK HOUR						PM PEAK HOUR					
		EXISTING CONDITION		BACKGROUND CONDITION		20-YEAR BUILD CONDITION		EXISTING CONDITION		BACKGROUND CONDITION		20-YEAR BUILD CONDITION	
		LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
1	Park Ave at Railroad Ave	B	15.1	B	15.0	B	15.0	B	17.4	B	17.6	B	17.6
2	South Ave at Railroad Ave	D	37.2	D	52.3	D	52.3	C	25.7	C	32.1	C	32.1
3	South Ave at Iranistan Ave	B	11.0	B	12.3	B	12.3	B	10.9	B	11.3	B	11.3

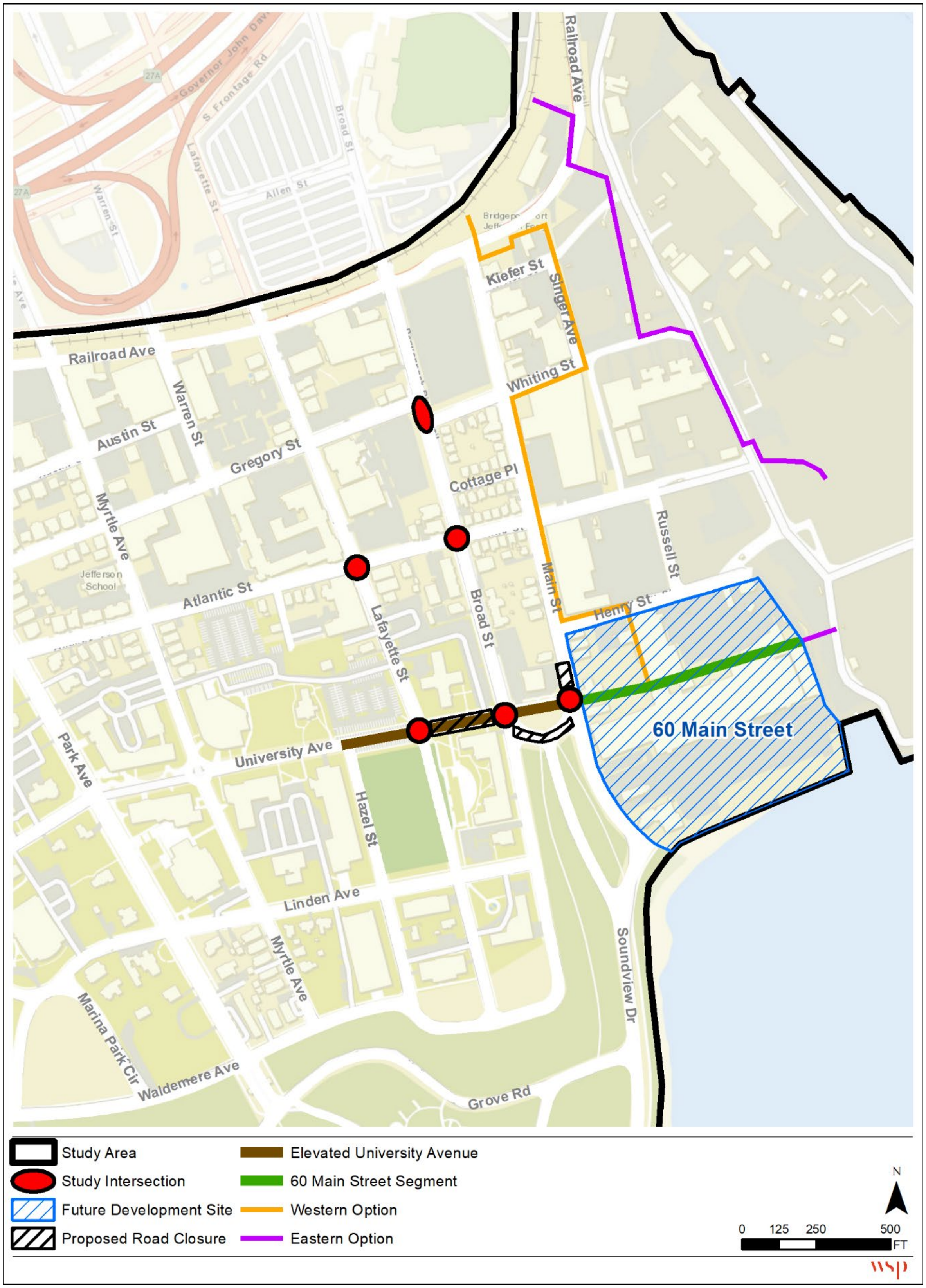
Note: Delay values are in seconds.

Table 4.13-2. RBD Pilot Project Traffic Operations Analysis - Unsignalized Intersections

		AM PEAK HOUR						PM PEAK HOUR					
		EXISTING CONDITION		BACKGROUND CONDITION		20-YEAR BUILD CONDITION		EXISTING CONDITION		BACKGROUND CONDITION		20-YEAR BUILD CONDITION	
		LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
1	Park Ave at Johnson St	B	10.4	B	10.8	B	10.8	B	11.9	B	12.8	B	12.8
2	Columbia St at Ridge Ave	A	8.8	A	8.9	A	8.9	A	8.9	A	9	A	9
3	Iranistan Ave at Sims St	A	9.9	B	10.4	B	10.4	A	10	B	10.5	B	10.5
4	Iranistan Ave at Cole St	A	0.2	A	0.12			B	10.4	B	10.7		
5	Iranistan Ave at Ridge Ave	A	9.1	A	9.1	A	9.1	A	9.3	A	9.4	A	9.4
6	Iranistan Ave at Burnham	A	9.9	B	10.2	B	10.2	A	9.8	A	10	A	10
7	Johnson St at Columbia					A	9.6					A	9.7
8	Johnson St/Cole St at Iranistan Ave					A	9.1					B	11.2

Notes: Delay is based on side street movements. Delay values are in seconds.

Figure 4.13-7. Proposed Roadway Network- Build Future Condition



Source: WSP 2018

Table 4.13-3 summarizes the results of the analysis conducted as part of this study. All intersections operate at LOS B or better in the existing, No-Build and Build Alternative scenarios. All the analysis from Synchro Reports are included in Appendix H.

Based on the traffic analysis as described above, site access and circulation would be at a satisfactory LOS under the Build Alternative. All movements operate at LOS B or better during peak periods. Thus, elevating University Avenue and rerouting traffic to the proposed roadway network, would not adversely impact traffic operating conditions at study intersections in the 2038 Build condition; traffic would remain at satisfactory level during peak periods. There would be minor increases in delay at each of the intersections between the future No-Build and Build scenarios and one intersection – Main Street and University Avenue – would decrease LOS from A to B, between the No-Build and Build scenarios. All other intersections would maintain the same free flow condition.

The northern end of the coastal flood defense system would tie into the New Haven Line railroad viaduct. The viaduct is owned by CTDOT. Coordination with CTDOT has been ongoing and would continue during final design to ensure no impacts to the railroad infrastructure or rail service as a result of the Flood Risk Reduction Project.

The Flood Risk Reduction Project would provide a beneficial impact to pedestrians in the area. The elevated University Avenue would be restricted to pedestrians only from Park Avenue to Main Street, improving pedestrian access within the University of Bridgeport and at the entrance to Seaside Park. The elevated cross-streets (Broad Street and Main Street) would maintain their current sidewalks. The impacted streets would include street lighting and some landscaping. There would be no change to bicycle facilities in the project area. In the long-term, it is expected that the Route 1 bus service would continue its current route along Broad Street. There would likely be an indirect impact on the bus service due to an increase in ridership from the future development at 60 Main Street. GBT would be expected to adjust service to accommodate any increase in ridership. Although the ferry terminal is located within the study area, it would not be within the area of protection for either option of the coastal flood defense system. There would be no impacts to the ferry terminal or ferry service as a result of the Flood Risk Reduction Project.

Resilience Center

The Resilience Center would not directly or indirectly adversely impact transportation within the study area. There would be no change to the street network or the pedestrian or bicycle facilities. The center would only generate small amounts of traffic in the area of the Freeman Houses on intermittent occasions. The facility would not have the capacity to generate levels of traffic that would exceed the capacity of the current street network. In addition, many users of the Resilience Center would be located within walking distance.

Table 4.13-3. Flood Risk Reduction Project Traffic Operations Analysis

		AM PEAK HOUR						PM PEAK HOUR					
		EXISTING CONDITION		20-YEAR NO-BUILD CONDITION		20-YEAR BUILD CONDITION		EXISTING CONDITION		20-YEAR NO-BUILD CONDITION		20-YEAR BUILD CONDITION	
		LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
1	University Avenue at Lafayette Street	A	7.3	A	7.3			A	7.5	A	7.5		
2	Broad Street at University Avenue	A	7.5	A	7.6	A	9	A	7.8	A	7.9	A	9.6
3	Main Street at University Avenue	A	0.0	A	0.0	B	11	A	0.0	A	0.0	B	10.7
4	Lafayette Street at Atlantic Street	A	7.8	A	7.9	A	8.4	A	8.0	A	8.1	A	8.0
5	Broad Street at Atlantic Street	A	7.6	A	7.6	A	8.7	A	7.6	A	7.7	A	9.0
6	Gregory Street at Broad Street	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow	Free Flow

Notes: All delays in seconds/vehicle for highest delay of all approaches

Construction

Construction activities would occur in multiple concurrent phases lasting approximately 36 months beginning fall 2019 through September 2022. The RBD Pilot Project would take 16 months beginning in the fall of 2019 through the end of 2020. Flood Risk Reduction Project would take the full 36 months. The Resilience Center schedule is unknown but would be within the 36-month Flood Risk Reduction Project schedule. Construction of the three projects under the Proposed Action would most likely occur under multiple concurrent contracts. The geographic separation of the RBD Pilot and Flood Risk Reduction projects allows for flexibility in the sequencing of the work and would allow for concurrent activities throughout the study area. The Resilience Center components will be integrated into the Flood Risk Reduction Project area, requiring coordination between the different contracts.

It is assumed that construction would take place during one work shift per day (averaging 8 hours in length) and five- to six-day work week depending on activities and schedule. Construction staging for the RBD Pilot Project would be within the former Marina Village site. Staging for the Flood Risk Reduction Project would potentially be at the 60 Main Street site. Construction worker parking areas would be agreed upon by the stakeholders (potentially at the former Marina Village site for the RBD Pilot Project).

Hauling routes to and from the construction sites (Figure 4.13-8). All trucks destined to or from the construction sites would be routed through the I-95 / Wordin Avenue interchange and would travel along collector roadways.

For the RBD Pilot Project, the hauling route would operate along collector roadways and would generally avoid the residential communities within the South End. Daily traffic volumes along key hauling route corridors such as Iranistan Avenue are currently under 2,000 vehicles per day. Peak hour traffic volumes on these corridors are well below capacity. The number of anticipated truck trips (deliveries, demolition materials) over the construction period for the RBD Pilot Project is 1,500 trips. This would amount to approximately 5 trips average per day, although during the course of the construction there could be more than 5 trips on a given day.

For the Flood Risk Reduction Project and Resilience Center, some portions of the hauling route would operate on the outer perimeter of residential neighborhoods within the South End community. However, this route was determined to be the only feasible route as there are several low clearance structures adjacent to Railroad Avenue (carrying both Metro-North Railroad and Amtrak Railroad) that would prohibit trucks from traveling to and from the construction site from further east. Daily traffic volumes along key hauling route corridors such as Iranistan Avenue, Waldemere Avenue, and Broad Street are currently under 2,000 vehicles per day. Peak hour traffic volumes on these corridors are well below capacity. The number of anticipated truck trips (deliveries, demolition materials) over the construction period for the Flood Risk Reduction Project and Resilience Center is approximately 9,770 trips. This would amount to approximately 13-14 trips average per day, although during the construction, there could be more than 14 trips on a given day.

Construction would require the following temporary road closures within the study area:

- Iranistan Avenue and Columbia Street to allow for tie-in of the new Johnston Street extension (RBD Pilot Project). Ridge Avenue could also be temporary closed due to adjacent construction activities. Installation of the stormwater infrastructure (force main) along Iranistan Avenue and South Avenue could require temporary lane closures (limited to one lane).
- University Avenue between Broad Street and Main Street is proposed to be closed for the full duration of construction.

- Broad Street is planned to be closed at University Avenue for approximately 8-9 months.
- Main Street is proposed to be closed at University Avenue for 8-9 months.
- Temporary traffic disruptions are anticipated along Main Street, Henry Street, Atlantic Street, Whiting Street, Keifer Street, and Ferry Access Road. Main Street between Henry Street and Whiting Street is expected to have a single lane closed for approximately 3-4 months. Atlantic Street, Whiting Street, Keifer Street are expected to each be closed for approximately 2-3 weeks while gates are installed. Ferry Access Road is expected to have single lane closure for approximately 4 weeks during gate installation.
- Installation of the pump station and force main could require temporary road closures. Main Street, University Avenue, Henry Street, Atlantic Street, Whiting Street, Keifer Street could all have temporary traffic disruptions during construction.

The increased truck traffic and temporary road closures from construction of the Proposed Action is not anticipated to result in a significant adverse impact to traffic in the study area. A Traffic Management Plan (TMP) would be developed in order to minimize impacts on existing traffic patterns.

The GBT bus routes along Iranistan Avenue (#9) and Broad Street (#1) could be temporarily impacted during construction due to increased traffic on the routes and temporary road or lane closures. There could be delays and bus stops could have to be moved for short periods of time. These potential impacts would be addressed in the TMP and coordinated between GBT, the contractors and the City of Bridgeport. There would be no impact to ferry service under the Proposed Action. Amtrak and Metro-North rail service is not anticipated to be affected by construction of the coastal flood defense system at the connection point with the railroad viaduct.

Sidewalks in the immediate vicinity of the construction sites could be temporarily closed during construction. Efforts would be made to maintain safe pedestrian access to the extent possible. There would be no anticipated impacts to bicycle facilities during construction.

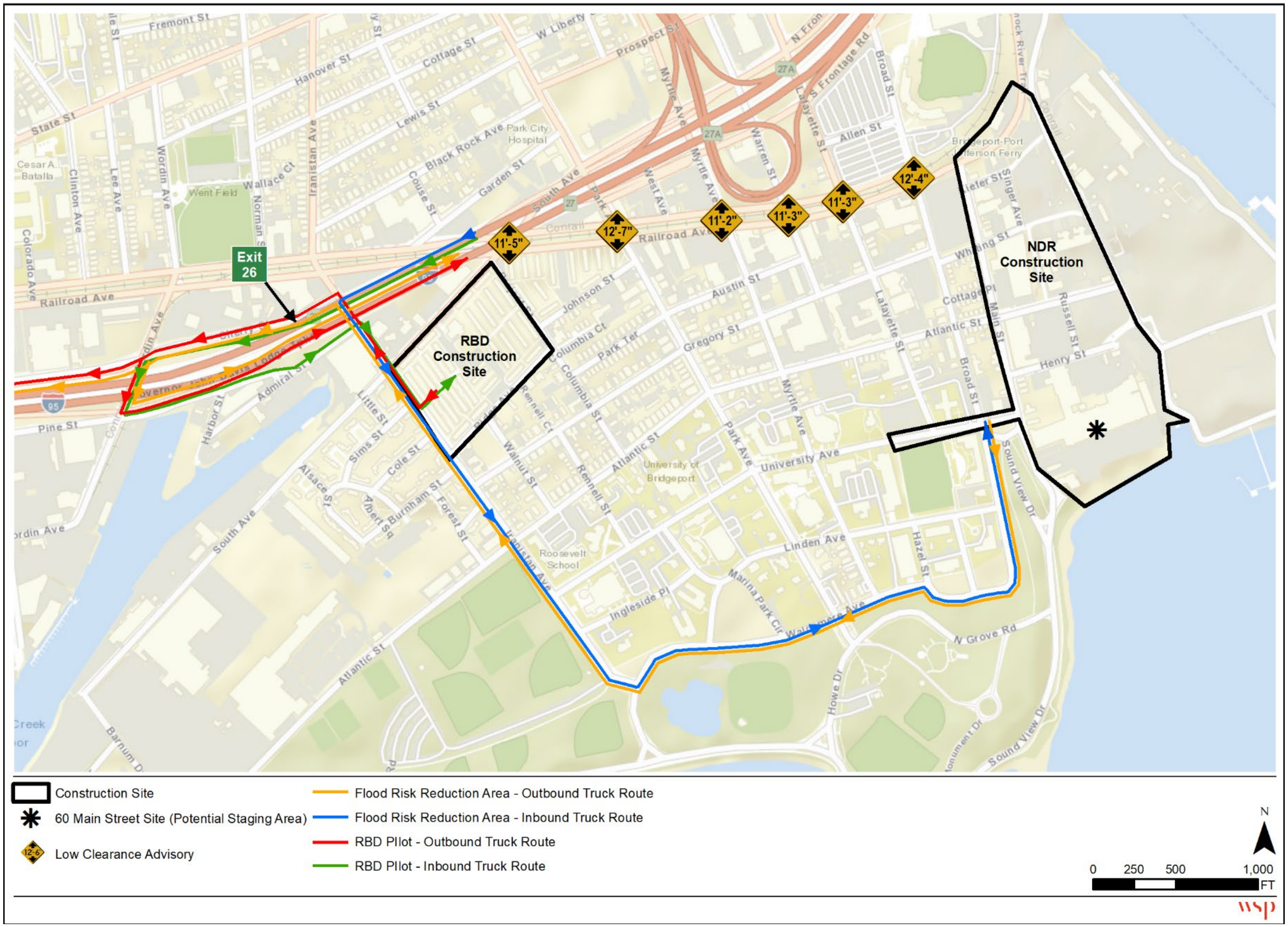
4.13.4 Mitigation Measures and Best Management Practices

The following mitigation measures and best management practices would be implemented to minimize impacts from the Proposed Action:

- Where the Proposed Action would cross or impact sewer lines or other utility lines, design accommodations would be implemented (for example hand excavations, use of jet grout seals or use of sleeves) to reduce impacts.
- Relocation of sewer and other utility lines would be considered only if other design solutions were impractical.
- A TMP would be developed in order to minimize impacts on existing traffic patterns.
- Public outreach during construction would be implemented to notify the public of construction schedule, upcoming activities and potential impacts. As needed, construction project staff will reach out to local community groups to provide in-person updates on construction progress and potential impacts.
- Variable Message Signs could be used throughout the project area to warn motorists, pedestrians, and cyclists of changes in traffic patterns including road closures.

RESILIENT BRIDGEPORT

Figure 4.13-8. Proposed Construction Truck Haul Routes



Source: CTDOT, CTDEEP

4.14 COMMUNITY FACILITIES AND PUBLIC SERVICES

This section identifies public services and other community facilities within Bridgeport that serve the study area population. Community facilities include schools, religious institutions, libraries, institutional residences, hospitals, municipal buildings, senior centers, and health care facilities. Public services include police departments, emergency medical services, and fire stations. These services and facilities provide social services and enhance public safety.

4.14.1 Methodology and Regulatory Context

For information on existing schools in Bridgeport, including location and total number of elementary, middle, and high schools, the City of Bridgeport's public school dataset was downloaded from University of Connecticut's Map and Geographic Information Center (UConn MAGIC). Other public services and community facilities in the study area, such as public libraries (Bridgeport Library Hours and Locations n.d.), City Hall, senior centers (Senior Centers n.d.), police stations, hospitals, and fire station, were identified using the City of Bridgeport's website and Google Maps. These locations were then geocoded and mapped using ArcGIS. Religious institutions and institutional residences were not mapped as they are not public meeting spaces.

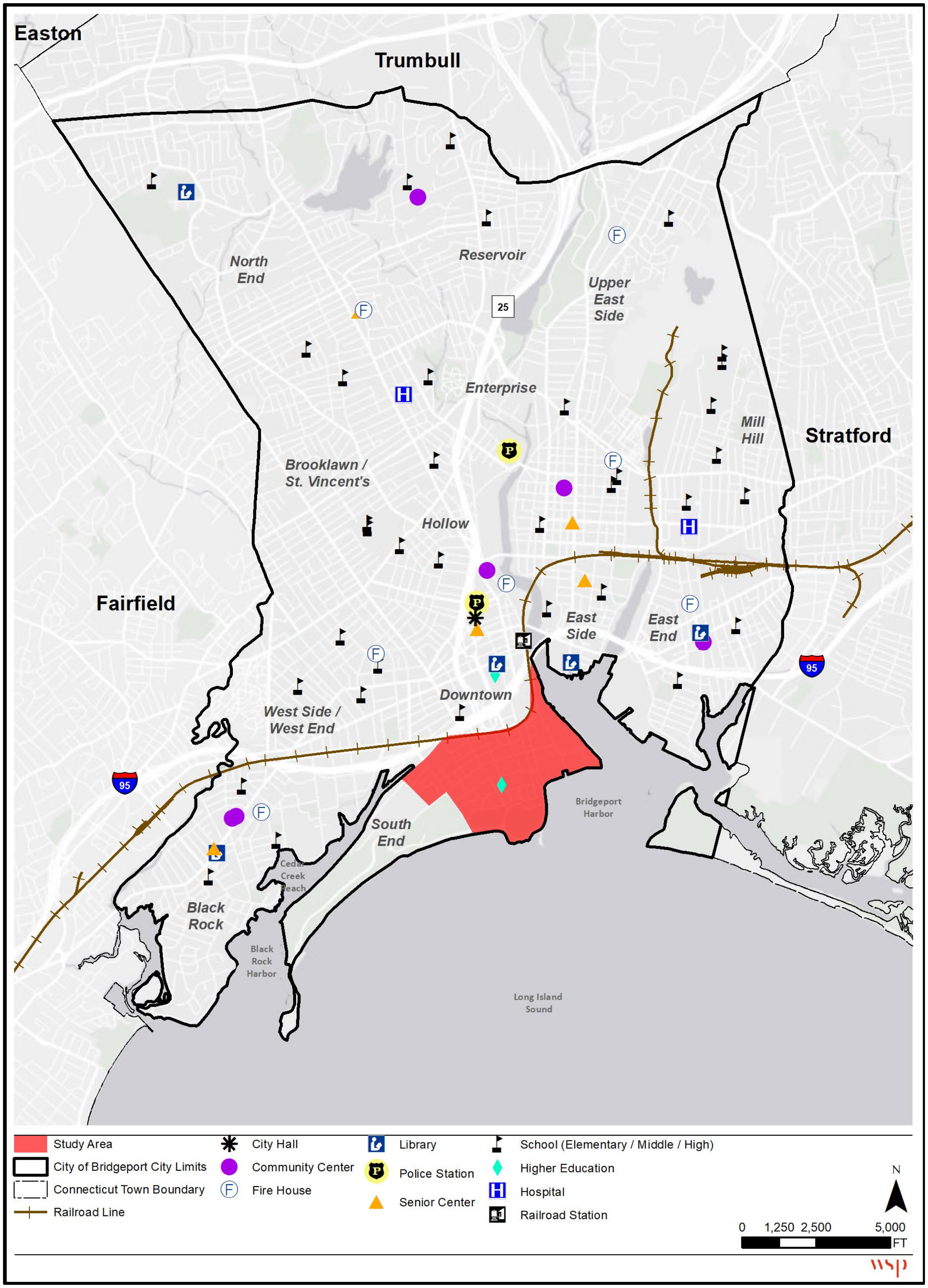
The City of Bridgeport's master plan was last updated in 2008 and the City of Bridgeport is in the process of updating the plan. Since the information regarding planned community facilities is likely out of date, the master plan was not cited in the analysis of impacts.

Pursuant to Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, each federal agency should make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and should verify that policies, programs, activities, and standards address disproportionate risks to children. Specific areas of impact to children include noise exposure, air pollution, contamination and hazardous material exposure, and site safety considerations.

4.14.2 Affected Environment

As shown in Figure 4.14-1 and listed in Table 4.14-1, Bridgeport includes six community centers, five public libraries, five senior centers, two hospitals, two police stations, and seven fire stations. However, there are no community facilities or public services within the study area. The nearest police station and fire station are located approximately 1.3 and 1.1 miles, respectively, from the center of the study area. The closest community center (the Cardinal Shehan Center) is located approximately 1.4 miles away and the nearest senior center (the Dwight D. Eisenhower Senior Center) is located 1.1 miles away, and is close to two other senior centers. Several branches of the public library are near the study area, the closest of which is the Burroughs and Saden Main Library, approximately 0.7 mile away. St. Vincent's Medical Center and Bridgeport Hospital are both located approximately 3 miles away from the center of the study area.

Figure 4.14-1. Community Facilities and Public Services in Bridgeport



Source: UConn MAGIC database, City of Bridgeport, ESRI, Google Maps

Table 4.14-1. Community Facilities in Bridgeport

FACILITY	NAME	ADDRESS	ZIP
Community Center	Cardinal Shehan Center	1494 Main Street	06604
	Burroughs Community Center	2470 Fairfield Avenue	06605
	Smilow Wakeman Boys and Girls Club	2414 Fairfield Avenue	06605
	Trumball Gardens Citywide Youth Center	715 Trumball Avenue	06606
	Ralphola Taylor Community Center	790 Central Avenue	06607
	McGivney Community Center	338 Stillman Street	06610
Library	Burroughs and Saden Main Library	925 Broad Street	06604
	Black Rock Branch Library	2705 Fairfield Avenue	06605
	North Branch Library	3455 Madison Avenue	06606
	Newfield Branch Library	1277 Stratford Avenue	06607
	Old Mill Green Branch Library	1677-81 East Main Street	06608
Senior Center	Dwight D. Eisenhower Senior Center	307 Golden Hill Street	06604
	Black Rock Senior Center	2676 Fairfield Avenue	06605
	North End Bethany Center	20 Thorme Street	06606
	East Side Senior Center	1057 East Main Street	06608
	Hall Neighborhood Senior Center	52 George E. Pipkin Way	06608
Police Station	Bridgeport Police Department	108 River Street	06604
	Bridgeport Police Department	300 Congress Street	06604
Fire House	Bridgeport Fire Department Battalion	30 Congress Street	06604
	Bridgeport Fire Department	245 Ocean Terrace	06605
	Bridgeport Fire Department Station 3	233 Wood Avenue	06605
	Bridgeport Fire Department Station 12	265 Beechmont Avenue	06606
	Bridgeport Fire Department Station 6	1035 Central Avenue	06607
	Bridgeport Fire Department Station 10	950 Boston Avenue	06610
	Bridgeport Fire Department Station 15	104 Evers Street	06610
City Hall	Bridgeport City Hall	45 Lyon Terrace	06604
Hospital	Bridgeport Hospital	267 Grant Street	06610
	St. Vincent's Medical Center	2800 Main Street	06606

Source: UConn MAGIC database, City of Bridgeport, ESRI, Google Maps

Travel times for emergency vehicles between the nearest hospitals or fire stations and the South End community during moderate to high levels of traffic is 10 minutes for St. Vincent's Medical Center, 11 to 13 minutes for Bridgeport Hospital, and 8 to 9 minutes for the fire station (225 Wood Avenue). The typical routes would enter the South End via Park Avenue, Iranistan Avenue or Broad Street., all of which have over 12'4" clearance underneath the railroad viaduct. Iranistan Avenue and Broad Street are at lower elevations so there is often standing water at the underpasses during major rainfalls or storm events. Park Avenue has the highest elevation providing the ridge line for the neighborhood and linking it to elevated lateral streets for dry egress during flooding.

