US Army Corps of Engineers®
New York District

Harlem River Shore Based Measures Actionable Element

Feasibility Design Memorandum

DRAFT

New York – New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study

June 2025

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Glossary

Term/Acronym	Expanded	Definition
Actionable Element Site		Location where a measure has been identified
ADCIRC	Advanced Circulation Model	
AEP	Annual Exceedance Probability	The probability that at least one event in excess of a particular magnitude will occur in any given year
CEM	Coastal Engineering Manual	
CPT	Cone Penetration Test	
CSO	Combined Sewage Outfalls	
CSRM	Coastal Storm Risk Management	
DEP	Department of Environmental Protection	
EurOtop	European Overtopping Manual	
EAS	Environmental Assessment Statement	
Elevation		The height of an object relative to an established datum such as mean sea level
ERDC	Engineering Research and Development Center	
FSR	Feasibility Study Report	
GIS	Geographic Information System	
HRM	Harlem River Drive	
LiDAR	Light Detection and Ranging	
MHHW	Mean Higher High Water	The average of the higher high-water height each tidal day observed over AdH simulation period
MLLW	Mean Lower Low Water	The average of the lower low water height each tidal day observed over AdH simulation period
MSL	Mean Sea Level	
MTA	Metropolitan Transportation Authority	
NACCS	North Atlantic Comprehensive Coastal Study	
NAN	North Atlantic Division – New York District	
NAVD88	North American Vertical Datum of 1988	The vertical control datum established in 1991 by the minimum-constraint adjustment of the Canadian-Mexican-United States leveling observations
NFS	Non-Federal Sponsor	

Term/Acronym	Expanded	Definition
NOAA	National Oceanic and Atmospheric Administration	
NY	New York (State)	
NYC	New York City	
NYCDEP	New York City Department of Environmental Protection	
NYCEDC	New York City Economic Development Corporation	
NYCT	New York City Transit	
NYNJHAT	New York New Jersey Harbor and Tributaries	
NYNJHATS	New York New Jersey Harbor and Tributaries Study	
PED	Pre-Construction Engineering and Design	
QTO	Quantity Take Off	
RRF	Residual Risk Features	
SBM	Shore-Based Measure	On-land perimeter measures such as levees, floodwalls, dunes, promenades, etc., that are constructed to impede coastal storm surge
SPDES	State Pollutant Discharge Elimination System	
SPT	Standard Penetration Test	
Study Area		Broader NYNJHATS Comprehensive Plan Area
STWAVE	Steady-state spectral Wave	
SWL	Still Water Level	Average water surface elevation at any instant, excluding local variation due to waves and wave set-up, but including the effects of tides, storm surges and long period seiches
TSP	Tentatively Selected Plan	
USACE	United States Army Corps of Engineers	
Wave Overtopping		The amount of water flowing over the crest of a coastal structure such as a seawall, a dike, a breakwater, due to wave action

1 Project Overview

1.1 Introduction

The New York-New Jersey Harbor and Tributaries Feasibility Study (NYNJHATS) was conducted to determine the feasibility of coastal storm risk management (CSRM) in the NJNYHAT study area and to recommend a plan that contributes to community and environmental resilience. The study developed a Tentatively Selected Plan (TSP) which identified various reaches of Shore Based Measures (SBMs), Residual Risk Features (RRFs), and Storm Surge Barriers (USACE, 2022).

The purpose of this report is to take a closer look at an area that has been identified as an Actionable Element. Specifically, the alignment and structural sections of the East Harlem SBM reach of the TSP from the Macombs Dam Bridge to the south end of Highbridge Park will be reevaluated and refined. The refined design will be used to inform a Class 4 cost estimate. The engineering analyses are at the same level of design maturity as the TSP but based on site specific information.

1.2 Study Location

The East Harlem SBM reach of the TSP spans from Carl Shurz Park to Highbridge Park, in New York City, refer to the Engineering Appendix (Appendix B) of the Feasibility Study Report (USACE, 2022). The focus of this study is to address the flooding in the area surrounding Fredrick Douglass Blvd, as indicated in the yellow dashed box in Figure 1-1 below. The section of the East Harlem SBM alignment of the TSP within the study area is shown in Figure 1-2 below.

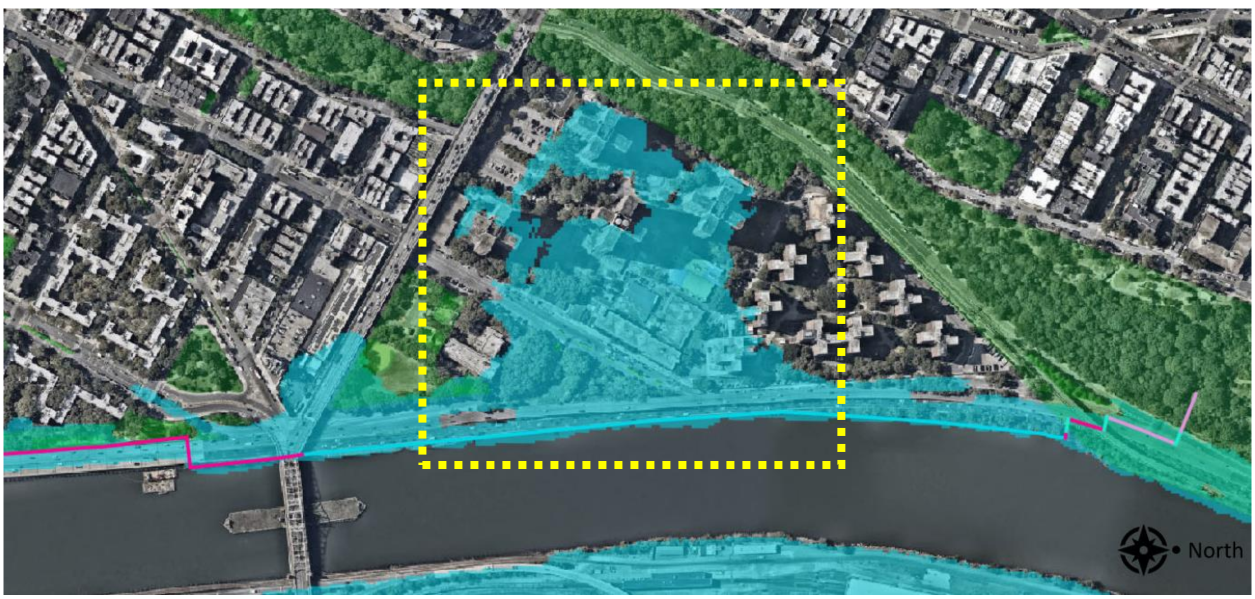

Figure 1-1: Area of Study showing the 100-year Return period Flood Extents

Figure 1-2: East Harlem SBM (northern section of the reach) from the Tentatively Selected Plan (TSP)

The East Harlem SBM measure types along this portion of the TSP alignment include a large floodwall, medium floodwall, seawall, and deployable vehicular gates (see Appendix 1 for map of alignment from the TSP). The floodwalls are composed of an inverted T-shape reinforced concrete structure with a 4-foot-thick base, battered H-piles and a vertical steel sheet pile cut-off wall. The large and medium floodwall are differentiated by their stem heights. The seawall is a composite structure and comprises of a rubble mound structure and an H-pile supported T-shape reinforced concrete floodwall with a vertical sheet pile cut-off wall. The vehicular gate is a deployable flood barrier across a road which allows for unimpeded access across the alignment during day-to-day operations. Details of these structures can be found in Appendix B of the 2022 Feasibility Study Report (FSR) (USACE, 2022).

1.3 NYNJHAT Study Context

A limited series of reasonable and conceptually generic structural measures to provide flood risk reduction were developed prior to release of the 2022 report (USACE, 2022). As noted earlier, these structural measures are referred to as East Harlem SBMs and include typical structures like floodwalls and levees. The focus of this study is more narrow, spanning approximately 4,000ft of shoreline, and the design and measure types will be more specific to the site conditions. Nonetheless, to achieve a class 4 cost estimate, the design is still conceptual in nature, with substantial lack of technical information. While certain major construction elements are defined, there is still substantial uncertainty relative to some major construction components and the description of the project will rely, in part, on assumptions. Ultimately it is the intent to progress this concept design later this year to achieve a class 3 cost estimate.

1.4 Readers Guide

The following sections will provide a brief overview of relevant site-specific information and any data gaps identified (Section 2.5). The modified alignment specific to the Harlem River Actionable Element is presented in Section 3. Section 4 includes the design development narrative, with quantity take-offs (QTOs) presented in Section 5. Final conclusions and recommendations for the next steps are included in Section 6.

2 Data Collection and Data Gap

2.1 General Site Data

The study team relied on previously collected NYNJHAT Study data for a general description and characterization of the project area (NYC tax lot data, open space, streets, etc. as available on NYC Open Data) as well as waterfront structure categorization as provided by New York City Economic Development Corporation (NYCEDC) (see maps in Appendix 2). Bathymetric Data from 2024 was obtained from U.S. Army Corps of Engineers' (USACE) NAN channel survey conditions for the Harlem River (see Appendix 2). Topography data in the form of Digital Elevation Models and LiDAR (U.S. Geological Survey, 2014) was used to assess the needed size of a CSRM intervention, e.g., the height above existing grade. No detailed information for buried utilities within the project area was available at the time of the study. There are 4 DEP CSO outfalls discharging into the Harlem River along this alignment per the NY States CSO inventory (New York State, 2025). Outfalls identified have the following SPDES ID: NY0026131-046, NY0026131-047, NY0026131-048 and NY0026131-050. Details of size and invert of each outfall are unknown. The NOAA nautical chart 12342 identifies the river area spanning about 200 yards south and north of around the Macombs Dam Bridge as a "Cable Area". This appears to relate to power and control cables for the Macombs Dam Bridge. However, based on charted utilities mapped in support of a proposed cable project along the Harlem River, these cables appear to run from the center of the bridge to the eastern bank of the river thereby without apparent conflict with the Harlem River Actionable Element alignment. Details on any subaqueous utility crossings are unknown at this time. Lastly, subway tunnels are situated underneath the Harlem River within the study area. This set of tunnels is referred to as the 155th Street Subway. Given the historic nature of the tunnels (construction 1929), some general engineering information could be retrieved, but is very limited.

2.2 Site-Specific Data

The Non-Federal Sponsor (NFS) has provided reports related to the Harlem River Greenway. NYC agencies are proposing the development and improvement of the Manhattan Greenway along the Harlem River (Harlem River Greenway). That proposed project would complete a missing link of the Greenway on Manhattan's eastside and activate a vacant waterfront area in the East Harlem neighborhood. The proposed project would also repair or replace damaged bulkheads to ensure the longevity of the Greenway. Construction drawings and geotechnical engineering reports in support of subproject 2 and subproject 3 of the Greenway project contain useful data to obtain an understanding of geotechnical soil properties as well as some other site characteristics. A brief overview of the relevant related reports is tabulated below (Table 2-1). Apart from geotechnical information, the Greenway plans also provided an approximation of the NYCT Easement for the 155th Street subway tunnel. Use of the information from these reports is further detailed in the following sections, specifically Section 2.4 and 4.2.

Table 2-1: Harlem River Greenway Reports and brief description

Name	Description	Filename
EAS 13 November 2020	City Environmental Quality Review - Environmental Assessment Statement for the Greenway Project	20SBS006M_Complete EAS_11.13.20.pdf
Geotechnical Engineering Report for Manhattan Green Way – Harlem River - Subproject 3 9 March 2021	Report presents the results of the geotechnical engineering study for the proposed Sub-Project 3 of the Manhattan Greenway – Harlem River project, in Manhattan, New York	2021-03-09 - MGHR SP3 Geotechnical Engineering Report_Sealed (1).pdf
Manhattan Green Way – Harlem River - Subproject 3 September 1st, 2022	100% Construction Drawings for Subproject 3	Manhattan Greenway SP3 100_ CD Drawings - 2022-09-02.pdf
Geotechnical Data Report for Manhattan Green Way – Harlem River - Subproject 2 5 April 2023	Geotechnical data report presents the results of the geotechnical subsurface evaluation for the proposed Subproject 2 portion of the Manhattan Greenway – Harlem River project, in Manhattan, New York.	2023-04-05 - MGHR SP2 - Geotechnical Data Report.pdf
Manhattan Green Way – Harlem River - Subproject 2 September 1st 2022	100% Construction Drawings for Subproject 2	Manhattan Greenway SP2 100_ CD Drawings - 2022-09-01.pdf
Harlem River Greenway Project Cost Estimate November 2nd 2023	Construction Cost for Manhattan Greenway – Harlem River. Total construction cost inclusive of sub projects 1, 2 and 3.	2023-11-02 MGHR IFB Estimate Summary.pdf

2.3 Site Observations

A site visit on foot was performed on April 14, 2025, to complete general reconnaissance of the area of interest. The site visit focused on the waterfront area north of 150th Street up to the northern extent of Rangel Houses. During the site visit both an alignment along the Harlem River, similar to the East Harlem SBM included in the TSP, as well as an alternate alignment that would run west of the Harlem River Drive (HRD) were cursorily explored and kept in mind when making site condition observations. Due to limited direct access to the waterfront, observations were mainly done from the Macombs Dam Bridge. Site visit observations were further supplemented with available aerial imagery and oblique aerial photography from sources such as Google and Bing Maps.

2.4 Geotechnical Data Collection

The Geotechnical Engineering Report for Manhattan Greenway – Harlem River (Sub-Project 3) prepared by Langan Engineers and dated 9 March 2021 was the predominant geotechnical data resource used for preliminary design. This geotechnical data report contains the results of five (5) in-water and one (1) on-land geotechnical borings along the Harlem River between the East 155th and Swindler's Cove. Three (3) of these in-water borings fall approximately within the current limits of the project study area. As detailed in Section 4.2, these borings were used to inform the conceptual design of the measures discussed herein. No laboratory analysis was conducted on soil samples collected as part of this project. Laboratory data is required to confirm visual soil classification conducted during drilling, to characterize soil type and behavior, and to provide engineering design parameters such as soil unit weight and soil strength. This data and the subsequent design are limited in nature, and additional geotechnical investigations including soil sampling and laboratory analysis should be conducted within the project limits.

The Geotechnical Data Report for Manhattan Greenway – Harlem River (Subproject 2) prepared by Langan Engineers and dated 5 April 2023 was also reviewed. This project scope covers the existing Harlem River Park from East 132nd Street to East 145th Street. This geotechnical data report contains the results of three (3) in-water and thirty-eight (38) on-land geotechnical borings along the Harlem River. Laboratory analyses were conducted on collected soil samples, and the laboratory data was submitted as part of the geotechnical report. While this data was reviewed during design, the borings and laboratory analysis conducted as part of this project fall outside of the area of interest for the current design and therefore are considered limited.

2.5 Data Gap

As stated earlier, no site-specific data collection campaign was completed. The study team relied on publicly available data and data collected for other projects in the study area that was provided by the NFS. The data available is sufficient to generate a conceptual design and provide a class 4 cost estimate. However, to further the level of design maturity and provide a class 3 cost estimate during the next phase of the project, additional data will need to be collected. Data gaps have been identified. Table 2-2 summarizes the primary data gaps from an engineering and design perspective, and the potential impact on the project design progression. The list in Table 2-2 is not anticipated to be all inclusive or comprehensive as it is anticipated that additional data in accordance with local, state and federal regulations and non-engineering disciplines may also be required.

Table 2-2: Engineering Data Gaps for Harlem River Actionable Element

Category	Data Gap	Impact	Action Step
Geotechnical Information	Detailed Subsurface Exploration	Lack of soil borings and laboratory testing data will require conservative design assumptions (i.e., weak soil parameters), potentially increasing the size and cost of structure in this reach. Lack of understanding as to the variability of bedrock (depth to bedrock, rock quality, and rock composition) impacts selected foundation type and size, likewise impacting cost of structure and selected construction methodology.	Obtain detailed geotechnical information from other projects within direct vicinity, or complete project specific geotechnical investigation including CPTs, SPTs, boreholes with soil sampling and rock coring, and laboratory testing. Geophysical testing to understand depth to rock along the line of protection may also be recommended.
Utilities (storm water)	Storm water infrastructure mapping is not available	The need for, size and details of outfall penetrations through the alignment is not well defined. Conservative assumptions can be made but large contingencies around this item remain.	Obtain storm water infrastructure as-built records, digital infrastructure files and other pertinent storm water data.
Utilities (subaqueous cables	Type(s) and size of cabled utilities at or below riverbed have not been identified	The need for, size and details of utility crossing is not well defined. Conservative assumptions can be made but large contingencies around this item remain	Complete utility survey. Obtain as-builts or record drawings.

Category	Data Gap	Impact	Action Step
Utilities (other)	Utility surveys are not available	Impacts to existing utilities and/or need for relocation of utilities is largely undefined. Although it is generally believed that few utilities are present within the footprint of the proposed (seaward) alignment, conservative assumptions will need to be made and contingencies are high.	Complete utility survey. Obtain as-builts or record drawings.
Record Drawings of Infrastructure	Record drawings of existing infrastructure (e.g., HRD, 155^{th} Street subway Tunnel, Macombs Dam Bridge, and the MTA 148^{th} Street Yard)	The CSRM alignment will be constructed in close proximity to the existing infrastructure. To avoid conflicts and interference with existing civil works construction drawings or as-builts are needed.	Obtain record drawings
Other Environmental	Tree Survey is missing	Lack of tree survey leads to an assumption that no major trees are affected.	Complete tree survey to better estimate impacts to and need of removal of trees.
Real Estate	No parcel investigations were completed along alignment	Construction easements and any possible limitations imposed during construction may affect project design	Complete preliminary easement mapping and identify real estate data needs
Topography & Bathymetry	Surveyed topographic information.	Surveyed topographic elevations are needed for the next phase of design. Especially elevations of grades where overhead obstructions are present (next to or under HRD) lead to assumptions that need to be verified.	Obtain topographic survey.

Category	Data Gap	Impact	Action Step
Coastal Hydrodynamic Models	Information on design wave characteristics is sparse within the Harlem River.	Design wave characteristics kept uniform for the entire alignment based on conservative assumptions. Spatially more refined design wave information could provide more economical design.	Complete wave modeling to establish design wave characteristics.

3 Shore Based Measures for Harlem River

3.1 Alignment Refinement

Following site visits and discussion between USACE and the NFS, the East Harlem SBM alignment was agreed upon to run for the majority along the banks of the Harlem River. The following is a brief overview of changes and characteristics of the East Harlem SBM alignment that will be further studied and designed as the Harlem River Actionable Element:

- The alignment was limited to the northern end of the East Harlem SBM alignment as shown in the TSP (USACE, 2022).
- The alignment would approximately extend from the MTA Facility (148th Street Yard) to the northern end of Rangel Houses
- The alignment would tie in to natural high ground at either end (Elevation 15.6 ft NAVD88 or greater)
- Four (4) principal measure types will be utilized within this alignment and include
    - A floodwall: conventional CSRM measure constructed on land and in locations where spaces are constraint
    - An anchored combiwall: a CSRM measure that would be built in the water and function as seawall, combiwall is short for combination wall
    - A vehicular gate: a conventional CSRM measure to allow for vehicles to pass during normal day-to-day conditions, but keep floodwaters at bay when closed, and
    - A special measure that would be a continuation of the combi-wall but is specifically designed to span the subway tunnel and not to impose any loads on it.

3.2 Alignment Description

The Harlem River Actionable Element alignment, shown in Figure 3-1 and summarized in Table 3-1 below, can be described as follows: Starting from the southern end, a conventional floodwall structure will be used to start at “high ground” and run to a point where currently a vehicular gate is located on the MTA facility. As part of the alignment, a new vehicular floodgate structure is proposed in that location. This gate structure then ties to the anchored combiwall, which will function as CSRM measure, that will run along the western bank of the Harlem River. This measure will be the same for the entire, approximately 3600 ft, run along the Harlem River with the exception of where the alignment crosses the MTA tunnel. At the northern end, the alignment will cross the Harlem River drive, again utilizing a conventional vehicular flood gate. This gate will abut the earthen embankment which is the start of the elevated south-bound HRD. On the west side of the earthen embankment, the alignment will continue, consisting of a conventional floodwall, and run another approximately 200 ft north before, at its terminus, tying in to natural high ground.

Figure 3-1: Harlem River SBM Alignment as Actionable Element

Table 3-1: Summary of measures along Harlem River SBM Alignment as Actionable Element

Reach ID	Measure Type	Measure Length (ft)	Measure Description
1	Floodwall	80	Conventional Floodwall to start the alignment and tie-in the alignment to high ground
2	Vehicular Gate	40	Gate to allow vehicular access to the MTA Facility along the waterfront
3	Anchored Combiwall	3,637	CSRM Measure along the Harlem River
	Tunnel Span	155	A site-specific design will be needed to span the tunnel
4	Vehicular Gate	40	Gate to allow uninterrupted vehicular traffic on north bound HRD
5	Floodwall	238	Conventional floodwall to tie-in the alignment to natural high ground

4 Engineering Analysis

The following sections describe the engineering analyses performed as part of this study.

4.1 Basis of Design

The basis of design of the engineering analyses performed is as documented for the NYNJHAT Study (USACE, 2022), unless otherwise noted in the sections below.

4.2 Geotechnical Analysis

Design soil profiles were developed based on review of Langan's geotechnical report, "Geotechnical Engineering Report for Manhattan Greenway – Harlem River (Sub-Project 3)" dated 9 March 2021 (Langan, 2021). Five (x5) in-water borings and one (x1) on-land boring were conducted along the Harlem River between East 155^{th} and Swindler's Cove. The in-water borings were drilled to depths between 27 and 96.5 ft below the mudline, and the on-land boring was drilled to a depth of 127 ft below ground surface. No laboratory analyses were conducted on the boring soil samples. Subsequently, the geotechnical design profiles were based on the visual soil classification and standard penetration test (SPT) blow counts noted in the boring logs.

The depth to bedrock, as well as the composition of the bedrock, varies along Harlem River within the project limits. Figure 4-1 below shows the depth to bedrock varying from ~0 to 150 ft within the project reach. Bedrock was encountered as shallow as 17 ft below the mudline in boring SP3-04(W). Land boring SP3-07 was drilled to 127 ft below ground surface without encountering bedrock. The bedrock encountered in the borings was described as schist, micaceous schist, and light gray granite.

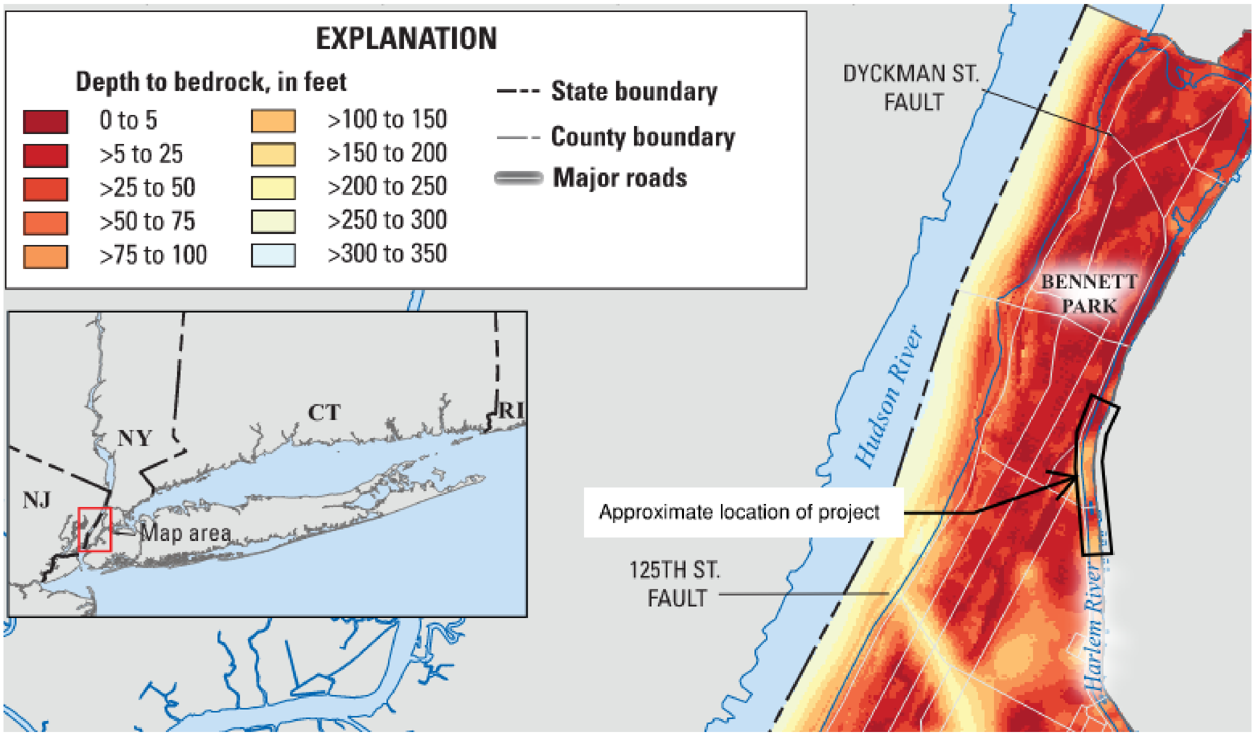

Figure 4-1: "Bedrock-Surface Elevation and Overburden Thickness Maps of the Five Boroughs, New York City, New York," Data Report 1176, USGS (DeMott, Stumm, & Finkelstein, 2023).