The University of Bridgeport is a major institution within the study area. Centered along University Avenue, the 86-acre campus has an enrollment of approximately 5,400 students and a faculty of over 500. There are no elementary, middle or high schools within the study area; however, there are school age children who reside in the study area. Many of these children travel to school via school bus routes through the study area.

4.14.3 Environmental Consequences

4.14.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action will not be constructed and there will be no change to the existing community facilities and public services in Bridgeport. The residential population within the study area will be expected to increase from the construction of planned development projects, although the rate of growth is not expected to be as high as with the Proposed Action due to continued risk of flooding. The increase in residents will result in a minor increase in demand for existing public services but is not expected to adversely affect those services. Under the No Action Alternative, there will be continued flooding in the South End and increased risk from coastal storms and sea level rise. Without the Proposed Action, there will be no improvements to dry egress, which would allow for access by emergency services during flood events. Therefore, there will be adverse impacts to public services and safety under the No Action Alternative.

There will be no public health benefits under the No Action Alternative. Health risks due to flooding will remain unchanged or increase from current conditions. Continued flooding events will facilitate public health risks such as infectious disease, injuries, and death; exposure to microbial pathogens from combined sewer overflow (CSO) events; mold growth and associated aggravation of respiratory conditions and lung infections; and mental health issues including stress, depression, anxiety disorders, and sleeplessness. Further, public safety risks associated with the damaged public infrastructure and private investments and lack of street accessibility during flood events will continue unabated.

4.14.3.2 Proposed Action

Under the Proposed Action, there would be no direct increase in residential population in the study area and therefore no direct increase in demand for existing public services. The infrastructure improvements, dry egress, and coastal flood defense system could facilitate future residential and commercial development in the area. The extent of the impact of such future development cannot be estimated until future development projects are approved. At that time, if warranted, an assessment of community facility needs should be conducted.

With the exception of the University of Bridgeport, there are no community facilities or public services located in the study area; therefore, the Proposed Action would not result in direct impacts to the existing community facilities or public services in Bridgeport during or following construction. However, school bus routes could be temporarily affected since buses could be diverted during construction. Access for emergency vehicles would be maintained through coordination with contractor. (See Section 4.8.3, Transportation, for discussion of impacts to traffic during construction.)

<u>RBD Pilot Project</u>

The RBD Pilot Project would include extending and elevating Johnson Street to provide dry egress as well as constructing a 2.5-acre stormwater facility and green infrastructure to help alleviate flooding and keep more water off the streets. Overall, the RBD Pilot Project would be designed to be both an infrastructure upgrade and urban amenity composed of natural and fortified solutions to facilitate a more resilient neighborhood. The dry egress would provide a beneficial impact to public services and safety by allowing emergency vehicles access during flood conditions.

Flood Risk Reduction Project

The flood risk reduction measures under the Proposed Action would include a combination of measures within eastern South End that would reduce the flood risk within this proposed project area from future coastal surge and chronic rainfall events. Community facilities near the study area would not be affected by the project.

Raising University Avenue would ensure vehicular and public transit access to the Park Avenue corridor during major storm events and would set a new, higher, ground plain for future long-term development. In addition, once complete, raised streets would have a beneficial impact on emergency vehicle access to adjacent residences and retail buildings. Elevating University Avenue would not result in any impact on public facilities and community services.

Western Option

The Western Option for the north-south boundary of the coastal flood defense system would be within the public right-of-way and would provide flood risk reduction to residential areas west of Main Street from University Avenue to the railroad tracks at the northern edge of the study area. Upon completion, the low-lying underpasses under the railroad viaduct would be less likely to flood and would allow for safe egress options and improve emergency vehicle access in the area in case of a flooding event.

Eastern Option

The Eastern Option of the north-south boundary of the coastal flood defense system would continue from Main Street into the PSEG's property in the easternmost part of the study area and connect to the elevated podium for the Harbor Unit 5 (HU5) perimeter sheet-pile wall. This alignment would continue along the eastern border of Emera's site until it reaches the United Illuminating Company's Pequonnock Substation relocation site, where it would continue north along the eastern property line of the site across Ferry Access Road with a northern tie-in at the elevated Connecticut Department of Transportation New Haven Line. This would provide flood risk reduction to utilities, in addition to the residences west of Main Street. The Eastern Option would provide dry egress to HU5 and reduce the risk of flooding under the railroad underpasses, providing vehicle access during flooding events, including for emergency vehicles.

Resilience Center

The Proposed Action would include a Resilience Center, which would serve the South End community in its ongoing commitment to building a resilient Bridgeport. The investment in the Freeman Houses would provide a local hub for resilience activities, and provide a place for education on resiliency and local history. This would provide a new community facility for the South End, an area that is currently lacking such facilities. It would provide a meeting place year-round and during storm events and other emergencies would provide a location for the community to meet, disseminate information, distribute supplies such as water, and generally assist the community in recovery efforts. Overall, the purpose of the Resilience Center is to support current resiliency efforts and to keep the neighborhood safe during future emergencies. Although the design details of the Resilience Center are still being determined, this project of the Proposed Action would be expected to result in a beneficial impact to community facilities in the study area. Further, public health provider community facilities (e.g., police and fire stations and personnel) around the study area would benefit from the added emergency relief infrastructure the Resilience Center proposes.

Public Health and Safety Consequences

The Proposed Action's combined effect would improve public health and safety within the study area since the incidence of acute and chronic flooding associated with both regular rainfall and storm surge events would be significantly reduced. Acute and chronic flooding within the study area poses health and safety hazards, including, but not limited to the following:

- Immediate flooding danger to residents of the study area as well as the natural environment
- Physical damage to public infrastructure and private developments
- Power outages
- Interruptions to the provisions of health and safety services (i.e., police, fire, and emergency medical services)
- CSO events with outfalls discharging into surrounding waterbodies

The following various elements of the Proposed Action would ameliorate and mitigate the dangers related to acute and chronic flooding:

- RBD Pilot Project - Dry egress; a new stormwater facility and green infrastructure
- Flood Risk Reduction Project - Coastal flood defense system and dry egress
- Resilience Center - Safety information dissemination services

All proposed infrastructure would work in concert to better allow for the management of stormwater runoff as well as physically blocking storm-surge-related flooding while providing enhanced flood safety via dry egress and information dissemination during storm events.

Public health benefits would include a reduction in the following:

- Infectious disease, injuries, and death
- Exposure to microbial pathogens from CSO events
- Mold growth and associated aggravation of respiratory conditions and lung infections
- Flood-induced mental health issues including stress, depression, anxiety disorders, and sleeplessness

Public safety benefits would include a reduction in physical damage to public and private infrastructure and improved egress during flood events.

During construction, access for emergency vehicles would be maintained.

Pursuant to Executive Order 13045, the Proposed Action would result in various public health benefits through the reduction of infectious diseases, exposure to microbial pathogens, mold growth and associated respiratory afflictions, and flood-induced mental health issues. These public health benefits would be realized by all stakeholders within the study area, including children. School bus routes could be temporarily affected during construction since buses could be diverted due to road closures; however, safety measures would be maintained to ensure local children would not be adversely affected by the temporary diversions.

4.15 OPEN SPACE AND RECREATION

The assessment in this section describes the potential effects on parks, open spaces, and recreational facilities located within the study area from the modifications resulting from the Proposed Action. This includes physical changes to existing facilities resulting from the construction of the projects that make up the Proposed Action, as well as any activities or change in conditions that could alter the use and/or access to an existing, public facility such that it may no longer serve the same user population. The assessment of effects also considered conditions that would temporarily affect the use of a park, open space, or recreational facility within the study area.

4.15.1 Methodology

Existing publicly accessible parklands, open spaces, and recreational areas in Bridgeport and the South End neighborhood were identified through a variety of resources including: Connecticut Department of Energy and Environmental Protection GIS data clearinghouse, *Bridgeport 2020: A Vision for the Future*, the University of Bridgeport website, the Green Village Initiative website, and the Connecticut Metropolitan Council of Governments website. The analysis also identified planned future changes to parks, open spaces, and recreational facilities within the study area. Additional resources included online aerial and street-view photographs.

4.15.2 Affected Environment

Bridgeport has 1,346 acres of public spaces and parks, earning the city the nickname "Park City" (City of Bridgeport 2011). Bridgeport has 24 miles of shoreline, with 30 percent accessible as park space, approximately 50 percent publicly controlled land outside parks, and another 14 percent with private owners where public access could be negotiated (City of Bridgeport 2017). There are over 45 parks in the system, including two iconic Frederick Law Olmsted landscapes (Seaside and Beardsley Parks) and dozens of neighborhood parks.

The City of Bridgeport adopted The Parks Master Plan 2011 to lay out the framework for reconnecting to the often-hidden waterfront, enhancing existing parks, creating new parks and providing better connections between people and parks (City of Bridgeport 2011). The Parks Master Plan 2011 seeks to restore the connection between urban parks and the city's rich natural environment. The focus of the plan is providing walkable neighborhood parks with family-friendly play activities and durable fields and courts. The most needed amenities were established to be playgrounds (with a need for over fifty more playgrounds) followed by tennis courts, and basketball courts. Addressing the open space and recreation needs in the most underserved area of the city, across the center of downtown Bridgeport, is a priority of the master plan. Five strategically located "hyper-parks" are being planned to serve the more densely populated areas of Bridgeport with more recreational amenities such as splash pads, high-demand court sports and sports fields (City of Bridgeport 2015). These hyper-parks are planned for the West Side/West End, Upper East Side, and East Side neighborhoods, but not within the Study Area.

The 2017 Waterfront Bridgeport: Bridgeport, CT, Waterfront Master Plan identifies priority areas within the study area for new waterfront parks and public spaces. These future parks would serve the existing residential population within the area and would serve as a catalyst for future development. In addition, the Waterfront Bridgeport: Bridgeport, CT, Waterfront Master Plan proposes to activate the waterfront by building more amenities at the Bridgeport Ferry Terminal, which would include a restaurant, visitor's kiosk, public landing for water shuttles, and a new public plaza with movable furniture.

As shown in Figure 4.15-1, the study area for the assessment of effects for open space and recreational facilities encompasses 687 acres of land within the South End neighborhood of Bridgeport. This acreage includes the area that could be affected by the resiliency measures that would modify existing infrastructure within the South End neighborhood.

As listed in Table 4.15-1 and shown in Figure 4.15-1, there are 10 parks and recreational resources in the South End, which includes one public park, one public playground, two community gardens, a baseball stadium, an indoor sports and entertainment arena, a gymnasium, a recreation center, and one performing arts theater.

Table 4.15-1. Parks and Recreation Facilities in the Study Area

NO.	PARK/FACILITY NAME AND LOCATION	DESCRIPTION	APPROXIMATE SIZE
1	Seaside Park, along the Bridgeport Harbor, Long Island Sound shoreline	Ball fields, picnic areas, a bathing beach, bath houses, and hiking trails. Parts of the park offering views of the water are wheelchair accessible. Food concessions, an access pier and boat launching facilities are available.	375 acres
2	Knights Field	The field is located at the corner of Lafayette Street and University Avenue, in the center of campus.	950-people capacity
3	Community Garden #1	Located on the southwest corner of Lafayette Street and Railroad Avenue.	
4	Community Garden #2	Located on the northwest corner of Gregory Street and Walnut Street.	
5	Public Playground	The only outdoor public playground located within the study area outside of Seaside Park, located on the northwest corner of Gregory Street and Walnut Street.	
6	The Ballpark at Harbor Point	Baseball stadium at Long Island Sound waterfront.	5,300-seat capacity
7	Webster Bank Arena	Indoor music, sports, and entertainment venue.	10,000-seat capacity
8	Harvey Hubbell Gymnasium	Located on Waldemere Avenue, between Hazel Street and Myrtle Avenue. The gymnasium is home to University of Bridgeport's men's and women's basketball teams and women's volleyball teams.	
9	Wheeler Recreation Center	Located on University Avenue between Park Avenue and Rennell Street, the recreation center provides the students, faculty, staff, and alumni of the University of Bridgeport with recreational and fitness opportunities that are geared to increase an individual's overall health and well-being. Facilities include, a swimming pool, three multipurpose courts, weight room, martial arts studio, and racquetball court.	
10	Mertens Theater	A performing arts theater located on Iranistan Avenue between University Avenue and Inglesiede Place.	938-seat capacity

Figure 4.15-1. Parks and Recreational Facilities in the Study Area

Source: Google Maps, The Parks Master Plan 2011

As shown in Figure 4.15-1, despite the many parks and recreational opportunities located throughout the South End, no designated open space exists within the area near the RBD Pilot Project. However, there is a basketball court in the center of the former Marina Village site—which is presumably used by Marina Village residents and potentially by other members of the community—and a public playground on the property to the southwest of the intersection of Ridge Avenue and Walnut Street, to the south of Marine Village. Immediately to the south of the public playground is a community garden.

Seaside Park, situated along the Long Island Sound shoreline, is the most notable park in the South End neighborhood. The 370-acre park is the longest stretch of a municipal park within Connecticut. The park was laid out just after the Civil War by Calvert Vaux and Frederick Law Olmsted, whose other efforts include Manhattan's Central Park and Prospect Park in Brooklyn (Bridgeport, Seaside Park History n.d.). See Section 4.4, Cultural Resources, for more information on the history of the park. The park offers many amenities including a bathing beach, bathhouse, two playgrounds, a swimming area, a fishing area, picnic areas, waterfront, two eateries, a bicycling/greenway, hiking trails, a volleyball court, a soccer field, a baseball field, and one skate park (Figure 4.15-2).

Figure 4.15-2. Seaside Park

Source: Google Maps, The Parks Master Plan 2011, ESRI, CTDEEP

The Pequonnock River Trail

The Housatonic Railbed Trail is a multiuse path that runs along the Pequonnock River from its southern terminus in downtown Bridgeport, five miles north past Monroe, CT. According to the Regional Transportation Plan for the Greater Bridgeport Planning Region: 2011-2040, this trail is proposed to be extended down through the eastern portion of the South End neighborhood to connect to Seaside Park. The Connecticut Metropolitan Council of Governments plans to connect the segmented Housatonic Railbed Trail into one seamless pathway, and rename it the Pequonnock River Trail, which will follow along the abandoned Housatonic railway corridor running parallel to the Pequonnock River. Since 2004, the first extension of the Pequonnock River Trail has been designed and will connect the town of Trumbull with northern Bridgeport. Of the partially completed Pequonnock River Trail, 10.2 miles have been constructed while another 3 miles have been designated. The Pequonnock River Trail extension focuses on the remaining southern 3 miles within Bridgeport, which are required to complete the trail, a portion of which would be located within the study area of the Proposed Action.

Within the study area, the Pequonnock River Trail extension proposes one-way shared bike lines along Broad and Main Streets (running south and north, respectively) from Seaside Park at University Avenue to Ferry Access Road, continuing along Ferry Access Road northerly to the Bridgeport Ferry Terminal, before heading northwest beyond the study area limits to link up with existing Pequonnock River Trail infrastructure. Construction is anticipated to start in the summer 2019 and would last approximately 6 to 9 months, resulting in the trail being operational by spring 2020 at the latest.

Knights Field

Knights Field, located at the corner of Lafayette Street and University Avenue in the center of the University of Bridgeport campus is home to the University of Bridgeport's men's and women's soccer and women's lacrosse teams. The field has capacity of 950 people (University of Bridgeport n.d.).

Community Gardens and Playground

The Green Village Initiative is a non-profit organization that funds and maintains 13 "Urban Roots Community Gardens" within Bridgeport, two of which are located within the study area. As shown in Figure 4.16-1, Community Garden 1 is on the southwest corner of Lafayette Street and Railroad Avenue. Community Garden 2 is on the northwest corner of Gregory Street and Walnut Street. Just to the north of Community Garden 2 is the only outdoor public playground located within the study area outside of Seaside Park.

Former Ballpark at Harbor Yard

The former Ballpark at Harbor Yard, bounded by I-95 to the north and the eastern portion of the study area to the south is being redeveloped into a boutique concert venue with a capacity of 5,500 persons to be scheduled with at least 25 concert events per year sponsored by Live Nation. (The venue could host other, non-Live Nation-related events seasonally as well.) Construction and renovation activities commenced in July 2018 and are anticipated to be completed in spring 2019. When operational, the venue is anticipated to generate 1,246 jobs, with a mix of full- and part-time positions. The stadium opened in 1998 and is owned by the City of Bridgeport. The Bridgeport Bluefish, a member of the independent Atlantic League of Professional Baseball, played baseball at the stadium from 1998 to 2017.

Webster Bank Arena

The Webster Bank Arena, which hosts music, sports, and entertainment events, is a 10,000-seat multipurpose arena in the northeastern part of the study area on Main Street.

Other Recreational Facilities—University of Bridgeport Campus

The following other recreational facilities comprise the University of Bridgeport campus (University of Bridgeport n.d.):

- The Harvey Hubbell Gymnasium, on Waldemere Avenue is a 1,600-person-capacity gymnasium, home to University of Bridgeport's men's and women's basketball teams and women's volleyball team.
- The Wheeler Recreation Center is a recreational and fitness center for students, facility and greater Bridgeport community.
- Mertens Theater is a 938-seat performing arts theater on University Avenue that includes teaching, rehearsal, and performance spaces.

4.15.3 Environmental Consequences

4.15.3.1 No Action Alternative

Under the No Action Alternative, some of the proposed parks, including the Pequonnock River Trail extension, will still be constructed; however, these projects have not yet been funded. As part of the University of Bridgeport Campus Master Plan, athletic fields will be relocated; however, there will be no change in the amount of recreational space. The existing basketball court in the existing Marina Village will be demolished under the No Action Alternative and will not be supplemented or replaced by the amenities associated with the proposed stormwater facility's construction as part of the RBD Pilot Project. The northwestern area of the South End will continue to be underserved by open space, parks, and recreational facilities. Therefore, the No Action Alternative will not result in impacts to existing open space and recreation in the area, but will result in long-term, moderate, negative impacts to open space and recreation opportunities in the future, since no new green space or passive recreational space will be created to serve the residents and visitors of the South End community.

4.15.3.2 Proposed Action

Under the Proposed Action there would be a beneficial impact to parks, open space, and recreational facilities. There would be modifications to the entrance to Seaside Park at University Avenue but no adverse impact to the resource or to the community's access to the park. The stormwater facility that would be constructed as part of the RBD Pilot Project would provide a new open space resource to an underserved section of the South End.

RBD Pilot Project

There are no open space resources within the RBD Pilot Project footprint, except for the basketball court at the former Marina Village site, which will be demolished under the No Action Alternative as well.

Implementing the RBD Pilot Project would result in significant, permanent, and positive impacts to open space and recreation in the South End neighborhood. As shown in Figure 4.15-3, the proposed stormwater facility would be constructed between the proposed Johnson Street extension and Ridge Avenue. As presently designed, the facility would provide green space that would be publicly accessible and would incorporate passive recreational space in the forms of benches and picnic areas, as well as potential active recreational space in the forms of a splash pad, a perimeter pedestrian/bike path, small playing fields, and children's play equipment.

Implementing the proposed RBD Pilot Project would ultimately result in permanent, beneficial impacts to open space and recreation by providing a green space for passive recreational use serving the residential areas immediately surrounding the proposed stormwater facility.

Flood Risk Reduction Project

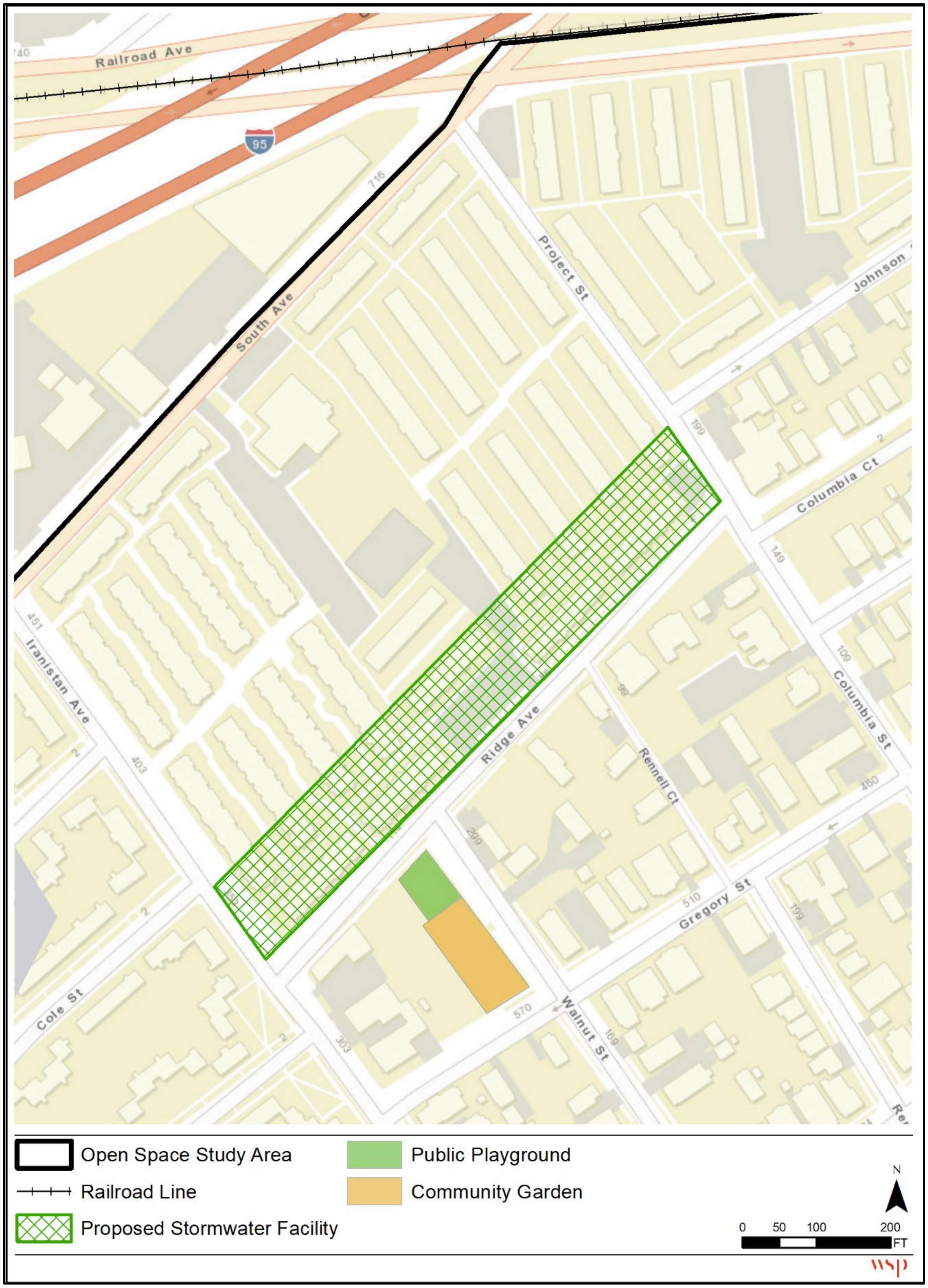
As part of the Flood Risk Reduction Project, University Avenue would be elevated, resulting in a modification to the entrance to Seaside Park at University Avenue between Broad Street and Main Street. This modification would not block the entrance to the park or any of the park amenities. One design option under consideration would dead-end Main Street at University Avenue. Pedestrians would be able to continue south to enter Seaside Park via stairs and handicap-accessible ramps incorporated into the design of the elevated University Avenue. As discussed in Section 4.5, Urban Design and Visual Resources, the elevated road would not block any existing views of the waterfront from the north for travelers using either Broad Street or Main Street, or those who live and work in the adjacent homes and businesses along Broad Street, Main Street, and University Avenue.

The north-south segment of the proposed coastal flood defense system (either Western or Eastern Option from 60 Main Street to the railroad viaduct) would have no impact to open space or recreational resources. There would be no change in the amount of open space or recreational areas and no direct change to the number of residents served by the existing resources. The design of an elevated University Avenue would allow for construction of future amenities (e.g., benches, landscaping, water features) adjacent to the roadway by the University of Bridgeport, which would provide an opportunity for beneficial impacts to open space.

Resilience Center

Renovating the Freeman Houses to serve as the Resilience Center would not affect open space and recreational resources in the South End. With the construction of a design element north of Seaside Park at University Avenue as part of the Resilience Center, educational and emergency services would be integrated into the South End community. These improvements would provide an educational resource to the community and would not affect access to the park's amenities or reduce the amount of open space available to the public.

Figure 4.15-3. RBD Pilot Project: Proposed Parks and Open Space



4.16 AIR QUALITY & GREENHOUSE GAS EMISSIONS

Air quality is a general term used to describe pollutant levels in the atmosphere. The Proposed Action would create a new road and modify an existing road network, affecting traffic and bringing traffic emissions closer to sensitive land uses. These actions may have an adverse effect on the local air quality. The Proposed Action's potential impact on local air quality was evaluated near the affected intersections and sensitive land uses. Additionally, emissions from construction equipment, construction trucks and construction activities could elevate air quality levels during construction. This chapter summarizes the Proposed Action's air quality analysis for construction and operations.

4.16.1 Methodology and Regulatory Context

4.16.1.1 Applicable Air Quality Standards

Following requirements of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) has promulgated National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to the public health and environment. The CAA established two types of national air quality standards. Primary standards set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called "criteria" pollutants (Table 4.16-1): carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), particulate matter (in two sizes: smaller than 10 and 2.5 microns in the aerodynamic diameter, PM_{10} and $PM_{2.5}$, respectively), and sulfur dioxide (SO_2).

In Bridgeport, as in other urban areas, motor vehicle activity predominantly influences ambient concentrations of CO, hydrocarbons, and O_3. Nitrogen oxides are emitted from both mobile and stationary sources; sulfur oxides are associated mainly with stationary sources; and particulate matter emissions are associated with stationary sources and, to a lesser extent, with diesel-fueled mobile sources (e.g., heavy trucks and buses).

Greenhouse gases refers to a variety of gases in the Earth's atmosphere that react with sunlight in a way that influence global air temperature. Greenhouse gases (GHGs) include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride.[18] These GHGs are typically reported in units of carbon dioxide equivalent (CO_2e). Research has shown a direct correlation between fuel combustion and GHG emissions. Estimated GHG emissions are identified, but are not assigned a significance impact level due to the regional nature of their impact.

4.16.1.2 Regulatory Setting

Pursuant to the CAA, the EPA designates nonattainment areas, which are geographical regions that do not meet one or more of the NAAQS. Maintenance areas are defined as previously having nonattainment status and have an EPA-approved plan to maintain attainment. Fairfield County is designated as a moderate nonattainment area for O_3 as part of New York-New Jersey-Long Island-Connecticut metropolitan region.

[18] *www.epa.gov/ghgemissions/overview-greenhouse-gases*

Fairfield County is in maintenance status for 8-hour CO and for 24-hour $PM_{2.5}$ standards also as part of the metropolitan region designation.

Table 4.16-1. National and State Air Quality Standards

POLLUTANT	PRIMARY/ SECONDARY	AVERAGING TIME	LEVEL	FORM
Carbon Monoxide (CO)	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	Primary and Secondary	Rolling 3-month average	0.15 µg/m3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	1 year	53 ppb(2)	Annual Mean
Ozone (O_3)	Primary and Secondary	8 hours	0.070 ppm(3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	Primary	1 year	12.0 µg/m3
		Secondary	1 year	15.0 µg/m3
		Primary and Secondary	24 hours	35 µg/m3
	PM_{10}	Primary and Secondary	24 hours	150 µg/m3
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb(4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards additionally remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.
(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a State Implementation Plan call under the previous SO_2 standards (40 CFR 50.4(3)). A State Implementation Plan call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.
ppm = parts per million; ppb = parts per billion; µg/m3 = micrograms per cubic meter of air

4.16.1.3 Conformity Rule

The CAA Amendments of 1990 directs the EPA to implement environmental policies and regulations that will ensure acceptable levels of air quality. Section 176(c)1(A) of the CAA defines conformity as follows:

> Conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards; and that such activities will not:
>
> - Cause or contribute to any new violation of any NAAQS in any area;
> - Increase the frequency or severity of any existing violation of any NAAQS in any area; or
> - Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

4.16.1.4 Pollutants of Concern

Of the six criteria pollutants, CO and particulate matter are considered to be the pollutants of concern for the mobile source component of the Proposed Action. NO_2 and SO_2 ambient concentrations would not be affected by the change in mobile source emissions associated with the Proposed Action's operations, but could be affected by construction activities. The Proposed Action would not likely significantly affect Pb concentrations. NO_2, SO_2 and Pb emissions analysis was not warranted. Regional emissions would not be significantly affected by the changes in local mobile source emissions from the Proposed Action and therefore were not evaluated.

4.16.2 Affected Environment

Table 4.16-2 summarizes representative monitored ambient air quality data for the Fairfield County study. These data are provided on the EPA AirData database for year 2017, the latest full year for available data. Monitored levels are the highest pollutant levels recorded during the 2017 calendar year. The monitoring site in Fairfield County in Bridgeport (Roosevelt School Park Avenue) is just north of I-95 and the study area. CO, PM_{10}, $PM_{2.5}$ and SO_2 are monitored at this location. O_3 and NO_2 readings were taken from the Westport, CT, monitoring station also in Fairfield County. Concentrations of all pollutants except O_3 were below respective NAAQS. The highest O_3 concentration monitored in Fairfield County was above the NAAQS level in 2017. Exceeding the level of the ambient air quality standard does not in all cases constitute a violation of the standard because of the form of the exceeded standards. The design value for each pollutant is the calculated concentration that is comparable to the standard. For O_3, the design value is the fourth-highest daily maximum averaged over three years. However, Fairfield County is designated as moderate nonattainment area for the 8-hour O_3 standard as part of the bigger New York-New Jersey-Long Island-Connecticut metropolitan area. Sherwood Island State Park monitored data supports the nonattainment designation.

Table 4.16-2. Representative Ambient Air Quality Data (2017)

POLLUTANT	MONITOR	AVERAGING TIME	HIGHEST CONCENTRATION	NAAQS
O_3	Sherwood Island State Park, Westport	8-hour	0.097 ppm	0.070 ppm
CO	Roosevelt School Park Avenue, Bridgeport	1-hour	1.9 ppm	35 ppm
		8-Hour	1.5 ppm	9 ppm
NO_2	Sherwood Island State Park, Westport	1-Hour	39 ppb	100 ppb
SO_2	Roosevelt School Park Avenue, Bridgeport	1-Hour	4.8 ppb	75 ppb
PM_{10}	Roosevelt School Park Avenue, Bridgeport	24-Hour	32 µg/m3	150 µg/m3
$PM_{2.5}$	Roosevelt School Park Avenue, Bridgeport	24-Hour	22.8 µg/m3	35 µg/m3
		Annual	6.9 µg/m3	12 µg/m3

Source: EPA Airdata Database: https://www.epa.gov/outdoor-air-quality-data

4.16.3 Environmental Consequences

4.16.3.1 No Action Alternative

Traffic under the No Action Alternative is expected to increase as a result of the natural growth of the existing conditions without implementing resiliency measures that constitute the Proposed Action. Two traffic studies were conducted for the RBD Pilot Project (concentrated on the area of the former Marina Village) and for the Flood Risk Reduction Project (focused on the area around University Avenue and Main Street) (see Appendix D). Both studies examined the No Action Alternative condition for the different areas, incorporating traffic generated by background growth and known development projects (i.e., 60 Main Street and Windward Development).

The RBD Pilot Project area includes intersections between Park and Iranistan Avenues from South Avenue to Gregory Street. Of the analyzed 10 intersections, three have signals and the remaining seven are controlled by stop signs. The unsignalized intersections will remain largely at the same level-of-service (LOS) A or B under the No Action Alternative compared to existing conditions in the AM and PM peak hours. The signalized intersections also will not change level-of-service from existing conditions. Two of the three signalized intersections are at LOS B and will remain at this level-of-service with similar delays under the No Action Alternative. One intersection is at LOS D in the AM and LOS C in the PM hour in the existing condition. The levels-of-service will not change under the No Action Alternative, but delays will increase by 25 percent in the PM and by 41 percent in the AM.

Several intersections were analyzed in the Flood Risk Reduction Project area under the No Action Alternative. These intersections cluster along Lafayette Street and at Broad and Main Streets, where they intersect with Atlantic Street and University Avenues. All these intersections are unsignalized under existing conditions and will remain controlled by the stop sign in the same way under the No Action Alternative. The level-of-service predicted in the study operate at LOS A and will remain at LOS A for the No Action Alternative in both peak AM and PM hours. Delays at these intersections will also stay at the level very close to the delays for existing conditions.

EPA Guidelines for Modeling CO from Roadway Intersections (EPA 1992) and 40 CFR 93.123 (a)(1)(ii) state that based on modeling, only intersections at LOS D or worse could affect CO concentrations. All intersections within the Flood Risk Reduction Project area and most of the intersections within the RBD Pilot Project area are at LOS C or better. The CO concentrations near these intersections will not be of concern. The only intersection that is LOS D in the AM peak hour (South Street and Railroad Avenue) has low volume under the No Action Alternative and is not likely to cause an exceedance of the CO standard, especially considering that the background concentrations are a small fraction of the standard levels and have been very low in the recent years (see Table 4.16-2).

The particulate matter levels are affected when a significant number of diesel vehicles are introduced by a project. This is not the case in the Proposed Action. In summary, the No Action Alternative will not have a potential for a significant impact on air quality.

4.16.3.2 Proposed Action

The Proposed Action operational impacts would be mostly from the changes in traffic patterns that would affect intersections in the neighborhood. In addition, although not part of the Proposed Action, the future condition would include the same increase in traffic from both background growth and the proposed developments at 60 Main Street and the Windward Development as the No Action Alternative. There would be no direct increase in traffic as a result of the Proposed Action. The screening analysis conducted for the affected intersections demonstrated no significant impacts on CO, particulate matter concentrations, or GHGs under the Proposed Action.

Constructing the projects that constitute the Proposed Action could adversely affect the localized air quality levels; however, due to the relatively small scale and short duration of construction and with the implementation of proposed mitigation measures, the Proposed Action is not expected to significantly affect air quality.

Construction would cause an irreversible increase in GHGs, but the increase would be small and insignificant compared to the regional scale that GHGs are measured.

RBD Pilot Project

Under the RBD Pilot Project, Johnson Street would be extended west from Columbia Street to Iranistan Avenue as a two-way street. In the future, as a separate project, it is assumed that the former Marina Village site would be redeveloped; the existing apartment buildings will be demolished and a new mixed-used complex constructed. Development at the former Marina Village site is not part of the Proposed Action, but the traffic volume generated by this development was accounted for in project's traffic model.

The level-of-service for the unsignalized study intersections under the Proposed Action would remain at LOS B or better. The new unsignalized intersections created by the Johnson Street extension would also have LOS B or better. The signalized intersections would not change from the No Action Alternative and would remain at LOS C or better for AM and PM peak hours at all intersections but one. The South Street and Railroad Avenue intersection would have LOS D in the AM peak hour with the same delay as under the No Action Alternative. As with the No Action Alternative, the impact of this intersection is not expected to have a potential to significantly affect the air quality in the vicinity.

Constructing the RBD Pilot Project would involve earth-moving activities, require use of heavy construction equipment, and last for approximately 16 months. The construction-related trucks would be added to the existing traffic in the neighborhood primarily along Iranistan Avenue, between I-95 and the staging area at the former Marina Village site. Some roads near the project area would be temporarily closed for short periods and would require diverting traffic. These activities would be temporary and relatively short in duration. Mitigation measures are proposed to ensure that constructing the RBD Pilot Project would not cause significant air quality impacts (see Section 4.16.3.3).

Flood Risk Reduction Project

Under the Proposed Action in the area of the Flood Risk Reduction Project, several street segments would be elevated (University Avenue, Broad Street, Soundview Circle, and Main Street under one option) and under one option Main Street would dead-end north of University Avenue. These would result in a minor reconfiguration of traffic patterns. There would be no direct increase in traffic as a result of the Proposed Action. In the future, although not part of the Proposed Action, traffic volume generated by the proposed development at 60 Main Street was taken into account in the traffic model for the Flood Risk Reduction Project.

The level-of-service with the Flood Risk Reduction Project (assuming Main Street dead ends at University Avenue) would be LOS B or better. That level-of-service should not have a potential to negatively affect CO levels in the area. The project would not generate any diesel traffic and therefore would not affect particulate matter levels in the vicinity.

Constructing the Flood Risk Reduction Project would involve the use of construction equipment, earth-moving operations, paving, temporary closure of streets to traffic, and additional construction-related trips on local streets. The scale of construction would not be large; the overall duration of the project would be no longer than 36 months, spread over the full alignment of the coastal flood defense system. The street closures would be temporary and the additional construction-related traffic would not significantly increase traffic volumes or affect levels of services at any intersections associated with the project. Mitigation measures are proposed for construction activities for the Flood Risk Reduction Project (see Section 4.16.3.3). As such, no significant air quality impacts are expected.

4.16.4 Mitigation Measures

To minimize temporary construction impacts, the following mitigation measures should be implemented:

- **Dust Control** - To minimize fugitive dust emissions from construction activities, a fugitive dust control plan, including a robust watering program, should be required as part of contract specifications. For example, all trucks hauling loose material could be equipped with tight-fitting tailgates and their loads securely covered prior to leaving the construction area; and water sprays could be used for all demolition, excavation, and transfer of soils to ensure that materials would be dampened as necessary to avoid the suspension of dust into the air.
- **Clean Fuel** – Ultra-low-sulfur-diesel[19] fuel would be used exclusively for all diesel engines used during construction.
- **Idling Restriction** - In addition to adhering to the local law restricting unnecessary idling on roadways, on-site vehicle idle time should be restricted to five minutes for all equipment and vehicles that are not using their engines to operate a loading, unloading, or processing device (e.g., concrete mixing trucks) or are otherwise required for the proper operation of the engine.
- **Best Available Tailpipe Reduction Technologies** – Nonroad diesel engines with a power rating of 50 horsepower (hp) or greater and controlled truck fleets (i.e., truck fleets under long-term contract with the project), including but not limited to concrete mixing and pumping trucks, could utilize the best available tailpipe technology for reducing diesel particulate matter emissions. Diesel particulate filters (DPFs) is the tailpipe technology proven to have the highest reduction capability. Construction contracts could specify that all diesel nonroad engines rated at 50 hp or greater would utilize DPFs, either installed by the original equipment manufacturer or retrofitted. Retrofitted DPFs must be verified by the EPA. Active DPFs or other technologies proven to achieve an equivalent reduction may also be used.
- **Utilization of Newer Equipment –** EPA's Tiers 1 through 4 standards for nonroad diesel engines regulate the emission of criteria pollutants from new engines, including particulate matter, CO, nitrogen oxides, and hydrocarbons. All diesel-powered nonroad construction equipment with a power rating of 50 hp or greater should meet at least the Tier 3 emissions standard.
- **Diesel Equipment Reduction** – Electrically powered equipment should be preferred over diesel-powered and gasoline-powered versions of that equipment to the extent practicable.

[19] The EPA required a major reduction in the sulfur content of diesel fuel intended for use in locomotive, marine, and nonroad engines and equipment, including construction equipment. As of 2015, the diesel fuel produced by all large refiners, small refiners, and importers must be ultra-low-sulfur-diesel fuel. Sulfur levels in nonroad diesel fuel is limited to a maximum of 15 parts per million.

4.17 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table 4.17-1 summarizes the direct and indirect impacts from the No Action Alternative and Proposed Action, for each of the resources analyzed.

4.17.1 Irreversible and Irretrievable Commitment of Resources

NEPA Section 102(2)(c)(v) and 40 CFR 1502.16 states that a project should consider the irreversible and irretrievable commitment of resources. This refers to the usage or loss of resources in a way that cannot be reversed after the project is implemented. This includes the commitment of natural, physical, human, and financial resources. This can include the use of non-renewable energy (such as fossil fuels to power construction equipment), commitment of land to alternative uses, or the extraction of mineral resources from the ground.

The Proposed Action is not anticipated to irreversibly utilize or commit a significant quantity of resources. Implementation of the Proposed Action would result in irreversible usage of resources in the forms of raw building materials (e.g., soils, concrete, asphalt, metals) for the construction of the projects as well as consumption of non-renewable energy (such as fossil fuels) to power construction equipment. Given the overall size of the project and duration of construction activities, these are not anticipated to substantially deplete available quantities of these resources.

A very small amount of land would be irretrievably used for the construction of the Proposed Action – for the construction of the north-south segment of the coastal flood defense system. For the Western Option, the flood wall would be entirely on public land. For the Eastern Option, an easement on private property would be required for construction and maintenance of the flood wall.

Construction of the Proposed Action would require a one-time expenditure of federal (and potentially state) funds, which are not retrievable. However, the combined result of the Proposed Action would be reduced flooding associated with regular rainfall events and storm surges, such that maintenance, repair, and replacement costs for both public and private development in the study area would be significantly reduced.

The short-term use of public funds, construction labor, fossil fuels for construction equipment, and the materials needed to build the Proposed Action would ensure the long-term gains to local residents, businesses, institutions, and public infrastructure by improving health and safety associated with flood risks, improving visual aesthetics, and encouraging economic redevelopment.

4.17.2 Unavoidable Significant Impacts

The Proposed Action would result in unavoidable significant adverse impacts Seaside Park – a National Register-listed historic resource. As described in Section 4.4.2, The entrance to Seaside Park would be redesigned to accommodate the increased elevation of University Avenue, to provide coastal flood defense to the eastern South End. In addition, the south ends of Broad Street and Main Street, along either side of the park entrance, would be elevated. The proposed changes to that section of Seaside Park would provide benefits, such as views of Long Island Sound and new pedestrian amenities. In addition, the adverse effects would be mitigated to the extent possible through measures agreed upon during ongoing agency and stakeholder consultation (see Section 4.4.4). The mitigation would reduce the severity of the adverse impact.

There would be no other unavoidable significant impacts as a result of the Proposed Action.

4.17.3 Growth Inducing Aspects of the Project

Growth inducing impacts and their assessment are described as:

> "…the likelihood that the proposed action will cause significant increases in local population and trigger further development by, for example, increasing employment opportunities, or providing utilities, public services, and other factors that allow or encourage people to move to an area."[20]

Examples of growth-inducing actions are those that would remove barriers or constraints to development so that significant increases in the local population or further development of the affected area could occur. Projects that create significant numbers of new jobs or that attract large numbers of new visitors to an area could also potentially result in significant increases in local population due increased demand for goods and services, including housing and shopping opportunities.

As described in Chapter 2, "Purpose and Need," two of the primary targeted outcomes of the Proposed Action is to lower the risk of acute and chronic flooding and to provide dry egress during emergencies. An additional benefit that was identified was potentially unlocking development or public realm opportunities.

The Proposed Action would unlock development potential within the South End by providing dry egress to two different sites (required for residential development that uses State funds) and by constructing a coastal flood defense system that would remove between 39 and 64 acres of land from the 1-percent annual chance floodplain. This undertaking is anticipated to have the secondary effect of making the South End more attractive to private investment, potentially facilitating new development resulting in increased residential populations and businesses / business activity.

The South End currently has many vacant lots and developed lots that are underutilized. Future development would be required to follow Bridgeport's zoning regulations and master plan (currently being updated). As such, the induced development resulting from the Proposed Action would not represent growth beyond what is currently legally permissible within the study area.

[20] *Environmental Impact Review in New York* (1990).

Table 4.17-1. Summary of Environmental Consequences

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION: RBD PILOT PROJECT	PROPOSED ACTION: FLOOD RISK REDUCTION	PROPOSED ACTION: RESILIENCE CENTER
Land Use, Zoning and Public Policy	■ **Direct:** No impact. ■ **Indirect**: Regular flooding will continue and increased risk due to sea level rise and higher frequency of storm events will result in indirect adverse impact on land use. ■ Inconsistent with public policies related to improving coastal resiliency and reducing community vulnerability.	■ **Direct:** No adverse impacts. No changes to land use or zoning. ■ **Indirect**: Long-term indirect benefits to existing land uses from added dry egress and green space, and reduced flood risk. ■ Consistent with public policies related to improving coastal resiliency and reducing community vulnerability.	■ **Direct:** No significant adverse impacts. No changes to land use under Western Option; easement on private property required for Eastern Option. No changes to zoning. ■ **Indirect**: Long-term indirect benefits to existing land uses from added dry egress and reduced flood risk. ■ Consistent with public policies related to improving coastal resiliency and reducing community vulnerability.	■ **Direct:** No adverse impacts. No changes to land use or zoning. ■ **Indirect**: No impacts. ■ Consistent with coastal resiliency goal of the City of Bridgeport.
Socioeconomics	■ **Direct:** No Impact. ■ **Indirect**: Regular flooding will continue and increased risk due to sea level rise and higher frequency of storm events will continue adverse trends of low vacancy rates and residential and commercial disinvestment in the study area.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ■ **Indirect**: Long-term indirect benefits to residents and businesses by facilitating construction of Phase II of Windward Development public housing and promoting investment in the area.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ■ **Indirect**: Long-term indirect benefits to residents and businesses by facilitating development of 60 Main Street and promoting investment in the area by decreasing area of flood risk by 39 acres (Western Option) to 64 acres (Eastern Option).	■ **Direct:** Minor, temporary impacts may occur during construction. ■ **Indirect**: No indirect impacts to residents and businesses.

Table 4.17-1. Summary of Environmental Consequences (continued)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Environmental Justice	■ **Direct:** No Impact. ■ **Indirect:** Continued and increased risk of acute and chronic flooding would have an adverse indirect impact on EJ populations. Future development, including low-income housing, would be limited and/or delayed. Businesses with EJ employees may experience adverse impacts due to flooding.	■ **Direct:** No significant direct adverse impacts. Temporary impacts to air quality, noise and transportation during construction. Following construction, direct beneficial impacts to traffic and open space. No disproportionate adverse impacts to EJ communities. ■ **Indirect:** Long-term indirect benefits to the EJ community with dry egress and stormwater improvements that would facilitate construction of low-income housing.	■ **Direct:** No significant direct adverse impacts. Temporary impacts to air quality, noise and transportation during construction. Following construction, adverse impacts to visual resources. No disproportionate adverse impacts to EJ communities. ■ **Indirect:** Long-term indirect benefits to the EJ community with dry egress and reduced flood risk that would provide additional housing and commercial options for EJ populations.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. Direct benefits following construction by providing a community facility and improving public safety and visual resource. No disproportionate impacts to EJ communities. ■ **Indirect:** Long-term indirect benefits to the EJ community through resiliency education and restoring African-American resource.
Cultural Resources	■ **Direct:** No direct Impact. ■ **Indirect:** Adverse indirect impact to historic and archaeological resources through increased risk from flooding and sea level rise.	**Direct:** No direct adverse impacts to historical architecture. Potential adverse impacts to archaeological resources to be mitigated through additional investigation and monitoring. ■ **Indirect:** Long-term indirect benefits by protecting resources from future flooding events.	■ **Direct:** Direct adverse impact to National Register listed Seaside Park to be mitigated with agreement from consulting parties. Potential adverse impacts to archaeological resources to be mitigated through additional investigation and monitoring. ■ **Indirect:** Long-term indirect benefits by protecting resources from future flooding events.	■ **Direct:** Direct beneficial impact to the NR-listed Freeman Houses. Potential adverse impacts to archaeological resources to be mitigated through additional investigation and monitoring. ■ **Indirect:** No indirect impacts.

Table 4.17-1. Summary of Environmental Consequences (continued)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Urban Design and Visual Resources	■ **Direct:** No direct impact. ■ **Indirect**: Minor indirect impact as Freeman Houses would continue to deteriorate.	■ **Direct:** Temporary impacts may occur during construction. Beneficial impacts to the overall viewshed and Seaside Village with construction of stormwater facility. ■ **Indirect**: Beneficial indirect impacts due to construction of new development in place of dilapidated buildings.	■ **Direct:** Temporary impacts may occur during construction. No significant adverse impacts. Some obstructed views of Seaside Park; improved aesthetics along University Avenue and from elevated view of waterfront, as well as new landscaping features. **Indirect**: No indirect impact.	■ **Direct:** Temporary impacts may occur during construction. Beneficial impacts to the viewsheds near the Freeman Houses and Seaside Park entrance. ■ **Indirect**: No indirect impact.
Hazardous Materials	■ **Direct:** No direct impact. ■ **Indirect**: Potential indirect impact from flooding that may release hazardous materials from disturbed soils.	**Direct:** Direct adverse impacts during construction due to disturbance of contaminated soil or groundwater would be mitigated through BMPs. No adverse impacts in the long-term. ■ **Indirect**: Indirect benefits to public health from removal and disposal of contaminated materials.	**Direct:** Direct adverse impacts during construction due to disturbance of contaminated soil or groundwater would be mitigated through BMPs. No adverse impacts in the long-term. ■ **Indirect**: Indirect benefits to public health from removal and disposal of contaminated materials.	■ **Direct:** Limited adverse impacts may occur during construction. ■ **Indirect**: No indirect impact.
Noise and Vibration	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** Mitigation measures would be implemented to minimize the temporary impacts that may occur during construction. No long-term direct impacts. ■ **Indirect**: Minor adverse indirect impact from traffic generated by Windward Development on new Johnson Road extension.	■ **Direct:** Mitigation measures would be implemented to minimize the temporary impacts that may occur during construction. No long-term direct impacts. ■ **Indirect**: Minor adverse indirect impact from traffic generated by 60 Main Street development with reconfigured street network.	■ **Direct:** Temporary, less-than-signficant impacts may occur during construction that may be mitigated with BMPs. No long-term direct impacts. ■ **Indirect**: No indirect impact.

Table 4.17-1. Summary of Environmental Consequences (continued)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Natural Resources	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** Minor adverse impacts to ecological communities resulting from repair and recommissioning work at Outfall E. No effect to T&E species. Long-term beneficial impact from trees and vegetation planted for stormwater facility. ■ **Indirect**: Long-term indirect benefits from expansion of the urban forest canopy and reduction of the pollutant load entering aquatic environments.	**Direct:** Temporary impacts may occur during construction. Minor (Eastern Option) to moderate (Western Option) adverse impacts due to removal of street trees and repair of existing outfall(s). ■ **Indirect**: Long-term indirect benefits from reduction of the pollutant load entering aquatic environments.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ■ **Indirect**: No indirect impacts.
Geology and Soils	■ **Direct:** No direct impact. ■ **Indirect**: Indirect adverse impact as a result of turbidity and sedimentation caused by soil erosion from continued and increased flooding.	■ **Direct:** Temporary adverse impact during construction from excavation and filling. ■ **Indirect**: Long-term indirect benefits due to decrease in impervious surface and increase in vegetated area.	■ **Direct:** Temporary adverse impact during construction from excavation and filling. ■ **Indirect**: Long-term benefits from reduced flood risk that would stabilize geologic conditions and soils.	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.
Hydrology and Flooding	■ **Direct:** No direct Impact. ■ **Indirect**: Compared to the Build Alternative, more intense rainfall over time from climate change could have direct potentially significant adverse impacts on hydrology and flooding in the study area.	■ **Direct:** No significant direct adverse impacts. Long-term beneficial impacts from dry egress and stormwater improvements. ■ **Indirect**: No indirect impacts.	■ **Direct:** No significant direct adverse impacts. Long-term beneficial impact with reduced flooding risk to 39 acres (Western Option) to 64 acres (Eastern Option). ■ **Indirect**: No indirect impacts.	■ **Direct:** No direct Impacts. ■ **Indirect**: No indirect impact.

Table 4.17-1. Summary of Environmental Consequences (continued)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Water Resources	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.	▪ **Direct:** Temporary adverse impact during construction. No significant direct adverse impacts. Long-term beneficial impacts to Cedar Creek due to stormwater improvements. ▪ **Indirect**: Long-term indirect benefits to surrounding water bodies.	▪ **Direct:** Temporary adverse impact during construction. No significant direct adverse impacts. Long-term beneficial impacts to Bridgeport Harbor due to stormwater improvements. ▪ **Indirect**: Long-term indirect benefits to surrounding water bodies.	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.
Coastal Zone	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact. ▪ Consistent with the Connecticut Coastal Management Act	▪ **Direct:** No long-term direct adverse impacts. Reduced impervious surface and improved infiltration rates and enhanced visual quality. Temporary impacts may occur during construction because of work within the Coastal Zone. ▪ **Indirect** Long-term indirect benefits due to reduced occurrence of CSO events. ▪ Consistent with the Connecticut Coastal Management Act	▪ **Direct:** No long-term significant direct adverse impacts. Impacts to vegetation. Reduced area of coastal flooding hazard (39 acres with Western Option; 64 acres with Eastern Option) and reduced discharge to surface waters. Temporary impacts may occur during construction because of work within the Coastal Zone. ▪ **Indirect**: Long-term indirect benefits due to improved drainage, reduced occurrence of CSO events, and improvements to water quality. ▪ Consistent with the Connecticut Coastal Management Act	▪ **Direct:** No direct adverse Impacts. ▪ **Indirect**: No indirect impacts. ▪ Consistent with the Connecticut Coastal Management Act

Table 4.17-1. Summary of Environmental Consequences (continued)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Infrastructure	▪ **Direct:** No direct impact. ▪ **Indirect**: Increased coastal storm events and local flooding could have potentially significant adverse indirect impacts to sanitary sewer, utilities and transportation.	▪ **Direct:** No significant direct adverse impacts to utilities and infrastructure. Temporary impacts may occur during construction including temporary disruption of utility services service and road closures. Long-term benefits to stormwater infrastructure. ▪ **Indirect**: Minor indirect impacts associated with increased usage from future development.	▪ **Direct:** No significant direct adverse impacts to utilities and infrastructure. Temporary impacts may occur during construction including temporary disruption of utility services service and road closures. Long-term benefits to stormwater infrastructure, and under the Eastern Option, long-term benefits to utility providers. ▪ **Indirect**: Minor indirect impacts associated with increased usage from future development.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ▪ **Indirect**: No indirect impacts.
Community Facilities and Services	▪ **Direct:** No direct impact. ▪ **Indirect**: No indirect impact.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ▪ **Indirect**: Long-term, beneficial impacts to public health and safety with dry egress.	▪ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction. ▪ **Indirect**: Long-term beneficial impacts to public health and safety with dry egress and coastal flood defense system.	▪ **Direct:** Direct beneficial impacts with new community facility within rehabilitated Freeman Houses. ▪ **Indirect**: Long-term beneficial impacts to public health and safety from added emergency relief infrastructure.