To account for the variability of the bedrock depth in the design, a "high bedrock" and "no bedrock" profile were developed. The "no bedrock" profile was based on boring SP3-03, where bedrock was not encountered. The "high bedrock" profile was based on boring SP3-04, where bedrock was encountered 17 ft below the mudline. See Langan, 2021, for details on the borings. The design soil profiles and design parameters are displayed in Figure 4-2, and Table 4-1 and Table 4-2 below.

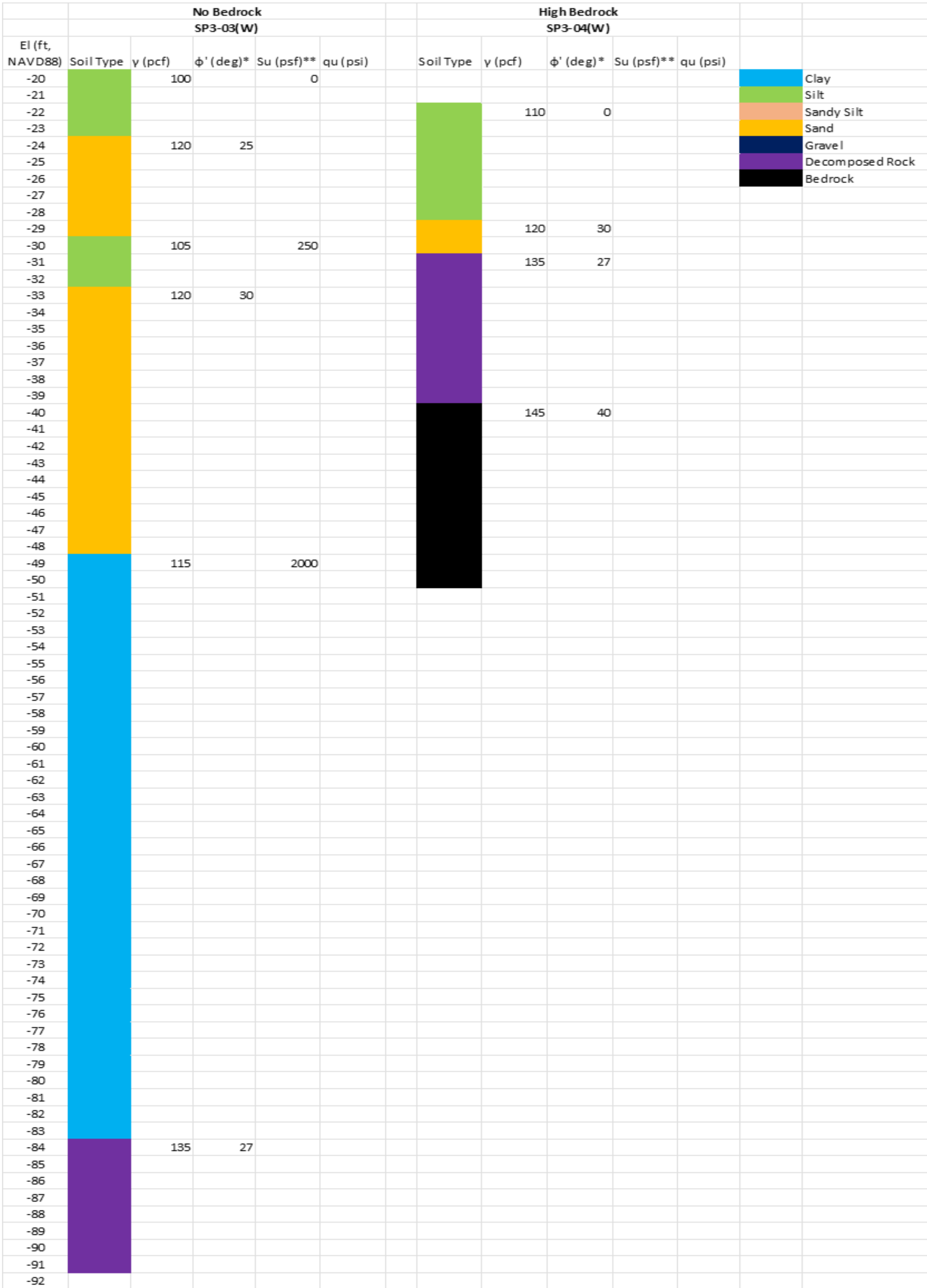

Figure 4-2: Seaward design soil profiles

Table 4-1: “No bedrock” design profile soil parameters

No Bedrock Profile (SP3-03 (W))					
Layer Name	**Top of layer El**	**Layer Thickness (ft)**	**γ (pcf)**	**φ' (deg)**	**Su (psf)**
Silt	-20	4	100		
Sand with Silt	-24	6	120	25	
Silt	-30	3	105		250
Sand	-33	16	120	30	
Clay	-49	35	115		2000
Decomposed Rock	-84		135	27	

Table 4-2: “High bedrock” design profile soil parameters

High Bedrock Profile (SP3-04 (W))					
Layer Name	**Top of layer El**	**Layer Thickness (ft)**	**γ (pcf)**	**φ' (deg)**	**Su (psf)**
Silt	-23	6	110		
Sand	-29	2	120	30	
Decomposed Rock	-31	9	135	27	
Bedrock	-40		145	40	

To ensure the seaward structure designs can accommodate both high and low bedrock, both profiles should be used during design.

Only one soil boring was collected on the landward side as part of Manhattan Greenway – Harlem River (Sub-Project 3), boring SP3-07. The first approximately 24 ft of soil below ground surface was classified as “uncontrolled fill.” Generic fill design parameters were developed based on the SPT blow counts, as shown in the Table 4-3 below. It is assumed that hydraulic fill will be placed behind the combination wall from the mudline to an elevation of approximately +7 ft NAVD88. The properties specified in the Table 4-3 below assume a loosely placed clean sand hydraulic fill.

Table 4-3: Fill design soil parameters

Fill					
Layer Name	**Top of layer El**	**Layer Thickness (ft)**	**γ (pcf)**	**φ' (deg)**	**Su (psf)**
On-land Fill	Varies	Varies	120	30	
Hydraulic Fill	7	Varies	105	28	

The depth to bedrock on the landward side of the proposed flood risk reduction alignment is also highly variable. Subsequently, the “no bedrock” and “high bedrock” profiles should also be used for the landward structures. To account for the additional placed fill landward, fill with soil parameters as detailed above should be considered overlaying the above soil profiles, up to the existing ground surface elevation.

4.3 Coastal Analysis

4.3.1 Tidal Datums

Tidal datums at the Harlem River Actionable Element were extracted using NOAA's Vertical Datum Transformation (VDATUM 4.7) tool (Office of Coast Survey, 2025). The local tidal levels relative to the NAVD88 geoid are shown in Table 4-4.

Table 4-4: Tidal datums for Harlem River Actionable Element relative to NAVD88

Datum	Elevation relative to NAVD88 (ft)
Mean Higher High Water (MHHW)	+2.30
Mean High Water (MHW)	+2.02
Local Mean Sea Level (MSL)	-0.11
Mean Low Water (MLW)	-2.32
Mean Lower Low Water (MLLW)	-2.49

4.3.2 Extreme Water Levels and Waves

Site-specific coastal input parameters for this project location were developed based on data from the North Atlantic Comprehensive Coastal Study (NACCS). The NACCS data compiled as part of the Coastal Hazard System (CHS) by the USACE Engineering Research and Development Center (ERDC) is based on a statistical analysis of model outputs from the simulation of a large set of historical and synthetic storms using ADCIRC (for storm surge) and STWAVE (for nearshore waves). Figure 4-3 shows the locations of available Save Points with calculated statistics for extreme water levels. The water levels were extracted from the closest available data point to the alignment at Save Point ID 11882. Wave-height statistics were not available at all the locations however, and the locations with available wave statistics are highlighted in blue.

Figure 4-3: Location of NACCS Save Points with extreme Water Level statistics

Projected sea level rise up to the year 2095 based on the USACE Intermediate projection at the Battery, NY (i.e., 2.2 ft) was added to the NACCS water level statistics to obtain the design water levels (USACE, 2022).

Extreme wave-height statistics for this project location are based on NACCS outputs a little over half a mile south of the alignment at Save Point ID 4400. These results may be further corroborated or updated based on a more detailed (higher resolution) site-specific modeling study during the subsequent design phase. As such, these wave data may be expected to be somewhat conservative as they may not sufficiently account for the local bathymetry along the alignment. Model outputs from the NACCS simulated storm set were analyzed to obtain the most commonly co-occurring Peak Wave Periods corresponding to the tabulated wave-heights for each scenario.

The coastal basis of design parameters consisting of the water-levels and wave characteristics are shown in Table 4-5.

Table 4-5: Coastal Basis of Design Parameters

Return Period (yrs)	Scenario	Design Still Water Level (ft, NAVD88)[1]	Significant wave height (ft)	Peak wave period (s)	Top of Wall Elevation (ft, NAVD88)
10	10-year	9.4	2.71	2.7	17.5
100	100-year	12.2	2.97	2.7	17.5
500	Extreme	15.3	3.16	2.7	17.5
750	Unusual	16.2	3.20	2.7	17.5

Note 1: Water Levels include SLC to the end of the 50-year planning horizon.

4.3.3 Freeboard Analysis

The required freeboard for the Harlem River Actionable Element feature was estimated based on a 1 liter per second per meter threshold at 90% statistical confidence limit, identical to prior analyses of the Draft report (USACE, 2022). A probabilistic approach was applied using the equations for overtopping from the EurOtop II manual, which also specifies mean and standard deviation of overtopping coefficients. For the design coastal input parameters at the 100-year conditions for the Harlem River Actionable Element, this resulted in a calculated freeboard (above the Stillwater elevation) of 5 feet.

This freeboard was then added to the 100-year design still water elevation to calculate the minimum required top of wall elevation. Rounding up to the nearest half a foot level, this leads to a top of wall elevation of 17.5 ft NAVD88,

4.3.4 Wave Loads Analysis

For wave loads, separate analyses were conducted for the section of the alignment in water and the floodwall or vehicular gate sections at the northern and southern ends of the alignment. Following guidance from the Coastal Engineering Manual (CEM), the type of wave loads on the structure was first analyzed and determined to be classified as “non-impact” based on the normalized incident wave height criteria. Therefore, the modified Goda method was used for the wave load calculation for each of these sections. The results of the wave load analysis are presented in Table 4-6.

Table 4-6: Calculated Wave Loads on different Harlem River Actionable Element Alignment sections

Section	RP	Top of Wall	Assumed Mudline Elevation	Pressure p1 (at SWL)	Pressure p3 (at bottom)	Pressure p4 (top of wall)	Resultant Horizontal Force	Resultant Force Elevation
	years	ft, NAVD88	ft, NAVD88	lb/sqft	lb/sqft	lb/sqft	Kips/ft	ft, NAVD88
In Water	10	17.5	-20.0	175.0	2.0	0.0	3.2	1.7
In Water	100	17.5	-20.0	191.0	2.0	55.0	3.8	3.6
In Water	500	17.5	-20.0	204.0	1.0	147.0	4.0	4.7
In Water	750	17.5	-20.0	206.0	1.0	173.0	4.0	4.9
North Tie-in	10	17.5	+7.0	274.0	221.0	0.0	1.5	10.3
North Tie-in	100	17.5	+7.0	233.0	140.0	67.0	1.8	11.9
North Tie-in	500	17.5	+7.0	218.0	90.0	158.0	1.7	12.9
North Tie-in	750	17.5	+7.0	217.0	79.0	182.0	1.6	13.0
South Tie-in	10	17.5	-2.0	178.0	48.0	0.0	1.9	7.0
South Tie-in	100	17.5	-2.0	192.0	34.0	55.0	2.3	9.0
South Tie-in	500	17.5	-2.0	204.0	22.0	147.0	2.3	10.2
South Tie-in	750	17.5	-2.0	206.0	19.0	173.0	2.3	10.4

4.4 Structural Analysis

As presented earlier, the Harlem River Actionable Element alignment has three (3) typical measures to provide flood risk reduction: 1) floodwall, 2) vehicular flood gate and 3) anchored combiwall. However, due to the presence of the 155th Street subway tunnel, a special tunnel spanning structure is proposed for that area. Through high-level concept design iterations and design analyses a structural design for each measure type was converged upon. Design for the project is still in the early stage, and the designs are conceptual in nature but with sufficient design maturity to achieve a class 4 cost estimate (USACE, 2016). The following sections briefly describe the structural design of each measure.

4.4.1 Floodwall

Floodwall systems are independent, single purpose structures that aim to provide flood risk reduction. A floodwall is typically a reinforced concrete structure supported on steel piles, which can incorporate a steel sheet pile cut-off wall as a seepage control measure.

The reinforced concrete structure consists of a concrete stem and base slab that form an inverted T and is supported on pairs of battered micropiles. Due to the limited overhead clearance and space available, micropiles were used in the design. A micropile is a small diameter, drilled and grouted non-displacement pile that is typically reinforced. They can be installed by methods that cause minimal disturbance to adjacent structures and where access is limited. A sheet pile is included to provide for seepage cut-off. For the floodwall, the approximate existing ground elevation was assumed to be + 5 feet NAVD88. With a crest elevation of +17.5 ft NAVD88, the reveal height of the wall is 12.5 feet. Pile design depends on design loads and soil parameters. For this study, soil characteristics as described in Section 4.2 were used.

The floodwalls are located in a relatively protected area away from the water's edge and as such not designed for vessel impact load. The structural design of the floodwall has been performed in accordance with EM 1110-2-2502 Floodwalls and other Hydraulic Retaining Walls (USACE, 2022) and FHWA Micropile Design and Construction Manual.

A typical cross-section for the floodwall is shown in Appendix 3.

4.4.2 Vehicular Floodgate

4.4.2.1 Structural Design

Vehicular floodgates are deployable flood barriers added to a line of coastal storm damage risk reduction, across a road or driveway, which allows for unimpeded access across the alignment during normal day-to-day conditions. Deployable floodgates can be either manually or automatically operated; however, the prototypical deployable floodgate developed for this study is designed to be manually operated to be consistent with assumptions made previously (USACE, 2022). Manually operated gates require operation personnel to physically go to the location of the gate and close it during impending storm conditions. The gate will then be locked into place to prevent tampering with.

Both swing gates and roller gates were considered initially, the choice of gate type depends on the orientation and space available. In general, a roller gate can slide into place along a track and a swing gate is supported on one side by the top and bottom hinges attached to a support structure. Due to space constraints and the relatively large span needed to cross the HRD a roller gate was selected.

For the roller gate, the approximate existing ground elevation was assumed to be +5 feet NAVD88. With a crest elevation of +17.5 feet NAVD88, the reveal height of the gate is 12.5 feet. When not in use, the roller gate will be stored in the gate monolith adjacent to the gate structure. Due to the housing needed for the gate, the top of the monolith is greater in height at El. +19 feet.

The roller gate is mainly comprised of horizontal and vertical steel structural members, intermediate diagonal steel braces, steel face plates, caster assemblies and track with seal. The diagonal steel braces were provided due to the relatively large span (42 feet). These braces will need to be put in place during deployment of the gate.

The reinforced concrete gate storage monolith is shaped like an inverted T. A slot is provided in the stem wall for the gate storage. Both the monolith and gate structures were designed to be supported on pairs of battered micropiles to minimize disturbance to adjacent structures. Pile design depends on design loads and soil parameters. For this study, soil characteristics as described in Section 4.2 were used. A sheet pile is included to provide for seepage cut-off.

The cross-section and plan of the typical vehicular floodgate (roller gate) and the adjacent monolith is shown in Appendix 3.

The vehicular gate is located in a relatively sheltered area away from the coastal edge or behind the anchored combiwall, hence it is not designed for vessel impact load. The structural design of the vehicular floodgate has been performed in accordance with EM 1110-2-2502 Floodwalls and other Hydraulic Retaining Walls (USACE, 2022) and FHWA Micropile Design and Construction Manual.

4.4.2.2 Vehicular Floodgate closure frequency

The traffic volume on the Harlem River Drive is high. With a floodgate across the HRD, the closure frequency, i.e., the expected average reoccurrence of operations to close the gate, could be a concern as it would impact traffic on a major artery in Harlem. To assess the average recurrence interval of floodgate closure a preliminary closure frequency analysis was conducted. This analysis is documented in Appendix 4. Based on this analysis, the estimated average closure interval for the vehicular gate over its service life would range between 3.6 years in 2045 to 1.4 years by the end of service life in 2095 if the closure criterion is set to a +7.0ft NAVD88.

4.4.3 Anchored Combiwall

The anchored combiwall is an in-water floodwall that aims to provide flood risk reduction. A combined wall system is composed of the king pile and a pair of intermediary sheet piles. The intermediary sheet piles serve as seepage cutoff and transfer the water and soil pressures to the king piles, which are steel pipe piles and carry most of the load. A concrete cap ties the vertical and battered piles together. The concrete cap is shaped as a wall with a concrete stem and base slab that form an L. Additional steel pipe braces were designed to provide support to the concrete cap wall.

The anchored combiwall is designed to have a crest elevation of +17.5 feet NAVD88. The approximate existing mudline was assumed to be El. -20 feet and is representative of the average conditions along the alignment. The bottom of the concrete base slab of the cap is at El. 5 feet and is above Mean Higher High Water. Backfill is placed behind the anchored combiwall up to an elevation of +7 feet NAVD88.

The anchored combi wall has been designed in accordance with EM 1110-2-3402 Barge Impact Forces for Hydraulic Structures (USACE, 2022), EM 1110-2-2502 Floodwalls and other Hydraulic Retaining Walls (USACE, 2022) and EM 1110-2-2906 Design of Pile Foundations (USACE, 1991).

The cross-section of the anchored combiwall is shown in Appendix 3.

4.4.4 Tunnel Span

New York City Transit (NYCT) B and D subway tunnels cross the Harlem River to connect Manhattan and The Bronx within the project area. Based on available data (see Section 2) the tunnels are approximately 600ft north of the Macombs Dam Bridge. The top of the tunnels and base of the rail are at about 25ft and 35ft below the HRD, respectively. The tunnel infrastructure consists of three individual 17ft-diameter subway tubes that are horizontally spaced approximately 25ft on center. The HRD above the tunnel is a pile supported platform structure.

Special design considerations will need to be accounted for since the CSRM alignment crosses the MTA tunnel infrastructure. MTA provides a series of general notes for proposed projects in adjacency to their infrastructure (MTA Construction and Development, 2022). The following is a description of the conceptual design for the flood risk management measure that will span the tunnel.

The approximate 100-ft wide tunnel span structure comprises a steel truss and two steel jacket structures which will support the truss on either side of the tunnel. The approximate existing mudline, on top of the tunnel, was assumed to be El. -18.5 feet. The truss and the jacket structures were designed to have a crest elevation of +17.5 feet NAVD88. The jacket structure is a steel frame supported on Sixteen battered steel pipe piles which are rock-socketed at the bottom. The piles were located and battered in a way that they will not encroach the existing subway tunnel and a skin plate attached to the exterior perimeter of the truss will provide the water barrier up to the elevation of +17.5 feet. Steel sheet piling connects the ends of the tunnel barrier structure to the anchored combiwall to provide continuity.

To prevent seepage below the bottom of the truss, seepage control measures such as installing vertical steel sheet piles from the bottom of the skin plate to the tunnel crown, or pressure grouting can be implemented to cut off potential flow paths and maintain the continuity of the barrier.

The tunnel span has been designed in accordance with EM 1110-2-3402 Barge Impact Forces for Hydraulic Structures (USACE, 2022), EM 1110-2-2502 Floodwalls and other Hydraulic Retaining Walls (USACE, 2022) and EM 1110-2-2906 Design of Pile Foundations (USACE, 1991).

The cross-section and plan of the tunnel span are shown in Appendix 3.

4.5 Design Summary

A brief overview of the Harlem River Actionable Element alignment, the structural characteristics and engineering challenges is presented in the following Table 4-7. The list of challenges is not intended to be complete and all-inclusive but instead highlights some of the perceived main challenges that would need further study in future phases of design. The data is a summary of data presented within the preceding sections. Reveal heights as reported in the Table 4-7 below are based on the established +17.5 ft NAVD88 crest elevation, average existing ground elevations, or in the case of seaward structures a mudline elevation of -20ft NAVD88.

Table 4-7: Summary of CSRM Measures along Harlem River Actionable Element Alignment identified as Actionable Element

Reach ID	Measure Type	Measure Length (ft)	Reveal Height (ft)	Detailed Measure Description	Engineering Design Challenges
1	Floodwall	80	12.5	Conventional Floodwall at the south end provides tie-in to natural high ground. Replace existing MTA floodwall with a new design to meet NYNJHAT Study design crest elevation. Foundation on micropiles	Space constraints for construction, limited overhead clearances due to presence of overhead HRD roadway and existing flood risk reduction infrastructure. Conceptual design includes micropiles as foundation piles.
2	Vehicular Flood Gate	40	12.5	Gate to allow vehicular access across the MTA Facility. Replace existing MTA vehicular gate with new design to meet NYNJHAT Study design crest elevation	Similar as above.
3A	Anchored Combiwall	2232	37.5	Combi wall with batter piles (36-inch diameter pipe piles with NZ19 sheets and 30-inch diameter batter piles) with concrete monolith on top that functions as floodwall along the Harlem River. Hydraulic fill will be placed behind the structure at locations where there is currently no land/fill.	With the mudline at approximately -20 ft NAVD88 and crest at +17.5ft NAVD88 the structure will have a large unsupported height where design loads primarily will act on the upper portion. Interference with other infrastructure (pile supported HRD, Macombs Dam Bridge etc.) will need to be evaluated in future phases.

3B	Tunnel Span	155	33.5	Special purpose structure. Two piers (jacket structures) support a truss with skin plate that will function as floodwall to span the MTA tunnel below the Harlem River bed.	115th street subway tunnel may not be impacted per MTA guidelines. Clear span across the tunnel and offsets are needed. Poor soil conditions in combination with the high design loads result in a complex and, comparatively large CSRM structure. Transitions and connections to prevent seepage[1] will be complex given the geometry and unknown location of tunnel cover.
3C	Anchored Combiwall	1405	37.5	Same structure as reach 3A	See reach 3A above
4	Vehicular Flood Gate	40	12.5	Gate to allow uninterrupted vehicular traffic on north bound HRD. Same structure as reach 2	Gate storage and abutment of the vehicular gate immediately adjacent to highway with high traffic volume combined with space constraints will pose design challenges. Due to large span gate will likely need intermediate support posts. Further gate type evaluations needed prior to design progression.
5	Floodwall	238	12.5	Conventional floodwall to tie-in the alignment to natural high ground	Need to tie in to south bound abutment and adequacy for flood risk reduction will need further investigation.

Note:

1. Seepage is allowed but should be minimized to meet design criteria

5 Quantity Take Offs

5.1 Introduction

The previous section presented the preliminary designs for the measures developed under this study. Due to the large area covered by Harlem River Actionable Element alignment, limitations in the available data and study intent, the design for the Harlem River Actionable Element is preliminary in nature yet sufficient to establish a quantity take-off (QTO) of construction materials (material tonnage etc.). The preliminary designs of the measures presented and the alignment location, allow for an inventory of the structural measures and a quantity take off to support cost estimating. The inventory is separated into two data sets:

1) Inventory of number and length of SBMs.

2) Quantity take-off per SBM and

These two data sets are then used to complete cost estimates for the project. The reader is referred to Appendix 5 for Quantity Take Offs and to Appendix 6 for construction cost estimates.

5.2 Inventory of SBMs for Harlem River Actionable Element

An inventory of measure types is shown in Table 5-1. This table includes measure lengths in feet for the floodwall and anchored combiwall and measure counts for the deployable feature (vehicular gate) and the floodwall that spans the MTA tunnel. Measure counts were added for these features since cost estimates were performed per individual structure (otherwise per linear distance for the remaining features).

Table 5-1: Detailed inventory of SBMs for Harlem River Actionable Element

Measure Type	Measure Length (ft)	Count (-)	Reach ID(s)	Notes
Floodwall	318		1,5	Total length of North and South Floodwall combined
Vehicular Gate		2	2,4	Unique features, count provided instead of length
Tunnel Span		1		Unique feature, count provided instead of length
Anchored Combiwall	3637		3	

5.3 Quantity Take-offs

Quantity take-offs for each prototypical SBM were completed. This was done per linear foot, with the exception of the deployable vehicular gate and the tunnel span. Appendix 5 includes all quantity take-offs for the measures presented herein. Additional appurtenances were described qualitatively instead of quantitively, and additional caveats and notes regarding the items covered within each quantity take-off are listed in that same appendix.

6 Design Summary and Next Steps

6.1 Summary

This memorandum documents the general design criteria and preliminary design for the Harlem River Actionable Element. The purpose of the study is to review available site data, develop a preliminary design and construction cost estimate and identify the required next steps to progress the design with sufficient level of details for a class 3 cost estimate (USACE, 2016).

For the Harlem River Actionable Element, in many instances, the alignment or the selection of the SBM relied on a high-level review of available data. It should be reiterated that no project-specific topographic survey, bathymetric survey, condition survey, and/or geotechnical analysis have been completed. Instead, in accordance with USACE's SMART planning principles, the alignment, and the selection of the SBM type was based on qualitative data and a desktop-level analysis of available data from past projects. This yielded generalizations of existing conditions and generally broad design assumptions.

The implications of these assumptions are that further optimization of the alignment is possible and that for locations where conflicts are apparent, an alternative comparison on a reach-by-reach basis is recommended during a future phase.

6.2 Recommendations for Next Steps

To refine and progress the presented preliminary design to a greater level of design maturity the next steps are broken down into two categories: 1) studies and data collection and 2) design tasks.

6.2.1 Studies and Data Collection:

The studies listed hereafter are recommended to further refine the alignment during the next study phase. Some of these studies could potentially be completed during the Pre-Construction Engineering and Design (PED) phase but will require evaluation as to determine whether they are critical to define project planning, scope, and construction quantities for a class 3 cost estimate.

1. Obtain site topographic survey.
2. Obtain bathymetric survey.
3. Obtain existing structure surveys (condition surveys and record drawings).
4. Obtain site-specific geotechnical data (Obtain detailed geotechnical information from other projects within direct vicinity, or complete project specific geotechnical investigation including CPTs, SPTs, boreholes with soil sampling and rock coring, and laboratory testing. Geophysical testing to understand depth to rock along the line of protection may also be recommended).
5. Obtain sub-surface utility survey and obtain stormwater infrastructure as-built records, digital infrastructure files and other pertinent stormwater data.

6. Obtain tree survey to better estimate impacts to and need of removal of trees.

7. Complete site-specific wave modeling to establish design wave characteristics.

8. Complete comprehensive interior drainage modeling.

9. Continuation of stakeholder and public outreach such that input and comments from stakeholders can further inform alignment alternatives to be evaluated.

10. Complete vessel impact analysis to assess vessel impact load conditions for the alignment and the individual structures.

11. Complete an analysis of easement delineation and real estate studies such that impacts beyond the footprint of the measures can be preliminarily assessed.

12. Complete an analysis of the potential for induced flooding impacts and changes in induced flooding patterns (if any) compared to the Alternative 3B analysis that was completed previously.

13. Complete utility conflict investigations and/or relocations studies.

14. Complete construction cost estimates and impact assessments for alignment alternatives.

15. Complete site hazardous waste studies.

6.2.2 Recommendations for Further Design Refinements of Harlem River Actionable Element SBMs

Assumptions, as discussed in the report, have been made to advance the design, but it should be noted that additional data and studies are needed for the next design phase to refine the SBM designs such that more site-specific measures can be developed for the Harlem River Actionable Element project and a class 3 cost estimate can be prepared. Recommendations for next phases of the project include:

1. Refine the design of each SBMs and develop of additional site-specific SBMs where required.

2. Assess and design the transitions between various SBMs and transitions between SBMs and the existing high ground.

3. Refine the requirements for future adaptability and refine the SBM designs to incorporate adaptability into the design.

4. Setting the wave overtopping criterion and optimize it for this project. Ideally, the overtopping criterion is informed by two main considerations:

a. The ability of the risk reduction system to handle the volume of overtopping (i.e., pumping or storage on the land side of the risk reduction alignment may allow for accepting large overtopping volumes), and

b. The type of construction on the land side of the alignment, e.g., grey infrastructure has a relative high tolerance for large overtopping discharges prior to the onset of structural failure while levees have a lower tolerance. Given the urban nature of the project area and relatively high portion of grey SBMs, a higher overtopping criterion could be considered.

5. Complete a gate-type evaluation. For the locations where deployable flood gates are required, determine the best gate types, sizes, and configurations.

6. Assess the control, security, and deployment requirements for the deployable flood barriers.

7. Evaluate the need for maintenance and inspections for each SBM.

8. Continuation and furthering stakeholder and public outreach such that input and comments from stakeholders – including city, state agencies, and the public – can be incorporated for better integration of the SBMs into the urban fabric.

9. Coordinate and provide supports for non-structural elements, such as lighting, conduits, landscaping, public amenities, and utilities.

Finally, albeit that major construction items have been accounted for in the quantity take-off, a number of items could only be qualitatively discussed, since insufficient information or data is available at this stage in the study to provide meaningful quantitative data. For the SBMs, additional data collection and studies should be completed such that existing data gaps can be filled and a more complete inventory of items and work form the basis of the cost estimates. Such items are detailed in Table 6-1.

Table 6-1: Detailed Design Items to be Considered During Next Phases of the Study

SBM Appurtenances and Construction Related Work Items	Example
Utility relocation	Gas, water, electricity, cables, etc.
Additional drainage features	Storm water collection, discharge etc.
Additional aesthetic features	Pavers, textured wall, lighting, etc.
Additional access features for inspection	Ramps, railing, stairs, guard rails, etc.

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Appendices

Appendices to this memorandum follow hereafter.

Appendix 1	Excerpts from TSP
Appendix 2	Maps of Project Area
Appendix 3	Structural Sections/Plans
Appendix 4	Coastal Analysis
Appendix 5	QTO
Appendix 6	Cost EngineeringQTO

Harlem Shore Based Measure
Actionable Element

Feasibility Design Memorandum

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Appendix 1 – Excerpts from TSP

New York – New Jersey Harbor and Tributaries
Coastal Storm Risk Management Feasibility Study

June 2025

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SBM - SITE PLAN (13 OF 27)

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A	DRAFT for DQC-NYNJHAT Study - TSP Plan Set	08.26.22	MK

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212-768-7454

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NEW YORK - NEW JERSEY HARBOR AND TRIBUTARIES COASTAL STORM RISK TENTATIVELY SELECTED PLAN

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SBM - SITE PLAN (14 OF 27)

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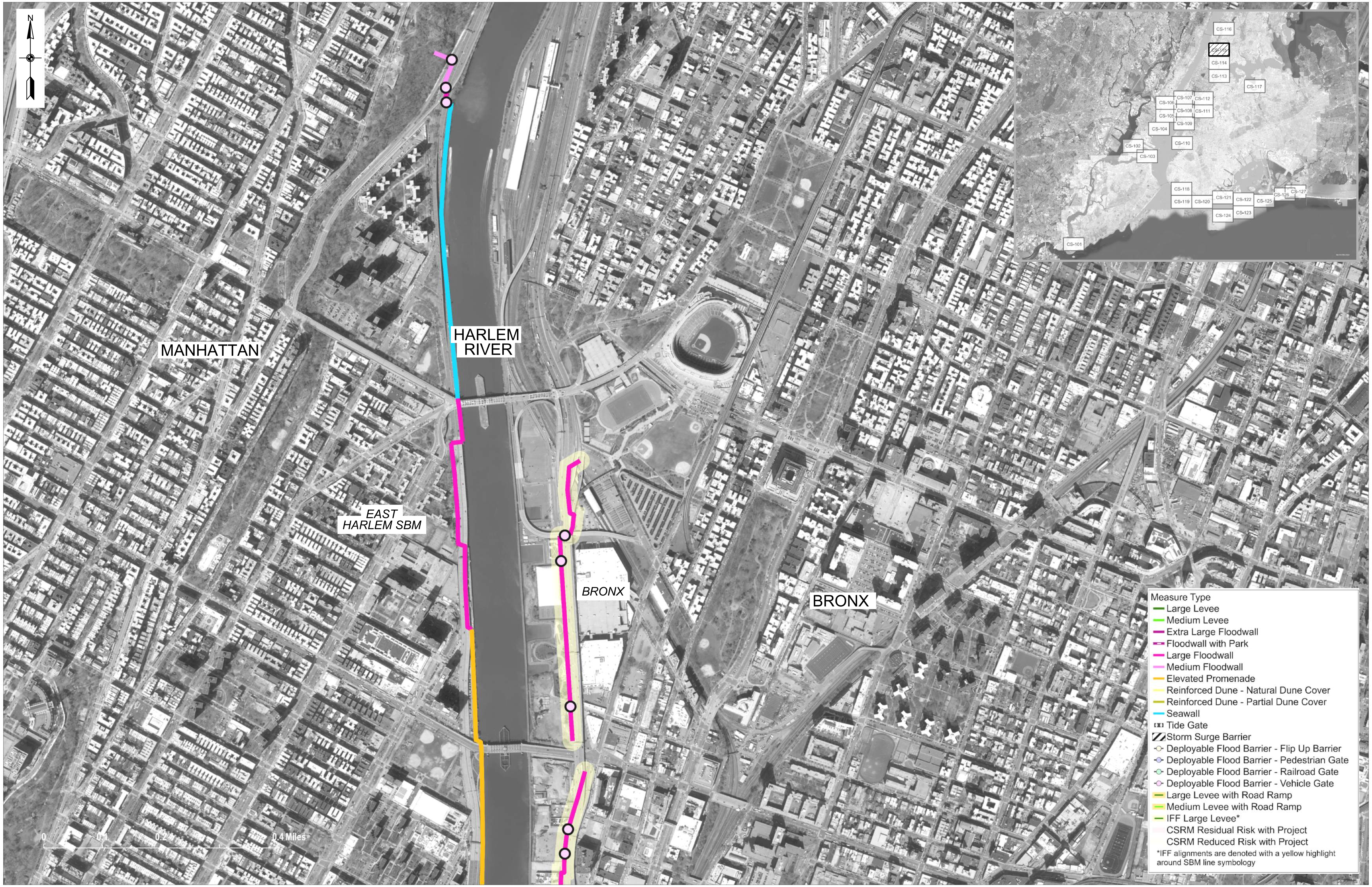

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SBM - SITE PLAN (15 OF 27)

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Harlem Shore Based Measure
Actionable Element

Feasibility Design Memorandum

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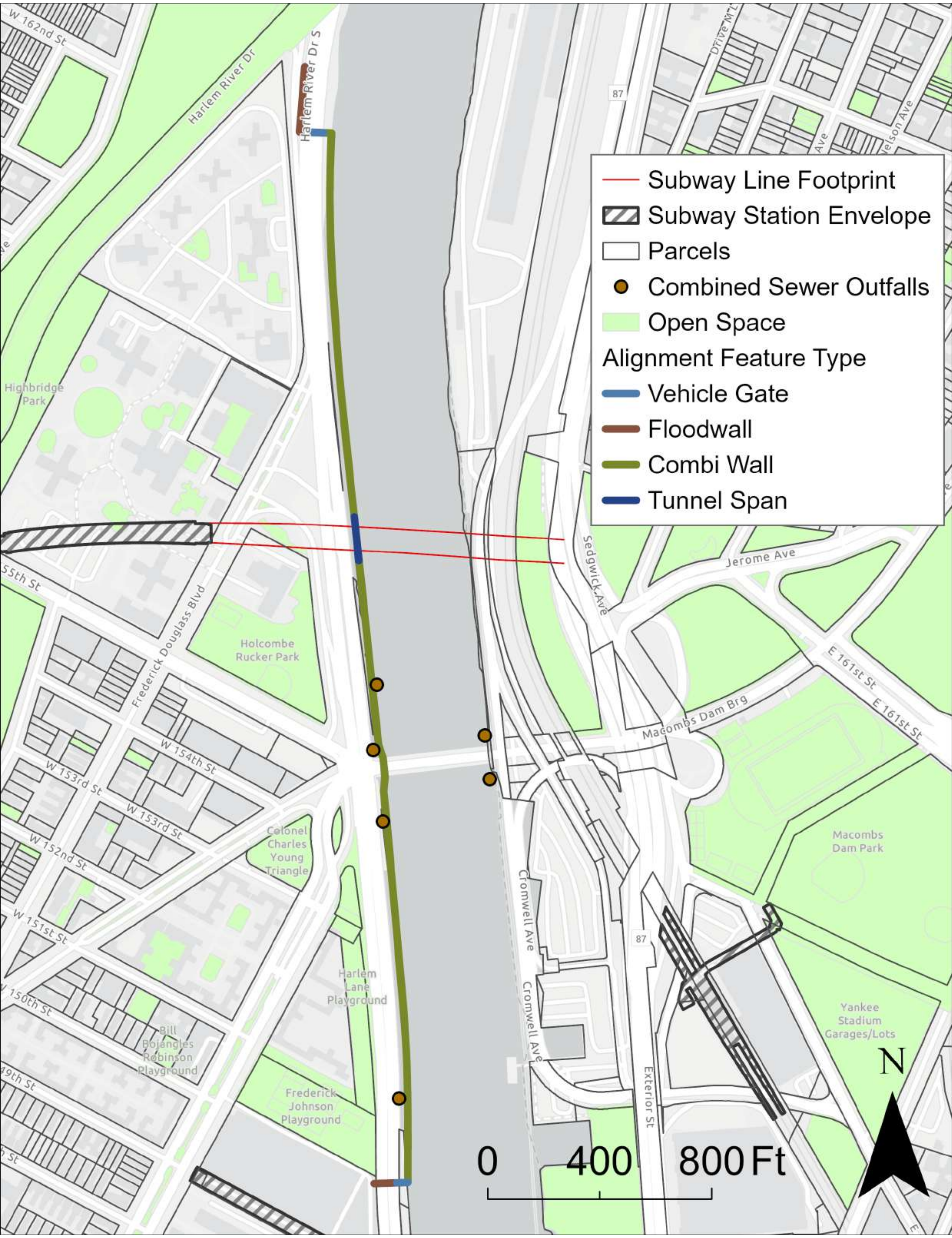
Appendix 2 – Maps of Project Area

New York – New Jersey Harbor and Tributaries
Coastal Storm Risk Management Feasibility Study

June 2025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Subway Station Envelope
Parcels
Combined Sewer Outfalls
Open Space
Alignment Feature Type
Vehicle Gate
Floodwall
Combi Wall
Tunnel Span
W 162nd St
Harlem River Dr
Harlem River Dr S
Highbridge Park
Holcombe Rucker Park
Frederick Douglass Blvd
W 154th St
W 153rd St
W 152nd St
W 151st St
Colonel Charles Young Triangle
Harlem Lane Playground
Bill Bojangles Robinson Playground
Frederick Johnson Playground
Sedgwick Ave
Jerome Ave
E 161st St
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Macombs Dam Park
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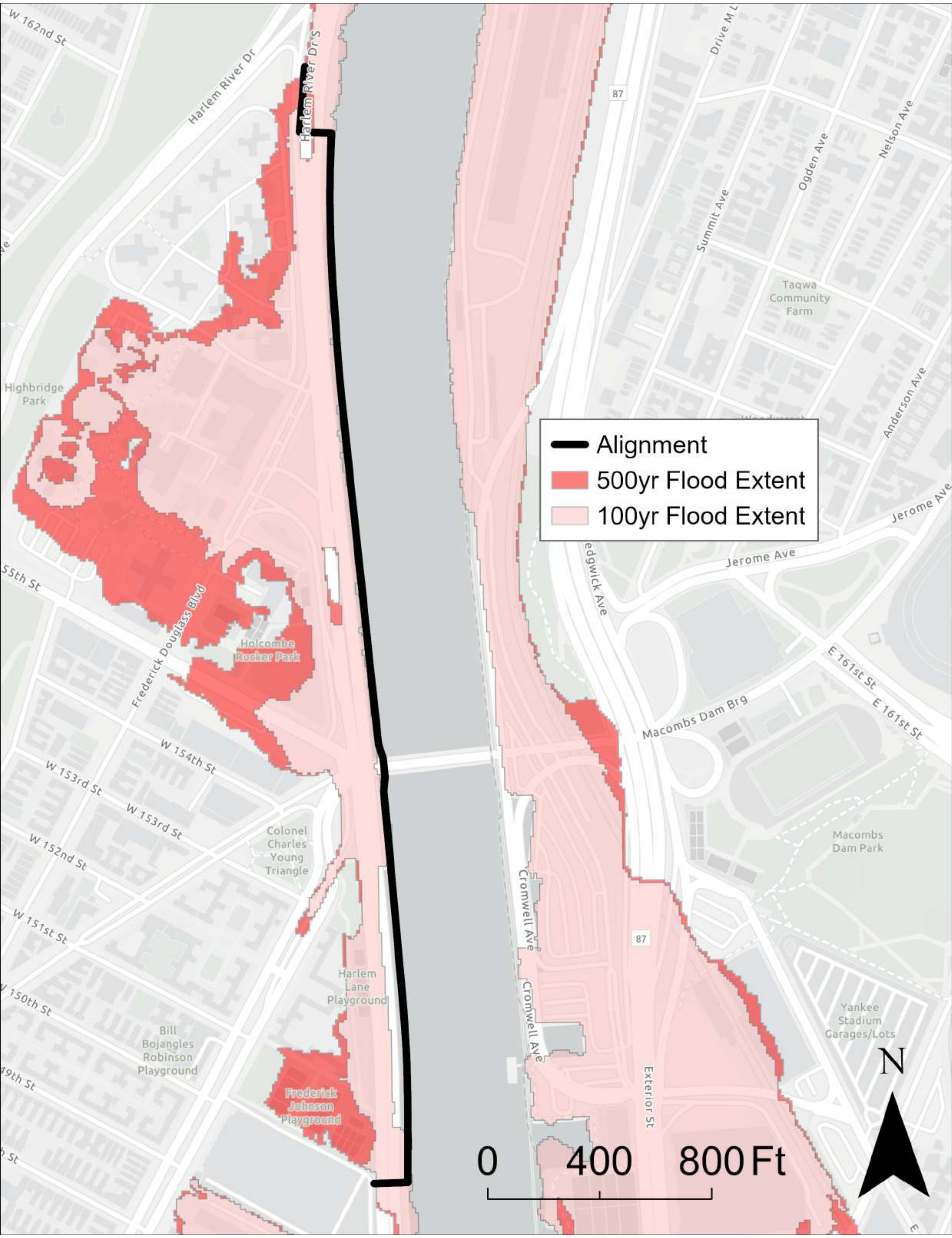
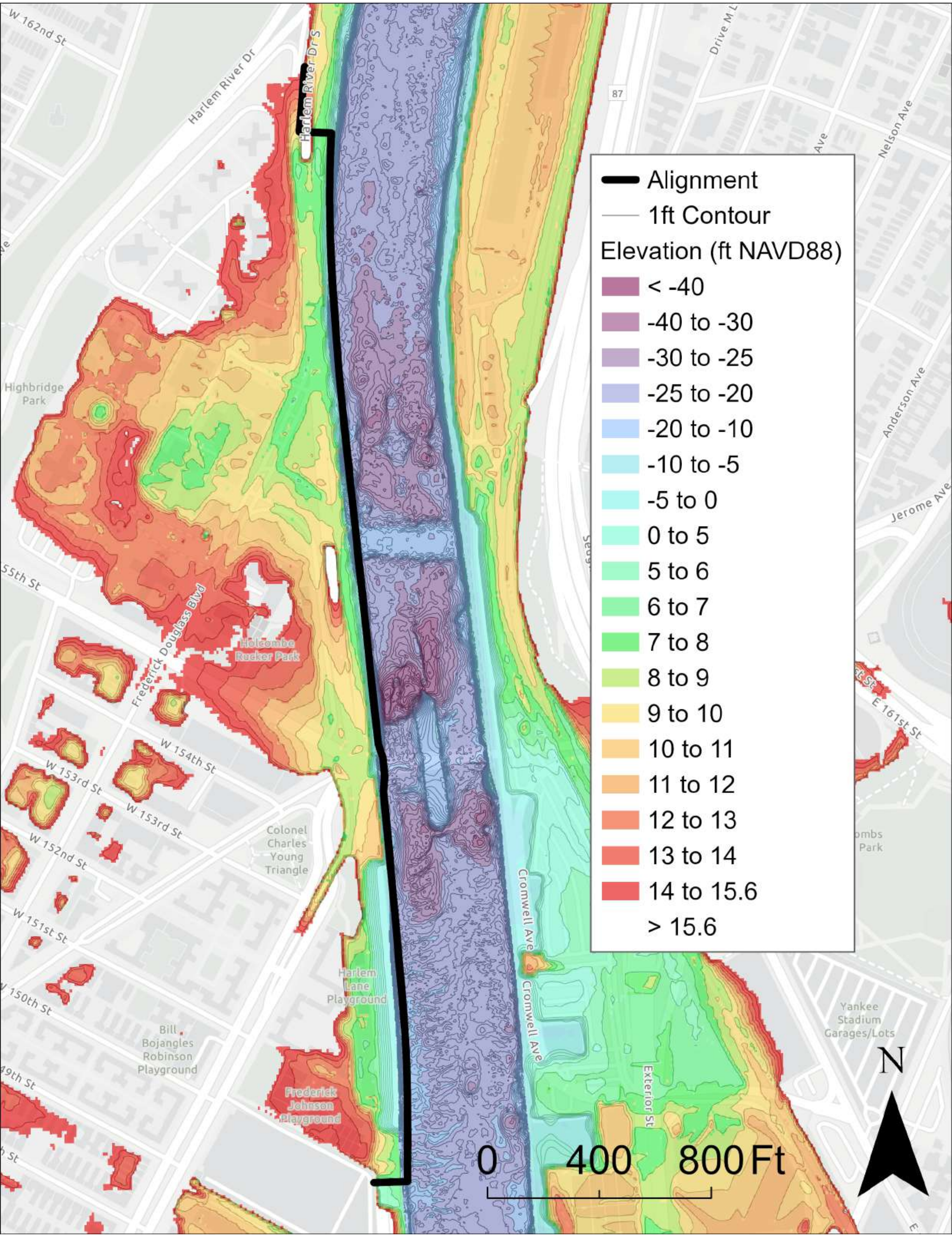
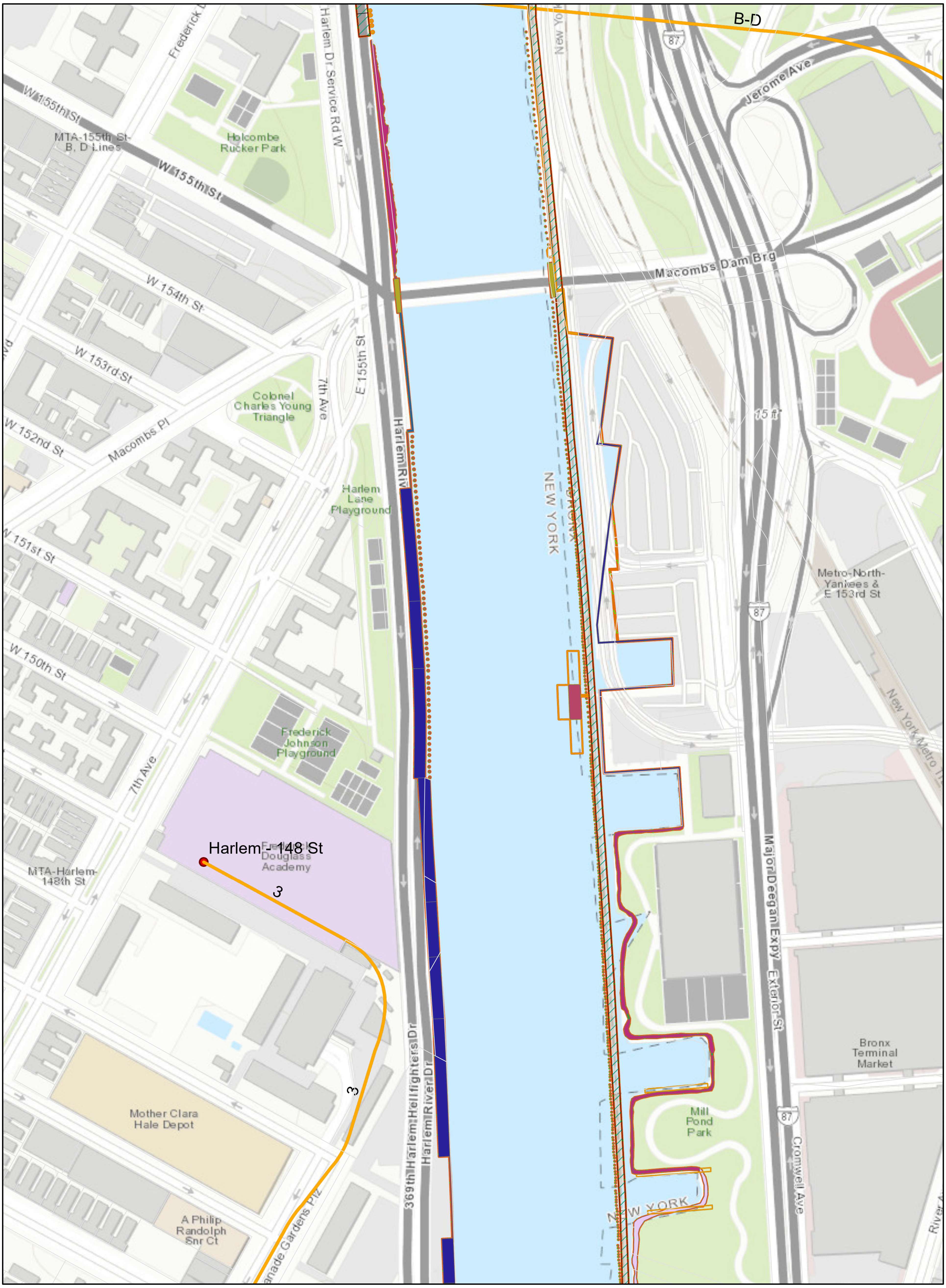


Alignment
500yr Flood Extent
100yr Flood Extent
0
400
800 Ft
N
W 162nd St
Harlem River Dr
Harlem River Dr S
Highbridge Park
55th St
Frederick Douglass Blvd
Holcombe Rucker Park
W 154th St
W 153rd St
W 153rd St
W 152nd St
W 151st St
150th St
49th St
Colonel Charles Young Triangle
Harlem Lane Playground
Bill Bojangles Robinson Playground
Frederick Johnson Playground
87
Drive M L
Summit Ave
Ogden Ave
Nelson Ave
Taqwa Community Farm
Anderson Ave
Jerome Ave
Jerome Ave
edgwick Ave
E 161st St
E 161st St
Macombs Dam Brg
Macombs Dam Park
Cromwell Ave
Cromwell Ave
87
Exterior St
Yankee Stadium Garages/Lots