Table 4.17-1. Summary of Environmental Consequences (continued)

RESOURCE	NO ACTION ALTERNATIVE	PROPOSED ACTION		
		RBD PILOT PROJECT	FLOOD RISK REDUCTION	RESILIENCE CENTER
Open Space and Recreation	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** No significant direct adverse impacts. Long-term benefits from increased open space (stormwater facility). ■ **Indirect**: No indirect impact.	■ **Direct:** No significant direct adverse impacts. Temporary impacts may occur during construction including disruption to access to Seaside Park. In the long-term, changes to Seaside Park entrance would not adversely impact access. ■ **Indirect**: Long-term benefits to open space as elevating University Avenue would allow installation of future amenities.	■ **Direct:** No significant direct adverse impacts. Direct beneficial impact with construction of design element near entrance to Seaside park. ■ **Indirect**: No indirect impact.
Air Quality and Greenhouse Gas Emissions	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.	■ **Direct:** No long-term direct impacts. Temporary adverse impacts may occur during construction due to usage of construction equipment and construction related traffic. ■ **Indirect**: Impact from indirect increase in traffic from future development is not expected to have a potential to significantly affect the air quality in the vicinity.	■ **Direct:** No long-term direct impacts. Temporary adverse impacts may occur during construction due to usage of construction equipment and construction related traffic. ■ **Indirect**: Impact from indirect increase in traffic from future development is not expected to have a potential to significantly affect the air quality in the vicinity.	■ **Direct:** No direct impact. ■ **Indirect**: No indirect impact.

4.17.4 Mitigation Measures and Best Management Practices

The Proposed Action would have potentially adverse impacts on multiple technical resources areas. Numerous mitigation measures and Best Management Practices (BMPs) have been identified to reduce potential adverse impacts that could result from the Proposed Action.

4.17.4.1 Cultural Resources

Based upon mitigation measures that were developed and approved for similar projects in the past, appropriate mitigation measures for this project could include the following:

- Pre-construction documentation of historic resources that would be significantly altered, such as the following:
  - A new National Register nomination for Seaside Park as a cultural landscape, and/or documentation of Seaside Park in the Historic American Landscape program.
  - A historic structures report for the Freeman Houses preparatory to its rehabilitation.
- Designs for new elements that will be visually compatible with adjacent historic properties.
- Relocation and rehabilitation of the Henry Bergh monument in Seaside Park, restoring its fountain to working order.
- Interpretive installations in Seaside Park for the public and other educational programs, focusing on the park's history, changing uses, engineering projects, and resiliency.

For archaeological resources, mitigation measures will be refined once the types and significance of archaeological resources in the APE are known and the project impacts to those resources are defined. Typical mitigation measures include terrestrial and/or underwater archaeological data recovery programs, public education, and paleoenvironmental reconstruction using geoprobe, vibracore, and manual soil core data.

Archaeological data recovery programs, comprising the removal of all or part of a site, would be appropriate in areas where significant archaeological sites will be impacted, if those areas are accessible and safe to excavate (i.e., not contaminated). All data recovery programs would be prepared in consultation with CTDOH, CTSHPO, and the interested THPOs.

Mitigation in the form of a public education program could include information about the history, archaeology, and environment of the project area disseminated to the public through websites, museum exhibits, and public presentations.

4.17.4.2 Hazardous Materials

Several measures would be taken to mitigate risk and reduce potential impacts from hazardous materials, including the following:

- Completion of a follow-up Task 210: Subsurface Site Investigation (or equivalent Phase II sampling), as appropriate
- Development of site-specific plans/procedures (e.g., HASPs, SAMPs, etc.)

- Implementation of carefully selected BMPs (e.g., use of dust control measures, use of stockpile liners, etc.)
- Adherence to regulations regarding proper handling, management, storage, and transport of hazardous substances.

To reduce possible health and environmental risks from hazardous materials, a comprehensive soil/groundwater SAMP would be developed and implemented to effectively address contamination prior to the start of any construction activities. Based on the results of environmental sampling, a site-specific HASP would be implemented, further minimizing exposure risks associated with construction activities. An MMP would also be developed to address the relocation and/or off-site disposal of contaminants identified in soil and groundwater.

4.17.4.3 Noise and Vibration

Since potential noise or vibration impact conditions were identified during construction, mitigation measures would be implemented during construction, as appropriate. The potential effectiveness and cost of each mitigation measure would need to be assessed during the Proposed Action's final design.

The main source of concern from a construction noise and vibration perspective would be the use of pile drivers. Consequently, the following potential mitigation measures focus on reducing noise and vibration emissions from pile driving. Mitigation measures would vary depending on proximity to sensitive receptors as well as to existing structures and infrastructure, and could include the following:

- Use noise barriers along the edges of work zones.
- Use an alternative pile driving method such as hydraulic pile pushing system in specific locations.
- Use drilled caissons or slurry walls instead of piles in specific locations.
- Wrap the pile with noise curtains or bellow that collapse as the pile is driven in specific locations.
- Pre-trench the holes with a long-arm backhoe when work is close to tunnels, utilities, or other sensitive structures.
- Include a Noise Specification and a Vibration Specification in the contractor's bid documents.
- Require the contractor to develop a Noise and Vibration Control and Mitigation Plan based on proposed equipment and methods to document expected noise levels and noise control measures that would be implemented.
- Perform noise and vibration monitoring during construction to ensure the contractor is complying with specified thresholds.

4.17.4.4 Natural Resources

For the duration of planned construction work on outfalls, relevant federal and state regulations would be followed to ensure that significant consequences to ecological communities are avoided or suitably mitigated. As added protection for the threatened and endangered aquatic species in the vicinity of the study area (i.e., sea turtles and sturgeon), recommendations provided by NOAA Fisheries regarding harm mitigation measures, such as use of silt management and soil erosion best practices, would be applied during any in-water work or during any activities that could affect water resources. In addition, during the maintenance of existing outfalls, appropriate protective strategies, such as use of temporary erosion control fencing and storage of construction equipment away from the shoreline, would be implemented to preserve ecological communities (e.g., beach-dune complexes) potentially affected by proposed sewer system modifications.

To minimize anticipated impacts, seasonal tree-cutting restrictions would be developed based on avian breeding seasons, and additional mitigation measures (e.g., restoring affected landscapes, replacing uprooted trees, shielding undisturbed vegetation) near the project site would be implemented as necessary. In addition, protective measures would be taken to ensure that trees are safeguarded against adverse impacts associated with the construction process. For instance, the contractor would be required to station possible hazards (e.g., heavy equipment, vehicles) away from intact root systems. The contractor would also be responsible for effectively mitigating any damage to existing trees that would occur as a result of construction activities.

4.17.4.5 Water Resources and Water Quality

The Proposed Action would be designed to comply with the Connecticut CT WQS. No intentional use or discharge to groundwater is expected from project work and all necessary best management practices will be implemented to avoid unintentional groundwater use/discharge of untreated waters.

Water from dewatering would be sampled and handled/disposed of appropriately, in accordance with state and federal requirements.

Impacts to water quality from soil erosion would be mitigated through existing regulatory programs and controls and by use of best management practices. Stormwater runoff captured by the RBD Pilot Project would be pretreated by a series of grassed swales and rain gardens prior to discharge.

During the installation of a StormTech Chamber, or other large-scale subterranean features, erosion and sediment control mitigation measures must be implemented during construction. These measures can include vegetation, temporary sediment barriers such as silt fences, hay bales, fabric-wrapped catch basin grates, and strategic stormwater management. The StormTech Chamber manufacturer recommends the application of pipe plugs on the inlet-pipe until the unit is ready for service.

Connecticut has construction requirements for mitigation and management of stormwater and erosion. Stormwater runoff during the construction resulting from the project would be managed in accordance with the CTDEEP Stormwater Management Regulations.

4.17.4.6 Coastal Zone Management

Best management practices would be included in project design and construction plans for the RBD Pilot Project to minimize impacts to the tidal wetland vegetation present near Outfall E along Cedar Creek Reach. Similarly, the effects of any potential outfall work as part of the Flood Risk Reduction Project (such as sludge clearing or gate installation) would be suitably mitigated through a combination of BMPs and design choices. For example, where feasible, debris clearing would be conducted from an upland access point (e.g., a manhole) to reduce littoral sediment disturbance.

Appropriate erosion control measures, including use of removable sediment barriers (e.g., silt fences, hay bales) and planting of stabilizing vegetation, would be applied during those construction activities of the Proposed Acton that would require ground/soil disturbance (i.e., sewer pipe upsizing, force main installation, pump station construction, flood wall construction, flood gate installation) to sufficiently minimize expected impacts.

4.17.4.7 Infrastructure

The following mitigation measures and best management practices would be implemented to minimize impacts from the Proposed Action:

- Where the Proposed Action would cross or impact sewer lines or other utility lines, design accommodations would be implemented (for example hand excavations, use of jet grout seals or use of sleeves) to reduce impacts.
- Relocation of sewer and other utility lines would be considered only if other design solutions were impractical.
- A traffic management plan would be developed in order to minimize impacts on existing traffic patterns.
- Public outreach during construction would be implemented to notify the public of construction schedule, upcoming activities and potential impacts. As needed, construction project staff will reach out to local community groups to provide in-person updates on construction progress and potential impacts.
- Variable Message Signs could be used throughout the project area to warn motorists, pedestrians, and cyclists of changes in traffic patterns including road closures.

4.17.4.8 Air Quality

To minimize temporary construction impacts, the following mitigation measures should be implemented:

- **Dust Control** - To minimize fugitive dust emissions from construction activities, a fugitive dust control plan, including a robust watering program, should be required as part of contract specifications. For example, all trucks hauling loose material could be equipped with tight-fitting tailgates and their loads securely covered prior to leaving the construction area; and water sprays could be used for all demolition, excavation, and transfer of soils to ensure that materials would be dampened as necessary to avoid the suspension of dust into the air.
- **Clean Fuel** – Ultra-low-sulfur-diesel[21] fuel would be used exclusively for all diesel engines used during construction.
- **Idling Restriction** - In addition to adhering to the local law restricting unnecessary idling on roadways, on-site vehicle idle time should be restricted to five minutes for all equipment and vehicles that are not using their engines to operate a loading, unloading, or processing device (e.g., concrete mixing trucks) or are otherwise required for the proper operation of the engine.
- **Best Available Tailpipe Reduction Technologies** – Nonroad diesel engines with a power rating of 50 horsepower (hp) or greater and controlled truck fleets (i.e., truck fleets under long-term contract with the project), including but not limited to concrete mixing and pumping trucks, could utilize the best available tailpipe technology for reducing diesel particulate matter emissions. Diesel particulate filters (DPFs) is the tailpipe technology proven to have the highest reduction capability. Construction contracts could specify that all diesel nonroad engines rated at 50 hp or greater would utilize DPFs, either installed by the original

[21] The EPA required a major reduction in the sulfur content of diesel fuel intended for use in locomotive, marine, and nonroad engines and equipment, including construction equipment. As of 2015, the diesel fuel produced by all large refiners, small refiners, and importers must be ultra-low-sulfur-diesel fuel. Sulfur levels in nonroad diesel fuel is limited to a maximum of 15 parts per million.

equipment manufacturer or retrofitted. Retrofitted DPFs must be verified by the EPA. Active DPFs or other technologies proven to achieve an equivalent reduction may also be used.

- **Utilization of Newer Equipment –** EPA's Tiers 1 through 4 standards for nonroad diesel engines regulate the emission of criteria pollutants from new engines, including particulate matter, CO, nitrogen oxides, and hydrocarbons. All diesel-powered nonroad construction equipment with a power rating of 50 hp or greater should meet at least the Tier 3 emissions standard.
- **Diesel Equipment Reduction** – Electrically powered equipment should be preferred over diesel-powered and gasoline-powered versions of that equipment to the extent practicable.

4.17.5 Permits and Approvals

The Proposed Action must comply with federal, state and local regulatory approvals. The following is a list of potential regulatory approvals that the Proposed Action may require.

- **Federal**
  - Federal Emergency Management Agency (FEMA): Review of proposed flood protection components will require FEMA review for any potential changes to Flood Insurance Rate Maps (FIRM).
- **State**
  - CTDEEP Land & Water Resources Division (LWRD) Dam Safety Permit.
  - CTDEEP, LWRD Permit for Diversion of Waters of the State pursuant to section 22a-368 of the Connecticut General Statutes (CGS) and section 22a-377(c)-1 of the Regulations of Connecticut State Agencies (RCSA).
  - CTDEEP, Permitting & Enforcement Division, General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction (GP-015).
  - CTDEEP, LWRD General Permit Registration Form.
  - CTDEEP LWRD, Long Island Sound.
  - CTDEEP, Connecticut Coastal Management Act Consistency Review/Concurrence.
  - Certified as being in compliance with flood and stormwater management standards: Section 25-68d of the CGS and section 25-68h-1 through 25-68h-3 of the RCSA.
  - CT Call Before You Dig: Identification of utilities before performing any excavation.
- **Local and Municipal**
  - Bridgeport Municipal Separate Storm Sewer System (MS4).
  - City Building Permit: The Building Department issues permits and inspects work done to all buildings and structures.
  - City Electrical/Plumbing Permit: The Building Department issues permits and inspects work done to all buildings and structures.

- City Street and Sidewalk Excavation Permit: The Public Facilities Department issues permits to perform street and sidewalk excavation.
- City Sidewalk Permit: The Public Facilities Department issues permits for sidewalks.
- City Public Right-of-Way Occupancy: The Public Facilities Department issues permits to occupy the public right-of-way.
- City Planning and Zoning Commission Approval: Project may include zoning compliance and coastal site plan review.
- City Sewer Extension Approval: Approval for extension of a proposed connection to the sewer system must comply with Sewer Extension Conditions.
- City Council: Council resolution required for street discontinuance and/or acceptance for extension.
- City Board of Police Commissioners: Commission resolution required for change of streets from one-way to two-way.

Chapter 5 – Cumulative Impacts

Contents

Figures

5. Cumulative Impacts

5.1 METHODOLOGY AND REGULATORY CONTEXT

In accordance with 40 CFR § 1508.7, and as detailed in the Council on Environmental Quality guidance entitled Considering Cumulative Effects Under the National Environmental Policy Act (1997) and Section 22a-1a-3 of the Regulations of Connecticut State Agencies, the Connecticut Department of Housing must analyze the potential cumulative effects that may occur when considering the Proposed Action "when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." Cumulative effects may be accrued over time and in conjunction with other pre-existing effects from other activities in the study area. Therefore, previous impacts and multiple smaller impacts should also be considered. Overall, assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the Proposed Action to determine if they overlap in space and time.

The geographic scope of the cumulative impact analysis was identified as the same study area as each technical resource defined in Chapter 4. The timeframe for the analysis is from 2015 to 2025. This factors in recently completed projects, continues through the construction of the Proposed Action (to be completed by September 2022) and accounts for projects to be initiated immediately following the Proposed Action construction.

After identifying a comprehensive list of past, present and reasonably foreseeable future actions within the study area, the potential impacts from those actions were identified and then the magnitude of the cumulative impacts to each resource with potential adverse impacts was determined.

5.2 PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIONS

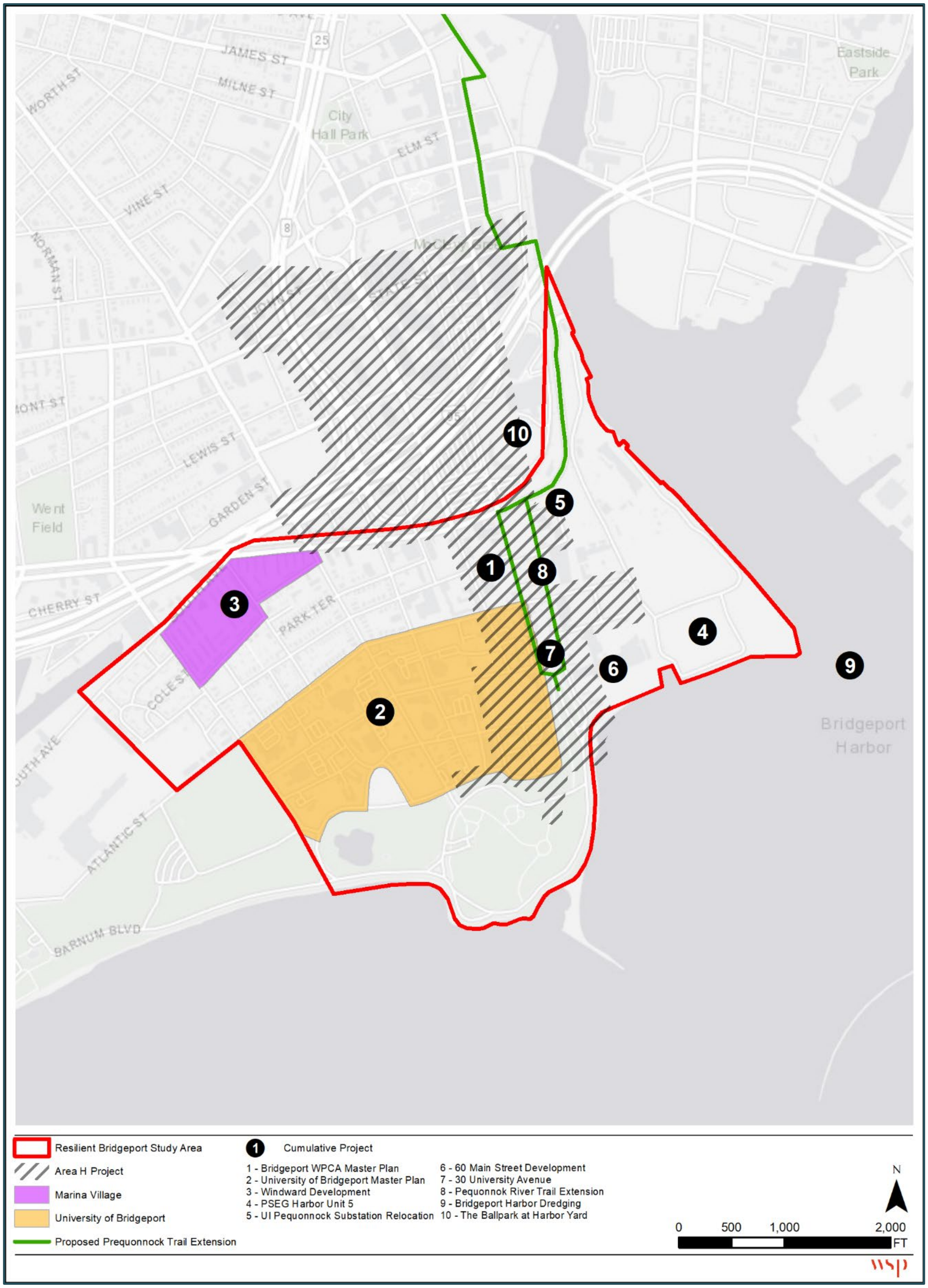
A comprehensive evaluation of available data was undertaken to determine recently completed, ongoing, and reasonably foreseeable future (RFF) projects within the study area for the Proposed Action. Various criteria were considered to identify projects likely to have the potential for contributing to cumulative effects, including the location within the Proposed Action's study area; whether they have the potential to significantly increase population or development density in or around the study area; relates directly to proposed flooding/stormwater controls or other resiliency measures that may affect the study area; and if they may affect environmental resources that would be affected by the Proposed Action, as described in Chapter 4, within a similar timeframe and/or geographic location.

Based on the above criteria, the following projects within or immediately adjacent to the study area were identified as potentially contributing to cumulative impacts for the Proposed Action (see Figure 5-1):

- *Bridgeport Water Pollution Control Authority (WPCA) Area H Project*: The WPCA has ongoing plans to separate the sanitary and stormwater systems in part of the South End of Bridgeport, referred to as the WPCA Area H Project, anticipated to be completed in 2021. The separation of sanitary and storm sewers will result in a separate system that would reduce the number of combined sewer overflow (CSO) events, as rainfall will be discharged through a parallel sewer system, alleviating capacity issues that result from wet weather flows entering the combined sewer system. Long-term beneficial impacts to water quality are anticipated, particularly due to a reduction of harmful bacteria discharged into the surface waters of Bridgeport Harbor and Long Island Sound. It is noted that this project will not change the combined sewer system that discharges into Black Rock Harbor and Cedar Creek Reach, and the same environmental conditions are expected to persist there with the implementation of the WPCA Area H Project.

- *University of Bridgeport Master Plan:* The University has a three-phase plan to be implemented over 20 years, which includes incorporating resiliency planning into proposed campus development, a new Health Sciences building, new Engineering Building, renovation of and addition to the Wheeler Recreation Center. The plan also includes the relocation of Campus Safety and Facilities, Engineering labs, School of Nursing, and the College of Chiropractic and Health Science and demolition of Norseman Hall, Milford Hall and North-South Hall. The near-term plan (to begin in the next couple of years) will construct new student housing, a Campus Safety and Facilities building, a student center, and an addition to the Hubbell Gymnasium. As with the initial phase, the near-term phase relocates and demolishes several buildings. The final long-term phase includes construction of new student housing, garages, mixed use buildings, and redesigns of the Wellness and Student Life Quads and phase two of University Promenade. Knight's Field and College of Chiropractics and Health Sciences will be relocated north of University Avenue.
- *Windward Development:* This is a multi-phase redevelopment of the former Marina Village site. Residents of Marina Village were relocated to other public housing as part of an earlier action. Next, demolition of the existing buildings on both parcels (38 brick residential buildings with multiple units and one community building) was initiated (Fuss & O'Neill, 2013; work still underway). Phase 1 is redevelopment of the triangular, easternmost parcel and consists of a four-story, 60-unit building with mixed-income guidelines, 48 for households with incomes up to 60 percent of Area Median Income, including 15 project-based Section 8 rental subsidies, 12 supportive units and 12 market-rate units. The ground floor 10,000 square feet medical clinic will be occupied by a new Southwest Community Health Center facility. They estimate a potential increase to 12,000 visits per year with the new facility. The estimated completion date is spring 2019. Phase 2, which will begin after completion of the proposed RBD Pilot Project, will complete the full build-out and will similarly include mixed-income residential and some commercial space.
- *Public Service Enterprise Group (PSEG) Harbor Unit 5*: A 485megawatt duel fuel, single train combined-cycle power plant, using a combustion turbine, a steam turbine and a heat recovery steam generator to power more than 500,000 homes. The plant is being constructed on a podium above the 0.2 percent annual chance Federal Emergency Management Agency flood level and is expected to come online in mid-2019. PSEG has agreed to retire the existing Harbor Unit 3 coal-fired power plant by July 1, 2021, as part of the Community Environmental Benefits Agreement.
- *United Illuminating (UI) Pequonnock Substation Relocation*: UI plans to relocate the existing Pequonnock Substation approximately 0.15-mile westward to 1 Kiefer Street, which includes the relocation of the existing transmission and distribution lines that connect to the substation. The construction is expected to begin in the third quarter of 2019 and be operational by the end of 2021.

Figure 5-1. Cumulative Projects Map



- *60 Main Street Development*: It is expected that the large site adjacent to the waterfront in the South End would be developed as mixed use in the near future. The former Remington Shaver facility is a brownfield site that is currently vacant. Development would increase the amount of impervious surface. For the purposes of the traffic analysis, the development was assumed to consist of two phases. Phase 1 of the development is assumed to include 250 new residential units and 20,000 square feet of retail space. Phase 2 is assumed to add close to 1,000 residential units. Any construction would begin after the coastal flood defense system that is part of the proposed Flood Risk Reduction Project is completed through the site.

- *30 University Avenue*: The 0.77-acre site is planned for future multifamily residential development. The building on the site was demolished in Summer 2018; however, the schedule for construction is unknown. Detailed plans for the site are not known at this time, but full build-out based on existing zoning would result in up to 150 residential units in a 5-story building.

- *Pequonnock River Trail Extension:* The Pequonnock River Trail is a partially complete 16.2 trail from the Long Island Sound at Bridgeport, Connecticut at its southern end to the Monroe-Newtown town line, of which approximately 10.2 miles have been constructed and another 3 miles of which have been designed. The Pequonnock River Trail Extension focuses on the remaining southern 3 miles within Bridgeport, which are required to complete the trail, a portion of which would be located within the study area of the Proposed Action. Within the study area, the Pequonnock River Trail Extension proposes one-way shared bike lines along Broad and Main Streets (running south and north, respectively) from Seaside Park at University Avenue to Ferry Access Road, continuing along Ferry Access Road northerly beyond the study area limits to the Bridgeport Ferry Terminal, before heading northwest to link up with existing Pequonnock River Trail infrastructure. Construction of the extension is anticipated to start in the summer 2019 and would last approximately 6 to 9 months, resulting in the trail being operational by spring 2020 at the latest.

- *Bridgeport Harbor Dredging:* In February 2010, the United States Army Corps of Engineers (USACE) released a Draft Environmental Impact Statement for Maintenance Dredging and Dredged Material Disposal at Bridgeport Harbor, a federal navigation channel that was last dredged in 1963, portions of which are now operating below the federally authorized depth of 35 feet. However, the original proposal including dumping dredged materials of various contamination levels at several open water sites in the Long Island Sound, the approval for which was never obtained. Per a quarterly Connecticut State Update Report from the New England District of the of the USACE dated June 30, 2018, the status of the project is described as follows:

  > "The city of Bridgeport has requested maintenance dredging of Bridgeport Harbor. In response to this request, the New England District performed a Preliminary Assessment for Bridgeport Harbor, which concluded that continued maintenance of Bridgeport Harbor is likely justified, but that a detailed Dredge Material Management Plan (DMMP) for Bridgeport Harbor should be developed. The state and city of Bridgeport have requested that dredging of the Black Rock Harbor Federal navigation project (in Bridgeport, Conn.) be included in the Bridgeport DMMP. Investigations are being conducted and the current draft DMMP and EA will be revised to include Black Rock Harbor. The revised draft DMMP and EA will then be sent out for Public Notice, coordinated with resource agencies, and then submitted for approval."

  A review of the previous USACE New England District quarterly Connecticut State update reports dating back to December 31, 2016 (the earliest update that was found in the USACE's records) reiterates this status report for the Bridgeport Harbor Dredging project virtually verbatim. As such, a timeframe for commencement of dredging and associated preparatory activities cannot be determined at this time, as well as whether such activities would overlap with those of the Proposed Action or other past, present and RFF projects. It is not expected that the dredging activities would conflict with the Proposed Action or RFF projects.

- *The Ballpark at Harbor Yard:* The former Ballpark at Harbor Yard, bounded by I-95 to the north, Broad Street to the west, and the railroad viaduct to the south and east, is currently being redeveloped into a boutique concert venue with a capacity of 5,500 persons to be scheduled with at least 25 concert events per year sponsored by Live Nation. The venue would potentially host other, non-Live Nation related events seasonally as well). Construction and renovation activities commenced in July 2018 and are anticipated to be completed in the spring of 2019. When operational, the venue is anticipated to generate 1,246 jobs, with a mix of full- and part-time positions. The events would generate short-term traffic spikes, primarily on I-95, Route 8 and north of the South End.

5.3 POTENTIAL CUMULATIVE IMPACTS

Cumulative impacts were determined based on the Proposed Action's impacts on technical resource areas (as determined in Chapter 4) when combined with impacts from the past, present and reasonably foreseeable projects in the study area. A summary of construction ("C") and operational ("O") impacts from each project within the Proposed Action (RBD Pilot Project, Flood Risk Reduction Project – Western Option, Flood Risk Reduction Project – Eastern Option, and Resilience Center) is presented in Table 5-1.