Alignment
1ft Contour
Elevation (ft NAVD88)
< -40
-40 to -30
-30 to -25
-25 to -20
-20 to -10
-10 to -5
-5 to 0
0 to 5
5 to 6
6 to 7
7 to 8
8 to 9
9 to 10
10 to 11
11 to 12
12 to 13
13 to 14
14 to 15.6
> 15.6
0
400
800 Ft
N
W 162nd St
Harlem River Dr
Harlem River Dr S
87
Nelson Ave
Highbridge Park
Anderson Ave
Jerome Ave
Frederick Douglass Blvd
Holcombe Rucker Park
E 161st St
W 154th St
W 153rd St
W 152nd St
W 151st St
W 150th St
Colonel Charles Young Triangle
Harlem Lane Playground
Bill Bojangles Robinson Playground
Frederick Johnson Playground
Cromwell Ave
Exterior St
Yankee Stadium Garages/Lots

Existing Conditions (NYC Waterfront Facilities Maintenance Management System)



May 13, 2025

Site polygon	Dolphin	Outfall
Facility polygon	Floating Dock	Revetment
System polygon	Gravity Retaining Wall	<all other values>
<Null>	High-Level Deck Platform	Subway Stations
Bridge Pier	Low-Level Deck Platform	Subway Lines
Bulkhead		

1:4,000

0 0.03 0.06 0.12 mi

0 0.05 0.1 0.2 km

NYC OpenData, State of New Jersey, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA

Web AppBuilder for ArcGIS

Existing Conditions (NYC Waterfront Facilities Maintenance Management System)

May 13, 2025

Site polygon
Facility polygon
System polygon
<Null>
Bridge Pier
Bulkhead
Dolphin
Floating Dock
Gravity Retaining Wall
High-Level Deck Platform
Low-Level Deck Platform
Outfall
Revetment
<all other values>
Subway Stations
Subway Lines

1:4,000

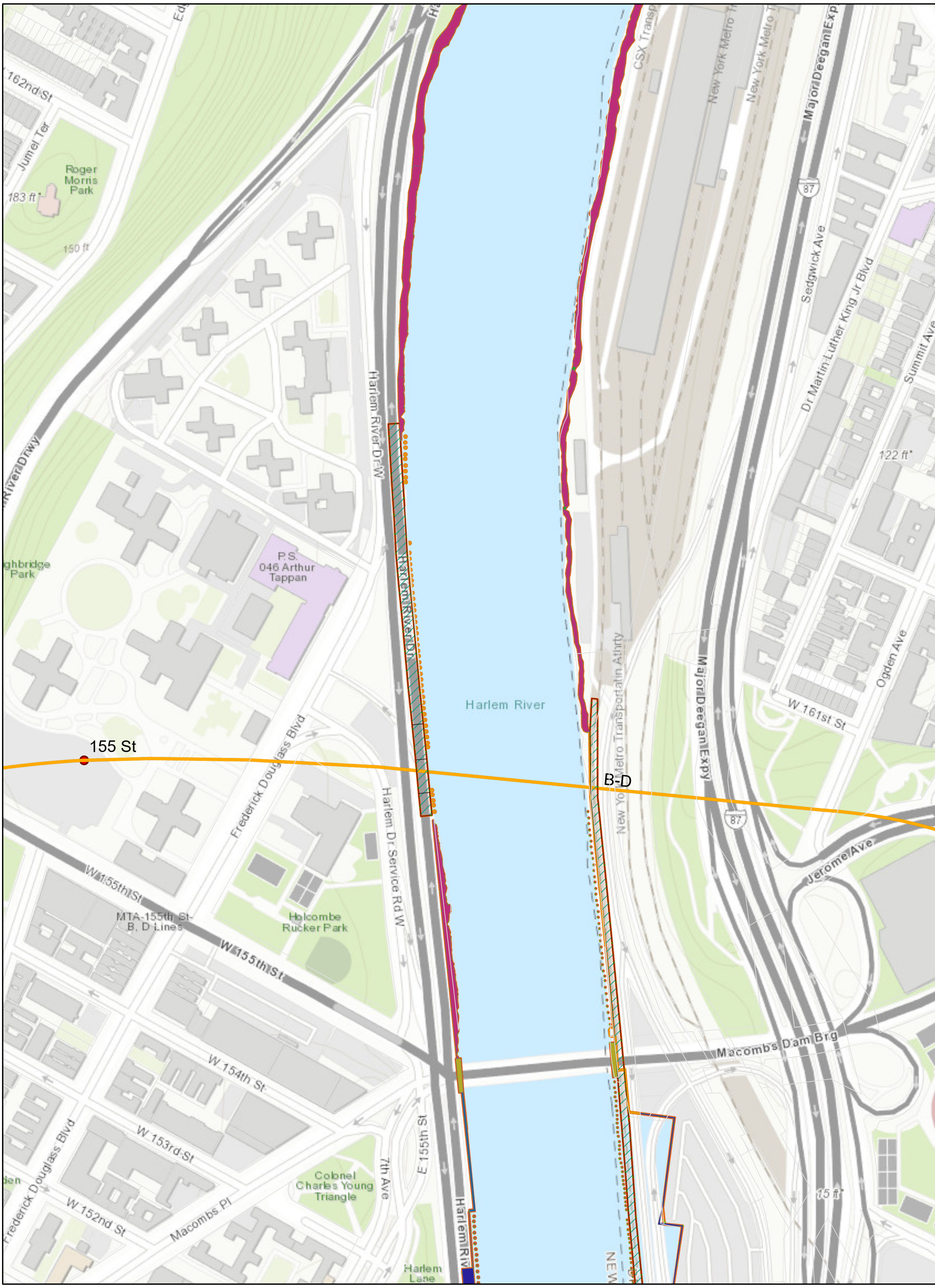
0 0.03 0.06 0.12 mi

0 0.05 0.1 0.2 km

NYS ITS Geospatial Services, Westchester County GIS

Web AppBuilder for ArcGIS

Existing Conditions (NYC Waterfront Facilities Maintenance Management System)



May 13, 2025

- Site polygon
- Facility polygon

System polygon

- <Null>
- Bridge Pier
- Bulkhead
- Dolphin
- Gravity Retaining Wall
- High-Level Deck Platform
- Low-Level Deck Platform
- Outfall
- Revetment
- Subway Stations
- Subway Lines

1:4,000

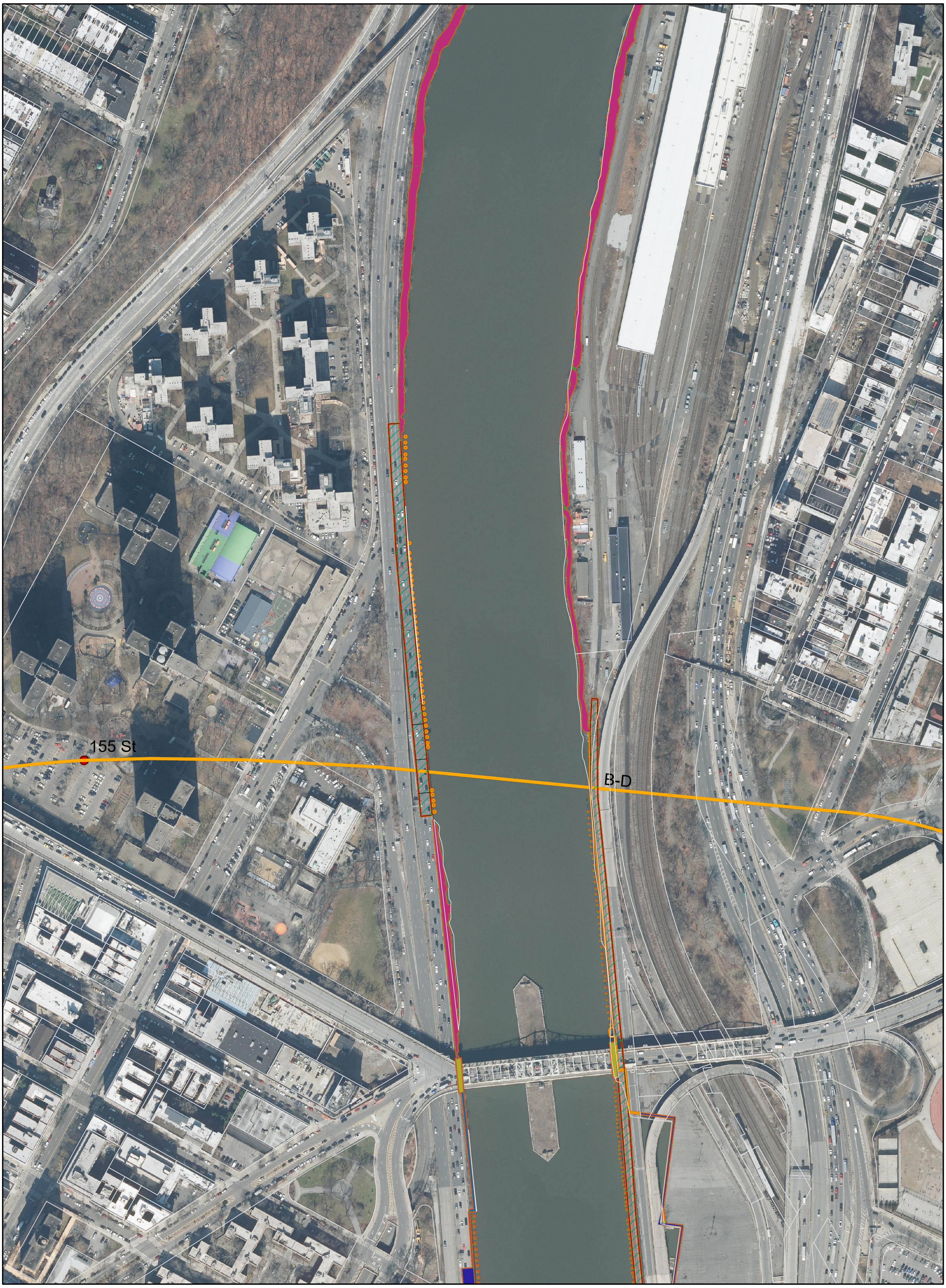
0 0.03 0.06 0.12 mi

0 0.05 0.1 0.2 km

NYC OpenData, State of New Jersey, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA

Web AppBuilder for ArcGIS

Existing Conditions (NYC Waterfront Facilities Maintenance Management System)



May 13, 2025

- Site polygon
- Facility polygon
- System polygon
- <Null>
- Bridge Pier
- Bulkhead
- Dolphin
- Gravity Retaining Wall
- High-Level Deck Platform
- Low-Level Deck Platform
- Outfall
- Revetment
- Subway Stations
- Subway Lines

1:4,000

0 0.03 0.06 0.12 mi

0 0.05 0.1 0.2 km

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Web AppBuilder for ArcGIS

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Actionable Element

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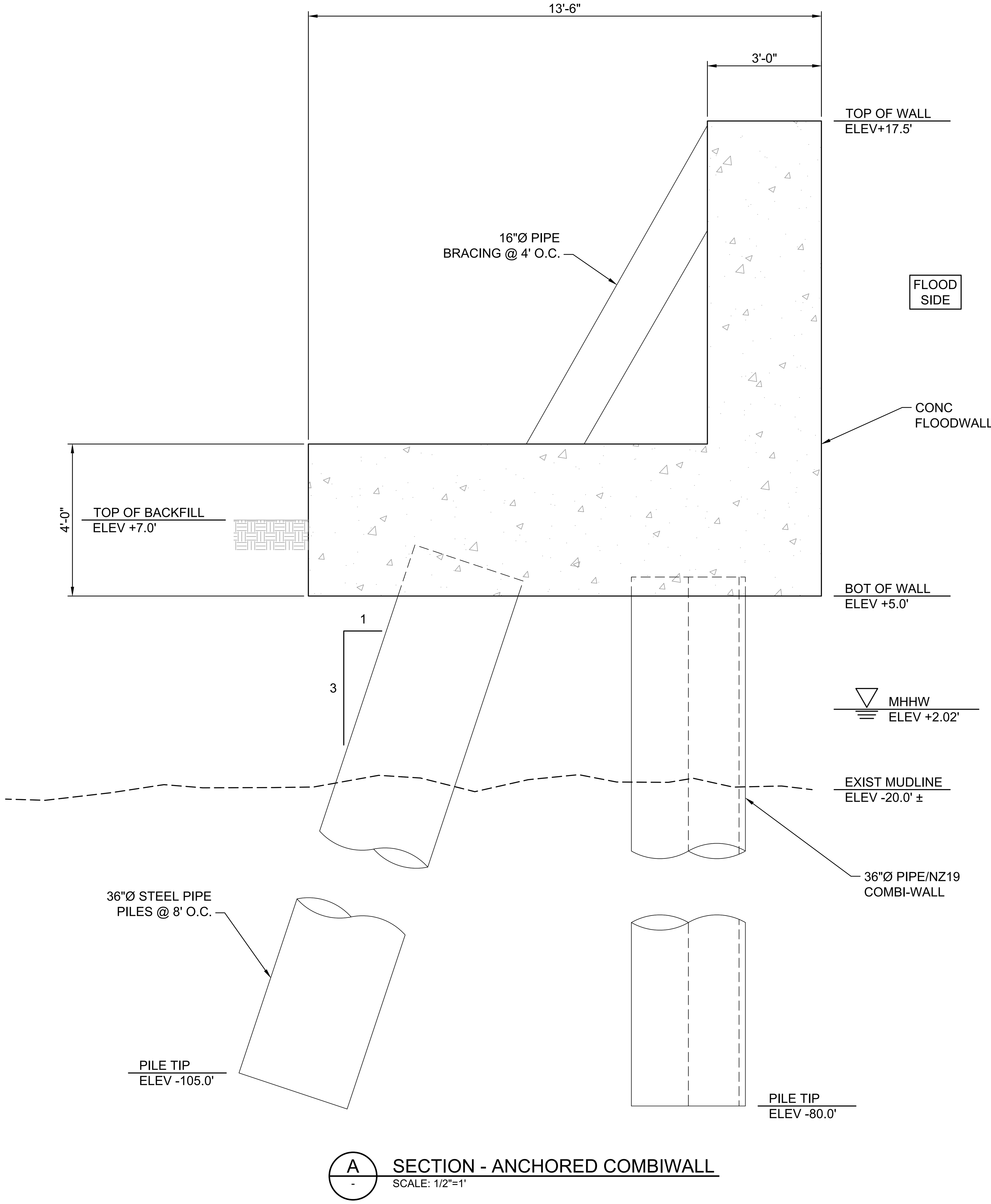
Appendix 3 – Structural Sections/Plans

New York – New Jersey Harbor and Tributaries
Coastal Storm Risk Management Feasibility Study

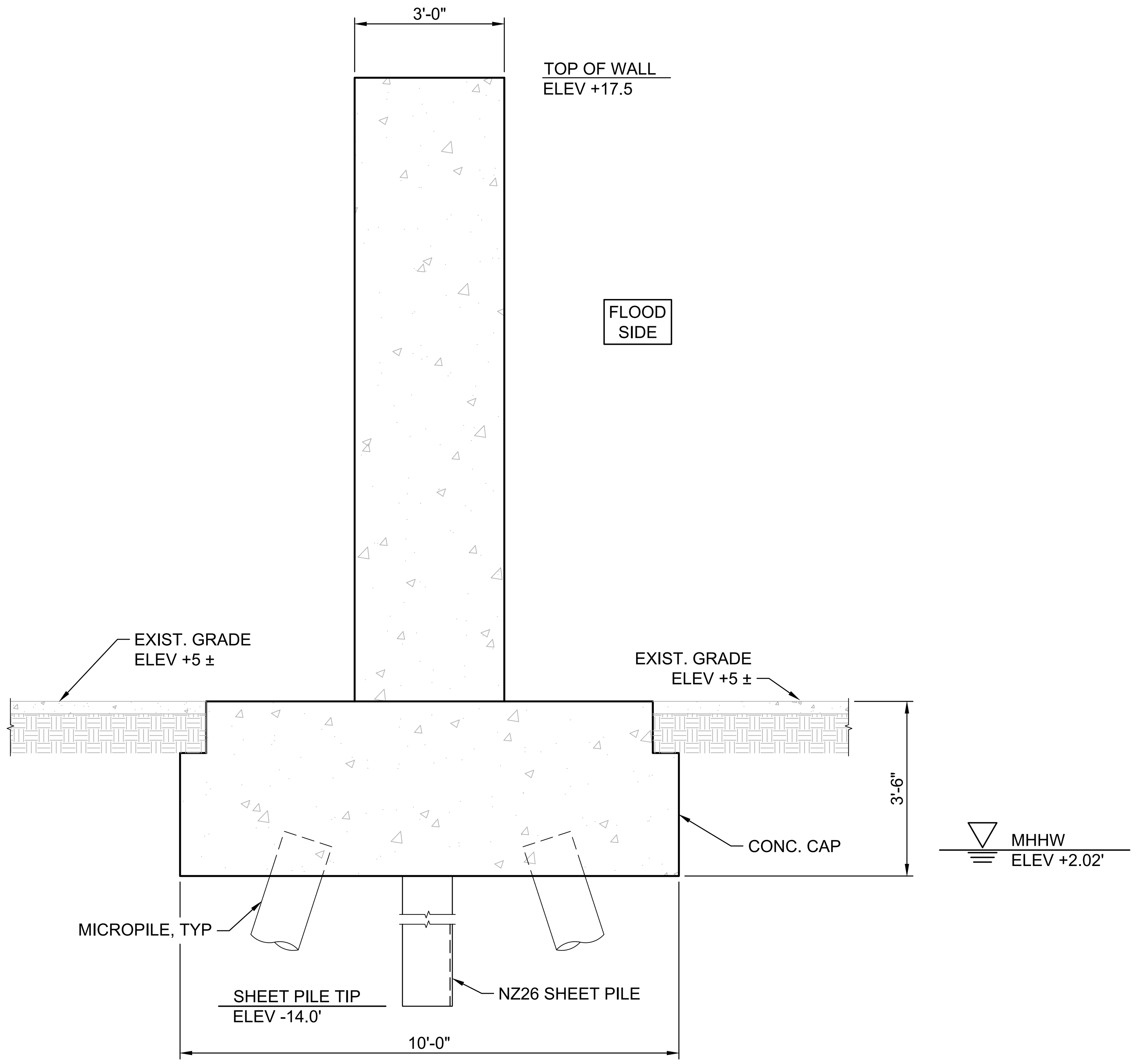
June 2025



SECTION - ANCHORED COMBIWALL

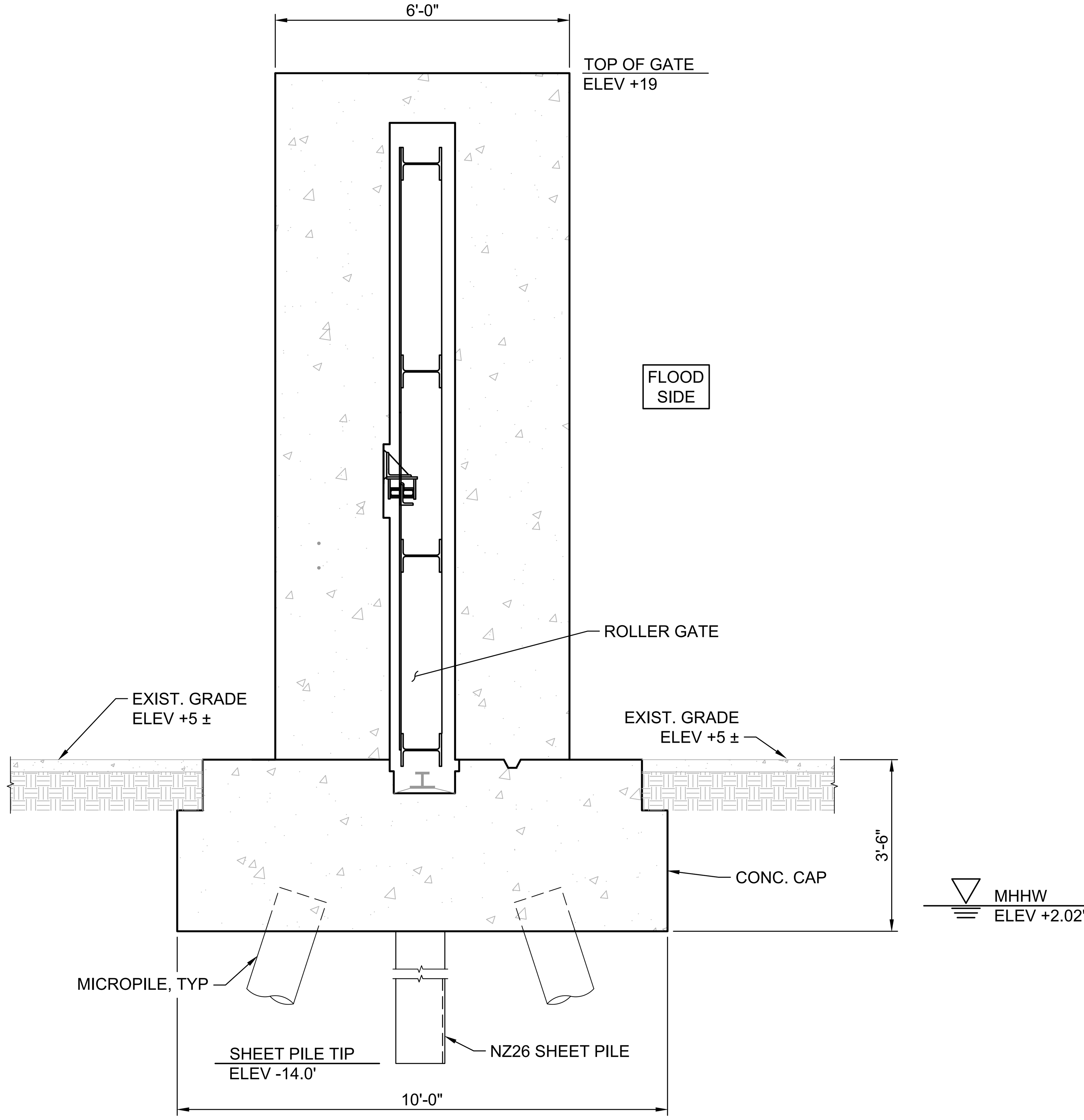
SCALE: 1/2"=1'

SCALE: 1/2"=1'-0"

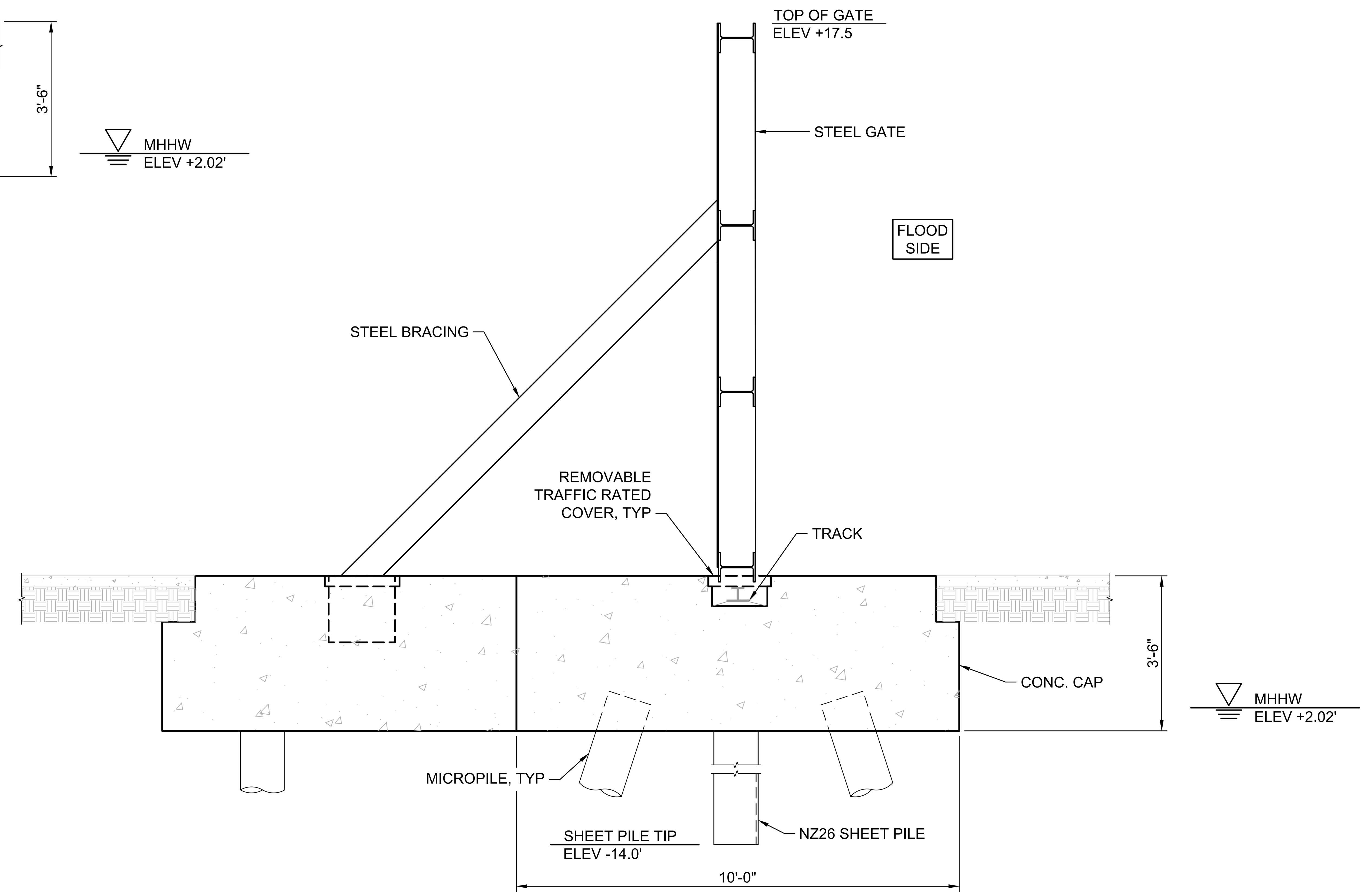


A
SECTION - FLOOD WALL
SCALE: 1/2"=1'