Table 5-1. Cumulative Impacts from Construction and Operation of the Proposed Action

Technical Resource Area	Proposed Project			
	RBD Pilot	Flood Risk Reduction – Western Option	Flood Risk Reduction – Eastern Option	Resilience Center
Land Use, Zoning and Public Policy	C: No Impact	C: No Impact		C: No Impact
	O: Long-term, beneficial	O: Long-term, beneficial		O: No Impact
Socioeconomics	C: Short-term, beneficial	C: Short-term, beneficial		C: Short-term, beneficial
	O: Long-term, beneficial	O: Long-term, beneficial		O: Long-term, beneficial
Environmental Justice	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: Less-than-significant, adverse
	O: Long-term, beneficial	O: Long-term, beneficial		O: Long-term, beneficial
Cultural Resources	C: Less-than-significant, adverse	C: Significant, adverse		C: Less-than-significant, adverse
	O: Long-term, beneficial	O: Long-term, beneficial		O: Substantial long-term, beneficial
Urban Design and Visual Resources	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: Less-than-significant, adverse
	O: Long-term, beneficial	O: No Impact		O: Long-term, beneficial
Hazardous Materials	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: Less-than-significant, adverse

	O: No Impact	O: No Impact		O: No Impact

Table 5-1. Cumulative Impacts from Construction and Operation of the Proposed Action (continued)

Technical Resource Area	Proposed Project			
	RBD Pilot	Flood Risk Reduction: Western Option	Flood Risk Reduction: Eastern Option	Resilience Center
Noise and Vibration	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: No Impact
	O: No Impact	O: No Impact		O: No Impact
Natural Resources	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: Less-than-significant, adverse
	O: Long-term, beneficial	O: Long-term, beneficial		O: No Impact
Geology and Soils	C: Less-than-significant, adverse	C: Less-than-significant, adverse		O: No Impact
	O: Long-term, beneficial	O: Long-term, beneficial		O: No Impact
Hydrology and Flooding	C: No Impact	C: No Impact		C: No Impact
	O: Substantial long-term, beneficial	O: Substantial long-term, beneficial (39 acres)	O: Substantial long-term, beneficial (64 acres)	C: No Impact
Water Resources	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: No Impact
	O: Long-term, beneficial	O: Long-term, beneficial		O: Long-term, beneficial
Coastal Zone	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: No Impact
	O: Long-term, beneficial	O: Long-term, beneficial		O: No Impact
Infrastructure	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: Less-than-significant, adverse
	O: Long-term, beneficial	O: Long-term, beneficial		O: No Impact
Community Facilities and Services	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: No Impact
	O: Long-term, beneficial	O: Long-term, beneficial		O: Long-term, beneficial
Open Space and Recreation	C: No Impact	C: Less-than-significant, adverse		C: No Impact
	O: Substantial long-term, beneficial	O: Long-term, beneficial		O: Long-term, beneficial
Air Quality and Greenhouse Gas	C: Less-than-significant, adverse	C: Less-than-significant, adverse		C: No Impact
	O: No Impact	O: No Impact		O: No Impact

A discussion of the anticipated cumulative effects, when considering the contribution and interaction of RFF projects and Proposed Action on each technical resource area, is presented below.

5.3.1 Land Use, Zoning, and Public Policy

5.3.1.1 Contribution of RFF Projects

The RFF projects are consistent with existing land use and zoning. The proposed development projects – Windward Development and 60 Main Street – are part of long-term development goals of the City of Bridgeport and were incorporated into recent zoning changes.

The number of people, jobs and housing in the South End is expected to increase over time. Cumulative development would be accompanied by area-wide increases in traffic, noise, air pollutant emissions, demands on public services and utilities. Such impacts are not exclusive to certain types of land use or particular projects, and would occur to some degree with any type of new development. Construction of the cumulative projects would occur over a long timeframe (full implementation is beyond the year 2025 temporal limit of this analysis) and the new development would not be at or near capacity (residential or commercial) for several years after construction. Growth itself, fostered by the Proposed Action and cumulative projects, would not result in a significant adverse impact. The WPCA Area H Project would improve drainage and reduce CSO events in the east side of the South End, benefiting future development in the area. Temporary land use impacts may occur during construction of any of the projects.

5.3.1.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of RBD Pilot Project on land use, zoning, and public policy are discussed in detail in Section 4.1.3.2. The RBD Pilot Project would not result in significant adverse cumulative impacts to land use and land use planning in the South End when added to the contribution of RFF projects. The RBD Pilot Project would enhance the resiliency in both acute and chronic flooding events to the area immediately adjacent to the Marina Village site, facilitating the development affordable housing and fulfilling long-term goals of the City of Bridgeport Master Plan, the *Natural Hazard Mitigation Plan* and *Waterfront Bridgeport: Bridgeport, Connecticut Waterfront Master Plan*. Temporary land use impacts may occur during construction of the RBD Pilot Project. Coordination with the City and other stakeholders to ensure cumulative impacts are not significant.

5.3.1.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of Flood Risk Reduction Project on land use, zoning, and public policy are discussed in detail in Section 4.1.3.2. The Flood Risk Reduction Project – Western Option would not result in significant adverse cumulative impacts to land use and land use planning in the South End when added to the contribution of RFF projects. The Flood Risk Reduction Project – Western Option is consistent with University of Bridgeport Campus Master Plan and, combined with the WPCA Area H Project, would enhance the resiliency of the eastern South End furthering the coastal resiliency policies of the City of Bridgeport. The coastal defense system and dry egress would facilitate future development of the 60 Main Street site. The north-south segment of the Western Option of the coastal flood defense system be entirely on public right-of-way. Neither option for the intersection at Main Street and University Avenue would not result in significant adverse impacts to land uses.

Temporary land use impacts may occur during construction of the Flood Risk Reduction Project – Western Option. Coordination with the City and other stakeholders to ensure cumulative impacts are not significant

5.3.1.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of Flood Risk Reduction Project on land use, zoning, and public policy are discussed in detail in Section 4.1.3.2. The Flood Risk Reduction Project – Eastern Option would not result in significant adverse cumulative impacts to land use and land use planning in the South End when added to the contribution of RFF projects. The Flood Risk Reduction Project – Eastern Option is consistent with University of Bridgeport Campus Master Plan and, combined with the WPCA Area H Project, would enhance the resiliency of the eastern South End furthering the coastal resiliency policies of the City of Bridgeport. The coastal defense system and dry egress would facilitate future development of the 60 Main Street site. The north-south segment of the Eastern Option of the coastal flood defense system would require easements on private property. The Eastern Option would result in a larger area of primarily industrial or vacant land (zoned heavy industrial) to be taken out of the 1 percent chance floodplain furthering the coastal resiliency policies of the City of Bridgeport.

Neither option for the intersection at Main Street and University Avenue would not result in significant adverse impacts to land uses. Temporary land use impacts may occur during construction of the Flood Risk Reduction Project – Eastern Option. Coordination with the City and other stakeholders to ensure cumulative impacts are not significant

5.3.1.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of Resilience Center on land use, zoning, and public policy are discussed in detail in Section 4.1.3.2. The Resilience Center would not result in significant adverse cumulative impacts to land use and land use planning in the South End when added to the contribution of RFF projects. The project would rehabilitate an existing historic resource within the South End (Freeman Houses) and add design elements to the north side of University Avenue, consistent with the adjacent Seaside Park. The Resilience Center would further the coastal resiliency goal of the City of Bridgeport

Temporary land use impacts may occur during construction of the Resilience Center. Coordination with the City and other stakeholders to ensure cumulative impacts are not significant

5.3.1.6 Cumulative Impacts of Proposed Action

The total impact of the Proposed Action including the RBD Pilot Project, Flood Risk Reduction Project, and Resilience Center would not result in significant adverse cumulative impacts to land use and land use planning in the South End when added to the contribution of RFF projects. The Proposed Action complies with the existing land use and underlying zoning and would further the coastal resiliency policies of the City of Bridgeport, Natural Hazard Mitigation Plan and Waterfront Bridgeport: Bridgeport, Connecticut Waterfront Master Plan.

5.3.2 Socioeconomic Conditions

5.3.2.1 Contribution of RFF Projects

Cumulative potential adverse impacts of RFF projects include impacts to businesses and residents from construction activities; these effects would be intermittent and temporary. RFF projects planned for future construction would temporarily increase dust, noise, vibration, and traffic congestion near businesses and communities within the study area. These short-term cumulative impacts would be reduced through coordinating construction activities, implementing best management practices (BMPs), and complying with local requirements and ordinances.

RFF projects would cumulatively benefit the economy through employment and taxes and revenue due to project-related spending. In addition, RFF project would increase and improve social amenities through the creation of a recreation area (Pequonnock River Trail Extension) and entertainment venue (the Ballpark at Harbor Yard); while development projects (Windward Development, 60 Main Street, and 30 University Avenue) will provide housing and new retail options. Development of these RFF projects will lead to area improvements. In addition, RFF projects involving drainage improvements (WPCA Area H Project) will provide benefits by increasing flood protection in the long-term and helping to stabilize property values that would otherwise be affected by an increased number of flooding events.

5.3.2.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on socioeconomic resources are discussed in detail in Section 4.2.3.2. Incremental impacts of the RBD Pilot Project would not result in significant adverse cumulative impacts to socioeconomic conditions in the study area when added to the contribution of RFF projects.

Construction of the RBD Pilot Project would contribute short-term, beneficial cumulative impacts on temporary employment, and the economy. In the long-term, the project would contribute to the stability of the housing stock and a new social amenity (open space within the stormwater facility).

5.3.2.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on socioeconomic resources are discussed in detail in Section 4.2.3.2. Incremental impacts of the Western Option would not result in significant adverse cumulative impacts to socioeconomic conditions in the study area when added to the contribution of RFF projects.

Construction of the Flood Risk Reduction Project would contribute short-term, beneficial cumulative impacts on temporary employment, and the economy. In the long-term, the project would contribute to the stability of the housing stock, increased investment in the neighborhood, and reduced property damage for homes, businesses, and public infrastructure.

5.3.2.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on socioeconomic resources are discussed in detail in Section 4.2.3.2. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to socioeconomic conditions in the study area when added to the contribution of RFF projects.

Construction of the Flood Risk Reduction Project would contribute short-term, beneficial cumulative impacts on temporary employment, and the economy. In the long-term, the project would contribute to the stability of the housing stock, increased investment in the neighborhood, and reduced property damage for homes, businesses, and public infrastructure.

5.3.2.5 Cumulative Impacts of Resilience Center

The Resilience Center would provide a meeting place for the community, distribute information on coastal resiliency and local history, and assist in future recovery efforts. It would not be expected to have an impact on socioeconomic conditions in the South End.

5.3.2.6 Cumulative Impacts of Proposed Action

Incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to socioeconomic conditions in the study area when added to the contribution of RFF projects.

Construction of the Proposed Action would contribute short-term, beneficial cumulative impacts on temporary employment, and the economy. In the long-term, the Proposed Action would contribute to the stability of the housing stock, a new social amenity (open space within the stormwater facility), increased investment in the neighborhood, and reduced property damage for homes, businesses, and public infrastructure.

5.3.3 Environmental Justice

As described in Section 4.3.2, the study area for impacts on Environmental Justice (EJ) populations is the four census tract block groups that comprise the South End. All of Bridgeport is considered a distress municipality and, therefore, an Environmental Justice Community. The percentage of minority population in the study area is 62.6 percent and the percentage of low-income persons is 25.7 percent.

5.3.3.1 Contribution of RFF Projects

The major cumulative adverse impacts of RFF projects on EJ populations within the study area are elevated levels of noise, dust, and vibration from construction of RFF projects. The construction projects may cause traffic congestion and potential effects to public transportation services resulting from construction work that may disproportionately affect EJ populations. However, potential EJ impacts would be intermittent and temporary, lasting only for the duration of construction. Based on existing schedules, no RFF projects would displace or result in long-term adverse impacts to EJ populations within the study area.

RFF projects would cumulatively benefit EJ communities in the study area, primarily through an increase in housing and employment opportunities. The Pequonnock River Trail Extension would add new bike lanes, providing an alternate transportation option for EJ populations. In addition, RFF projects providing flood protection and reduction in CSO events (WPCA Area H Project) would help EJ populations more vulnerable to impacts housing, access to community facilities, and health effects associated with flooding. The resiliency/flood protection measures incorporated in the RFF utility projects would reduce disruption of service to EJ customers within and outside of the study area.

5.3.3.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on EJ populations are discussed in detail in Section 4.3.3.2. Incremental impacts of the RBD Pilot would not result in significant adverse cumulative impacts to EJ communities in the study area when added to the contribution of RFF projects.

The RBD Pilot Project would contribute to long-term beneficial cumulative impacts on the EJ community by providing dry egress for evacuation and emergency vehicle access during storm events, reduced flood damage to housing and businesses, and a new open space and visual feature with the stormwater facility. In addition, the dry egress and stormwater improvements would allow for Phase II of the Windward Development with some proportion of units set aside for low-income populations.

5.3.3.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on EJ populations are discussed in detail in Section 4.3.3.2. Incremental impacts of the Western Option would not result in significant adverse cumulative impacts to EJ communities in the study area when added to the contribution of RFF projects.

The Flood Risk Reduction Project would contribute to long-term beneficial cumulative impacts on the EJ community by providing dry egress for evacuation and emergency vehicle access during storm events and reduced flood damage to housing and businesses. During a severe coastal surge event, it is anticipated that the Western Option of the coastal flood defense system would decrease the area at risk of flooding by approximately 39 acres. There would be some benefits and some impacts to visual resources as a result of the elevation of University Avenue and coastal flood defense system.

5.3.3.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on EJ populations are discussed in detail in Section 4.3.3.2. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to EJ communities in the study area when added to the contribution of RFF projects.

The Flood Risk Reduction Project would contribute to long-term beneficial cumulative impacts on the EJ community by providing dry egress for evacuation and emergency vehicle access during storm events and reduced flood damage to housing and businesses. During a severe coastal surge event, it is anticipated that the Eastern Option of the coastal flood defense system would decrease the area at risk of flooding by approximately 64 acres, as well as provide dry egress to Harbor Unit 5 and coastal defense to the Emera site and new Pequonnock Substation relocation site. By incorporating these properties behind the coastal flood defense system, there would be reduced flood risk to several critical utility locations that serve both EJ and non-EJ populations in the study are and throughout the region. There would be some benefits and some impacts to visual resources as a result of the elevation of University Avenue and coastal flood defense system.

5.3.3.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on EJ populations are discussed in detail in Section 4.3.3.2. Incremental impacts of the Resilience Center would not result in significant adverse cumulative impacts to EJ communities in the study area when added to the contribution of RFF projects.

The Resilience Center would contribute to long-term beneficial cumulative impacts on the EJ community by providing a community meeting place, resiliency and local history education, and resources during storm events. In addition, the rehabilitation of the Freeman Houses would be expected to provide a benefit to the African American community.

5.3.3.6 Cumulative Impacts of Proposed Action

Incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to EJ communities in the study area when added to the contribution of RFF projects. The Proposed Action would contribute to long-term beneficial cumulative impacts on the EJ community by providing dry egress for evacuation and emergency vehicle access during storm events and reduced flood damage to housing and businesses. During a severe coastal surge event, it is anticipated that the coastal flood defense system would decrease the area at risk of flooding by between 39 and 64 acres. The Proposed Action provide a new open space and visual feature with the stormwater facility and a community meeting place and resource for assistance during storm events. There would be some benefits and some impacts to visual resources as a result of the elevation of University Avenue and coastal flood defense system.

5.3.4 Cultural Resources

5.3.4.1 Contribution of RFF Projects

The cumulative adverse impacts from RFF projects on cultural resources would result primarily from construction activities. The RFF projects are not expected to have a direct effect on historic architectural resources within the study area. RFF projects planned for future construction would potentially present visual impacts to historic resources. The Windward Development, University of Bridgeport Master Plana, and 60 Main Street and 30 University Avenue developments may indirectly impact nearby historic resources and districts. The entire study area is likely sensitive for Late Woodland and Contact period archaeological sites, including burial and village remnants. Elements of the RFF projects that require excavation have the potential to adversely impact archaeological resources. Federal actions require consultation per Section 106 of the National Historic Preservation Act which may result in a construction monitoring plan and other mitigation measures designed to avoid or minimize impacts on archaeological and historic resources. If impacts are unavoidable, recovery of any resources could occur prior to construction. Based on the nature and scope of RFF projects, long-term cumulative adverse impacts to cultural resources are not anticipated.

The beneficial impact of cumulative RFF projects is the protection of cultural resources from future flood events. The WPCA Area H Project and University of Bridgeport Master Plan would be expected to reduce flood risks that have the potential to impact historic resources in the area.

5.3.4.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of RBD Pilot Project on historic resources are discussed in detail in Section 4.4.2.3 and archaeological resources in Section 4.4.3.2. As designed, the RBD Pilot Project would not appear to have an adverse effect on Seaside Village's setting. The tallest structure, the proposed pump station at the southeast corner of Iranistan and South Avenues, would have a relatively low profile and does not appear to overwhelm the neighborhood or adjacent historic resources. Similarly, proposed street improvements on Iranistan Avenue do not appear to pose a negative impact.

The general project vicinity of the RBD Pilot Project has the potential to contain intact archaeological resources and human remains. In advance of construction activities, investigation of soil sequences within the project area by a system of geotechnical investigations (e.g., geoprobes, augers) to further explore the complicated soil sequences in this area and monitoring by an archaeologist would limit any possible impacts to human remains that could be buried within the study area. With additional investigations and monitoring, incremental impacts of the RBD Pilot Project would not result in significant adverse cumulative impacts to cultural resources. The RBD Pilot Project would not contribute any additional cumulative beneficial impacts aside from flood reduction benefits.

5.3.4.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of Flood Risk Reduction Project – Western Option on historic resources are discussed in detail in Section 4.4.2.3 and archaeological resources in Section 4.4.3.2. The Flood Risk Reduction Project – Western Option's elevation of Seaside Park's entrance between Broad and Main Streets would have an adverse effect on the historic entrance of the park. The remaining portion of the coastal flood defense system is not expected to have an adverse effect on historic resources. The Western Option has the potential to have adverse effect on the Freeman Houses due to damage from vibration (from excavation and construction) since the buildings are extremely fragile. Adverse effects to above-ground resources would be mitigated through measures agreed upon during ongoing agency and stakeholder consultation.

The Flood Risk Reduction Project has the potential to contain intact archaeological resources and human remains. The Western Option north-to-south section, due to the proximity to the Freeman Houses and the preservation of the stone pavement on Singer Street, could affect significant archaeological resources. In advance of construction activities, investigation of soil sequences within the project area by a system of geotechnical investigations (e.g., geoprobes, augers) to further explore the complicated soil sequences in this area and monitoring by an archaeologist will limit any possible impacts to human remains that could be buried within the study area. With additional investigations and monitoring, incremental impacts of the Flood Risk Reduction Project – Western Option would not result in significant adverse cumulative impacts to archaeological resources.

Given the likelihood of repeated flooding events, the Flood Risk Reduction Project – Western Option would have a cumulative beneficial impact on cultural resources by reducing flood risk and erosion for those resources behind the proposed coastal flood defense system.

5.3.4.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of Flood Risk Reduction Project – Eastern Option on historic resources are discussed in detail in Section 4.4.2.3 and archaeological resources in Section 4.4.3.2. The Flood Risk Reduction Project – Eastern Option's elevation of Seaside Park's entrance between Broad and Main Streets would have an adverse effect on the historic entrance of the park. The remaining portion of the coastal flood defense system is not expected to have an adverse effect on historic resources. Adverse effects to above-ground resources would be mitigated through measures agreed upon during ongoing agency and stakeholder consultation.

The Flood Risk Reduction Project has the potential to contain intact archaeological resources and human remains. In advance of construction activities, investigation of soil sequences within the project area by a system of geotechnical investigations (e.g., geoprobes, augers) to further explore the complicated soil sequences in this area and monitoring by an archaeologist will limit any possible impacts to human remains that could be buried within the study area. With additional investigations and monitoring, incremental impacts of the Flood Risk Reduction Project – Eastern Option would not result in significant adverse cumulative impacts to archaeological resources.

Given the likelihood of repeated flooding events, the Flood Risk Reduction Project – Eastern Option would have a cumulative beneficial impact on cultural resources by reducing flood risk and erosion for those resources behind the proposed coastal flood defense system.

5.3.4.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on historic resources are discussed in detail in Section 4.4.2.3 and archaeological resources in Section 4.4.3.2. The project is in the very early stages of conceptualization, however, the concept involves financial contributions to the restoration and rehabilitation of the Freeman Houses and utilizing a portion of their space. In addition to flood reduction from the RFF projects, cumulative benefits of the Resilience Center to historic resources are the proposed adaptive re-use of a portion of one or both of the Freeman Houses.

Any construction in or near the Freeman Houses should be preceded by a ground-penetrating radar survey, as recommended (Surabian 2008), and a Phase IB archaeological survey, to assess the historical deposits that are preserved at the Freeman Houses. Any other ground disturbances associated with this project should be reviewed to assess their potential impact to archaeological resources. With additional investigations and monitoring, incremental impacts of the Resilience Center would not result in significant adverse cumulative impacts to archaeological resources.

5.3.4.6 Cumulative Impacts of Proposed Action

The Proposed Action would have an adverse effect on an historic architectural resource (Seaside Park), as well as positive effect on the Freeman Houses through the investment for rehabilitation as part of the Resilience Center. Proposed mitigation measures would reduce the impact to the historic resource. In advance of construction activities, investigation of soil sequences within the project area by a system of geotechnical investigations (e.g., geoprobes, augers) to further explore the complicated soil sequences in this area and monitoring by an archaeologist will limit any possible impacts to human remains that could be buried within the study area. In addition, given the likelihood of repeated flooding events, the Proposed Action would have a cumulative beneficial impact on other historic resources by reducing flood risk for those resources behind the proposed coastal flood defense system.

5.3.5 Urban Design and Visual Resources

5.3.5.1 Contribution of RFF Projects

The urban design and visual resources of the South End would be impacted by the RFF projects. The noteworthy visual resources in the study area include the waterfront, Seaside Park, and multiple historic buildings. In addition, the utilities on the eastern end of the South End are a dominant visual resource, though they are not considered a sensitive visual resource.

The primary cumulative adverse impacts of RFF projects during construction on urban design and visual resources are the introduction of construction equipment to the viewshed, the regrading of surfaces, and the opening of streets for purposes of installing subsurface stormwater utilities and appurtenances. Additionally, barges used for dredging activities required of RFF projects (Bridgeport Harbor Dredging) would affect aesthetic quality the waterfront. However, construction activities would be short-term and consistent with activities typical of an urban environment.

Long-term benefits of RFF projects include visual improvements to the study area through redevelopment and facility upgrades. In the area of the former Marina Village site, the Windward Development would replace old buildings in disrepair, with new, modern buildings. In proximity to the northern portion of Seaside Park that abuts University Avenue, new residential construction at 30 University Avenue and 60 Main Street is planned.

These projects would alter the viewshed in the area of the Park; however, the future development projects would be consistent with the existing urban design. Although 60 Main Street would be constructed on the waterfront, the site does not currently allow for public access to the waterfront, so the future construction would not eliminate public access to the waterfront and the associated views.

The new construction by PSEG and UI would change the existing views but would not impact any sensitive visual resources. Harbor Unit 5 is being constructed along the waterfront in an area that is not accessible to the public and was a previous utility facility. The relocated Pequonnock Substation would be within existing industrial land use. The views of the waterfront in this area are not publicly accessible.

5.3.5.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of RBD Pilot Project on urban design and visual resources are discussed in detail in Section 4.5.3.2. Incremental impacts or the RBD Pilot Project would not result in significant adverse cumulative impacts to urban design and visual resources within the study when added to the contribution of RFF projects. The RBD Pilot would complement the urban design of the RFF projects (Windward Development).

In addition to the cumulative benefits from new development, the RBD Pilot Project would contribute long-term, beneficial cumulative impacts to urban design and visual resources within the study area by adding new green space to the neighborhood in the form of the stormwater facility and a green street. Collectively, the RBD Pilot Project would Windward Development would enhance the visual aesthetics of the neighborhood by the replacement of dilapidated structures with green space, new buildings, and reconfigured and resurfaced streets and sidewalks.

5.3.5.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of Flood Risk Reduction Project – Western Option on urban design and visual resources are discussed in detail in Section 4.5.3.2. Incremental impacts or the Western Option would not result in significant adverse cumulative impacts to urban design and visual resources within the study when added to the contribution of RFF projects. In some locations, impacts to visual resources would be adverse but would be mitigated the extent possible with landscaping and other design elements.

Through the University of Bridgeport, the raising of University Avenue as part of the proposed coastal flood defense system would integrate with the new construction on either side of the street as part of the University's Master Plan. The work would involve demolition of existing buildings and construction of new facilities. It is expected that these changes would have a positive impact on visual resources and would not impede views to significant visual resources.

As part of the proposed coastal flood defense system, the portion of Seaside Park that abuts University Avenue would be altered to elevate a small portion of the park, remove some pavement within the park and add pedestrian pathways and handicap-accessible ramps. Some trees would be removed in this area of the park. Although the trees would be replaced, it takes many years for the trees to have the same visual benefits

Under the Western Option, the north-south portion of the coastal flood defense system would be within the public realm but would abut existing industrial land uses. The proposed alignment would avoid impacts to the historically significant Freeman Houses.

5.3.5.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of Flood Risk Reduction Project – Eastern Option on urban design and visual resources are discussed in detail in Section 4.5.3.2. Cumulative impacts on urban design and visual resources from operation of the Flood Risk Reduction Project – Eastern Option would be similar to those discussed under the Western Option. The north-south alignment of the coastal flood defense system would be set within industrial land uses, reducing the visual impacts to the public.

5.3.5.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of Resilience Center project on urban design and visual resources are discussed in detail in Section 4.5.3.2. The Resilience Center project would not result in significant adverse cumulative impacts to urban design and visual resources in the South End when added to the contribution of RFF projects. The Resilience Center project elements would be integrated with the existing built and social environment within the South End neighborhood. Rehabilitation of the Freeman Houses would improve the viewshed toward that important resource. Other elements of the project such as streetscape interventions, pedestrian amenities, and information kiosks would be located within the public right-of-way; therefore, the proposed elements would enhance the visual and aesthetic quality of the neighborhood and are not anticipated to result in adverse visual impacts.

5.3.5.6 Cumulative Impacts of Proposed Action

During construction of all the projects there may be temporary impacts from construction equipment and provisional lighting, as necessary (construction is expected to be undertaken during daytime only). These impacts would be minor and would not result in a significant adverse cumulative impact to urban design and visual resources.

Following construction of elevating University Avenue and development of 60 Main St, there would be minor obstruction of views of Seaside Park and the waterfront. However, the Proposed Action would result in positive effects to urban design and visual resources from the new stormwater facility and green infrastructure as part of the RBD Pilot Project, from improved aesthetics along University Avenue, an elevated view of the waterfront from the entrance of Seaside Park, and new landscaping features as part of the Flood Risk Reduction Project, and from rehabilitation of the Freeman Houses and design elements added near Seaside Park at University Avenue as part of the Resilience Center.

5.3.6 Hazardous Materials

The study area includes parcels of land at risk of encountering hazardous materials, hazardous substances, and other contaminants.

5.3.6.1 Contribution of RFF Projects

The potential cumulative adverse impacts of RFF projects on hazardous materials include discharge, spills, and contamination during construction efforts. Any RFF projects requiring ground -disturbing construction activities would potentially cause subsurface disturbance of hazardous materials and contribute to the spread of contaminants into the environment. However, it is expected that the RFF projects would be managed under existing regulatory programs.

In the long-term, RFF projects would benefit the study area by removing potentially contaminated soils during excavation. In addition, RFF projects that reduce the risk of flooding in the study area, such as the WPCA Area H Project, would reduce the potential for releases of hazardous materials from disturbed soils, protecting both public and environmental health. The PSEG Harbor Unit 5 project and UI Pequonnock Substation relocation would incorporate flood protection into the design to limit the potential for contaminant releases during flooding events.

5.3.6.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of RBD Pilot Project on hazardous materials are discussed in detail in Section 4.6.3.2. Incremental impacts of the RBD Pilot Project would not result in significant adverse cumulative impacts to hazardous materials in the South End when added to the contribution of RFF projects. Plans such as Sampling Analysis and Monitoring Plan (SAMP), Health and Safety Plan (HASP), and Material Management Plan (MMP) would include provisions for minimizing cumulative risk not only to workers, but also to surrounding businesses, residential properties, and the general public, in both the short- and long-term.

In addition to cumulative benefits from reduced flood risk, construction of the RBD Pilot Project would contribute long-term beneficial cumulative impacts to the study area from the removal of potentially contaminated soils. Concurrent with construction of RFF projects that would also potentially require the removal of contaminated soils, the RBD Pilot Project would contribute cumulative benefits due to the elimination or reduction of existing contaminants in the study area.

5.3.6.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of Flood Risk Reduction Project – Western Option on hazardous materials are discussed in detail in Section 4.6.3.2. The east-west segment of the system would intersect primarily with moderate-risk properties situated along University Avenue. The north-south segment of the proposed coastal flood defense system would primarily intersect with high-risk parcels belonging to major utilities, but some moderate-risk sites would also be encountered. Incremental impacts of the Western Option would not result in significant adverse cumulative impacts to hazardous materials in the South End when added to the contribution of RFF projects. Plans such as SAMPs, HASPs, and MMPs would include provisions for minimizing cumulative risk not only to workers, but also to surrounding businesses, residential properties, and the general public, in both the short- and long-term.

In addition to cumulative benefits from reduced flood risk, construction of the Flood Risk Reduction Project – Western Option would contribute long-term beneficial cumulative impacts to the study area from the removal of potentially contaminated soils. Concurrent with construction of RFF projects that would also potentially require the removal of contaminated soils, the Western Option would contribute cumulative benefits due to the elimination or reduction of existing contaminants in the study area.

5.3.6.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of Flood Risk Reduction Project – Eastern Option on hazardous materials are discussed in detail in Section 4.6.3.2. The east-west segment of the system would intersect primarily with moderate-risk properties situated along University Avenue. The north-south segment of the proposed coastal flood defense system is expected to intersect with more high-risk parcels since the alignment would be located primarily on private industrial/utility property. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to hazardous materials in the South End when added to the contribution of RFF projects. Plans such as SAMPs, HASPs, and MMPs would include provisions for minimizing cumulative risk not only to workers, but also to surrounding businesses, residential properties, and the general public, in both the short- and long-term.

In addition to cumulative benefits from reduced flood risk, construction of the Flood Risk Reduction Project – Eastern Option would contribute long-term beneficial cumulative impacts to the study area from the removal of potentially contaminated soils. Concurrent with construction of RFF projects that would also potentially require the removal of contaminated soils, the Eastern Option would contribute cumulative benefits due to the elimination or reduction of existing contaminants in the study area.

5.3.6.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of Resilience Center on hazardous materials are discussed in detail in Section 4.6.3.2. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to hazardous materials in the South End when added to the contribution of RFF projects. Since no additional (previously unidentified) sites are expected to be disturbed via Resilient Center construction or operation, no further impacts related to hazardous materials are anticipated. Moreover, the construction of the proposed Resilience Center is expected to necessitate only limited ground/soil disturbance.

5.3.6.6 Cumulative Impacts of Proposed Action

All the Proposed Action elements would involve similar land disturbances (e.g., excavation, dewatering of excavated areas when groundwater is encountered, regrading of soils, etc.) and thus could expose both on-site workers and nearby public to temporary health risks. Risks resulting from necessary land disturbances are expected to vary, primarily depending upon the properties and concentrations of contaminants present at disturbed areas. However, incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to hazardous materials in the South End when added to the contribution of RFF projects. Plans such as SAMP, HASP, and MMP) would include provisions for minimizing cumulative risk not only to workers, but also to surrounding businesses, residential properties, and the general public, in both the short- and long-term.

In addition to cumulative benefits from reduced flood risk, construction of the Proposed Action would contribute long-term beneficial cumulative impacts to the study area from the removal of potentially contaminated soils. Concurrent with construction of RFF projects that would also potentially require the removal of contaminated soils, the Proposed Action would contribute cumulative benefits due to the elimination or reduction of existing contaminants in the study area.

5.3.7 Noise and Vibration

5.3.7.1 Contribution of RFF Projects

Cumulative adverse impacts from RFF projects would include increased noise and vibration during construction. Those effects would be intermittent and short-term. Construction activities for the RFF projects would increase noise through use of on-site equipment for excavation, site grading, pile driving, etc. and from heavy truck traffic on local streets. Noise from construction activities is typically less-than-significant due to the temporary nature of construction and the consistency with the surrounding urban and industrial land uses. The impacts from noise and vibration would depend on the distance between the construction site and nearby sensitive noise receptors (residences). The Bridgeport Harbor Dredging project would cause underwater noise, potentially impacting aquatic species during construction. The WPCA Area H Project would include minor repairs to existing outfalls and would not be expected to contribute noise impacts to nearby aquatic life during construction.

Following construction, the RFF projects may contribute noise impacts as a result of increased traffic (Windward Development, 60 Main Street, and 30 University Avenue). The PSEG Harbor Unit 5 and UI Pequonnock Substation relocation would replace existing power plant facilities with new, modern facilities that would be expected to produce equivalent or lower noise impacts.

5.3.7.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on noise and vibration are discussed in detail in Section 4.7.3.2. Construction of the RBD Pilot Project would contribute to short-term, less-than-significant adverse cumulative impacts on noise and vibration within the study area, when considered in combination with RFF projects. Very few of the RFF projects would have an overlapping construction schedule with the RBD Pilot Project and there are no other RFF projects located on the western side of the South End. Noise impacts from construction equipment are generally limited to a 0.25-mile buffer surrounding the construction site because noise attenuates quickly within developed environments. Construction would be limited to daytime hours and BMPs would be implemented to mitigate any potential adverse impacts from on-site construction equipment. Due to the RBD Pilot Project site's proximity to I-95, on-road construction vehicles would have minimal travel time on local roads.

In the long-term, the RBD Pilot Project would not generate noise or vibration impacts. The project would facilitate the Windward Development; however, traffic volumes, compared to levels prior to demolition of the Marina Village site, would be equivalent or lower and would not result in cumulative noise impacts.

5.3.7.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Western Option of the Flood Risk Reduction Project on noise and vibration are discussed in detail in Section 4.7.3.2. Construction of the Flood Risk Reduction Project would contribute to short-term, less-than-significant adverse cumulative impacts on noise and vibration within the study area, when considered in combination with RFF projects. Very few of the RFF projects would have an overlapping construction schedule with the Flood Risk Reduction Project. Construction would be limited to daytime hours and BMPs would be implemented to mitigate any potential adverse impacts from on-site construction equipment. On-road construction vehicles would travel on set haul routes within the South End community, avoiding impacts to residential areas to the extent possible.

In the long-term, the Western Option of the Flood Risk Reduction Project would not generate noise or vibration impacts. The project would facilitate the redevelopment of 60 Main Street, which would generate traffic from residences and retail facilities. In addition, the roadway would be reconfigured at the Main Street and University Avenue intersection under the Dead-End Option. The noise analysis accounted for the additional traffic and roadway reconfiguration and found there would be no adverse impact to noise.

5.3.7.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Eastern Option of the Flood Risk Reduction Project on noise and vibration are discussed in detail in Section 4.7.3.2. Construction of the Eastern Option would result in similar or reduced cumulative impacts as construction of the Western Option. The Eastern Option of the coastal flood defense system would be constructed within private PSEG property, located further away from sensitive noise receptors. Construction would be limited to daytime hours and BMPs would be implemented to mitigate any potential adverse impacts from on-site construction equipment. On-road construction vehicles would travel on set haul routes within the South End community, avoiding impacts to residential areas to the extent possible.

In the long-term, the Eastern Option of the Flood Risk Reduction Project would not generate noise or vibration impacts. The noise analysis accounted for the additional traffic from 60 Main Street and the roadway reconfiguration (Dead-End Option) and found there would be no adverse impact to noise.

5.3.7.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on noise and vibration are discussed in detail in Section 4.7.3.2. Construction activities for the Resilience Center would be limited and would contribute to short-term, less-than-significant adverse cumulative impacts on noise and vibration within the study area, when considered in combination with RFF projects. Very few of the RFF projects would have an overlapping construction schedule with the Resilience Center. Due to the deteriorated nature of the Freeman Houses, care will be taken during construction to avoid excessive vibration that would further damage the buildings. Construction would be limited to daytime hours and BMPs would be implemented to mitigate any potential adverse impacts from on-site construction equipment. On-road construction vehicles would access the site from I-95 and have minimal travel time on local roads.

In the long-term, the Resilience Center would not generate noise or vibration impacts.

5.3.7.6 Cumulative Impacts of Proposed Action

Construction of the Proposed Action would contribute to short-term, less-than-significant adverse cumulative impacts on noise and vibration within the study area, when considered in combination with RFF projects. Very few of the RFF projects would have an overlapping construction schedule with the Proposed Action. Construction would be limited to daytime hours and BMPs would be implemented to mitigate any potential adverse impacts from on-site construction equipment. On-road construction vehicles would travel on set haul routes within the South End community, avoiding impacts to residential areas to the extent possible.

In the long-term, there would be no adverse cumulative impacts to noise and vibration as a result of the increased traffic from future development projects, facilitated by the Proposed Action. The minor changes to the roadway network would not impact traffic noise. There would be no other long-term impacts to noise as a result of the Proposed Action.

5.3.8 Natural Resources

5.3.8.1 Contribution of RFF Projects

Potential cumulative impacts to natural resources from RFF projects would result from impacts to street trees and water quality. The WPCA Area H Project may impact street trees; however, several projects, including the University of Bridgeport Master Plan, 60 Main Street development and Pequonnock River Trail Extension, will incorporate new landscaping into their design, providing new or replenished areas of green space in the study area. The Bridgeport Harbor Dredging may cause underwater noise, sedimentation, and turbidity impacts on aquatic habitats, but those impacts are expected to be temporary. Similarly, work on existing outfalls as part of the WPCA Area H Project may have minor, temporary impacts to water quality. In the long-term, improvements to water quality from the WPCA Area H Project are expected to have a beneficial, indirect impact on aquatic resources in Cedar Creek Reach and Bridgeport Harbor.

Overall, no significant adverse cumulative impacts to terrestrial and aquatic ecology or wildlife, threatened and endangered species or wetlands – tidal or inland – are expected to result from the RFF projects.

5.3.8.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on Natural Resources are discussed in detail in Section 4.8.3.3. Overall, the RBD Pilot Project would not result in significant adverse cumulative impacts to natural resources within and around the study area. In conjunction with the aforementioned benefits associated with the RFF projects, the stormwater facility to be constructed as part of the proposed RBD Pilot Project would result in a net positive impact to natural resources, specifically on aquatic resources in Cedar Creek Reach and Bridgeport Harbor. Further, creation of the proposed stormwater facility is expected to enhance the study area's existing urban forest canopy through the addition of new upland trees and new lowland trees and the expansion of vegetative groundcover.

5.3.8.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts associated of the Flood Risk Reduction Project – Western Option on natural resources are discussed in Section 4.8.3.3. Adverse cumulative impacts associated with this project would generally be temporary in nature and associated with construction activities (e.g., removal of street trees and other public flora); these cumulative impacts would not be significant.

The Western Option of the Flood Risk Reduction Project would produce long-term benefits to ecological communities and aquatic species that would work in conjunction with benefits to the same communities projected from RFF projects. Landscaping improvements to Seaside Park and along the north-south section of the coastal flood defense system along the public realm would mitigate loss of street trees during construction. Additional cumulative benefits would include drainage modifications that would improve water quality and, as such, ultimately enhance the quality of tidal and aquatic communities in the area.

5.3.8.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts associated of the Flood Risk Reduction Project – Eastern Option on natural resources are discussed in Section 4.8.3.3. The Eastern Option shares many features with the Western Option such that the Eastern Option. Due to the location of the north-south segment of the coastal flood defense system on private PSEG property, there would be less impact to street trees under this option.

The Western Option of the Flood Risk Reduction Project would produce long-term benefits to ecological communities and aquatic species that would work in conjunction with benefits to the same communities projected from RFF projects. Landscaping improvements to Seaside Park and along the north-south section of the coastal flood defense system along the public realm would mitigate loss of street trees during construction. Additional cumulative benefits would include drainage modifications that would improve water quality and, as such, ultimately enhance the quality of tidal and aquatic communities in the area.

The Eastern Option of the Flood Risk Reduction Project would produce long-term benefits to ecological communities and aquatic species that would work in conjunction with benefits to the same communities projected from RFF projects. Landscaping improvements to Seaside Park would mitigate loss of street trees during construction. Additional cumulative benefits would include drainage modifications that would improve water quality and, as such, ultimately enhance the quality of tidal and aquatic communities in the area.

5.3.8.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts associated of the Resilience Center on natural resources are discussed in Section 4.8.3.3. As stated in that section, the Resilience Center itself would have a relatively small footprint, such that no significant adverse impacts to natural resources are anticipated. In conjunction with other anticipated projects within the study area, the Resilience Center is also not expected to create cumulative impacts to natural resources.

5.3.8.6 Cumulative Impacts of Proposed Action

The total impact of the Proposed Action including the RBD Pilot Project, Flood Risk Reduction Project, and Resilience Center would not result in significant adverse cumulative impacts to natural resources in the South End when added to the contribution of RFF projects. The WPCA Area H Project and Pequonnock River Trail Extension would work in concert with the Proposed Action to provide cumulative beneficial impacts with regard to natural resources within the study area, including improving the overall quality of aquatic and tidal environments via projects designed to enhance water quality (e.g., sewer and stormwater infrastructure, etc.) and add landscaping.

5.3.9 Geology and Soils

5.3.9.1 Contribution of RFF Projects

Potential cumulative adverse impacts of RFF projects on geological resources would result directly from construction disturbance. RFF projects may require excavation and fill work, potentially impacting the underlying geology of the study area. In addition, construction activities would cause increased erosion and sediment runoff through changes in impervious surface and existing infrastructure. However, the majority of RFF projects (with the exception of 60 Main Street development) would be developed on previously disturbed sites, and construction activities would implement site-specific erosion and sedimentation control plans to minimize impacts on soils.

In the long-term, RFF projects would decrease erosion and runoff through the increased planting of trees along streets and the reduction of CSO events. Fewer CSO events (from the WPCA Area H Project) would lead to decreased runoff and turbidity.

5.3.9.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on geology and soils are discussed in detail in Section 4.9.3.3. Incremental impacts of the RBD Pilot Project would not result in adverse cumulative impacts to geology or soils in the study area when added to the contribution of RFF projects. The RBD Pilot Project would require some excavation and fill work for the construction of the Johnson Street extension and stormwater facility, potentially impacting the underlying geology of the study area. The project would result in a net decrease in impervious surface, resulting in a reduction in erosion and sediment runoff. The RBD Pilot Project would contribute to cumulative beneficial impacts from flood risk reduction benefits that would stabilize geologic conditions and soils.

5.3.9.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on geology and soils are discussed in detail in Section 4.9.3.3. Incremental impacts of the Flood Risk Reduction Project would not result in adverse cumulative impacts to geology or soils in the study area when added to the contribution of RFF projects. The Flood Risk Reduction Project would require some excavation and fill work for the elevation of University Avenue and construction of the coastal flood defense system, potentially impacting the underlying geology of the study area. The project would not significantly change the amount of impervious surface. The Flood Risk Reduction Project – Western Option would contribute to cumulative beneficial impacts from flood risk reduction benefits and coastal storm surge protection that would stabilize geologic conditions and soils.

5.3.9.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on geology and soils are discussed in detail in Section 4.9.3.3. Incremental impacts of the Eastern Option would be similar to those for the Western Option of the Flood Risk Reduction Project. There would be no adverse cumulative impacts to geology or soils in the study area when added to the contribution of RFF projects. The Flood Risk Reduction Project – Eastern Option would contribute to cumulative beneficial impacts from flood risk reduction benefits and coastal storm surge protection that would stabilize geologic conditions and soils.

5.3.9.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on geology and soils are discussed in detail in Section 4.9.3.3. As stated in that section, the Resilience Center itself would have a relatively small footprint, with no increase in impervious surface, such that no significant adverse impacts to geology and soils are anticipated. In conjunction with other anticipated projects within the study area, the Resilience Center is also not expected to create cumulative impacts to geology and soils.

5.3.9.6 Cumulative Impacts of Proposed Action

The total impact of the Proposed Action including the RBD Pilot Project, Flood Risk Reduction Project, and Resilience Center would not result in significant adverse cumulative impacts to geology and soils in the South End when added to the contribution of RFF projects. The increase in impervious surface from the 60 Main Street development would be offset slightly by the decrease in impervious surface from the RBD Pilot Project and construction activities would implement site-specific erosion and sedimentation control plans to minimize impacts on soils. The WPCA Area H Project would work in concert with the Proposed Action to provide cumulative beneficial impacts with regard to flood risk reduction and reduction of CSO events, protecting against future coastal storm surges, thereby stabilizing geologic conditions and soils, and decreasing runoff and turbidity.

5.3.10 Hydrology and Flooding

5.3.10.1 Contribution of RFF Projects

Potential cumulative adverse impacts of RFF projects on hydrology and flooding in the study area include a potential increase in flooding due to large-scale development. Only the 60 Main Street development would increase local impervious surface and potentially contribute to inundation of floodwaters during coastal storm surges and heavy precipitation events. The other development projects – Windward Development, University of Bridgeport Master Plan and 30 University Avenue, The Ballpark at Harbor Yard – would redevelop existing developed sites with no net increase in impervious surface. In addition, RFF projects would conform the local and state stormwater management and groundwater protection policies as appropriate such that the combined effect of all RFF projects would not result in any significant adverse cumulative impact on hydrology and flooding.

RFF projects would benefit hydrology and flooding in the long-term through increased flood risk reduction against heavy precipitation events. The WPCA Area H sewer separation project would provide beneficial impacts for rainfall-based flooding by effectively increasing the drainage capacity in the eastern South End.

5.3.10.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on hydrology and flooding are discussed in Section 4.10.3.2. In addition to cumulative benefits of improved flood resiliency through dry egress, the RBD Pilot Project would contribute to long-term beneficial cumulative impacts through a net decrease in impervious surface with the creation of a new open space and stormwater facility which would increase stormwater infiltration capacity. In addition, green infrastructure and other stormwater improvements as part of the RBD Pilot Project would contribute long-term beneficial cumulative impacts to hydrology and flooding within the study area.

5.3.10.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on hydrology and flooding are discussed in Section 4.10.3.2. In addition to cumulative benefits of improved flood resiliency through dry egress, the proposed coastal defense system infrastructure would work in concert with RFF projects (WPCA Area H Project) to contribute to long-term beneficial cumulative impacts by decreasing the area at risk of flooding during a severe coastal event by 39 acres. In addition, green infrastructure and other stormwater improvements as part of the Flood Risk Reduction Project would contribute long-term beneficial cumulative impacts to hydrology and flooding within the study area.

5.3.10.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on hydrology and flooding are discussed in Section 4.10.3.2. In addition to cumulative benefits of improved flood resiliency through dry egress, the proposed coastal defense system infrastructure would work in concert with RFF projects (WPCA Area H Project) to contribute to long-term beneficial cumulative impacts by decreasing the area at risk of flooding during a severe coastal event by 64 acres. In addition, green infrastructure and other stormwater improvements as part of the Flood Risk Reduction Project would contribute long-term beneficial cumulative impacts to hydrology and flooding within the study area.

5.3.10.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts associated of the Resilience Center on hydrology and flooding are discussed in Section 4.10.3.2. The proposed Resilience Center would comply with all required floodplain regulations such that this proposed project component would not contribute additional adverse cumulative impacts associated with hydrology and flooding when considering the RFF projects within the study area.

5.3.10.6 Cumulative Impacts of Proposed Action

In addition to cumulative benefits of improved flood resiliency through dry egress, the Proposed Action would work in concert with RFF projects (WPCA Area H Project) to contribute to long-term beneficial cumulative impacts to hydrology and flooding by decreasing the area at risk of flooding during a severe coastal event by 39 to 64 acres and reducing the area of impervious surface with the creation of a new open space and stormwater facility which would increase stormwater infiltration capacity. In addition, green infrastructure and other stormwater improvements under the Proposed Action would contribute long-term beneficial cumulative impacts to hydrology and flooding within the study area, including increased coastal and interior flood resiliency.

5.3.11 Water Resources and Water Quality

5.3.11.1 Contribution of RFF Projects

Potential cumulative adverse impacts of RFF projects on water resources in the study area would occur primarily through construction activities. RFF projects will not require any significant in-water work with the exception of the Bridgeport Harbor Dredging. The WPCA Area H Project will require some improvements to existing outfalls. Construction sites can be sources of soil and sediment disturbance, which would lead to sediment and contaminant transport and runoff into nearby waterbodies.

The WPCA Area H Project would have a beneficial impact on water resources and water quality by capturing stormwater runoff and routing it directly to the outfalls, minimizing some of the stormwater entering the combined sewer system and triggering CSO events. Instead, a greater amount of sanitary flow would be treated at the wastewater treatment plant prior to discharge. The development at 60 Main Street would add impervious surface to a vacant site. All the other RFF projects would redevelop existing impervious surfaces and would, therefore, maintain the current level of impervious surface. The projects would not significantly change stormwater runoff or water quality.

5.3.11.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on water resources and water quality are discussed in Section 4.11.3.2. The stormwater infrastructure improvements as part of the RBD Pilot Project may require minor in-water work during construction to rehabilitate existing outfall into Cedar Creek Reach. Incremental impacts of the RBD Pilot would not result in significant adverse cumulative impacts to water resources or water quality in the study area when added to the contribution of RFF projects.

The RBD Pilot Project, in concert with RFF projects, would have cumulative benefits to water quality via improved stormwater detention and infiltration that would reduce contaminant transport and runoff into Cedar Creek Reach and Long Island Sound.

5.3.11.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on water resources and water quality are discussed in Section 4.11.3.2. The stormwater infrastructure improvements as part of the Flood Risk Reduction Project may require minor in-water work during construction to rehabilitate existing outfalls into Long Island Sound. Incremental impacts of the Western Option would not result in significant adverse cumulative impacts to water resources or water quality in the study area when added to the contribution of RFF projects.

The Flood Risk Reduction Project – Western Option, in concert with RFF projects (WPCA Area H Project), would have cumulative benefits to water quality via improved stormwater infrastructure improvements that would reduce contaminant transport and runoff into Long Island Sound and the occurrence of CSO events.

5.3.11.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on water resources and water quality are discussed in Section 4.11.3.2. The stormwater infrastructure improvements as part of the Flood Risk Reduction Project may require minor in-water work during construction to rehabilitate existing outfalls into Long Island Sound. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to water resources or water quality in the study area when added to the contribution of RFF projects.

The Flood Risk Reduction Project – Eastern Option, in concert with RFF projects (WPCA Area H Project), would have cumulative benefits to water quality via improved stormwater infrastructure improvements that would reduce contaminant transport and runoff into Long Island Sound and the occurrence of CSO events.

5.3.11.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts associated with the Resilience Center on water resources and water quality are discussed in Section 4.11.3.2. As the Resilience Center would not include any elements that are likely to affect water resources or water quality, no cumulative impacts when considered in conjunction with RFF projects are anticipated.

5.3.11.6 Cumulative Impacts of Proposed Action

Incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to water resources or water quality in the study area when added to the contribution of RFF projects. RFF projects (WPCA Area H Project in particular) would work in concert with the Proposed Action to provide cumulative beneficial impacts with regard to water quality and water resources within the study area, including enhanced stormwater detention and filtration, reduction in CSO events, and enhanced sewer infrastructure (including green infrastructure and higher capacity gray infrastructure).

5.3.12 Coastal Zone Management

A portion of the study area is within the Connecticut Coastal Management Area. Pursuant to the Connecticut Coastal Management Act, any proposed project within the Coastal Management Area must avoid or sufficiently minimize adverse impacts to existing resources, as well to future water-dependent development opportunities and activities.

5.3.12.1 Contribution of RFF Projects

Figure 5-2 illustrates that all of the RFF projects are partially or entirely within the Connecticut Coastal Management Area. As the Coastal Management Act requires that any proposed activity that impacts coastal functions or resources be deemed consistent with Connecticut's approved coastal management program, it is assumed that those RFF projects within the Coastal Management Area have or would receive consistency determinations from the Office of Long Island Sound Programs prior to construction. Therefore, no significant adverse cumulative impacts to coastal zone management are anticipated.

Cumulative benefits of RFF projects on coastal resources are limited to the reduced flood risk and occurrence of CSO events as a result of the WPCA Area H Project.

5.3.12.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on coastal zone management are discussed in Section 4.12.3.2. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result. No long-term cumulative impacts associated with the RBD Pilot Project are anticipated, as the project would realize improvements to various aspects of coastal zone management, including, but not limited to, improved stormwater infiltration and detention and reduced occurrence of CSO events.

5.3.12.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on coastal zone management are discussed in Section 4.12.3.2. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result. The Western Option would have the cumulative effect of enhancing coastal zone management within the study area in concert with various RFF projects through drainage system improvements and flood risk reduction infrastructure.

5.3.12.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on coastal zone management are discussed in Section 4.12.3.2. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result. Similar to the Western Option, the Flood Risk Reduction Project – Eastern Option would have the cumulative effect of enhancing coastal zone management within the study area in concert with various RFF projects through drainage system improvements and flood protection infrastructure.