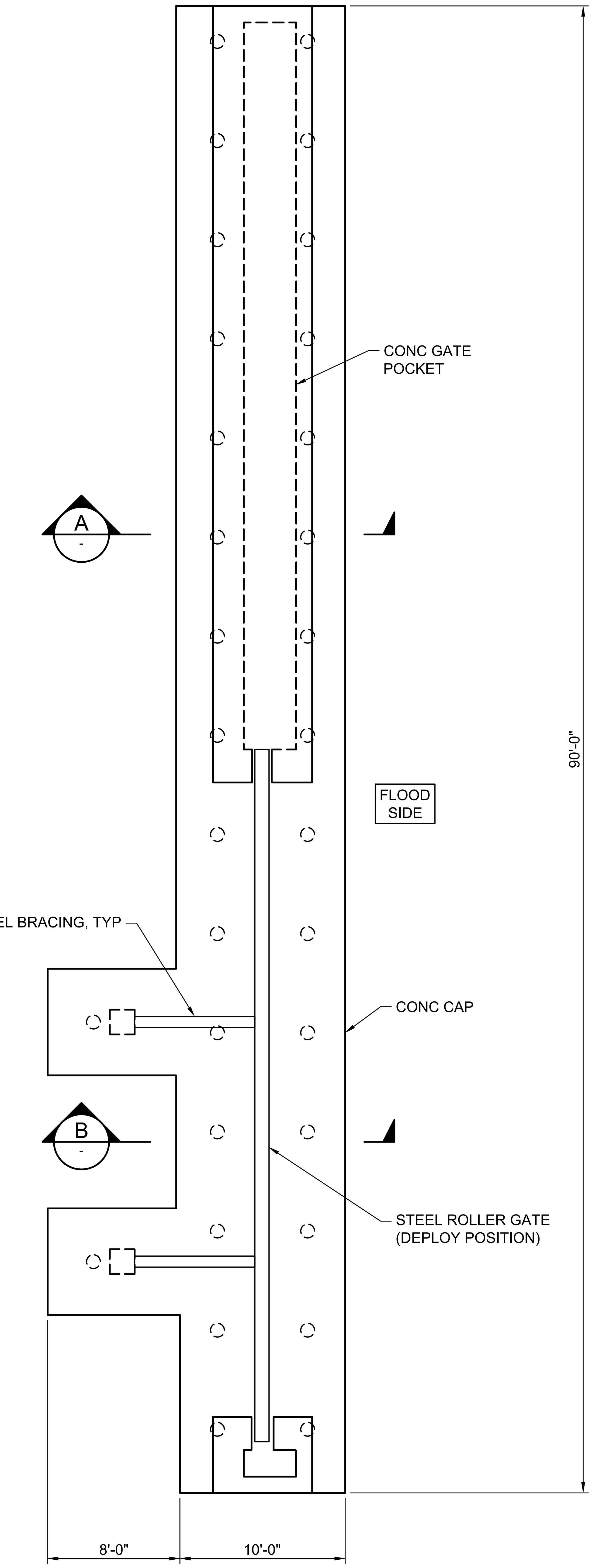
SCALE: 1/2"=1'-0"



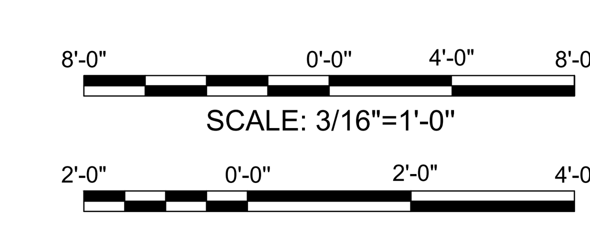
A SECTION - STORAGE MONOLITH
SCALE: 1/2"=1'

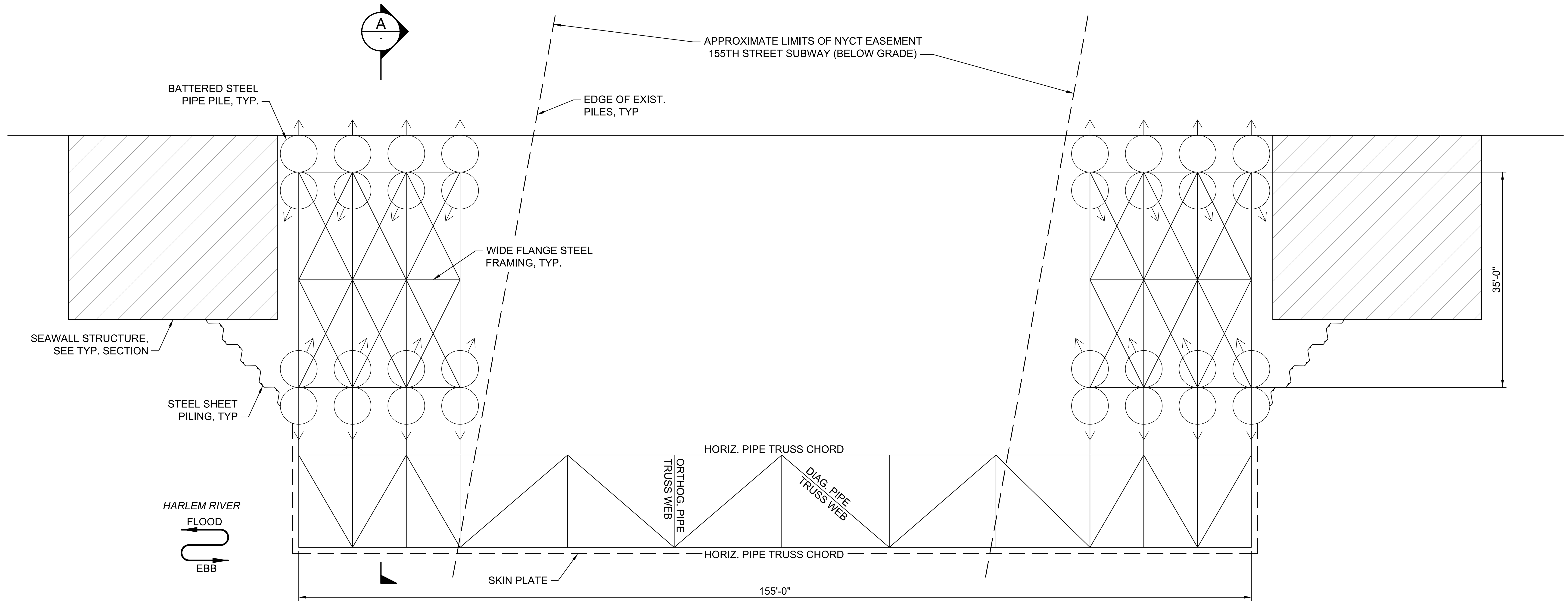


B SECTION - ROLLER GATE
SCALE: 1/2"=1'



C PLAN
SCALE: 3/16"=1'



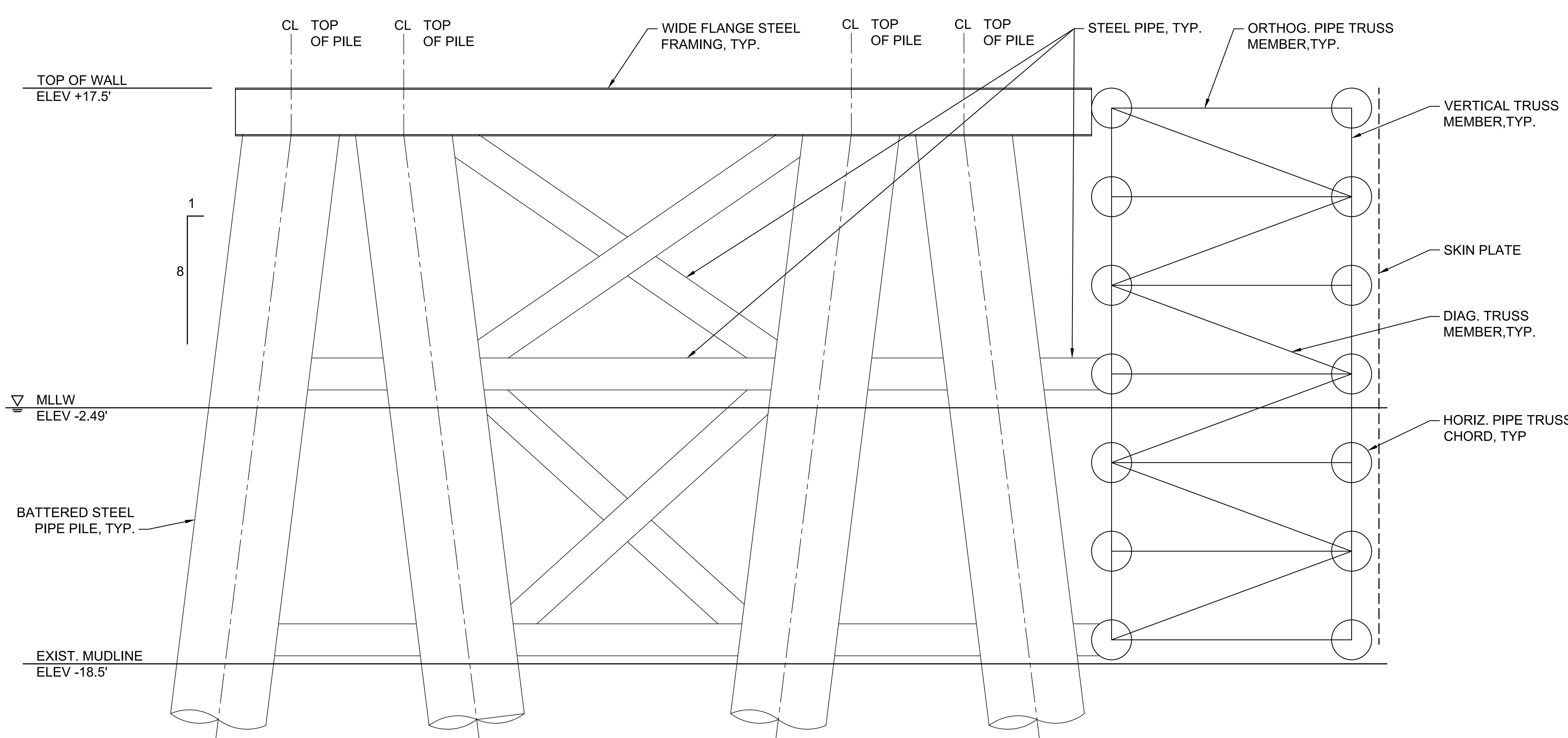


PLAN - FLOOD WALL SPAN AT MTA TUNNEL

SCALE: 1"=10'

10'-0" 0'-0" 10'-0" 20'-0"

SCALE: 1"=10'



A
-
SECTION - FLOODWALL SPAN AT MTA TUNNEL

SCALE: 1"=5'

5'-0" 0'-0" 5'-0" 10'-0"

SCALE: 1"=5'

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Appendix 4 – Coastal Analysis

New York – New Jersey Harbor and Tributaries
Coastal Storm Risk Management Feasibility Study

June 2025

1.0 SUMMARY

The proposed Harlem Shore Based Measure (SBM) alignment consists of vehicular gates at the tie-ins to high ground. The ground elevation at these locations is about 7 ft NAVD88 based on the contours at the tie-in location shown in Figure 1-1. Closure of the vehicular gate feature will be required when the still water elevation exceeds this elevation. An analysis of the estimated frequency of such closure is described below.

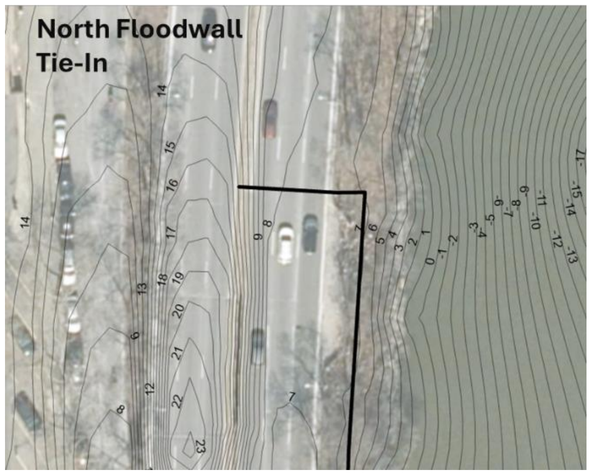

Figure 1-1: Map of Elevation Contours at the Harlem SBM Tie-In to High Ground

Stage Frequency Curves for this location were developed based on data from the North Atlantic Comprehensive Coastal Study (NACCS), and using Sea Level Rise projections from USACE. The assumed service life of the project from the estimated date of completion in 2045 to 50 years hence in 2095. Annual exceedance probability curves for water levels at this location are available just offshore of this alignment at NACCS Save Point ID 11881. The Intermediate USACE Sea Level Rise projection from the Battery, NY was used to update this curve over the timeline of the expected project service life. These curves are shown in Figure 1-2 below, with the Average Recurrence Intervals corresponding to a closure elevation of +7 ft NAVD88 indicated using colored text labels for the corresponding years. Uncertainty bands around the expected Average Recurrence Intervals to account for inaccurate timing of gate closure which may be triggered at still water elevations withing +/-0.5 ft of the closure elevation are shown in shaded areas of the corresponding color, for each year. Based on this analysis, the estimated average closure interval for the vehicular gate over its service life would range between 3.6 years in 2045 to 1.4 years by the end of service life in 2095.

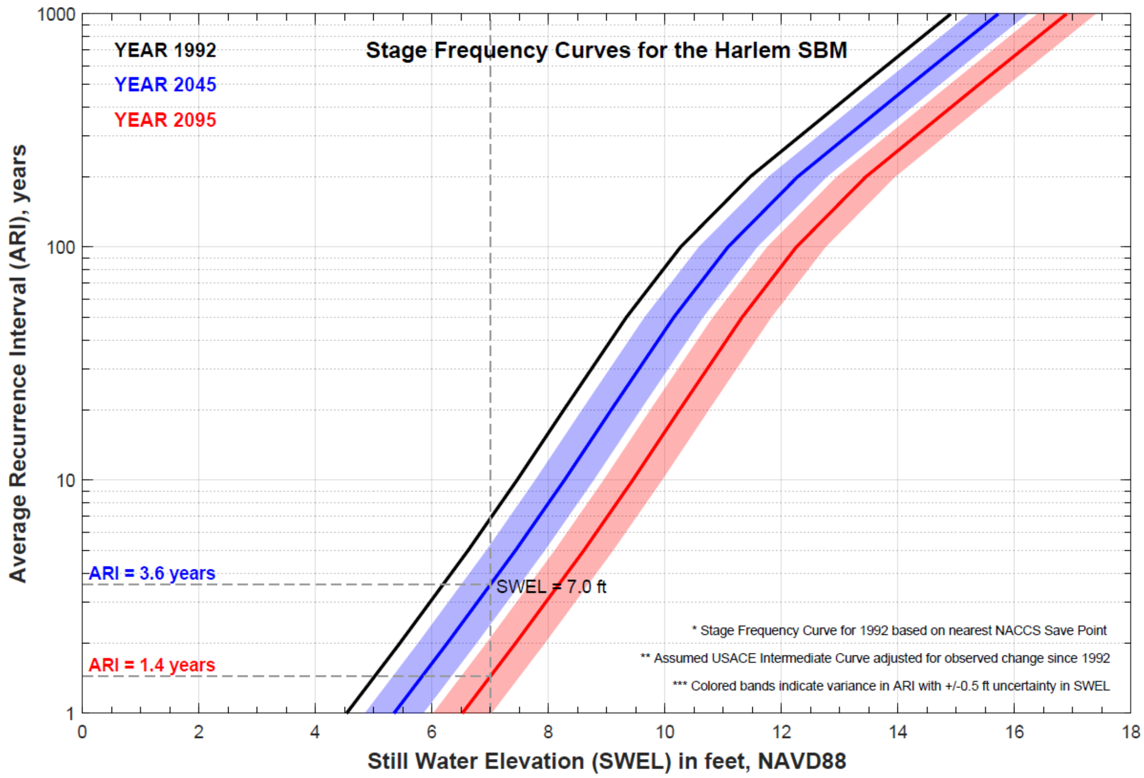

Figure 1-2: Stage Frequency Curves for the Harlem SBM alignment

For a closure elevation of +6 ft NAVD88, which corresponds to a lower estimate of the ground elevation, the stage frequency curves would drop a little lower as shown in Figure 1-3. At this closure elevation, the average closure interval for the gates would range from 1.6 years at the beginning of service life in 2045 to less than 1 year at the end of service life in 2095.

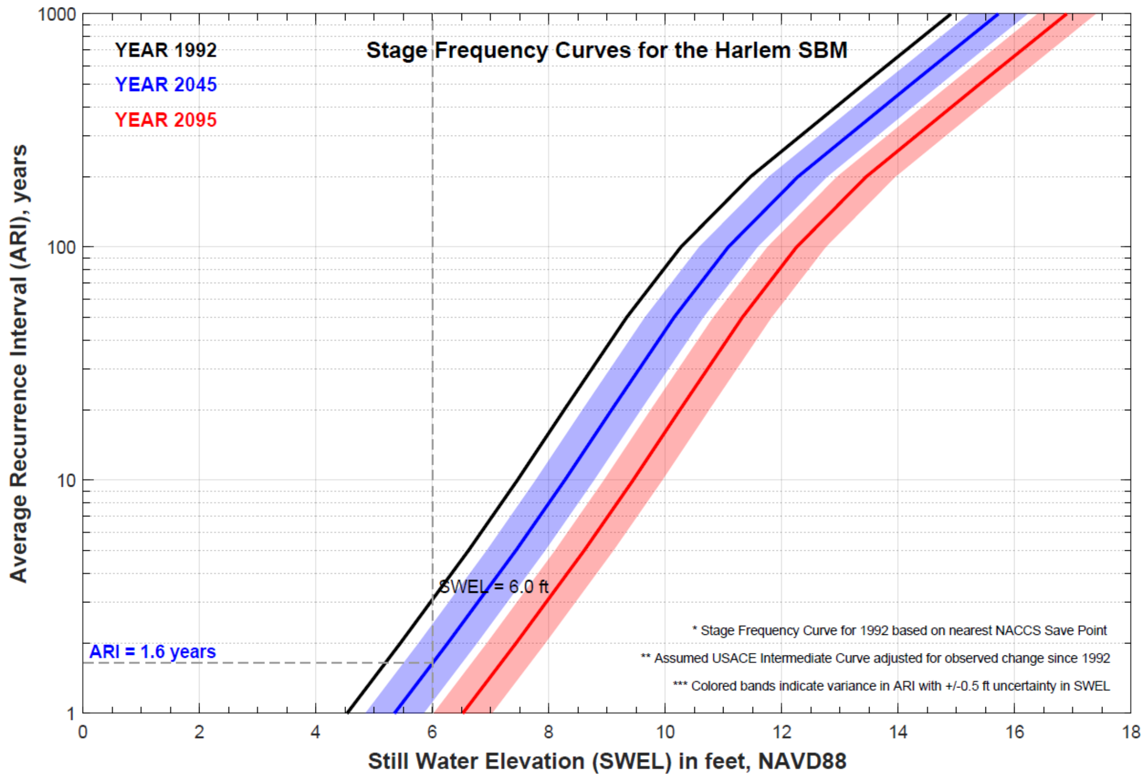

Figure 1-3: Stage Frequency Curves for Harlem SBM showing closure intervals for a +6 ft NAVD88 ground elevation

As apparent from both Figure 1-2 and Figure 1-3, the expected average closure interval would shorten over time as a result of the projected sea level rise. This trend is illustrated in Figure 1-4, which shows the change in the expected average recurrence interval of closure for different closure elevations (8, 7, and 6 ft NAVD88).

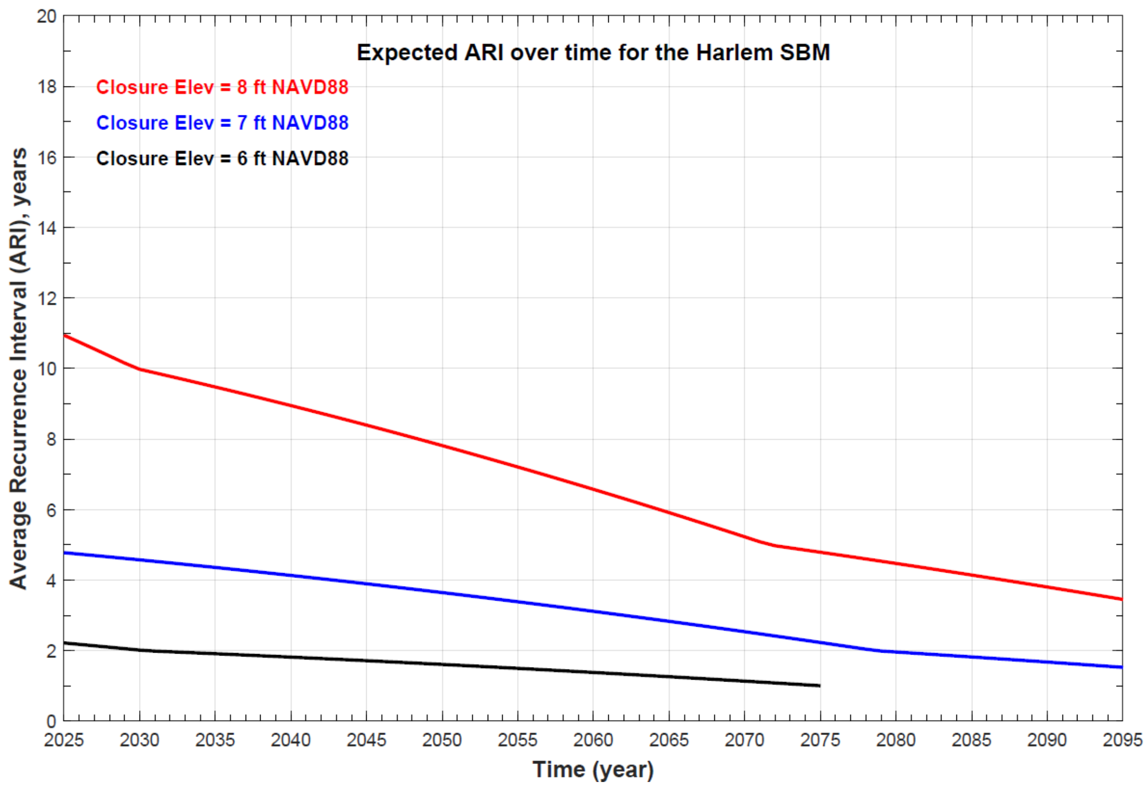

Figure 1-4: Change in expected Average Recurrence Interval over time

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Appendix 5 – QTO

New York – New Jersey Harbor and Tributaries
Coastal Storm Risk Management Feasibility Study

June 2025

Title:	Quantities Per Harlem River SBM		
Contract No.:	W912DS-18-D-0006	Discipline: Civil Engineering	Sheet: 1 of 1
Task Order No.:	W912DS-19F0111	Prepared By: Michelle Kim	Date: 6/2/2025
Project Title:	New York/New Jersey Harbor & Tributaries CSRM Study	Checked By: Nauman M	Date: 6/10/2025
Consultant Name:	Moffatt & Nichol		
Consultant Contact:	M. Kluijver		
Revision:	1		

Anchored Combiwall per LF

Item	Quantity	Unit
Reinforced Concrete for Combiwall	3.02	CY
Bracing (Pipe 16 X-Strong)	0.10	TN
Combi-Wall (36" Dia. Pipe/NZ-19)	1.48	TN
Batter Pile (36" Dia. X 0.625")	1.74	TN

Additional Appurtenances: The items below are outside of the core construction quantities but should still be considered in the cost estimate.
Hydraulic Fill from El-20 to El 7
Transitions between feature types
Aesthetic and architectural features, lightning design (if any), signage, environmental mitigation, etc

Vehicular Gate

Item	Quantity	Unit
Reinforced Concrete for Gate Foundation	201.29	CY
Sheet Pile (NZ26)	27.90	TN
Micropile (12"x0.5")	32.00	EA
micropile casing tonnage	24.60	TN
micropile grout volume	82.13	CY
Structural Steel	17.56	TN
Excavation	198.33	CY

Additional Appurtenances: The items below are outside of the core construction quantities but should still be considered in the cost estimate.
Mechanical, electrical items

Floodwall per LF

Item	Quantity	Unit
Reinforced Concrete for Floodwall	2.69	CY
Steel Sheet Pile (NZ26)	0.31	TN
Excavation	2.20	CY
Micropile (12'')	0.33	EA
Micropile casing tonnage	0.26	TN
Micropile grout volume	0.86	CY

Additional Appurtenances: The items below are outside of the core construction quantities but should still be considered in the cost estimate.
Transitions between feature types
Aesthetic and architectural features (if any), etc.