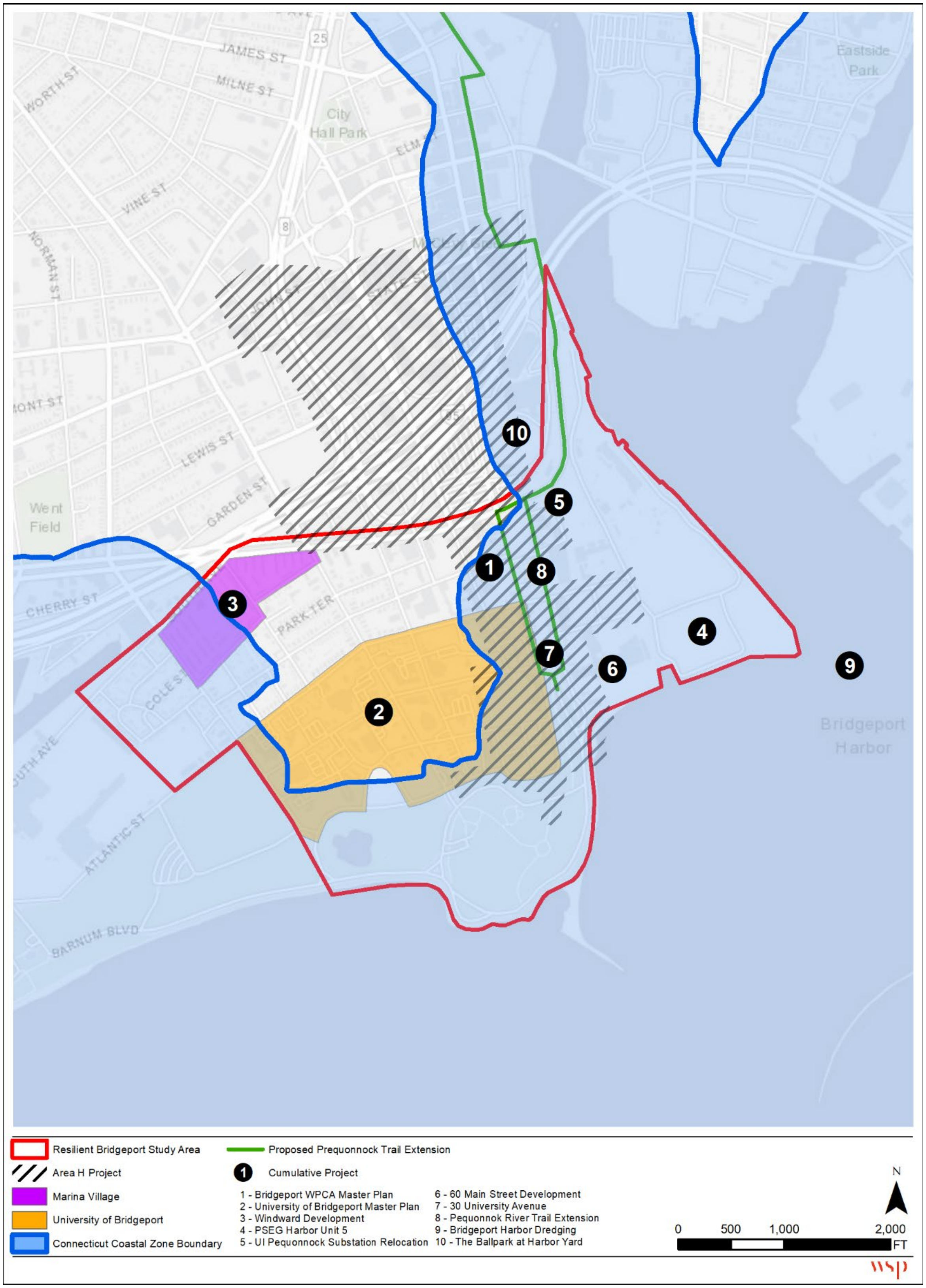
5.3.12.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on coastal zone management are discussed in Section 4.12.3.2. The proposed Resilience Center's small footprint would not result in any degradation of existing coastal resources or hinder future water-dependent opportunities within the study area, such that no significant adverse impacts to coastal zone management would result. In consideration with RFF projects, no significant adverse cumulative impacts are anticipated.

5.3.12.6 Cumulative Impacts of Proposed Action

The total impact of the Proposed Action would not result in significant adverse cumulative impacts to coastal zone management in the South End when added to the contribution of RFF projects. All RFF projects would be consistent with the Connecticut Coastal Management Act and the WPCA Area H Project would work in concert with the Proposed Action to provide cumulative beneficial impacts with regard to coastal zone management within the study area, including drainage system improvements, reduced occurrence of CSO events, and flood risk reduction infrastructure.

Figure 5-2. Cumulative Projects and Coastal Zone Map



5.3.13 Infrastructure

The analysis of infrastructure identified potential impacts to sanitary sewer and stormwater, utilities, and transportation.

5.3.13.1 Contribution of RFF Projects

Cumulative adverse impacts of RFF projects on infrastructure would result from construction activities that could cause interruptions to the various distribution networks. Construction activities may require removal or relocation of existing lines. There may be impacts to stormwater drainage and management from construction-related erosion. In addition, construction contractors using local utilities (e.g., electricity or water) for localized construction activities may increase demand on existing utility services. RFF projects planned for future construction would introduce personal vehicles for construction workers commuting to and from construction sites as well as heavy trucks transporting materials, soil, and debris. Potential traffic delays and interference with public parking availability would be expected. In addition, transportation-related RFF projects involving street resurfacing and intersection improvements would require road/lane closures and realignments during construction efforts, which would further contribute to adverse impacts on traffic. However, changes in infrastructure demand and any potential service disruptions from construction activities would be temporary and only cause short-term interference, if any, for the duration of the construction phase.

In the long-term, the RFF project involving stormwater drainage improvements (WPCA Area H Project) would improve sanitary sewer and stormwater infrastructure, as well as decrease the risk of power outages and increase flood protection against damages to utilities and service systems from storm events. The development projects would increase demand for sanitary sewer and utilities, as well as increase traffic volumes within the study area. The utilities are expected to have the capacity to serve the future development within the study area. Traffic analysis has demonstrated that the level of service would not significantly decrease as a result of the traffic generated by new mixed used development. The Ballpark at Harbor Yard is being redeveloped into a concert venue. The venue would generate increased traffic congestion in the study area due to increased demand and usage; however, the increased traffic would be intermittent and primarily directed north of the South End, toward I-95 and Route 8 or into downtown Bridgeport. The Pequonnock River Trail Extension will benefit transportation with the creation one-way shared bike lanes along Broad and Main Streets from Seaside Park at University Avenue to Ferry Access Road.

5.3.13.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on infrastructure are discussed in Sections 4.13.1.3, 4.13.2.3, and 4.13.3.3. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result.

In the long-term, the RBD Pilot Project would divert stormwater runoff from entering the combined sewer line on Iranistan Avenue thereby freeing up capacity in this system. This would have a beneficial impact on the combined sewer system and the West Side Plant by reducing the amount of stormwater that would need to be processed. The proposed Johnson Street extension, and its conversion to a two-way roadway, would not have any adverse impacts on traffic and would provide for the proposed future developments.

5.3.13.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on infrastructure are discussed in Sections 4.13.1.3, 4.13.2.3, and 4.13.3.3. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result.

It is anticipated that the design of the coastal flood defense system would minimize any impacts to existing sewer lines. To the extent practicable, the alignment for the north-south corridor would avoid the existing sewer lines or where necessary, cross the lines perpendicularly to minimize impacts. Only if other design solutions were impractical would relocation of sewer lines be considered. The proposed stormwater improvements would complement the WPCA Area H Project. Elevating University Avenue and rerouting traffic to the proposed roadway network, would not adversely impact traffic operating conditions at study intersections in the 2038 Build condition; traffic would remain at satisfactory level during peak periods.

5.3.13.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on infrastructure are discussed in Sections 4.13.1.3, 4.13.2.3, and 4.13.3.3. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result.

In general, long-term impacts to infrastructure would be similar for the Eastern Option as for the Western Option. However, under the Eastern Option of the coastal flood defense system, Emera and UI would be within the area of protection, resulting reduced risk of impacts from coastal surge and flooding and resulting service disruption.

5.3.13.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on infrastructure are discussed in Sections 4.13.1.3, 4.13.2.3, and 4.13.3.3. Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result.

The Resilience Center would have less-than-significant impacts on the sewer systems in the study area. There would be no long-term increase in demand for utilities and no increase in traffic as a result of the Resilience Center.

5.3.13.6 Cumulative Impacts of Proposed Action

Short-term adverse impacts generally associated with construction activities would be temporary and short in duration, such that no significant adverse cumulative impacts would result. In the long-term, the Proposed Action would have a beneficial impact on sanitary sewer with several sewer separations proposed for the eastern section of the study area. Coordination is currently ongoing with WPCA to ensure any negative impacts between the Proposed Action and the Area H Project are minimized and opportunities for synergistic benefits are incorporated where feasible. There would be no cumulative adverse impacts to utilities. The Proposed Action would not generate long-term impacts to transportation in the study area. The traffic analysis of the Proposed Action (accounting for the Windward Development and 60 Main Street) demonstrated that the potential roadway modification at the intersection of Main Street and University Avenue and the extension of Johnson Street would not result in a significant impact to traffic.

5.3.14 Community Facilities and Public Services

As described in Section 4.14.2, there are no community facilities or public services located within the study area, with the exception of the University of Bridgeport. Although there are school age children who reside in the study area, there are no elementary, middle or high schools within the study area. The nearest police station and fire station are located approximately 1.3 and 1.1 miles, respectively, from the center of the study area. St. Vincent's Medical Center and Bridgeport Hospital are both located approximately 3 miles away from the center of the study area.

5.3.14.1 Contribution of RFF Projects

Potential cumulative adverse impacts of RFF projects on public services primarily include restricted access during construction activities and changes in demand in the long term. RFF projects involving street resurfacing (such as the WPCA Area H Project) and large-scale development (such as the University of Bridgeport Master Plan or 60 Main Street) would require road/lane closures causing delays in emergency response times of police and fire departments and ambulances.

RFF projects would benefit public services over the long-term through implementation of stormwater drainage improvements (WPCA Area H Project) that would reduce interruptions to operations of public services from flood damage and increase the reliability of public services. The WPCA Area H Project will also indirectly reduce the frequency of emergency calls during flood hazard events and provide manageable demand for emergency responders.

5.3.14.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on community facilities and public services are discussed in detail in Section 4.14.3.2. Incremental impacts of the RBD Pilot would not result in significant adverse cumulative impacts to community facilities or public services in the study area when added to the contribution of RFF projects. There would be additional cumulative beneficial impacts on community facilities with the construction of the stormwater facility which would service as a public amenity. The dry egress from the proposed extension of Johnson Street would provide a cumulative beneficial impact to public services and safety by allowing emergency vehicles access during flood conditions.

5.3.14.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on community facilities and public services are discussed in detail in Section 4.14.3.2. Incremental impacts of the Western Option would not result in significant adverse cumulative impacts to community facilities or public services in the study area when added to the contribution of RFF projects. There would be additional cumulative beneficial impacts to public services with the construction of measures that would reduce the flood risk within the study area from future coastal surge and chronic rainfall events allowing emergency vehicles access during flood conditions. Upon completion of the Western Option, the low-lying underpasses under the railroad viaduct would be less likely to flood and would allow for safe egress options and improve emergency vehicle access in the area in case of a flooding event. The dry egress from the elevation of University Avenue would have a beneficial impact on emergency vehicle access to adjacent residences and retail buildings.

5.3.14.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on community facilities and public services are discussed in detail in Section 4.14.3.2. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to community facilities or public services in the study area when added to the contribution of RFF projects. The additional cumulative beneficial impacts to public services with the construction of the Eastern Option would be similar to those of the Western Option, with the added benefit of dry egress to PSEG's Harbor Unit 5.

5.3.14.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on community facilities and public services are discussed in detail in Section 4.14.3.2. Incremental impacts of the Eastern Option would not result in significant adverse cumulative impacts to community facilities or public services in the study area when added to the contribution of RFF projects. There would be additional cumulative beneficial impacts to community facilities with the rehabilitation of the Freeman Houses to serve as a hub for resilience activities.

5.3.14.6 Cumulative Impacts of Proposed Action

Incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to community facilities or public services in the study area when added to the contribution of RFF projects. There would be additional cumulative beneficial impacts to community facilities with the construction of the stormwater facility as a public amenity and rehabilitation of the Freeman Houses to serve as a hub for resilience activities. In addition, there would be additional cumulative beneficial impacts to public services with the construction of measures that would reduce the flood risk within the study area from future coastal surge and chronic rainfall events and dry egress on the Johnson Street extension and elevated University Avenue that would allow emergency vehicles access during flood conditions.

5.3.15 Open Space and Recreation

The assessment of open space and recreation includes physical changes to existing facilities resulting from the construction of the projects, as well as any activities or change in conditions that could alter the use and/or access to an existing, public facility such that it may no longer serve the same user population.

5.3.15.1 Contribution of RFF Projects

The cumulative impacts of RFF projects on open space and recreational resources are changes in use and access. RFF projects planned for future construction would adversely impact usage of and access to recreational facilities due to construction disturbance near resources (primarily Seaside Park), including noise and dust from construction activities, and disruptions to the viewshed from construction equipment and demolished buildings. In addition, temporary traffic delays from additional on-road vehicles or street resurfacing that require road/lane closures (such as for the WPCA Area H Project) would affect public access to recreational facilities. Waldemere Avenue along the north side of Seaside Park is a collector road that would likely serve as a haul route for RFF projects planned for future construction.

RFF projects that include residential development – Windward Development, 60 Main Street, and 30 University Avenue – would increase residents and users of the open space and recreational resources in the study area. However, the primary open space in the study area is the 375-acre Seaside Park which can accommodate a large increase in users; therefore, the RFF projects would not adversely affect open space and recreation in the long-term.

RFF projects would cumulatively benefit the study area through the creation and improvement of new and existing recreational facilities. The Pequonnock River Trail Extension would complete the remaining three miles of the trail within the City of Bridgeport, a portion of which would be located within the study area. The Ballpark at Harbor Yard is being redeveloped into a concert venue immediately north of the study area. In the long term, the WPCA Area H Project would reduce flooding and the subsequent frequency of road closures and improve access to open space and recreational areas, while also reducing flood-related closures of open space and recreational areas.

5.3.15.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on open space and recreation area discussed in detail in Section 4.15.3.2. Incremental impacts of the RBD Pilot Project would not result in significant adverse cumulative impacts to open space and recreational resources in the study area when added to the contribution of RFF projects.

In addition to the cumulative benefits from flood protection, operation of the RBD Pilot Project would contribute additional cumulative long-term, beneficial impacts to open space and recreation through the creation of a new open space area in the form of the proposed stormwater facility.

5.3.15.3 Cumulative Impacts of Flood Risk Reduction Project – Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on open space and recreation area discussed in detail in Section 4.15.3.2. Incremental impacts of the Western Option would not result in significant adverse cumulative impacts to open space and recreational resources in the study area when added to the contribution of RFF projects.

As part of the Flood Risk Reduction Project (regardless of coastal flood defense system alignment option), University Avenue would be elevated, resulting in a modification to the entrance to Seaside Park at University Avenue between Broad Street and Main Street. This modification would not block the entrance to the park or any of the park amenities. The Dead-End Option for the intersection of Main Street and University Avenue would allow pedestrians to continue south to enter Seaside Park via stairs and handicap-accessible ramps incorporated into the design of the elevated University Avenue. In addition to cumulative benefits from flood protection, the design of the Flood Risk Reduction Project would elevate the entrance of Seaside Park at University Avenue, reducing regular flooding within that area of the park.

5.3.15.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on open space and recreation area discussed in detail in Section 4.15.3.2. Incremental impacts of the Eastern Option would be the same as with the Western Option. It would not result in significant adverse cumulative impacts to open space and recreational resources in the study area when added to the contribution of RFF projects. In the long-term, pedestrian access to Seaside Park at Main Street and University Avenue would be incorporated into the design and flood protection measures would provide cumulative benefits to open space and recreation in the study area.

5.3.15.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on open space and recreation area discussed in detail in Section 4.15.3.2. Incremental impacts of the Resilience Center would not result in significant adverse cumulative impacts to open space and recreational resources in the study area when added to the contribution of RFF projects.

5.3.15.6 Cumulative Impacts of Proposed Action

Incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to open space and recreation in the study area when added to the contribution of RFF projects. There would be additional cumulative beneficial impacts to open space with the construction of the stormwater facility as part of the RBD Pilot Project. There would be changes to the entrance of Seaside Park at University Avenue but pedestrian access would be maintained. In addition, flood risk reduction measures and coastal surge protection measures would provide additional cumulative beneficial impacts to open space and recreation.

5.3.16 Air Quality and Greenhouse Gas Emissions

5.3.16.1 Contribution of RFF Projects

RFF projects would contribute adverse impacts on air quality and GHG emissions from construction activities. Excavating and filling soil would generate dust, use of heavy-duty trucks to transport materials would generate criteria pollutant emissions and non-road construction equipment would generate hazardous air pollutant emissions. However, the emissions would be temporary and are not expected to contribute adverse effects to overall air quality or human health in the regional airshed.

The RFF projects that involve new development – Windward Development, 60 Main Street, and 30 University Avenue – would generate traffic that would increase emissions to the regional airshed. The trips generated by the Windward Development and 60 Main Street Redevelopment were accounted for in the No Build condition of the traffic analysis, as described in Section 4.13.3. The traffic analysis found that there would not be a significant increase in traffic congestion as a result of the new development; therefore, the projects would not result in a significant increase in vehicular emissions.

Stationary sources of air pollution, such as power plants, much annually certify compliance with applicable requirements and renew permits to adhere with State and Federal standards. PSEG Harbor Unit 5 will replace the coal-fired Harbor Unit 3 power plant with a duel fuel, single train combined-cycle power plant. Harbor Unit 5 will use a combustion turbine, a steam turbine and a heat recovery steam generator, resulting in reduced point source emissions. The relocation of UI's Pequonnock Substation would not be expected to contribute any long-term change in point source emissions.

5.3.16.2 Cumulative Impacts of RBD Pilot Project

Direct and indirect impacts of the RBD Pilot Project on air quality and GHG emissions are discussed in detail in Sections 4.16.3.2. The construction of the RBD Pilot Project would have a temporary impact on air quality and GHGs as a result of increased truck traffic, employee vehicle traffic, and earth-moving activities associated with the roadway extension and stormwater facility construction. Incremental impacts of the RBD Pilot Project would not result in significant adverse cumulative impacts to air quality and GHGs when added to the contribution of RFF projects.

The RBD Pilot Project would not contribute to adverse cumulative impacts to operational (long term) air quality in the region. There would be no direct increase in traffic or new point source emissions. The proposed extension of Johnson Street would improve traffic and reduce congestion, resulting in an associated decrease in air emissions.

5.3.16.3 Cumulative Impacts of Flood Risk Reduction Project– Western Option

Direct and indirect impacts of the Flood Risk Reduction Project – Western Option on air quality and GHG emissions are discussed in detail in Sections 4.16.3.2. The construction of the Western Option would have a temporary impact on air quality and GHGs as a result of increased truck traffic, employee vehicle traffic, and earth-moving activities associated with the elevation of University Avenue, coastal flood defense system installation and construction of stormwater improvements. Incremental impacts of the Flood Risk Reduction Project – Western Option would not result in significant adverse cumulative impacts to air quality and GHGs when added to the contribution of RFF projects.

The Flood Risk Reduction Project – Western Option would not contribute to adverse cumulative impacts to operational (long term) air quality in the region. There would be no direct increase in traffic or new point source emissions. The potential roadway modification at the intersection of Main Street and University Avenue would not result in a significant impact to traffic or an associated increase in air emissions.

5.3.16.4 Cumulative Impacts of Flood Risk Reduction Project – Eastern Option

Direct and indirect impacts of the Flood Risk Reduction Project – Eastern Option on air quality and GHG emissions are discussed in detail in Sections 4.16.3.2. Impacts to air quality and GHG would be similar to those of the Western Option of the Flood Risk Reduction Project. The construction of the Eastern Option would have a temporary impact on air quality and GHGs as a result of increased truck traffic, employee vehicle traffic, and earth-moving activities associated with the elevation of University Avenue, coastal flood defense system installation and construction of stormwater improvements. Incremental impacts of the Flood Risk Reduction Project – Eastern Option would not result in significant adverse cumulative impacts to air quality and GHGs when added to the contribution of RFF projects.

The Flood Risk Reduction Project – Eastern Option would not contribute to adverse cumulative impacts to operational (long term) air quality in the region. There would be no direct increase in traffic or new point source emissions. The potential roadway modification at the intersection of Main Street and University Avenue would not result in a significant impact to traffic or an associated increase in air emissions.

5.3.16.5 Cumulative Impacts of Resilience Center

Direct and indirect impacts of the Resilience Center on air quality and GHG emissions are discussed in detail in Sections 4.16.3.2. The construction of the Resilience Center would have a temporary impact on air quality and GHGs as a result of increased truck traffic, employee vehicle traffic, and limited earth-moving activities. Incremental impacts of the Resilience Center would not result in significant adverse cumulative impacts to air quality and GHGs when added to the contribution of RFF projects.

The Resilience Center would not contribute to adverse cumulative impacts to operational (long term) air quality in the region. There would be no direct increase in traffic or new point source emissions.

5.3.16.6 Cumulative Impacts of Proposed Action

Incremental impacts of the Proposed Action would not result in significant adverse cumulative impacts to air quality and GHGs in the regional airshed when added to the contribution of RFF projects. The construction of the Proposed Action would have a temporary impact on air quality and greenhouse gases as a result of increased truck traffic, employee vehicle traffic, and earth-moving activities associated with the roadway elevation, stormwater facility construction, and coastal flood defense system installation.

The Proposed Action would not contribute in adverse cumulative impact to operational (long term) air quality in the region. There would be no direct increase in traffic or new point source emissions. The potential roadway modification at the intersection of Main Street and University Avenue and the extension of Johnson Street would not result in a significant impact to traffic or associated emissions.

6

Consultation and Coordination

Contents

Tables

6. Consultation and Coordination

This chapter describes the agency and public coordination efforts undertaken by the Connecticut Department of Housing (CTDOH) during the planning and design process for the Resilient Bridgeport: National Disaster Resilience and Rebuild by Design Projects (the Proposed Action) to ensure the process remained open and inclusive to the extent possible. This chapter also describes efforts to consult and coordinate with various government agencies in order to comply with legal requirements, including public scoping; designating cooperating agencies; governmental consultation; and the consistency process with tribal, local, county, and state plans during preparation of this Draft Environmental Impact Statement (DEIS). The planning activities were conducted in accordance with National Environmental Policy Act of 1969 (NEPA) requirements, Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), the U.S. Department of Housing and Urban Development (HUD) Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 CFR 58), and Connecticut Environmental Policy Act.

6.1 BACKGROUND

In 2014, as part of the Rebuild by Design (RBD) Competition, HUD awarded $10 million in funding to CTDOH for the Resilient Bridgeport project. The funds were designated to assess design conditions and develop a resiliency strategy for the area of Bridgeport that extends from downtown Bridgeport to Black Rock Harbor. Over the past several years, CTDOH, the City of Bridgeport, and Bridgeport residents and business owners have been consulted with to develop an overall resilience strategy, as well as to identify pilot projects for Bridgeport's South End and Black Rock Harbor areas, with a specific focus on the historic footprint of Marina Village. Throughout this process several workshops and open houses in the South End and downtown Bridgeport have been hosted. The purpose of these public events was to discuss the critical issues facing the Bridgeport following Superstorm Sandy in October 2010, outline the Resilient Bridgeport project process and timeline, share ongoing design work and project alternatives, and get community feedback. In 2016, Connecticut received an additional $54 million in funding, as part of the National Disaster Resilience Competition that was primarily dedicated to flood risk reduction and resiliency education projects in Bridgeport's South End.

The consultation and coordination efforts during the National Disaster Resilience phase builds on the previous public involvement activities under RBD.

6.2 CONSULTATION AND COORDINATION FRAMEWORK

CTDOH has assumed environmental compliance responsibilities for the Draft and Final Environmental Impact Statements on behalf of HUD and pursuant to 24 CFR 58.4 and 58.10, and will act as the lead agency during the review of this EIS. As the lead agency, CTDOH is responsible for public and agency coordination as outlined in the Agency Coordination Plan and the Community Engagement Plan, described in Sections 6.3 and 6.4.

Further, to proactively engage with the public and stakeholders, CTDOH has performed comprehensive outreach programs that included community relations management, media relations management, public inquiries, public outreach notifications, website, social media, and marketing materials. CTDOH is responsible for managing, planning, obtaining approvals, designing, and scheduling all public engagement efforts.

6.3 AGENCY COORDINATION

In compliance with the NEPA requirements, CTDOH prepared an Agency Coordination Plan to facilitate and document the review of this DEIS and the Final EIS (FEIS) with cooperating and participating agencies listed in Table 6-1. The plan describes the processes and communication methods for soliciting and considering information from these agencies, and will be in effect throughout the environmental review process, beginning with scoping and ending with the Record of Decision. The plan will be updated periodically during project development, as needed.

Table 6-1. Invited Cooperating and Participating Agencies

Cooperating Agencies	Participating Agencies
US Department of Housing and Urban Development	US Army Corps of Engineers
Federal Emergency Management Agency	Connecticut Department of Transportation
Environmental Protection Agency	Delaware Nation, Oklahoma
Connecticut Department of Energy and Environmental Protection	Delaware Tribe of Indians
Connecticut State Historic Preservation Office	Mashantucket (Western) Pequot Tribal Nation
	Mohegan Tribe of Indians of Connecticut
	Narragansett Indian Tribe

The agencies listed in Table 6-1 were identified as cooperating and participating agencies, responsible for identifying any issues of concern regarding Resilient Bridgeport's potential for environmental or socioeconomic impacts and providing input on various aspects during the preparation of this DEIS. A cooperating agency has jurisdiction by law of special expertise with respect to an environmental impact involved in a proposed project or project alternative, and a participating agency is an agency that has interest in the project.

The primary responsibilities of the cooperating agencies during this EIS process include providing input on the following:

- Purpose and need statement
- Range of alternatives
- Methodologies for documenting environmental conditions and assessing effects
- Identification of issues that could substantially delay or prevent granting of permit/approval
- Mitigation

Cooperating agencies also share the following responsibilities with the participating agencies, which include the following:

- Provide comments, responses, studies, or methodologies on those areas within the special expertise or jurisdiction of the agency.

- Use the process to address any environmental issues of concern to the agency.

Agencies were invited to a webinar on October 12, 2018, during which a PowerPoint was presented with a summary of the Proposed Action and the analysis of environmental consequences. Agencies were provided the opportunity to ask questions and give initial comments. Agencies were also given the opportunity to provide pre-public review of this DEIS and will similarly be given the opportunity to review the FEIS prior to publication.

All agencies will be notified of the availability of the DEIS and FEIS and be given appropriate comment opportunities. Following the Record of Decision by CTDOH, the appropriate agencies will be consulted to obtain any necessary permits.

6.4 COMMUNITY ENGAGEMENT

The primary goal of the Community Engagement Plan is to maximize opportunities to engage the public and neighboring communities through regular and proactive communication. The plan outlines how open communication with the public will be fostered and maintained. A Citizen Advisory Committee, comprising community leaders who represent the interests of the local community throughout the design effort, and a Technical Advisory Committee, comprising technical experts from state and city agencies, and other key technical stakeholders were formed to aid community engagement.

6.4.1 Citizen Advisory Committee

The Citizen Advisory Committee (CAC) comprises community leaders (e.g., advocates, local business owners, residents, etc.) who serve as an advisory panel that represent the interests of the local community throughout the environmental and design processes (see Appendix H for a list of CAC members).

The CAC members meet regularly to discuss community issues and needs related to the project. The first CAC meeting was held on November 2, 2017, to discuss the following:

- Presence of cemeteries within the project area and need for an archaeological monitor during construction
- RBD Pilot Project update
- Coordination between PSEG and Resilient Bridgeport for improved water access
- Proposed Resiliency Hub
- Schedule preliminary design meeting (30%) for fall 2018

The second CAC meeting (held on December 5, 2017) focused on community involvement, feedback, and a discussion on ways to increase community outreach. The meeting also included comments, questions, and suggestions from CAC members regarding upcoming public meetings.

A third CAC meeting was held on March 6, 2018, in advance of the of the DEIS Scoping Hearing and Design Workshop. a Draft PowerPoint presentations were previewed for the CAC before being shared at the public meeting. CAC members offered feedback for improving the presentation content and visuals, and flagged topics that could be more important to the community, including a better understanding of what was meant by

"Resilience Hub" (aka Resilience Center[1]) This feedback was incorporated into the final DEIS Scoping Hearing and Design Workshop presentations.

The fourth CAC meeting was held on May 30, 2018, to provide an update on stakeholder coordination efforts and the environmental process, and to discuss ways to facilitate a design workshop that would garner increased participation by the community at large. The CAC members were encouraged to contact others in the community to increase neighborhood representation at public meetings.

6.4.2 Technical Advisory Committee

The Technical Advisory Committee (TAC) comprises state and city agencies and other key technical stakeholders that can advise and provide input toward design, and aid in targeting permit requirements, critical design decisions, and policy concerns associated with potential project design elements (see Appendix H for a list of TAC members). The TAC includes technical experts within the State Agencies Fostering Resilience Council; representatives from state agencies—CTDOH, State Historic Preservation Office, the Water Pollution Control Authority, Connecticut Department of Transportation, and Connecticut Department of Energy & Environmental Protection; departments of the city—Bridgeport Buildings Department, City Economic Development, City Public Facilities, City Mayors, and City Engineering; and representatives from other key technical stakeholders, including WSP, Yale Urban Design Workshop, Arcadis Design, Waggonner Ball Architecture/Environment, Groundwork Bridgeport, GEI Consultants, and Connecticut Institute of Resilience & Climate Adaptation. The first TAC meeting was held on November 2, 2017, to discuss the purpose and need for the Proposed Action.

At the second meeting (held on March 1, 2018), the TAC discussed the following:

- Transitioning of the Resilient Bridgeport planning phase to the design phase
- Alignment alternatives and coastal stormwater modeling
- EIS process and schedule, with an anticipated Record of Decision in spring 2019
- Public outreach timeline and public comments/feedback received to date
- Ongoing coordination with project stakeholders and federal agencies

6.5 STAKEHOLDERS

CTDOH has regularly engaged the project stakeholders throughout the NEPA process.

6.5.1 PSEG Power Connecticut LLC

PSEG Power Connecticut LLC (PSEG) is an independent power producer that operates fossil fuel and natural gas power plants in Bridgeport and New Haven, CT, to produce electricity. The overall flood risk reduction strategy for the eastern South End includes a coastal flood defense system option on the PSEG property.

1 Resilience Hub was the term used at the time to facilitate discussion of what the Action Plan referred to as the Resilience Center. The term was subsequently changed back to Resilience Center for the purposes of this DEIS.

Coordination with PSEG is an important component since the PSEG improvements and the Proposed Action affect one another. PSEG provided input on the initial alignment options.

6.5.2 Emera Energy

Bridgeport Energy LLC, a subsidiary of Emera Energy, owns and operates a natural gas-fired combined cycle power generation plant located in the South End of Bridgeport. The coastal flood defense system for the eastern South End would include flood reduction options on the Bridgeport Energy property, and coordination with Emera Energy is an important component since the two projects affect each another. Emera provided input on the initial alignment options.

6.5.3 United Illuminating

United Illuminating Company (UI) is a regional electric distribution company that has existing utility lines within the study area. In addition, UI has plans for a new substation in Bridgeport along with measures to protect substation equipment from rising waters and flooding based on the coastal nature of its service territory. The overall resilient strategy for the project area was coordinated with UI, including background information on previous storm damage, topographic and site surveys, existing UI utility easements, substations resiliency design standards, existing distribution network serving South End, and clearance/construction restrictions for distribution and transmission network. UI provided input on the initial alignment options.

6.5.4 University of Bridgeport

The proposed master plan for the University of Bridgeport centers along University Avenue, which serves as an east-west spine connecting the edges of the campus. A network of public roads and private pedestrian malls extend from University Avenue. Nearly one-third of the campus is in the floodplain. The overall resilience strategy of the Proposed Action to improve flood resiliency in the South End neighborhood includes berm protection for part of the university campus, and creates high ground for elevated buildings seaward of the berm to connect to. The university provided input on the resiliency design strategies.

6.5.5 Section 106 Consulting Parties

Section 106 of the National Historic Preservation Act provides legal protection to historic preservation in federal planning, decision-making, and project execution. The act was developed by the National Park Service and the Advisory Council on Historic Preservation—an independent federal agency that promotes the preservation, enhancement, and productive use of our nation's historic resources—and advises the president and Congress on national historic preservation policy. The Section 106 process applies to any and all federal agencies when the following conditions apply:

- There is a federal or federally licensed action, including grants, licenses, and permits; and
- The proposed action has the potential to affect properties listed in or eligible for listing in the National Register of Historic Places.

When Section 106 applies, the applicable federal agency is required to perform the following:

- Identify and assess the effects of its action on historic resources; and
- Consult with appropriate state and local officials, including the State Historic Preservation Officer, Tribal Historic Preservation Officers, applicants for federal assistance, and members of the public and consider their views and concerns about historic preservation issues when making final project decisions.

In addition to coordinating with the State Historic Preservation Offices (cooperating agency), Tribal Historic Preservation Officers (participating agencies), and the University of Bridgeport (stakeholder), the following parties with a potential interest in the historic resources within the study area were consulted:

- Mary and Eliza Freeman Center for History and Community
- Barnum Museum
- Fairfield Garden Club
- Bridgeport History Center (at the Bridgeport Public Library)
- Bridgeport Community History Center

6.6 PUBLIC INVOLVEMENT

6.6.1 Public Meetings

Sign-in sheets and minutes from each of the public meetings can be found in Appendix H. The project website (*www.resilientbridgeport.com*) has archives of the presentations for each meeting.

6.6.1.1 Project Kick-off Meeting (#1)

A public kick-off meeting was held on October 18, 2017, at Littlefield Recital Hall of the Arnold Bernhard Arts & Humanities Center in Bridgeport, CT. Approximately 41 people attended the meeting. An open house session was held from 6:00 p.m. to 7:00 p.m., which provided attendees an opportunity to speak one-on-one with representatives from Resilient Bridgeport project team. The open house was followed by a presentation at 7:00 p.m. that provided detailed information on the Resilient Bridgeport Program and its transition from the RBD planning process to working on the implementation of the RBD and National Disaster Resilience funded projects. The focus of this public meeting was to provide an overview of the Resilient Bridgeport project, discuss the next project phase: environmental review and preliminary design, project alternatives, and collect comments and feedback from the public.

Below is a summary of the comments received during the meeting:

- Goals and Objectives:
  - Local job creation
  - Health measures in place
  - Safe connections to downtown
  - Different economic classes
  - Safe and desirable retail for residents
  - Raising streets for historical residences

  - Effect of standing water on insect populations
  - Discuss Seaside Village Pilot Project
  - Transportation connections to downtown and train station
  - Flood Insurance Cost assistance strategies

- Effects of Superstorm Sandy:
  - Water in basement resulted in foundation damage
  - Basement flooding – Atlantic Avenue, Seaside Village
  - Transportation network affected

- Resilience Center types:
  - Satellite Phone Connection
  - Emergency Response Brigade Center (neighborhood based)
  - Community driven data collection center

6.6.1.2 Concept Screening Meeting (#2)

The draft design concepts were first presented to the public on December 12, 2017, at the New Vision International Ministries in Bridgeport, CT, through an interactive public workshop. Approximately 40 people attended this meeting. The meeting included a presentation of the project, project goals and objectives, and strategies and opportunities related to water and urban design. The presentation was followed by a 60-minute urban design workshop with three themes: Public Realm Improvements, Connections, and Neighborhood Development.

The public meeting ended with a 20-minute discussion on the following:

- Connection to downtown Bridgeport, waterfront, and multimodal transportation system
- Need for a gateway in the South End
- Public infrastructure and community connectivity
- Encourage new businesses and residents, without compromising neighborhood character and supporting local needs
- Land reserved for water management and leveraged as a community asset
- Seaside Park
- Increase the number of street trees in South End
- Flood risk reduction infrastructure should include public art and new public spaces
- More public activities and programming necessary
- Creation of a Resilience Center

6.6.1.3 DEIS Scoping Meeting (#3)

Scoping is a public process designed to inform the public about the project and to identify the range of alternatives and impacts and significant issues to be addressed in an EIS, consistent with federal (40 CFR 1500-1508) and HUD's NEPA Regulations (24 CFR 58) requirements. For the Proposed Action, this public scoping process began on February 27, 2018, with the publication of the Notice of Intent (NOI) in the *Federal Register*. The NOI notified the public of CTDOH's intent to prepare a DEIS for the Resilient Bridgeport: National Disaster Resilience and Rebuild by Design Projects located in Bridgeport, CT, in accordance with NEPA. The public scoping process also included preparation of a draft Scope of Work, which was published on the project website (*https://resilientbridgeport.com/wp-content/uploads/2018/02/Resilient-Bridgeport-Draft-Scoping-Document.pdf*) followed by a 30-day comment period prior to the public scoping meeting.

The DEIS Scoping Meeting was held at 6:00 p.m. on March 14, 2018, at Schelfhaudt Gallery, Bridgeport, CT. At least two weeks in advance of the meeting, legal notices were published in local English and Spanish newspapers notifying the public of the time and location of the meeting, including contact information should anyone require translation services at the meeting. The public meeting included a presentation and discussion on the Draft Scoping Document for the Resilient Bridgeport's EIS, including a discussion on the purpose and need, preliminary design alternatives, and analysis methodologies. All comments received at the DEIS Scoping Meeting were recorded and were addressed in the FEIS Scoping Document (*https://resilientbridgeport.com/wp-content/uploads/2018/06/Resilient-Bridgeport-Final-Scoping-Doc_June2018.pdf*).

6.6.1.4 Alternatives Analysis Meeting (#4)

The alternatives analysis meeting was held on June 6, 2018, at the Schelfhaudt Gallery located in the Arnold Bernhard Arts & Humanities Center, 84 Iranistan Avenue in Bridgeport, CT. The meeting began with a presentation that included an update on the DEIS public review timeline, impact categories, and next steps; presentation of the Resilience Hub survey results, need for further evaluation, and next steps; alternatives analysis screening process, issues, and selected alternatives; stormwater strategies; and existing community assets. The presentation was followed by breakout groups to receive public feedback on the selected alternatives.

6.6.1.5 DEIS Public Hearing (#5)

A public hearing will be held to solicit community feedback on the content of this DEIS on February 12, 2019.

The hearing will provide an opportunity for the public to submit comments on the DEIS orally and/or in writing. The public hearing will be held on Tuesday, February 12, 2019, from 6:00 p.m. to 8:00 p.m. at the Schelfhaudt Gallery (84 Iranistan Avenue, Bridgeport, CT). Comments on this DEIS will be recorded at the hearing. Those who do not wish to voice their comments publicly will be offered an opportunity to provide a private written or verbal comment at the meeting, or submit comments through the CTDOH website (*https://www.ct.gov/doh/cwp/view.asp?a=4513&q=588726*), Resilient Bridgeport website, (*www.ResilientBridgeport.com*) or by mail to CTDOH:

Rebecca French
Director of Resilience, CTDOH
505 Hudson Street
Hartford, CT 06106
ATTN: Resilient Bridgeport
info@resilientbridgeport.com

All comments received by February 22, 2019, will be addressed in the FEIS.

6.6.2 Website

A project website (*www.ResilientBridgeport.com*) was developed during the RBD phase and is updated on an as-needed basis. The website is a digital, user-friendly public information outlet and is used as a single-source location to archive all public project materials.

The website provides the public with the following information:

- An overview, history, issues, and opportunities of the project
- Project updates and timeline
- Archive of all public meeting materials
- Information on upcoming public meetings, community events, and workshops
- Links to documents published during the EIS process, including the NOI, press release, fact sheet, and a copy of the poster boards from the public meetings
- Links to project social media accounts
- Links to related websites including CTDOH website
- Contact information for public comment

6.6.3 Social Media

The Resilient Bridgeport social media accounts were developed during the RBD phase of the project. These include the project Facebook account @resilientbridgeport and Twitter account @ResilientBPCT. These social media accounts will be maintained and have and will be used to distribute accurate and timely information to a broader audience. Regular updates include project updates, notice of public events, and event photos.

In addition, public meetings will be broadcast live through the Facebook Live feature and YouTube video content posted at the project website when appropriate. These postings are completed on an as-needed basis and in a consistent, expository style. Because all users of the social media accounts must consider its associated risks, including the conflation of personal and professional communications, spreading malware, disclosing sensitive information, and responding to crisis, only one RBD team member is responsible for all social media postings.

6.6.4 Press Releases and Media Alerts

CTDOH has maintained a close relationship with the local news outlets. Such contact involves press releases, media alerts, advertising, email correspondences, and periodic phone or in-person briefings. Through these media relationships and coordinating efforts, newspaper articles and newscasts that relay the project's intended messages are produced for the public.

Popular local media outlets in Bridgeport, CT include Newspaper/Online—Only in Bridgeport, La Voz (Spanish), and CT Post; Television/Online—WTNH, News 12; Radio—WPKN, WNLK-WSTC, WNPR, and Radio Cumbre (Spanish).

Throughout the environmental review and design process, press releases and media alerts notified the public about project milestones, public meetings/hearings, and/or other important project information. A distribution list for press releases is maintained.

6.6.5 Other Outreach Outlets

Other outreach efforts included door-to-door outreach, door hangers with meeting information, and maintenance of a stakeholder database.

Door-to-door outreach has been an essential way to maintain communication with those residing or working in Bridgeport's South End that may not have access to other means of notification. It is often the most effective way to contact local businesses and residents with important information. Residents and business managers have been personally informed about project updates/upcoming events. Door hangers were created in advance of public meetings and were distributed to Bridgeport's South End residents and businesses.

6.6.6 Construction Outreach

During construction, weekly construction updates will be issued via the email distribution list, project website and social media platforms. These updates will contain detailed information on construction schedule, activities and impacts for the following week. Variable Message Signs (VMS) may also be used throughout the project area to warn motorists, pedestrians, and cyclists of changes in traffic patterns including road closures. As needed, construction project staff will reach out to local community groups to provide in-person updates on construction progress and potential impacts.

7

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8

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8. Preparers

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9

Glossary and Acronyms

9. Glossary and Acronyms

9.1 GLOSSARY

Above Mean Sea Level	The elevation (on the ground) or altitude (in the air) of an object, relative to the average sea level datum.
Acute Flooding	Flooding conditions that can be characterized as severe and/or intense.
Affected Environment	The existing conditions to be affected by the proposed action.
Anoxia	The absence of oxygen, usually in reference to a body of water, body tissue, or organs.
Aquifer	Underground layers of porous rock saturated with water. Wells are drilled down into aquifers so that the stored water can be pumped out.
Area of Potential Effect (APE)	Term specific to compliance with Section 106 of the National Historic Preservation Act (54 USC § 306101 et seq.) and implementing regulations (36 CFR Part 800.16(d)), "Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."
Base Flood	A flood having a one percent chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the "100-year flood." The base flood is the national standard used by the National Flood Insurance Program and all federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development.
Best Available Treatment	Those treatments best for preventing or minimizing impacts on the environment regarding stormwater.
Best Available Technology	In pollution abatement, the technology approved for limiting pollutant discharges with regard to an abatement strategy. Similar terms are best available techniques, best practicable means or best practicable environmental option.
Best Management Practice	Methods that have been determined to be the most effective and practical means to aid in achieving desired outcomes; often associated with preventing or reducing pollution.
Bioretention	A type of green infrastructure practice where shallow basins (such as rain gardens) or structures (such as stormwater tree planters) collect stormwater and use vegetation and layers of soil and aggregates to filter, store and infiltrate the water. The vegetation also uses (transpires) the water. Bioretention is commonly installed in parks and wide road medians or sidewalks.
Bioswale	Landscape elements designed to concentrate or remove debris and pollution out of surface runoff water. They consist of a swaled drainage course with gently sloped sides that are filled with vegetation, compost and/or soilto treat, store, and infiltrate stormwater runoff.
Blue Streets	A street intentionally designed to store, detain, and/or convey water at the roadway surface temporarily without negatively affecting the intended use or adjacent properties.
Build Alternative(s)	One or more specific improvements involving new construction or reconstruction in a defined study area.
Catch Basins	A box-like structure or pit beneath a storm sewer inlet used to collect surface water drainage or runoff.
Chronic Flooding	Moderate flooding conditions that constantly recur.
Coastal Surge / Storm Surge	A rise in the normal water level on the coast due to the action of wind stress on the water surface and atmospheric pressure reduction.

Combined Sewer Overflow	The discharge from a combined sewer system that is caused by snowmelt or stormwater runoff. Combined sewer systems collect stormwater runoff, domestic sewage, and industrial wastewater in the same pipe and bring it to a wastewater treatment facility. The volume of wastewater can sometimes exceed the capacity of the sewer system or treatment plant, causing the excess untreated stormwater and wastewater to discharge directly into nearby streams, rivers, and water bodies.
Community Development Block Grant (CDBG)	Program that provides communities with resources to address a wide range of unique community development needs. Beginning in 1974, the CDBG program is one of the longest continuously run programs at HUD. The CDBG program provides annual grants on a formula basis to 1,209 general units of local government and states.
Contaminants of Concern	Contaminants that are likely to be present at a site above acceptable limits due to historic or current site conditions.
Contours	Lines drawn on a map connecting points of equal elevation, meaning if you physically followed a contour line, elevation would remain constant. Contour lines show elevation and the shape of the terrain.
Cumulative Impact	The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.
Dewatering	The action of removing or draining groundwater or surface water from a construction site, usually through pumping, evaporation, screening, centrifuging, filter pressing, or other means.
Dissolved Oxygen	Amount of oxygen dissolved (and hence available to sustain marine life) in a body of water such as a lake, river, or stream. Dissolved oxygen is the most important indicator of the health of a water body and its capacity to support a balanced aquatic ecosystem of plants and animals.
Egress (Raised Dry)	Vehicle entrance and exit access to property that is elevated above flood levels to ensure safety during flood events.
Eutrofication	The process whereby a body of water becomes rich in dissolved nutrients through natural or man-made processes, resulting in a deficiency of dissolved oxygen, producing an environment ideal for the growth of algae and other aquatic plant life.
Existing Conditions	The current condition of a resource.
Flood Resilience	The ability of a structure, facility or community to withstand a flooding event, minimize damage, and rapidly recover from disruptions to service.
Floodplain	The lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year (also known as a 100-year floodplain).
Force Main Connection	A pressure based system to move wastewater using pumps or compressors located in lift stations.
Gray Infrastructure Improvement	Constructed structures such as treatment facilities, sewer systems, stormwater systems, or storage basins. The term “gray” refers to the fact that such structures are often made of concrete.
Green Infrastructure Improvement	A water management approach that protects, restores, or mimics the natural water cycle, incorporating both natural environment and engineered systems to provide clean water, conserve ecosystem values and functions, and provide a wide array of benefits to people and wildlife
Green Streets	Green Streets facilities manage stormwater runoff as a resource rather than a waste. Green Streets are landscaped streetside planters or swales that capture stormwater runoff and allow it to soak into the ground as soil and vegetation filter pollutants.

Habitat	Localized surroundings to which an organism, species, or community is specially adapted and which provides for all or nearly all its needs. A habitat comprises physical factors such as light, moisture, and temperature and biological factors such as presence of food and predators.
Hypoxic	Low dissolved oxygen concentrations in water.
Indirect Effects	Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
Infiltration	Infiltration occurs when precipitation (rain, melting snow/ice) falls on pervious areas such as forests, prairies, mulch, grassed areas, and it soaks down through the soil layers and eventually recharges the underground aquifers (groundwater).
Infiltration Basins	An excavated area that impounds stormwater flow and gradually exfiltrates it through the basin floor.
Intertidal	The area of land or wetlands that is covered by water during high tide and exposed during low tide.
Littoral Zone	The part of a sea, lake or river that is close to the shore. In coastal environments, the littoral zone extends from the high-water mark, which is rarely submerged by water, to shoreline areas that are permanently submerged.
Mean High Water	A line on the shore established by the average of all high tides and (in Connecticut) the boundary of the public trust area based on the common law public trust doctrine.
Mean Higher High Water	The average height of all higher high waters recorded at a given place over a 19-year period.
Mean Low Water	The average height of all low waters recorded at a given place over a 19-year period.
Mean Lower Low Water	The average height of all lower low waters recorded at a given place over a 19-year period.
Mudflat	A flat area of very wet soil that is covered at high tide (= the time when the sea reaches its highest level) and is uncovered at low tide (= the time when the sea reaches its lowest level)
No Action Alternative	This alternative includes projects and plans that are projected to proceed by 2025 without action resulting from Resilient Bridgeport.
No Significant Impact(s)	A potential environmental impact associated with a proposed action is <u>not</u> considered significant when an assessment of the project's environmental context and the intensity of the action within that context shows <u>no</u> substantial beneficial or detrimental change to that environment.
Non-infiltration subsurface practices:	Stormwater management techniques such as infiltration basins or detention chambers that allow stormwater to flow to enter subsurface for possible collection, retention or filtration.
Proposed Action	The project, activity, or decision that an entity intends to implement or undertake.
Rain Garden	A rain garden is a bioretention stormwater management practice where a shallow basin is used to capture stormwater runoff. Vegetation and layers of different mulch, soils and aggregates are used to mimic the ecological functions of a natural landscape. Rain gardens capture, filter, treat and infiltrate or transpire stormwater.
Recognized Environmental Condition	The presence or likely presence of any hazardous substance or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment.
Record of Decision (ROD)	The ROD is the final step in the EIS process. The ROD is a document that states what the decision is and identifies the alternatives considered and discusses mitigation strategies, including any enforcement and monitoring commitments. The ROD will also discuss if all practical means to avoid or minimize environmental harm have been adopted, and if not, why they were not.
Responsible Entity	With respect to environmental responsibilities under programs listed in Sec. 58.1(b)(1), (2), (3)(i), (4), and (5), a recipient under the program.

Retrofits	The addition of new technologies to old and aging structures.
Scoping	Describes one major public involvement aspect of the National Environmental Policy Act EIS process. The overall goal is to define the scope of issues to be addressed in depth in the analyses that will be included in the EIS.
Seine Survey	Using a particular kind of fishing gear to measure abundance of species of interest in a given geographic area.
Sheet Piling	Sections of manufactured steel formed into a "z" shape with interlocking edges that are driven into the ground to provide earth retention and excavation support.
Significant Impact(s)	A potential environmental impact associated with a proposed action is considered significant when an assessment of the project's environmental context and the intensity of the action within that context shows substantial beneficial or detrimental change to that environment.
Spawning	The act of fish releasing eggs and sperm into the water.
Stakeholder(s)	The people and organizations who are involved in or affected by an action or policy and can be directly or indirectly included in the decision-making process.
Stormwater Runoff	Rainfall that flows over the ground surface. It is created when rain falls on roads, driveways, parking lots, rooftops and other paved surfaces that do not allow water to soak into the ground
Study Area	The geography for which data is analyzed in a report and/or map.
Submerged Aquatic Vegetation	A diverse group of plants that lives entirely beneath the water surface.
Subtidal	Of or relating to, inhabiting or existing in the region below the level of low tide, that is always underwater.
Substantive Comment(s)	Substantive comments do one or more of the following: ▪ Question, with reasonable basis, the accuracy of information in the EIS. ▪ Question, with reasonable basis, the adequacy of, methodology for, or assumptions used for the environmental analysis. ▪ Present new information relevant to the analysis. ▪ Present reasonable alternatives other than those analyzed in the EIS. ▪ Cause changes or revisions in one or more of the alternatives.
Swales	A shallow depression or low area of land with gently sloping sides that could be man-made or naturally created and often acts as an infiltration basin designed to manage water runoff, filter pollutants, and increase rainwater infiltration.
Vegetated Embankments	A thick wall of earth covered in plants such as trees, grasses, or shrubs that is built to carry a road or railway over an area of low ground or to prevent flooding in the area from a nearby body of water.
Wet Wall Pump	Wet wells are the holding sump for gravity-flow sewer systems. As sewage enters the wet well and the water level rises, pumps are engaged to pump out the sewage to a forced main, or the sewage is lifted to a higher grade to continue the gravity flow to the outlet point.
Wetlands	Areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season
Windshield Survey	Systematic observations of an area made from a moving vehicle

9.2 ACRONYMS

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effects
ASFPM	Association of State Floodplain Managers
ASTM	American Society for Testing and Materials
AVE	Area of Visual Effect
BCC	Birds of Conservation Concern
BMP	Best Management Practice
CAA	Clean Air Act
CAC	Citizen Advisory Committee
CDBG-DR	Community Development Block Grant Disaster Recovery
CEPA	Connecticut Environmental Policy Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIRCA	Connecticut Institute for Resilience and Climate Adaptation
COCs	Contaminants of Concern
CRCOG	Connecticut Metropolitan Council of Governments
CSO	Combined Sewer Overflow
CT WQS	Connecticut Water Quality Standards
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDOH	Connecticut Department of Housing
CTDOT	Connecticut Department of Transportation
CTSHPO	Connecticut State Historic Preservation Office
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DMMP	Dredge Material Management Plan
DPF	Diesel particulate filters
EA	Environmental Assessment
EDR	Environmental Data Resources, Inc.
EEA	Environmental Evaluation Assessment
EFH	Essential Fish Habitat
EIE	Environmental Impact Evaluation
EJ	Environmental Justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
ETPH	Extractable Total Petroleum Hydrocarbons
FDPO	Flood Damage Prevention Ordinance
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GBT	Greater Bridgeport Transit
GHG	Greenhouse Gas
GMP	Growth Management Principles
HACB	Housing Authority of the City of Bridgeport
HASP	Health and Safety Plan
HASP	Health and Safety Plan
HCM	Highway Capacity Manual
HUD	U.S. Department of Housing and Urban Development
IPaC	Information for Planning and Consultation
LEP	Licensed Environmental Professional
LGM	Locational Guide Map

LiDAR .... Light Detection and Ranging
LLC .... Limited Liability Company
LOS .... Level of service
METROCOG .... Connecticut Metropolitan Council of Governments
MGD .... Million gallons per day
MMP .... Material Management Plan
MS4 .... Municipal Separate Storm Sewer System
MUTCD .... Manual on Uniform Traffic Control Devices
MW .... Megawatt
NAAQS .... National Ambient Air Quality Standards
NACCS .... North Atlantic Coastal Comprehensive Study
NAVD88 .... North American Vertical Datum 1988
NDR .... National Disaster Resilience
NEPA .... National Environmental Policy Act of 1969
NFIP .... National Flood Insurance Program
NHMP .... Natural Hazard Mitigation Plan
NMFS .... National Marine Fisheries Service
NOA .... Notice of Availability
NOAA .... National Oceanic and Atmospheric Administration
NOI .... Notice of Intent
NPDES .... National Pollutant Discharge Elimination System
NRHP .... National Register of Historic Places
NRZ .... Neighborhood Revitalization Zone
OEPD .... Office of Planning and Economic Development
OMP .... Office of Policy and Management
PAHs .... Polycyclic Aromatic Hydrocarbons
PCBs .... Polychlorinated Biphenyls
PFA .... Priority Funding Area
PSEG .... Public Service Enterprise Group
RBD .... Rebuild by Design
RCSA .... Regulations of Connecticut State Agencies
REC .... Recognized Environmental Condition
RFF .... Reasonably Foreseeable Future
ROD .... Record of Decision
SAMP .... Sampling Analysis and Monitoring Plan
SARA .... Superfund Amendments and Reauthorization Act
SIP .... State Implementation Plan
SRHP .... State Register of Historic Places
SVOCs .... Semi-Volatile Organic Compounds
SWPC .... Surface Water Protection Criteria
TAC .... Technical Advisory Committee
TMP .... Traffic Management Plan
TNM .... Traffic Noise Model
TWSC .... Two-Way Stop Controlled
UI .... United Illuminating Company
USACE .... U.S. Army Corps of Engineers
USC .... United States Code
USFWS .... U.S. Fish and Wildlife Service
USGS .... U.S. Geological Survey
USTs .... Underground Storage Tanks
VMS .... Variable Message Signs
VOCs .... Volatile Organic Compounds
WICA .... Water Infrastructure and Conservation Act
WPCA .... Water Pollution Control Authority
WWTP .... Wastewater Treatment Plants