Tunnel Span

Item	Quantity	Unit
Jacket Structure -Steel Pipe Piles (60"dia x 1" thick)	2825.00	TN
Jacket Structure-Framing (W40x211)	87.00	TN
Truss Members (Member sizes vary)	560.00	TN
Truss Plate (0.38" Plate)	49.61	TN
Sheetpile Connection (SIZE)	12.96	TN
Jacket Structure-Steel Pipe Bracing (30" Dia. X 1")	451.00	TN

Additional Appurtenances: The items below are outside of the core construction quantities but should still be considered in the cost estimate.
Aesthetic and architectural features, lightning design (if any), signage, environmental mitigation, etc

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Harlem Shore Based Measure
Actionable Element

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Feasibility Design Memorandum

Appendix 6 – Cost Engineering

New York – New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study

June 2025

Table of Contents

LIST OF TABLES

LIST OF ACRONYMS

AE	Actionable Element
AMF	Access Material Factor
ARA	Abbreviated Risk Analysis
CCI	Construction Cost Index
CSRM	Coastal Storm Risk Management
CWCCIS	Civil Works Construction Cost Index System
CWWBS	Civil Works Work Breakdown Structure
ENR	Engineering News Record
ER	Engineer Regulation
G&A	General and Administrative
GIS	Geographic Information System
NYNJHAT	New York–New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study
HOOH	Home Office Overhead
JOOH	Job Office Overhead
MCASES	Micro-Computer Aided Cost Estimating System
MCI	Materials Cost Index
MCLEM	Marine Crew Labor and Equipment
MII	MCASES Second Generation
MPT	Maintenance and Protection of Traffic
NYD	New York District
SBM	Shore-Based Measures
SIOH	Supervision, Inspection, and Overhead
USACE	United States Army Corps of Engineers

1 Introduction

The New York District (NYD) Corps of Engineers is conducting a feasibility level study to evaluate coastal storm risk management (CSRM) on the New York New Jersey Harbors and Tributaries Study (NYNJHAT) area.

As the next step, the study will seek construction authorization for limited elements referred to as Actionable Elements (AEs). The AEs included in this task order will primarily be comprised of critical infrastructure facilities.

This appendix presents the cost estimate developed for one of the AEs along the East Harlem River Drive, to achieve a Class 4 cost estimate per United State Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1302. The cost estimate was developed in the Micro-Computer Aided Cost Estimating System (MCASES) Second Generation (MII) cost estimate software and followed the cost estimate approach developed for the NYNJHAT.

2 Cost Estimating Methodology

2.1 Scope of Work Summary

This section presents a narrative on the development of the construction cost estimate for the following elements:

2.2 Cost Estimate Development

Project quantities were developed for typical measure cross-sections primarily using Microsoft Excel calculations for major elements following design development. Linear foot costs for typical measures were developed in MII as assemblies, relying heavily on cost book data. Within MII, the quantity measure assemblies are multiplied by the length of each measure attributed to the specific site.

The typical features developed in MII include:

- Floodwall
- Deployable Flood Barrier – Vehicle Gate
- Anchored Combi-wall
- Tunnel Span

Site specific modifiers, such as population density, site access, and staging conditions, were applied as productivity, marine crew labor and equipment (MCLEM), and access material factor (AMF) markups within MII to account for construction cost variability at each site.

2.3 Relocation Cost Estimating

Relocation costs include removing, relocating, or reconstructing property of others, such as roads, railroads, cemeteries, utilities, buildings, and other structures, and includes real estate planning and acquisition expenses. For the NYNJHAT, relocations costs for each project were developed at a Class 5 level without site-specific investigations or surveys. A parametric formula for relocation costs was developed from recent similar projects in the Northeast using a best-fit exponential equation relating site-specific characteristics of the project area to the cost per foot for relocations. A linear foot unit cost of $13,263 (2022Q3) was escalated to the effective price level and adopted for this cost estimate.

3 Cost Estimate Assumptions

The cost estimate was developed in MII with the assumptions described in this section.

3.1 Effective Price Level

The price level for the cost estimate is Q2 2025 USD.

3.2 Cost Book

Cost book items are from the 2024 MII English Cost Book.

3.3 Labor Rates

Labor rates are Davis-Bacon prevailing wages based on General Decision Number: NY20250003 05/23/2025, and General Decision Number: NY20250001 02/21/2025, downloaded from SAM.gov June 2, 2025.

3.4 Equipment Rates

Equipment rates are from the MII Equipment 2024 Region 1 library.

3.5 Material Rates

Material costs were generally derived from the 2024 MII English Cost Book. For larger cost drivers in the project (e.g., steel hydraulic gates and tunnel span truss), reference projects were used to develop material costs.

3.6 Direct Cost Markups

3.6.1 Effective Price Level Markups

The following escalation factors were applied to escalate the Cost Book items to the current price level (2025 Q2):

- 6.24%%; 2022 Q3 to assumed midpoint of construction (2025 Q2)(For Relocations). Calculated using CWICCS 30 September 2024, 02-Relocations
- 1.98%; 2024 Q2 USD to 2025 Q2 USD (for Equipment). Calculated using ENR (Engineering News Record) Construction Cost Index (CCI) for USA (date range Jan-24 to Mar-25).
- -0.35%; 2024 Q2 USD to 2025 Q2 USD (for Cost Book materials). Calculated using ENR Materials Cost Index (MCI) for USA (date range Jan-24 to Mar-25). Due to calculated negative number the MII markup is set to 0%.

3.6.2 Productivity Markups

Productivity is applied on all costs built up with a crew-based approach. A productivity markup is applied to account for major productivity drivers in marine construction (e.g., Onboard and Warm-up, Disembark, Equipment Downtime, etc.). The total productivity markup for Harlem River SBM AE is 64.8% as established during NYNJHAT through a Geographic Information System (GIS) evaluation of site-specific conditions. See Section 3.6.3 for a description of site-specific modifiers.

3.6.3 Site-Specific Modifier Markups

As adopted for NYNJHAT, the baseline linear foot cost assemblies created from RSMeans Cost Book cost items were modified for site-specific conditions. Site-specific markups were applied to reflect the staging, site access, and population density conditions for along the Harlem River SBM AE. The site-specific modifier score ranged from 3 to 9 points with a lower score correlating to poor staging conditions, poor site access, and/or population dense project sites. Markups include:

- Marine Crew Labor and Equipment Markup (70%) – the baseline feature assembly cost estimate assumes land-based construction. This markup is applied to items that will require marine-based construction (i.e. anchored combi-wall and tunnel span).
- Access Material Factor (50%) – accounts for increased material cost due to poor site access (e.g., costs associated with trucking, barges, and transloading material to job site from remote laydown area).
- Phasing/Maintenance and Protection of Traffic (MPT)/Traffic – A 10% markup is applied to upland cost items (i.e., floodwall and vehicular gate).

3.6.4 Overtime Markups

Overtime is applied on all costs built up with a crew-based approach. The overtime markup assumes (5) 10-hour days per week with a 1.5 multiplier after (5) 8-hour days per week.

3.6.5 Additional Direct Cost Markups

The following additional direct cost markups were applied to the cost estimate:

- 10% allowance for mobilization and demobilization
- 2% allowance for general conditions
- 2% allowance for appurtenances, transitions, existing structure modifications, etc.

3.6.6 Sales Tax

A 4.4375% sales tax has been applied to the direct cost of materials (New York State – 4.0%, New York City – 4.875, assume ½ normal sales tax).

3.7 Contractor Markups

3.7.1 Contracting Strategy

Contracting assumptions for the application of contractor markups in the MII cost estimate are:

- The prime contractor will self-perform the floodwall and anchored combi-wall construction. A sub-contractor will construct the deployable flood barrier and tunnel span. The above strategy results in
- The project delivery method will be design-bid-build.

3.7.2 Job Office Overhead

Job Office Overhead (JOOH) is also referred to as general conditions or field office overhead. The general contractor's JOOH is applied as a running percentage at 13%. The subcontractor's JOOH is applied as a running percentage at 5%.

3.7.3 Home Office Overhead

Home Office Overhead (HOOH) is commonly referred to as general and administrative (G&A) costs. The general contractor's HOOH is applied as a running percentage at 3.9%. The subcontractor's profit HOOH is applied as a running percentage at 5%.

3.7.4 Profit

As adopted for the NYNJHAT, the general contractor's profit is applied as a running percentage at 11% and applied for sub-contractors a running percentage at 10%.

3.7.5 Bonds

Bonds are applied as a running percentage at 1%.

3.7.6 Insurance

The general contractor's insurance premium costs are applied as a running percentage 3% and applied for sub-contractors a running percentage at 0%.

3.8 Owner Markups

The following Owner Markups are included in the MII cost estimate.

3.8.1 Escalation to Mid-point of Construction

The NYNJHAT assumed a construction start date of 2030 (2030Q3). The total duration of the Harlem River SBM AE construction is estimated at 1.7 years. Escalation (17.52%) is applied within MII up to an assumed mid-point of construction of 2031Q3 using Civil Works Construction Cost Index System (CWICCS) dated 30 September 2024.

3.8.2 Contingency

Contingencies for each NYNJHAT alternative were developed during the Abbreviated Risk Analysis (ARA). The contingency developed for the SBM, including the East Harlem SBM, was 52.47%. The contingency developed for relocations was 76.33%.

3.8.3 SIOH

Supervisions, Inspection, and Overhead (SIOH) is not included in the MII cost estimate.

4 Construction Cost Estimate Summary

The cost estimate by Civil Works Work Breakdown Structure (CWWBS) is presented in Table 1.

Table 1: Harlem River SBM AE Cost Summary Table

Feat. Acct	Description	Subtotal	Escalation to Mid-Point of Construction	Cont. %	Cont. $$	Total Cost
02	RELOCATIONS	$59,030,000	$10,340,000	76.33%	$52,950,000	$122,320,000
11	LEVEES AND FLOODWALLS	$246,670,000	$43,220,000	52.47%	$152,110,000	$442,000,000
	Total	**$305,700,000**	**$53,560,000**		**$205,060,000**	**$564,320,000**

5 Annex 6.1 – MII Report

Estimated by	Baird
Designed by	Baird
Prepared by	Carl Swatzell
Preparation Date	6/25/2025
Effective Date of Pricing	6/25/2025
Estimated Construction Time	600 Days

Designed by	Design Document
Baird	Document Date 6/25/2025
Estimated by	District New York
Baird	Contact Caleb Barth
Prepared by	Budget Year 2024
Carl Swatzell	UOM System Original

Direct Costs

LaborCost
EQCost
MatlCost
SubBidCost
Allowance
Disposal Fee
UserCost3
UserCost4
UserCost5

Timeline/Currency

Preparation Date	6/25/2025
Escalation Date	9/30/2023
Eff. Pricing Date	6/25/2025
Estimated Duration	600 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB24EN: 2024 MII English Costbook

Labor : NewYorkCtyNYLabor20250602

Labor Rates

LaborCost1
LaborCost2
LaborCost3
LaborCost4

Equipment EP24R01: MII Equipment 2024 Region 01

Region 01 - NORTHEAST, (2024)

Sales Tax	8.88
Working Hours per Year	1,330
Labor Adjustment Factor	1.14
Cost of Money	4.63
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.181
Gas	3.118
Diesel Off-Road	3.801
Diesel On-Road	3.801

Shipping Rates

Over 0 CWT	106.88
Over 240 CWT	87.48
Over 300 CWT	75.64
Over 400 CWT	67.28
Over 500 CWT	99.65
Over 700 CWT	85.41
Over 800 CWT	44.01

Date	Author	Note

Direct Cost Markups	**Category**	**Method**
Esc to Current 2022Q3 to 2025Q2 6.24%	MiscDirect	Running % on Selected Costs
LaborCost		
EQCost		
MatlCost		
SubBidCost		
ShipCost		
Allowance		
Disposal Fee		
UserCost3		
UserCost4		
UserCost5		
EQCost Escalate to Current 1.98%	MiscDirect	Running % on Selected Costs
EQCost		
RSMMatlCost Escalate to Current 0%	MiscDirect	Running % on Selected Costs
MatlCost		
GovMatlCost Escalate to Current 3.84%	MiscDirect	Running % on Selected Costs
MatlCost		
Access Material Factor 50%	MiscDirect	Running % on Selected Costs
MatlCost		
Productivity Overtime	Productivity Overtime	Productivity Overtime

	Days/Week	*Hours/Shift*	*Shifts/Day*	*1st Shift*	*2nd Shift*	*3rd Shift*
Standard	*5.00*	*8.00*	*1.00*	*8.00*	*0.00*	*0.00*
Actual	*5.00*	*8.00*	*1.00*	*10.00*	*0.00*	*0.00*

Day	*OT Factor*	*Working*	*OT Percent*	*FCCM Percent*
Monday	*1.50*	*Yes*	*10.00*	*(20.00)*
Tuesday	*1.50*	*Yes*		
Wednesday	*1.50*	*Yes*		
Thursday	*1.50*	*Yes*		
Friday	*1.50*	*Yes*		
Saturday	*1.50*	*No*		
Sunday	*2.00*	*No*		

Sales Tax 4.4375%	TaxAdj	Running % on Selected Costs
MatlCost		
Mobilization 10%	MiscDirect	Running % on Selected Costs
LaborCost		
EQCost		
MatlCost		
SubBidCost		

ShipCost
Allowance
Disposal Fee
UserCost3
UserCost4
UserCost5

General Conditions 2%	MiscDirect	Running % on Selected Costs

LaborCost
EQCost
MatlCost
SubBidCost
ShipCost
Allowance
Disposal Fee
UserCost3
UserCost4
UserCost5

AppurtTransMod 2%	MiscDirect	Running % on Selected Costs

LaborCost
EQCost
MatlCost
SubBidCost
ShipCost
Allowance
Disposal Fee
UserCost3
UserCost4
UserCost5

Phasing/MPT/Traffic 10%	MiscDirect	Running % on Selected Costs

LaborCost
EQCost
MatlCost
SubBidCost
ShipCost
Allowance
Disposal Fee
UserCost3
UserCost4
UserCost5

Marine Construction 70%	MiscDirect	Running % on Selected Costs

LaborCost
EQCost
MatlCost
SubBidCost
ShipCost
Allowance
Disposal Fee

UserCost3
UserCost4
UserCost5

Contractor Markups	Category	Method	
JOOH	JOOH	Running %	
HOOH	HOOH	Running %	
Profit	Profit	Running %	
Profit WG	Profit	Profit Weighted Guidelines	
Guideline	*Value*	*Weight*	*Percentage*
Risk	*0.090*	*20*	*1.80*
Difficulty	*0.100*	*15*	*1.50*
Size	*0.030*	*15*	*0.45*
Period	*0.120*	*15*	*1.80*
Invest (Contractor's)	*0.120*	*5*	*0.60*
Assist (Assistance by)	*0.120*	*5*	*0.60*
SubContracting	*0.080*	*25*	*2.00*
Total		*100*	*8.75*
Bond	Bond	Running %	
Excise Tax	Excise	Running %	
Insurance	MiscContract	Running %	

Owner Markups	Category	Method
Esc to Mid Construction 17.52%	Escalation	Running %
Contingency	Contingency	Running %
SIOH	SIOH	Running %

Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	MiscOwner	ProjectCost	C/O
Project Cost Summary Report			**305,691,904.80**	**53,557,221.72**	**205,048,947.15**	**0.00**	**0.00**	**564,298,073.67**	
			305,691,904.80					*564,298,073.67*	
Base Bid	**1.00**	**EA**	**305,691,904.80**	**53,557,221.72**	**205,048,947.15**	**0.00**	**0.00**	**564,298,073.67**	
			59,025,570.32					*122,314,567.02*	
02 Relocations	**1.00**	**EA**	**59,025,570.32**	**10,341,279.92**	**52,947,716.79**	**0.00**	**0.00**	**122,314,567.02**	
			14,090.61					*29,198.99*	
0001 Relocations	**4,189.00**	**LF**	**59,025,570.32**	**10,341,279.92**	**52,947,716.79**	**0.00**	**0.00**	**122,314,567.02**	
			14,090.61	*17.52%*	*89.70%*	*0.00%*	*0.00%*	*29,198.99*	
USR Relocations	4,189.00	LF	59,025,570.32	10,341,279.92	52,947,716.79	0.00	0.00	122,314,567.02	
(Note: $13,263 / LF deveolped from HATS for East Harlem 2022Q3)									
			246,666,334.48					*441,983,506.65*	
11 Levees & Floodwalls	**1.00**	**EA**	**246,666,334.48**	**43,215,941.80**	**152,101,230.36**	**0.00**	**0.00**	**441,983,506.65**	
			16,133.52					*28,908.48*	
0002 Floodwall (south)	**80.00**	**LF**	**1,290,681.37**	**226,127.38**	**795,869.55**	**0.00**	**0.00**	**2,312,678.30**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Floodwall 2.69 CY Steel Sheet Pile (NZ26) 0.31 TN Excavation 2.20 CY Micropile (12") 0.33 EA Micropile casing tonnage 0.26 TN Micropile grout volume 0.86 CY)									
			1,854.89	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*3,323.65*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	215.20	CY	399,173.15	69,935.14	246,141.12	0.00	0.00	715,249.41	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)									
			9,395.90	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*16,835.82*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	24.80	TON	233,018.22	40,824.79	143,685.43	0.00	0.00	417,528.45	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)									
			153.60	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*275.23*	
USR IDW-DISPOSE IDW Disposal Fee	176.00	EA	27,034.38	4,736.42	16,670.14	0.00	0.00	48,440.95	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)									
			28.14	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*50.43*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	176.00	BCY	4,953.37	867.83	3,054.39	0.00	0.00	8,875.59	
			911.16	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*1,632.63*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	639.94	VLF	583,081.72	102,155.92	359,544.19	0.00	0.00	1,044,781.83	

Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	MiscOwner	ProjectCost	C/O
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)									
			1,871.57	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*3,353.54*	
USR Coal Tar Epoxy Coating	23.20	TON	43,420.52	7,607.28	26,774.28	0.00	0.00	77,802.08	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Floodwall Steel Sheet Pile (NZ26) 0.31 TN/lf (Assume 60% coating. Assuming extends 5ft below concrete). Micropile casing tonnage 0.26 TN/lf (Assume 40% coating. Assuming extends 5ft below concrete). Epoxy Q*(0.31*0.6+0.26*0.4))									
			30,273.67					*54,245.19*	
0003 Deployable Flood Barrier - Vehicle Gate (south)	**40.00**	**LF**	**1,210,946.67**	**212,157.86**	**746,702.94**	**0.00**	**0.00**	**2,169,807.47**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Gate Foundation 201.29 CY / 80 ft = 2.516125 cy/ft Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft Micropile (12"x0.5") 32.00 EA / 80 ft = 0.4 ea/ft micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft micropile grout volume 82.13 CY / 80 ft = 1.026625 cy/ft Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft Excavation 198.33 CY / 80 ft = 2.479125 cy/ft)									
			2,267.43	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*4,062.84*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	100.65	CY	228,205.38	39,981.58	140,717.70	0.00	0.00	408,904.66	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)									
			11,521.14	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*20,643.89*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	13.95	TON	160,719.83	28,158.12	99,104.26	0.00	0.00	287,982.21	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)									
			1,116.26	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*2,000.14*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	375.68	VLF	419,354.94	73,470.99	258,585.76	0.00	0.00	751,411.69	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)									
			37,565.06	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*67,310.11*	
USR Structural Steel(Vehicular Gate) TON	8.78	TON	329,821.24	57,784.68	203,376.83	0.00	0.00	590,982.74	
(Note: assumed $5,600 per ton(from RSM 051223772000). Add 100% contingency for rollers, hardware, botmmisc. steel, etc. material - $11,200/ton Add 60% for installation: $11,200/ton * 1.6 = $17,920 / TON)									
			188.66	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*338.05*	
USR IDW-DISPOSE IDW Disposal Fee	99.17	EA	18,708.85	3,277.79	11,536.39	0.00	0.00	33,523.03	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)									
			34.32	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*61.49*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	99.17	BCY	3,403.00	596.21	2,098.39	0.00	0.00	6,097.60	
			2,298.75	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*4,118.96*	

Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	MiscOwner	ProjectCost	C/O
USR Coal Tar Epoxy Coating	22.07	TON	50,733.43	8,888.50	31,283.62	0.00	0.00	90,905.55	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Deployable Flood Barrier Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft (Assume 60% coating. Assuming extends 5ft below concrete). micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft (Assume 40% coating. Assuming extends 5ft below concrete). Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft (Assume 100% coating). Epoxy Q*(0.34875*0.6+0.3075*0.4+0.2195*1))									
			49,460.19					*88,624.12*	
0004 Anchored Combi Wall	**3,636.00**	**LF**	**179,837,243.93**	**31,507,485.14**	**110,892,579.34**	**0.00**	**0.00**	**322,237,308.41**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Combiwall 3.02 CY Bracing (Pipe 16 X-Strong) 0.10 TN Combi-Wall (36" Dia. Pipe/NZ-19) 1.48 TN Batter Pile (30" Dia. X 0.625") 1.74 TN)									
			2,962.04	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*5,307.46*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	10,980.72	CY	32,525,322.60	5,698,436.52	20,056,006.41	0.00	0.00	58,279,765.52	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)									
			21,560.19	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*38,632.14*	
USR 051223171600 Column, structural, 6" to 12" dia, extra strong pipe, incl shop primer, cap & base plate, bolts, converted to per ton	363.60	TON	7,839,284.49	1,373,442.64	4,833,917.93	0.00	0.00	14,046,645.06	
(Note: converted to per ton)									
			13,734.69	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*24,610.19*	
RSM 314116100600 Sheet piling, steel, 38 psf, 25' excavation, per ton, left in place, excludes wales	5,381.28	TON	73,910,195.27	12,949,066.21	45,575,054.50	0.00	0.00	132,434,315.98	
(Note: Currently assuming 36inx0.438in with NZ19. assuming NZ Length / Pipe Length at 100% = 38.0lb/sf)									
			7,763.60	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*13,911.04*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization, converted to 36"x0.625" pipe per ton	6,326.64	TON	49,117,523.08	8,605,390.04	30,287,212.52	0.00	0.00	88,010,125.65	
(Note: Initial Material = 46.50/VLF, convert to ton using default 59 lb/lf, $46.5/VLF / 59lb/lf * 2000lb/ton = $1,576.27/ton Initial Crew Output = 44.3750VLF/hr, use same production rate converted to 36"x0.625" pipe with 236.4lb/ft, 44.375VLF/hr * 236lb/lf / 2000lb/ton = 5.23625TON/hr)									
			18.46	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*33.08*	
USR Dredge and Fill	72,720.00	CY	1,342,670.44	235,235.86	827,927.44	0.00	0.00	2,405,833.74	
(Note: This Item was added for backfill behind structure. From the construction of the Verrazano Narrows Sector Gate Islands we used $6.10-6.14 / CY to dredge nearby and fill the islands. round up to $7. ~20ft LOP offset, 20' x 27' x1' per foot of structure / 27ft3/cy = 20CY/LF)									
			2,892.43	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*5,182.74*	
USR Coal Tar Epoxy Coating	5,221.30	TON	15,102,248.05	2,645,913.86	9,312,460.55	0.00	0.00	27,060,622.46	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Anchored Combi Wall Combi-Wall (36" Dia. Pipe/NZ-19) 1.48 TN/lf (Assume 50%. Assuming extends 10-15ft below mudline). Batter Pile (30" Dia. X 0.625") 1.74 TN/lf (Assume 40%. Assuming extends 10-15ft below mudline). Epoxy Q*(1.48*0.5+1.74*0.4))									
			382,430.57					*685,249.59*	
0005 Tunnel Span	**155.00**	**LF**	**59,276,738.75**	**10,385,284.63**	**36,551,663.67**	**0.00**	**0.00**	**106,213,687.05**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Jacket Structure -Steel Pipe Piles (60"dia x 1" thick) 2825.00 TN / 155 ft = 18.22580645 tn/ft Jacket Structure-Framing (W40x211) 87.00 TN / 155 ft = 1.187096774 tn/ft Truss Members (Member sizes vary) 560.00 TN / 155 ft = 3.612903226 tn/ft Truss Plate (0.38" Plate) 49.61 TN / 155 ft = 0.320064516 tn/ft Sheetpile Connection (SIZE) 12.96 TN / 155 ft = 0.083612903 tn/ft Jacket Structure-Steel Pipe Bracing (30" Dia. X 1") 451.00 TN / 155 ft = 2.909677419 tn/ft)									

Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	MiscOwner	ProjectCost	C/O
			8,582.97	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*15,379.20*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization	2,825.00	TON	24,246,884.44	4,248,054.15	14,951,294.28	0.00	0.00	43,446,232.88	
(Note: Initial RSM 316333105040 item details: Material = $46.50/VLF, Crew Output = 44.3750VLF/hr. Convert VLF to TON. Material $46.50/ft / 59lb/ft * 2000lb/ton = $1,576.27/ton. Convert Crew Output VLF/hr to TON/hr. 44.3750vlf/hr * 630.7lb/ft / 2000lb/ton = 13.978125 TON/hr. 630.7lb/ft from skyline product manual for 60inx1in pipe. Change crew item from 50 ton crane to 100 ton crane)									
			19,584.98	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*35,092.90*	
USR 051223757900 Structural steel beam or girder, 100-ton project, 1 to 2 story building, W36x231, A992 steel, shop fabricated, incl shop primer, bolted connections	184.00	TON	3,603,635.64	631,356.96	2,222,100.62	0.00	0.00	6,457,093.22	
(Note: Initial for W36x231 material = $430.00/LF, Crew Output = 140.6250FT/hr, 231lb/ft. Convert material LF to TON. $430/lf / 231lb/ft *2000lb/ton = $3,722.94/TON Convert crew output LF/hr to TON/hr. 140.6250ft/hr * 231lb/ft / 2000lb/ton = 16.2421875TON/hr)									
			29,027.55	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*52,012.36*	
USR Tunnel Span Truss TON	560.00	TON	16,255,426.48	2,847,950.72	10,023,542.01	0.00	0.00	29,126,919.21	
(Note: assumed $5,600 per ton(from RSM 051223772000). material - $5,600/ton Add 60% for installation: $5,600/ton * 1.6 = $8,960 / TON use same cost from above calculated gate for truss and plates)									
			29,027.55	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*52,012.36*	
USR Tunnel Span Plates TON	49.61	TON	1,440,056.62	252,297.92	887,978.43	0.00	0.00	2,580,332.97	
(Note: assumed $5,600 per ton(from RSM 051223772000). material - $5,600/ton Add 60% for installation: $5,600/ton * 1.6 = $8,960 / TON use same cost from above calculated gate for truss and plates)									
			7,917.26	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*14,186.36*	
USR 314116102500 Sheet piling, wales, connections and struts, 2/3 salvage	12.96	TON	102,607.63	17,976.86	63,270.68	0.00	0.00	183,855.17	
(Note: convert $520.00/TON for 2/3 salvage to no salvage. $520.00/ton * 3ea = $1,560/TON)									
			9,184.92	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*16,457.79*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization (30")	451.00	TON	4,142,398.25	725,748.17	2,554,316.43	0.00	0.00	7,422,462.85	
(Note: Initial RSM 316333105040 item details: Material = $46.50/VLF, Crew Output = 44.3750VLF/hr. Convert VLF to TON. Material $46.50/ft / 59lb/ft * 2000lb/ton = $1,576.27/ton. Convert Crew Output VLF/hr to TON/hr. 44.3750vlf/hr * 310.0lb/ft / 2000lb/ton = 6.878125 TON/hr. 310.0lb/ft from skyline product manual for 30inx1in pipe. Change crew item from 50 ton crane to 100 ton crane)									
			3,552.61	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*6,365.67*	
USR Coal Tar Epoxy Coating	2,670.07	TON	9,485,729.70	1,661,899.84	5,849,161.22	0.00	0.00	16,996,790.76	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Tunnel Span Jacket Structure -Steel Pipe Piles (60"dia x 1" thick) 2825.00 TN / 155 ft = 18.22580645 tn/ft (assume 50% coating). Jacket Structure-Framing (W40x211) 87.00 TN / 155 ft = 1.187096774 tn/ft (Assume 100% coating). Truss Members (Member sizes vary) 560.00 TN / 155 ft = 3.612903226 tn/ft (Assume 100% coating). Truss Plate (0.38" Plate) 49.61 TN / 155 ft = 0.320064516 tn/ft (Assume 100% coating). Sheetpile Connection (SIZE) 12.96 TN / 155 ft = 0.083612903 tn/ft (Assume 100% coating). Jacket Structure-Steel Pipe Bracing (30" Dia. X 1") 451.00 TN / 155 ft = 2.909677419 tn/ft (Assume 100% coating). Epoxy Q*(18.22580645*0.5+1.187096774+3.612903226+0.320064516+0.083612903+2.909677419))									
			30,273.67					*54,245.19*	
0006 Deployable Flood Barrier - Vehicle Gate (north)	**40.00**	**LF**	**1,210,946.67**	**212,157.86**	**746,702.94**	**0.00**	**0.00**	**2,169,807.47**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Gate Foundation 201.29 CY / 80 ft = 2.516125 cy/ft Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft Micropile (12"x0.5") 32.00 EA / 80 ft = 0.4 ea/ft micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft micropile grout volume 82.13 CY / 80 ft = 1.026625 cy/ft Structural Steel									

Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	MiscOwner	ProjectCost	C/O
17.56 TN / 80 ft = 0.2195 tn/ft Excavation 198.33 CY / 80 ft = 2.479125 cy/ft)									
			2,267.43	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*4,062.84*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	100.65	CY	228,205.38	39,981.58	140,717.70	0.00	0.00	408,904.66	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)									
			11,521.14	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*20,643.89*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	13.95	TON	160,719.83	28,158.12	99,104.26	0.00	0.00	287,982.21	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)									
			1,116.26	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*2,000.14*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	375.68	VLF	419,354.94	73,470.99	258,585.76	0.00	0.00	751,411.69	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)									
			37,565.06	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*67,310.11*	
USR Structural Steel(Vehicular Gate) TON	8.78	TON	329,821.24	57,784.68	203,376.83	0.00	0.00	590,982.74	
(Note: assumed $5,600 per ton(from RSM 051223772000). Add 100% contingency for rollers, hardware, botmmisc. steel, etc. material - $11,200/ton Add 60% for installation: $11,200/ton * 1.6 = $17,920 / TON)									
			188.66	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*338.05*	
USR IDW-DISPOSE IDW Disposal Fee	99.17	EA	18,708.85	3,277.79	11,536.39	0.00	0.00	33,523.03	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)									
			34.32	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*61.49*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	99.17	BCY	3,403.00	596.21	2,098.39	0.00	0.00	6,097.60	
			2,298.75	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*4,118.96*	
USR Coal Tar Epoxy Coating	22.07	TON	50,733.43	8,888.50	31,283.62	0.00	0.00	90,905.55	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Deployable Flood Barrier Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft (Assume 60% coating. Assuming extends 5ft below concrete). micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft (Assume 40% coating. Assuming extends 5ft below concrete). Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft (Assume 100% coating). Epoxy Q*(0.34875*0.6+0.3075*0.4+0.2195*1))									
			16,133.52					*28,908.48*	
0007 Floodwall (north)	**238.00**	**LF**	**3,839,777.09**	**672,728.95**	**2,367,711.91**	**0.00**	**0.00**	**6,880,217.94**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Floodwall 2.69 CY Steel Sheet Pile (NZ26) 0.31 TN Excavation 2.20 CY Micropile (12") 0.33 EA Micropile casing tonnage 0.26 TN Micropile grout volume 0.86 CY)									
			1,854.89	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*3,323.65*	
USR 033053406300 Structural concrete, in place, cantilever	640.22	CY	1,187,540.13	208,057.03	732,269.83	0.00	0.00	2,127,866.99	

Description	Quantity	UOM	ContractCost	Escalation	Contingency	SIOH	MiscOwner	ProjectCost	C/O
retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing									
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)									
			9,395.90	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*16,835.82*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	73.78	TON	693,229.21	121,453.76	427,464.15	0.00	0.00	1,242,147.12	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)									
			153.60	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*275.23*	
USR IDW-DISPOSE IDW Disposal Fee	523.60	EA	80,427.29	14,090.86	49,593.67	0.00	0.00	144,111.82	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)									
			28.14	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*50.43*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	523.60	BCY	14,736.28	2,581.80	9,086.80	0.00	0.00	26,404.88	
			911.16	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*1,632.63*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	1,903.81	VLF	1,734,668.12	303,913.85	1,069,643.96	0.00	0.00	3,108,225.94	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)									
			1,871.57	*17.52%*	*61.66%*	*0.00%*	*0.00%*	*3,353.54*	
USR Coal Tar Epoxy Coating	69.02	TON	129,176.05	22,631.64	79,653.50	0.00	0.00	231,461.19	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Floodwall Steel Sheet Pile (NZ26) 0.31 TN/lf (Assume 60% coating. Assuming extends 5ft below concrete). Micropile casing tonnage 0.26 TN/lf (Assume 40% coating. Assuming extends 5ft below concrete). Epoxy Q*(0.31*0.6+0.26*0.4))									

Description	Quantity	UOM	Contractor	DirectCost	SubCMU	CostToPrime	PrimeCMU	ContractCost	C/O
Contract Cost Summary Report				**232,511,153.04**	**8,332,228.25**	**181,817,810.98**	**64,848,523.50**	**305,691,904.80**	
				232,511,153.04		*181,817,810.98*		*305,691,904.80*	
Base Bid	**1.00**	**EA**	**Prime**	**232,511,153.04**	**8,332,228.25**	**181,817,810.98**	**64,848,523.50**	**305,691,904.80**	
				59,025,570.32		*0.00*		*59,025,570.32*	
02 Relocations	**1.00**	**EA**		**59,025,570.32**	**0.00**	**0.00**	**0.00**	**59,025,570.32**	
				14,090.61		*0.00*		*14,090.61*	
0001 Relocations	**4,189.00**	**LF**		**59,025,570.32**	**0.00**	**0.00**	**0.00**	**59,025,570.32**	
				173,485,582.72		*181,817,810.98*		*246,666,334.48*	
11 Levees & Floodwalls	**1.00**	**EA**	**Prime**	**173,485,582.72**	**8,332,228.25**	**181,817,810.98**	**64,848,523.50**	**246,666,334.48**	
				11,900.18		*11,900.18*		*16,133.52*	
0002 Floodwall (south)	**80.00**	**LF**	**Prime**	**952,014.30**	**0.00**	**952,014.30**	**338,667.07**	**1,290,681.37**	
				18,180.45		*22,268.82*		*30,273.67*	
0003 Deployable Flood Barrier - Vehicle Gate (south)	**40.00**	**LF**	**Sub**	**727,218.03**	**163,534.97**	**890,753.00**	**320,193.67**	**1,210,946.67**	
				36,482.13		*36,482.13*		*49,460.19*	
0004 Anchored Combi Wall	**3,636.00**	**LF**	**Prime**	**132,649,027.37**	**0.00**	**132,649,027.37**	**47,188,216.57**	**179,837,243.93**	
				229,663.63		*281,309.81*		*382,430.57*	
0005 Tunnel Span	**155.00**	**LF**	**Sub**	**35,597,862.44**	**8,005,158.31**	**43,603,020.76**	**15,673,718.00**	**59,276,738.75**	
				18,180.45		*22,268.82*		*30,273.67*	
0006 Deployable Flood Barrier - Vehicle Gate (north)	**40.00**	**LF**	**Sub**	**727,218.03**	**163,534.97**	**890,753.00**	**320,193.67**	**1,210,946.67**	
				11,900.18		*11,900.18*		*16,133.52*	
0007 Floodwall (north)	**238.00**	**LF**	**Prime**	**2,832,242.56**	**0.00**	**2,832,242.56**	**1,007,534.53**	**3,839,777.09**	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
Project Direct Costs Report				**34,197,719.93**	**3,619,889.37**	**123,552,948.40**	**71,140,595.35**	**0.00**	**232,511,153.04**	**232,511,153.04**	
				34,197,719.93	*3,619,889.37*	*123,552,948.40*	*71,140,595.35*		*232,511,153.04*	*232,511,153.04*	
Base Bid	**1.00**	**EA**	**Prime**	**34,197,719.93**	**3,619,889.37**	**123,552,948.40**	**71,140,595.35**	**0.00**	**232,511,153.04**	**232,511,153.04**	
				0.00	*0.00*	*0.00*	*59,025,570.32*		*59,025,570.32*	*59,025,570.32*	
02 Relocations	**1.00**	**EA**		**0.00**	**0.00**	**0.00**	**59,025,570.32**	**0.00**	**59,025,570.32**	**59,025,570.32**	
				0.00	*0.00*	*0.00*	*14,090.61*		*14,090.61*	*14,090.61*	
0001 Relocations	**4,189.00**	**LF**		**0.00**	**0.00**	**0.00**	**59,025,570.32**	**0.00**	**59,025,570.32**	**59,025,570.32**	
				0.00	*0.00*	*0.00*	*14,090.61*		*14,090.61*	*14,090.61*	
USR Relocations	4,189.00	LF		0.00	0.00	0.00	59,025,570.32	0.00	59,025,570.32	59,025,570.32	
(Note: $13,263 / LF deveolped from HATS for East Harlem 2022Q3)											
				34,197,719.93	*3,619,889.37*	*123,552,948.40*	*12,115,025.03*		*173,485,582.72*	*173,485,582.72*	
11 Levees & Floodwalls	**1.00**	**EA**	**Prime**	**34,197,719.93**	**3,619,889.37**	**123,552,948.40**	**12,115,025.03**	**0.00**	**173,485,582.72**	**173,485,582.72**	
				4,315.10	*328.72*	*7,007.10*	*249.26*		*11,900.18*	*11,900.18*	
0002 Floodwall (south)	**80.00**	**LF**	**Prime**	**345,207.79**	**26,297.76**	**560,568.03**	**19,940.72**	**0.00**	**952,014.30**	**952,014.30**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Floodwall 2.69 CY Steel Sheet Pile (NZ26) 0.31 TN Excavation 2.20 CY Micropile (12") 0.33 EA Micropile casing tonnage 0.26 TN Micropile grout volume 0.86 CY)											
				821.39	*6.43*	*540.36*	*0.00*		*1,368.18*	*1,368.18*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	215.20	CY	Prime	176,762.90	1,383.92	116,285.69	0.00	0.00	294,432.51	294,432.51	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
				1,447.12	*355.84*	*5,127.51*	*0.00*		*6,930.47*	*6,930.47*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	24.80	TON	Prime	35,888.45	8,824.86	127,162.33	0.00	0.00	171,875.64	171,875.64	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
				0.00	*0.00*	*0.00*	*113.30*		*113.30*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	176.00	EA	Prime	0.00	0.00	0.00	19,940.72	0.00	19,940.72	19,940.72	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
				17.28	*3.48*	*0.00*	*0.00*		*20.76*	*20.76*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	176.00	BCY	Prime	3,041.16	612.48	0.00	0.00	0.00	3,653.64	3,653.64	
				202.39	*24.18*	*445.50*	*0.00*		*672.07*	*672.07*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	639.94	VLF	Prime	129,515.28	15,476.51	285,092.78	0.00	0.00	430,084.57	430,084.57	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
				0.00	*0.00*	*1,380.48*	*0.00*		*1,380.48*	*1,380.48*	
USR Coal Tar Epoxy Coating	23.20	TON	Prime	0.00	0.00	32,027.24	0.00	0.00	32,027.24	32,027.24	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Floodwall Steel Sheet Pile (NZ26) 0.31 TN/lf (Assume 60% coating. Assuming extends 5ft below concrete). Micropile casing tonnage 0.26 TN/lf (Assume 40% coating. Assuming extends 5ft below concrete). Epoxy Q*(0.31*0.6+0.26*0.4))											
				4,478.10	*376.05*	*8,093.67*	*5,232.63*		*18,180.45*	*18,180.45*	
0003 Deployable Flood Barrier - Vehicle Gate (south)	**40.00**	**LF**	**Sub**	**179,124.03**	**15,041.93**	**323,746.93**	**209,305.14**	**0.00**	**727,218.03**	**727,218.03**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Gate Foundation 201.29 CY / 80 ft = 2.516125 cy/ft Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft Micropile (12"x0.5") 32.00 EA / 80 ft = 0.4 ea/ft micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft micropile grout volume 82.13 CY / 80 ft = 1.026625 cy/ft Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft Excavation 198.33 CY / 80 ft = 2.479125 cy/ft)											
				814.88	*6.43*	*540.36*	*0.00*		*1,361.67*	*1,361.67*	
USR 033053406300	100.65	CY	Sub	82,013.86	647.23	54,384.63	0.00	0.00	137,045.72	137,045.72	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing											
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
				1,435.51	*355.84*	*5,127.51*	*0.00*		*6,918.87*	*6,918.87*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	13.95	TON	Sub	20,025.38	4,963.98	71,528.81	0.00	0.00	96,518.17	96,518.17	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
				200.67	*24.18*	*445.50*	*0.00*		*670.35*	*670.35*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	375.68	VLF	Sub	75,386.25	9,085.62	167,366.20	0.00	0.00	251,838.07	251,838.07	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
				0.00	*0.00*	*0.00*	*22,559.20*		*22,559.20*	*22,559.20*	
USR Structural Steel(Vehicular Gate) TON	8.78	TON	Sub	0.00	0.00	0.00	198,069.79	0.00	198,069.79	198,069.79	
(Note: assumed $5,600 per ton(from RSM 051223772000). Add 100% contingency for rollers, hardware, botmmisc. steel, etc. material - $11,200/ton Add 60% for installation: $11,200/ton * 1.6 = $17,920 / TON)											
				0.00	*0.00*	*0.00*	*113.30*		*113.30*	*113.30*	
USR IDW-DISPOSE	99.17	EA	Sub	0.00	0.00	0.00	11,235.35	0.00	11,235.35	11,235.35	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
IDW Disposal Fee											
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
				17.13	*3.48*	*0.00*	*0.00*		*20.61*	*20.61*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	99.17	BCY	Sub	1,698.54	345.09	0.00	0.00	0.00	2,043.63	2,043.63	
				0.00	*0.00*	*1,380.48*	*0.00*		*1,380.48*	*1,380.48*	
USR Coal Tar Epoxy Coating	22.07	TON	Sub	0.00	0.00	30,467.29	0.00	0.00	30,467.29	30,467.29	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Deployable Flood Barrier Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft (Assume 60% coating. Assuming extends 5ft below concrete). micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft (Assume 40% coating. Assuming extends 5ft below concrete). Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft (Assume 100% coating). Epoxy Q*(0.34875*0.6+0.3075*0.4+0.2195*1))											
				8,600.49	*906.10*	*26,703.16*	*272.38*		*36,482.13*	*36,482.13*	
0004 Anchored Combi Wall	**3,636.00**	**LF**	**Prime**	**31,271,380.61**	**3,294,590.50**	**97,092,694.50**	**990,361.75**	**0.00**	**132,649,027.37**	**132,649,027.37**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Combiwall 3.02 CY Bracing (Pipe 16 X-Strong) 0.10 TN Combi-Wall (36" Dia. Pipe/NZ-19) 1.48 TN Batter Pile (30" Dia. X 0.625") 1.74 TN)											
				1,339.78	*9.94*	*835.10*	*0.00*		*2,184.82*	*2,184.82*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	10,980.72	CY	Prime	14,711,703.59	109,132.66	9,170,036.34	0.00	0.00	23,990,872.60	23,990,872.60	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
				4,953.66	*647.63*	*10,301.64*	*0.00*		*15,902.92*	*15,902.92*	
USR 051223171600 Column, structural, 6" to 12" dia, extra strong pipe, incl shop primer, cap & base plate, bolts, converted to per ton	363.60	TON	Prime	1,801,149.86	235,476.92	3,745,676.37	0.00	0.00	5,782,303.15	5,782,303.15	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
(Note: converted to per ton)											
				1,788.73	*417.72*	*7,924.34*	*0.00*		*10,130.79*	*10,130.79*	
RSM 314116100600 Sheet piling, steel, 38 psf, 25' excavation, per ton, left in place, excludes wales	5,381.28	TON	Prime	9,625,650.24	2,247,867.29	42,643,084.83	0.00	0.00	54,516,602.35	54,516,602.35	
(Note: Currently assuming 36inx0.438in with NZ19. assuming NZ Length / Pipe Length at 100% = 38.0lb/sf)											
				811.31	*110.98*	*4,804.19*	*0.00*		*5,726.48*	*5,726.48*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization, converted to 36"x0.625" pipe per ton	6,326.64	TON	Prime	5,132,876.92	702,113.63	30,394,388.42	0.00	0.00	36,229,378.97	36,229,378.97	
(Note: Initial Material = 46.50/VLF, convert to ton using default 59 lb/lf, $46.5/VLF / 59lb/lf * 2000lb/ton = $1,576.27/ton Initial Crew Output = 44.3750VLF/hr, use same production rate converted to 36"x0.625" pipe with 236.4lb/ft, 44.375VLF/hr * 236lb/lf / 2000lb/ton = 5.23625TON/hr)											
				0.00	*0.00*	*0.00*	*13.62*		*13.62*	*13.62*	
USR Dredge and Fill	72,720.00	CY	Prime	0.00	0.00	0.00	990,361.75	0.00	990,361.75	990,361.75	
(Note: This Item was added for backfill behind structure. From the construction of the Verrazano Narrows Sector Gate Islands we used $6.10-6.14 / CY to dredge nearby and fill the islands. round up to $7. ~20ft LOP offset, 20' x 27' x1' per foot of structure / 27ft3/cy = 20CY/LF)											
				0.00	*0.00*	*2,133.48*	*0.00*		*2,133.48*	*2,133.48*	
USR Coal Tar Epoxy Coating	5,221.30	TON	Prime	0.00	0.00	11,139,508.54	0.00	0.00	11,139,508.54	11,139,508.54	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Anchored Combi Wall Combi-Wall (36" Dia. Pipe/NZ-19) 1.48 TN/lf (Assume 50%. Assuming extends 10-15ft below mudline). Batter Pile (30" Dia. X 0.625") 1.74 TN/lf (Assume 40%. Assuming extends 10-15ft below mudline). Epoxy Q*(1.48*0.5+1.74*0.4))											
				7,715.42	*1,230.20*	*152,158.08*	*68,559.93*		*229,663.63*	*229,663.63*	
0005 Tunnel Span	**155.00**	**LF**	**Sub**	**1,195,890.29**	**190,681.41**	**23,584,502.12**	**10,626,788.63**	**0.00**	**35,597,862.44**	**35,597,862.44**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Jacket Structure -Steel Pipe Piles (60"dia x 1" thick) 2825.00 TN / 155 ft = 18.22580645 tn/ft Jacket Structure-Framing (W40x211) 87.00 TN / 155 ft = 1.187096774 tn/ft Truss Members (Member sizes vary) 560.00 TN / 155 ft = 3.612903226 tn/ft Truss Plate (0.38" Plate) 49.61 TN / 155 ft = 0.320064516 tn/ft Sheetpile Connection (SIZE) 12.96 TN / 155 ft = 0.083612903 tn/ft Jacket Structure-Steel Pipe Bracing (30" Dia. X 1") 451.00 TN / 155 ft = 2.909677419 tn/ft)											
				301.01	*49.18*	*4,804.19*	*0.00*		*5,154.39*	*5,154.39*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18"	2,825.00	TON	Sub	850,361.32	138,944.61	13,571,840.23	0.00	0.00	14,561,146.16	14,561,146.16	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
diameter, 59 lb./L.F., excludes mobilization or demobilization											
(Note: Initial RSM 316333105040 item details: Material = $46.50/VLF, Crew Output = 44.3750VLF/hr. Convert VLF to TON. Material $46.50/ft / 59lb/ft * 2000lb/ton = $1,576.27/ton. Convert Crew Output VLF/hr to TON/hr. 44.3750vlf/hr * 630.7lb/ft / 2000lb/ton = 13.978125 TON/hr. 630.7lb/ft from skyline product manual for 60inx1in pipe. Change crew item from 50 ton crane to 100 ton crane)											
				378.46	*36.18*	*11,346.86*	*0.00*		*11,761.50*	*11,761.50*	
USR 051223757900 Structural steel beam or girder, 100-ton project, 1 to 2 story building, W36x231, A992 steel, shop fabricated, incl shop primer, bolted connections	184.00	TON	Sub	69,636.12	6,657.34	2,087,822.32	0.00	0.00	2,164,115.78	2,164,115.78	
(Note: Initial for W36x231 material = $430.00/LF, Crew Output = 140.6250FT/hr, 231lb/ft. Convert material LF to TON. $430/lf / 231lb/ft *2000lb/ton = $3,722.94/TON Convert crew output LF/hr to TON/hr. 140.6250ft/hr * 231lb/ft / 2000lb/ton = 16.2421875TON/hr)											
				0.00	*0.00*	*0.00*	*17,432.11*		*17,432.11*	*17,432.11*	
USR Tunnel Span Truss TON	560.00	TON	Sub	0.00	0.00	0.00	9,761,981.65	0.00	9,761,981.65	9,761,981.65	
(Note: assumed $5,600 per ton(from RSM 051223772000). material - $5,600/ton Add 60% for installation: $5,600/ton * 1.6 = $8,960 / TON use same cost from above calculated gate for truss and plates)											
				0.00	*0.00*	*0.00*	*17,432.11*		*17,432.11*	*17,432.11*	
USR Tunnel Span Plates TON	49.61	TON	Sub	0.00	0.00	0.00	864,806.98	0.00	864,806.98	864,806.98	
(Note: assumed $5,600 per ton(from RSM 051223772000). material - $5,600/ton Add 60% for installation: $5,600/ton * 1.6 = $8,960 / TON use same cost from above calculated gate for truss and plates)											
				0.00	*0.00*	*4,754.60*	*0.00*		*4,754.60*	*4,754.60*	
USR 314116102500 Sheet piling, wales, connections and struts, 2/3 salvage	12.96	TON	Sub	0.00	0.00	61,619.66	0.00	0.00	61,619.66	61,619.66	
(Note: convert $520.00/TON for 2/3 salvage to no salvage. $520.00/ton * 3ea = $1,560/TON)											
				611.74	*99.95*	*4,804.19*	*0.00*		*5,515.88*	*5,515.88*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization (30")	451.00	TON	Sub	275,892.85	45,079.46	2,166,690.25	0.00	0.00	2,487,662.55	2,487,662.55	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
(Note: Initial RSM 316333105040 item details: Material = $46.50/VLF, Crew Output = 44.3750VLF/hr. Convert VLF to TON. Material $46.50/ft / 59lb/ft * 2000lb/ton = $1,576.27/ton. Convert Crew Output VLF/hr to TON/hr. 44.3750vlf/hr * 310.0lb/ft / 2000lb/ton = 6.878125 TON/hr. 310.0lb/ft from skyline product manual for 30inx1in pipe. Change crew item from 50 ton crane to 100 ton crane)											
				0.00	*0.00*	*2,133.48*	*0.00*		*2,133.48*	*2,133.48*	
USR Coal Tar Epoxy Coating	2,670.07	TON	Sub	0.00	0.00	5,696,529.67	0.00	0.00	5,696,529.67	5,696,529.67	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Tunnel Span Jacket Structure -Steel Pipe Piles (60"dia x 1" thick) 2825.00 TN / 155 ft = 18.22580645 tn/ft (assume 50% coating). Jacket Structure-Framing (W40x211) 87.00 TN / 155 ft = 1.187096774 tn/ft (Assume 100% coating). Truss Members (Member sizes vary) 560.00 TN / 155 ft = 3.612903226 tn/ft (Assume 100% coating). Truss Plate (0.38" Plate) 49.61 TN / 155 ft = 0.320064516 tn/ft (Assume 100% coating). Sheetpile Connection (SIZE) 12.96 TN / 155 ft = 0.083612903 tn/ft (Assume 100% coating). Jacket Structure-Steel Pipe Bracing (30" Dia. X 1") 451.00 TN / 155 ft = 2.909677419 tn/ft (Assume 100% coating). Epoxy Q*(18.22580645*0.5+1.187096774+3.612903226+0.320064516+0.083612903+2.909677419))											
				4,478.10	*376.05*	*8,093.67*	*5,232.63*		*18,180.45*	*18,180.45*	
0006 Deployable Flood Barrier - Vehicle Gate (north)	**40.00**	**LF**	**Sub**	**179,124.03**	**15,041.93**	**323,746.93**	**209,305.14**	**0.00**	**727,218.03**	**727,218.03**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Gate Foundation 201.29 CY / 80 ft = 2.516125 cy/ft Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft Micropile (12"x0.5") 32.00 EA / 80 ft = 0.4 ea/ft micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft micropile grout volume 82.13 CY / 80 ft = 1.026625 cy/ft Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft Excavation 198.33 CY / 80 ft = 2.479125 cy/ft)											
				814.88	*6.43*	*540.36*	*0.00*		*1,361.67*	*1,361.67*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	100.65	CY	Sub	82,013.86	647.23	54,384.63	0.00	0.00	137,045.72	137,045.72	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
				1,435.51	*355.84*	*5,127.51*	*0.00*		*6,918.87*	*6,918.87*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	13.95	TON	Sub	20,025.38	4,963.98	71,528.81	0.00	0.00	96,518.17	96,518.17	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
				200.67	*24.18*	*445.50*	*0.00*		*670.35*	*670.35*	
USR 316333105040 Concrete-filled steel	375.68	VLF	Sub	75,386.25	9,085.62	167,366.20	0.00	0.00	251,838.07	251,838.07	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization											
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
				0.00	*0.00*	*0.00*	*22,559.20*		*22,559.20*	*22,559.20*	
USR Structural Steel(Vehicular Gate) TON	8.78	TON	Sub	0.00	0.00	0.00	198,069.79	0.00	198,069.79	198,069.79	
(Note: assumed $5,600 per ton(from RSM 051223772000). Add 100% contingency for rollers, hardware, botmmisc. steel, etc. material - $11,200/ton Add 60% for installation: $11,200/ton * 1.6 = $17,920 / TON)											
				0.00	*0.00*	*0.00*	*113.30*		*113.30*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	99.17	EA	Sub	0.00	0.00	0.00	11,235.35	0.00	11,235.35	11,235.35	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
				17.13	*3.48*	*0.00*	*0.00*		*20.61*	*20.61*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	99.17	BCY	Sub	1,698.54	345.09	0.00	0.00	0.00	2,043.63	2,043.63	
				0.00	*0.00*	*1,380.48*	*0.00*		*1,380.48*	*1,380.48*	
USR Coal Tar Epoxy Coating	22.07	TON	Sub	0.00	0.00	30,467.29	0.00	0.00	30,467.29	30,467.29	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Deployable Flood Barrier Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft (Assume 60% coating. Assuming extends 5ft below concrete). micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft (Assume 40% coating. Assuming extends 5ft below concrete). Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft (Assume 100% coating). Epoxy Q*(0.34875*0.6+0.3075*0.4+0.2195*1))											
				4,315.10	*328.72*	*7,007.10*	*249.26*		*11,900.18*	*11,900.18*	
0007 Floodwall (north)	**238.00**	**LF**	**Prime**	**1,026,993.18**	**78,235.84**	**1,667,689.89**	**59,323.65**	**0.00**	**2,832,242.56**	**2,832,242.56**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Floodwall 2.69 CY Steel Sheet Pile (NZ26) 0.31 TN Excavation 2.20 CY Micropile (12") 0.33 EA Micropile casing tonnage 0.26 TN Micropile grout volume 0.86 CY)											
				821.39	*6.43*	*540.36*	*0.00*		*1,368.18*	*1,368.18*	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	640.22	CY	Prime	525,869.63	4,117.15	345,949.92	0.00	0.00	875,936.70	875,936.70	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
				1,447.12	*355.84*	*5,127.51*	*0.00*		*6,930.47*	*6,930.47*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	73.78	TON	Prime	106,768.15	26,253.95	378,307.92	0.00	0.00	511,330.02	511,330.02	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
				0.00	*0.00*	*0.00*	*113.30*		*113.30*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	523.60	EA	Prime	0.00	0.00	0.00	59,323.65	0.00	59,323.65	59,323.65	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
				17.28	*3.48*	*0.00*	*0.00*		*20.76*	*20.76*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	523.60	BCY	Prime	9,047.46	1,822.12	0.00	0.00	0.00	10,869.57	10,869.57	
				202.39	*24.18*	*445.50*	*0.00*		*672.07*	*672.07*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long,	1,903.81	VLF	Prime	385,307.95	46,042.63	848,151.01	0.00	0.00	1,279,501.59	1,279,501.59	

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
unless specified otherwise, excludes pile caps or mobilization											

(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)

Description	Quantity	UOM	Contractor	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectCost	DirectCost	C/O
				0.00	*0.00*	*1,380.48*	*0.00*		*1,380.48*	*1,380.48*	
USR Coal Tar Epoxy Coating	69.02	TON	Prime	0.00	0.00	95,281.03	0.00	0.00	95,281.03	95,281.03	

(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Floodwall Steel Sheet Pile (NZ26) 0.31 TN/lf (Assume 60% coating. Assuming extends 5ft below concrete). Micropile casing tonnage 0.26 TN/lf (Assume 40% coating. Assuming extends 5ft below concrete). Epoxy Q*(0.31*0.6+0.26*0.4))

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
Project Bare to Direct Report			**112,453,571.77**	**5,160,336.31**	**645,972.76**	**2,732,574.62**	**102,671,642.25**	**4,789,501.38**	**4,057,553.94**	**232,511,153.04**	
			112,453,571.77	*5,160,336.31%*	*645,972.76%*					*232,511,153.04*	
Base Bid	**1.00**	**EA**	**112,453,571.77**	**5,160,336.31**	**645,972.76**	**2,732,574.62**	**102,671,642.25**	**4,789,501.38**	**4,057,553.94**	**232,511,153.04**	
			55,558,707.00	*0.00%*	*0.00%*					*59,025,570.32*	
02 Relocations	**1.00**	**EA**	**55,558,707.00**	**0.00**	**0.00**	**0.00**	**3,466,863.32**	**0.00**	**0.00**	**59,025,570.32**	
			13,263.00	*0.00%*	*0.00%*					*14,090.61*	
0001 Relocations	**4,189.00**	**LF**	**55,558,707.00**	**0.00**	**0.00**	**0.00**	**3,466,863.32**	**0.00**	**0.00**	**59,025,570.32**	
			13,263.00	*0.00%*	*0.00%*	*0.00%*	*6.24%*	*0.00%*	*0.00%*	*14,090.61*	
USR Relocations	4,189.00	LF	55,558,707.00	0.00	0.00	0.00	3,466,863.32	0.00	0.00	59,025,570.32	
(Note: $13,263 / LF deveolped from HATS for East Harlem 2022Q3)											
			56,894,864.77	*5,160,336.31%*	*645,972.76%*					*173,485,582.72*	
11 Levees & Floodwalls	**1.00**	**EA**	**56,894,864.77**	**5,160,336.31**	**645,972.76**	**2,732,574.62**	**99,204,778.94**	**4,789,501.38**	**4,057,553.94**	**173,485,582.72**	
			5,555.02	*981.73%*	*135.02%*					*11,900.18*	
0002 Floodwall (south)	**80.00**	**LF**	**444,401.73**	**78,538.18**	**10,801.95**	**18,920.15**	**322,327.12**	**41,124.37**	**35,900.81**	**952,014.30**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Floodwall 2.69 CY Steel Sheet Pile (NZ26) 0.31 TN Excavation 2.20 CY Micropile (12") 0.33 EA Micropile casing tonnage 0.26 TN Micropile grout volume 0.86 CY)											
			587.49	*64.80%*	*10.00%*	*3,924.84%*	*75.98%*	*14.29%*	*21.89%*	*1,368.18*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	215.20	CY	126,427.92	36,654.18	5,503.11	3,924.84	81,792.52	22,281.28	17,848.65	294,432.51	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
			3,335.35	*64.80%*	*10.00%*	*4,291.95%*	*75.98%*	*14.29%*	*21.89%*	*6,930.47*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	24.80	TON	82,716.70	9,954.93	1,035.57	4,291.95	66,069.39	4,138.72	3,668.37	171,875.64	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
			90.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	176.00	EA	15,840.00	0.00	0.00	0.00	4,100.72	0.00	0.00	19,940.72	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
			8.33	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*14.29%*	*21.89%*	*20.76*	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	176.00	BCY	1,465.31	799.35	96.92	0.00	619.20	334.23	338.63	3,653.64	
			315.21	*64.80%*	*10.00%*	*9,622.38%*	*75.98%*	*14.29%*	*21.89%*	*672.07*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	639.94	VLF	201,711.79	31,129.72	4,166.34	9,622.38	155,039.03	14,370.15	14,045.16	430,084.57	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
			700.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*1,380.48*	
USR Coal Tar Epoxy Coating	23.20	TON	16,240.00	0.00	0.00	1,080.98	14,706.26	0.00	0.00	32,027.24	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Floodwall Steel Sheet Pile (NZ26) 0.31 TN/lf (Assume 60% coating. Assuming extends 5ft below concrete). Micropile casing tonnage 0.26 TN/lf (Assume 40% coating. Assuming extends 5ft below concrete). Epoxy Q*(0.31*0.6+0.26*0.4))											
			10,165.25	*1,036.69%*	*141.42%*					*18,180.45*	
0003 Deployable Flood Barrier - Vehicle Gate (south)	**40.00**	**LF**	**406,609.84**	**41,467.47**	**5,656.71**	**10,927.02**	**223,815.40**	**21,373.00**	**17,368.58**	**727,218.03**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Gate Foundation 201.29 CY / 80 ft = 2.516125 cy/ft Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft Micropile (12"x0.5") 32.00 EA / 80 ft = 0.4 ea/ft micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft micropile grout volume 82.13 CY / 80 ft = 1.026625 cy/ft Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft Excavation 198.33 CY / 80 ft = 2.479125 cy/ft)											
			587.49	*64.80%*	*10.00%*	*1,835.58%*	*75.98%*	*14.29%*	*20.17%*	*1,361.67*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	100.65	CY	59,127.96	17,142.47	2,573.70	1,835.58	38,252.83	10,420.54	7,692.65	137,045.72	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
			3,335.35	*64.80%*	*10.00%*	*2,414.22%*	*75.98%*	*14.29%*	*20.17%*	*6,918.87*	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	13.95	TON	46,528.15	5,599.65	582.51	2,414.22	37,164.03	2,328.03	1,901.59	96,518.17	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
			315.21	*64.80%*	*10.00%*	*5,648.90%*	*75.98%*	*14.29%*	*20.17%*	*670.35*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	375.68	VLF	118,416.67	18,274.97	2,445.89	5,648.90	91,017.01	8,436.12	7,598.51	251,838.07	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
			17,920.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*22,559.20*	
USR Structural Steel(Vehicular Gate) TON	8.78	TON	157,337.60	0.00	0.00	0.00	40,732.19	0.00	0.00	198,069.79	
(Note: assumed $5,600 per ton(from RSM 051223772000). Add 100% contingency for rollers, hardware, botmmisc. steel, etc. material - $11,200/ton Add 60% for installation: $11,200/ton * 1.6 = $17,920 / TON)											
			90.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	99.17	EA	8,924.85	0.00	0.00	0.00	2,310.50	0.00	0.00	11,235.35	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
			8.33	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*14.29%*	*20.17%*	*20.61*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	99.17	BCY	825.61	450.38	54.61	0.00	348.88	188.32	175.83	2,043.63	
			700.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*1,380.48*	
USR Coal Tar Epoxy Coating	22.07	TON	15,449.00	0.00	0.00	1,028.32	13,989.97	0.00	0.00	30,467.29	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Deployable Flood Barrier Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft (Assume 60% coating. Assuming extends 5ft below concrete). micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft (Assume 40% coating. Assuming extends 5ft below concrete). Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft (Assume 100% coating). Epoxy Q*(0.34875*0.6+0.3075*0.4+0.2195*1))											
			11,212.15	*1,258.46%*	*156.86%*					*36,482.13*	
0004 Anchored Combi	**3,636.00**	**LF**	**40,767,366.01**	**4,575,749.34**	**570,344.28**	**2,120,442.51**	**76,449,524.86**	**4,419,531.39**	**3,746,068.97**	**132,649,027.37**	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
Wall											
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Combiwall 3.02 CY Bracing (Pipe 16 X-Strong) 0.10 TN Combi-Wall (36" Dia. Pipe/NZ-19) 1.48 TN Batter Pile (30" Dia. X 0.625") 1.74 TN)											
			587.49	*64.80%*	*10.00%*	*200,267.74%*	*135.98%*	*14.29%*	*21.89%*	*2,184.82*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	10,980.72	CY	6,451,066.83	1,870,303.63	280,799.94	200,267.74	11,251,309.93	2,169,188.33	1,767,936.20	23,990,872.60	
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
			4,794.22	*64.80%*	*10.00%*	*81,803.18%*	*135.98%*	*14.29%*	*21.89%*	*15,902.92*	
USR 051223171600 Column, structural, 6" to 12" dia, extra strong pipe, incl shop primer, cap & base plate, bolts, converted to per ton	363.60	TON	1,743,177.09	280,167.10	26,213.13	81,803.18	3,213,833.34	258,534.95	178,574.37	5,782,303.15	
(Note: converted to per ton)											
			3,158.56	*64.80%*	*10.00%*	*931,297.77%*	*135.98%*	*14.29%*	*21.89%*	*10,130.79*	
RSM 314116100600 Sheet piling, steel, 38 psf, 25' excavation, per ton, left in place, excludes wales	5,381.28	TON	16,997,080.22	1,640,759.41	170,682.11	931,297.77	32,304,017.93	1,299,075.99	1,173,688.92	54,516,602.35	
(Note: Currently assuming 36inx0.438in with NZ19. assuming NZ Length / Pipe Length at 100% = 38.0lb/sf)											
			1,803.82	*64.80%*	*10.00%*	*663,794.05%*	*135.98%*	*14.29%*	*21.89%*	*5,726.48*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization, converted to 36"x0.625" pipe per ton	6,326.64	TON	11,412,094.67	784,519.20	92,649.10	663,794.05	21,957,720.34	692,732.13	625,869.48	36,229,378.97	
(Note: Initial Material = 46.50/VLF, convert to ton using default 59 lb/lf, $46.5/VLF / 59lb/lf * 2000lb/ton = $1,576.27/ton Initial Crew Output = 44.3750VLF/hr, use same production rate converted to 36"x0.625" pipe with 236.4lb/ft, 44.375VLF/hr * 236lb/lf / 2000lb/ton = 5.23625TON/hr)											
			7.00	*64.80%*	*10.00%*	*0.00%*	*135.98%*	*0.00%*	*0.00%*	*13.62*	
USR Dredge and Fill	72,720.00	CY	509,040.00	0.00	0.00	0.00	481,321.75	0.00	0.00	990,361.75	
(Note: This Item was added for backfill behind structure. From the construction of the Verrazano Narrows Sector Gate Islands we used $6.10-6.14 / CY to dredge nearby and fill the islands. round up to $7. ~20ft LOP offset, 20' x 27' x1' per foot of structure / 27ft3/cy = 20CY/LF)											

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
			700.00	*64.80%*	*10.00%*	*0.00%*	*135.98%*	*0.00%*	*0.00%*	*2,133.48*	
USR Coal Tar Epoxy Coating	5,221.30	TON	3,654,907.20	0.00	0.00	243,279.76	7,241,321.58	0.00	0.00	11,139,508.54	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Anchored Combi Wall Combi-Wall (36" Dia. Pipe/NZ-19) 1.48 TN/lf (Assume 50%. Assuming extends 10-15ft below mudline). Batter Pile (30" Dia. X 0.625") 1.74 TN/lf (Assume 40%. Assuming extends 10-15ft below mudline). Epoxy Q*(1.48*0.5+1.74*0.4))											
			87,405.05	*1,222.34%*	*137.92%*					*229,663.63*	
0005 Tunnel Span	**155.00**	**LF**	**13,547,782.21**	**189,462.77**	**21,377.29**	**515,070.48**	**21,026,372.96**	**163,754.62**	**134,042.11**	**35,597,862.44**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Jacket Structure -Steel Pipe Piles (60"dia x 1" thick) 2825.00 TN / 155 ft = 18.22580645 tn/ft Jacket Structure-Framing (W40x211) 87.00 TN / 155 ft = 1.187096774 tn/ft Truss Members (Member sizes vary) 560.00 TN / 155 ft = 3.612903226 tn/ft Truss Plate (0.38" Plate) 49.61 TN / 155 ft = 0.320064516 tn/ft Sheetpile Connection (SIZE) 12.96 TN / 155 ft = 0.083612903 tn/ft Jacket Structure-Steel Pipe Bracing (30" Dia. X 1") 451.00 TN / 155 ft = 2.909677419 tn/ft)											
			1,664.02	*64.80%*	*10.00%*	*296,400.33%*	*135.98%*	*14.29%*	*20.17%*	*5,154.39*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization	2,825.00	TON	4,700,869.43	135,162.17	15,367.58	296,400.33	9,200,997.29	115,872.96	96,476.39	14,561,146.16	
(Note: Initial RSM 316333105040 item details: Material = $46.50/VLF, Crew Output = 44.3750VLF/hr. Convert VLF to TON. Material $46.50/ft / 59lb/ft * 2000lb/ton = $1,576.27/ton. Convert Crew Output VLF/hr to TON/hr. 44.3750vlf/hr * 630.7lb/ft / 2000lb/ton = 13.978125 TON/hr. 630.7lb/ft from skyline product manual for 60inx1in pipe. Change crew item from 50 ton crane to 100 ton crane)											
			3,827.24	*64.80%*	*10.00%*	*45,596.71%*	*135.98%*	*14.29%*	*20.17%*	*11,761.50*	
USR 051223757900 Structural steel beam or girder, 100-ton project, 1 to 2 story building, W36x231, A992 steel, shop fabricated, incl shop primer, bolted connections	184.00	TON	704,211.49	10,448.33	1,023.83	45,596.71	1,386,283.09	10,287.61	6,264.73	2,164,115.78	
(Note: Initial for W36x231 material = $430.00/LF, Crew Output = 140.6250FT/hr, 231lb/ft. Convert material LF to TON. $430/lf / 231lb/ft *2000lb/ton = $3,722.94/TON Convert crew output LF/hr to TON/hr. 140.6250ft/hr * 231lb/ft / 2000lb/ton = 16.2421875TON/hr)											
			8,960.00	*64.80%*	*10.00%*	*0.00%*	*135.98%*	*0.00%*	*0.00%*	*17,432.11*	
USR Tunnel Span Truss TON	560.00	TON	5,017,600.00	0.00	0.00	0.00	4,744,381.65	0.00	0.00	9,761,981.65	
(Note: assumed $5,600 per ton(from RSM 051223772000). material - $5,600/ton Add 60% for installation: $5,600/ton * 1.6 = $8,960 / TON use same cost from above calculated gate for truss and plates)											
			8,960.00	*64.80%*	*10.00%*	*0.00%*	*135.98%*	*0.00%*	*0.00%*	*17,432.11*	
USR Tunnel Span Plates TON	49.61	TON	444,505.60	0.00	0.00	0.00	420,301.38	0.00	0.00	864,806.98	
(Note: assumed $5,600 per ton(from RSM 051223772000). material - $5,600/ton Add 60% for installation: $5,600/ton * 1.6 = $8,960 / TON use same cost from above calculated gate for truss and plates)											
			1,560.00	*64.80%*	*10.00%*	*1,345.73%*	*135.98%*	*0.00%*	*0.00%*	*4,754.60*	
USR 314116102500 Sheet piling, wales, connections	12.96	TON	20,217.60	0.00	0.00	1,345.73	40,056.32	0.00	0.00	61,619.66	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
and struts, 2/3 salvage											

(Note: convert $520.00/TON for 2/3 salvage to no salvage. $520.00/ton * 3ea = $1,560/TON)

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
			1,754.61	*64.80%*	*10.00%*	*47,319.13%*	*135.98%*	*14.29%*	*20.17%*	*5,515.88*	
USR 316223134100 Concrete-filled steel piles, steel, pipe piles, no concrete, 50' long, 18" diameter, 59 lb./L.F., excludes mobilization or demobilization (30")	451.00	TON	791,329.09	43,852.27	4,985.89	47,319.13	1,531,281.14	37,594.05	31,300.99	2,487,662.55	

(Note: Initial RSM 316333105040 item details: Material = $46.50/VLF, Crew Output = 44.3750VLF/hr. Convert VLF to TON. Material $46.50/ft / 59lb/ft * 2000lb/ton = $1,576.27/ton. Convert Crew Output VLF/hr to TON/hr. 44.3750vlf/hr * 310.0lb/ft / 2000lb/ton = 6.878125 TON/hr. 310.0lb/ft from skyline product manual for 30inx1in pipe. Change crew item from 50 ton crane to 100 ton crane)

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
			700.00	*64.80%*	*10.00%*	*0.00%*	*135.98%*	*0.00%*	*0.00%*	*2,133.48*	
USR Coal Tar Epoxy Coating	2,670.07	TON	1,869,049.00	0.00	0.00	124,408.57	3,703,072.09	0.00	0.00	5,696,529.67	

(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Tunnel Span Jacket Structure -Steel Pipe Piles (60"dia x 1" thick) 2825.00 TN / 155 ft = 18.22580645 tn/ft (assume 50% coating). Jacket Structure-Framing (W40x211) 87.00 TN / 155 ft = 1.187096774 tn/ft (Assume 100% coating). Truss Members (Member sizes vary) 560.00 TN / 155 ft = 3.612903226 tn/ft (Assume 100% coating). Truss Plate (0.38" Plate) 49.61 TN / 155 ft = 0.320064516 tn/ft (Assume 100% coating). Sheetpile Connection (SIZE) 12.96 TN / 155 ft = 0.083612903 tn/ft (Assume 100% coating). Jacket Structure-Steel Pipe Bracing (30" Dia. X 1") 451.00 TN / 155 ft = 2.909677419 tn/ft (Assume 100% coating). Epoxy Q*(18.22580645*0.5+1.187096774+3.612903226+0.320064516+0.083612903+2.909677419))

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
			10,165.25	*1,036.69%*	*141.42%*					*18,180.45*	
0006 Deployable Flood Barrier - Vehicle Gate (north)	**40.00**	**LF**	**406,609.84**	**41,467.47**	**5,656.71**	**10,927.02**	**223,815.40**	**21,373.00**	**17,368.58**	**727,218.03**	

(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Gate Foundation 201.29 CY / 80 ft = 2.516125 cy/ft Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft Micropile (12"x0.5") 32.00 EA / 80 ft = 0.4 ea/ft micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft micropile grout volume 82.13 CY / 80 ft = 1.026625 cy/ft Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft Excavation 198.33 CY / 80 ft = 2.479125 cy/ft)

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
			587.49	*64.80%*	*10.00%*	*1,835.58%*	*75.98%*	*14.29%*	*20.17%*	*1,361.67*	
USR 033053406300 Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing	100.65	CY	59,127.96	17,142.47	2,573.70	1,835.58	38,252.83	10,420.54	7,692.65	137,045.72	

(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
			3,335.35	*64.80%*	*10.00%*	*2,414.22%*	*75.98%*	*14.29%*	*20.17%*	*6,918.87*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	13.95	TON	46,528.15	5,599.65	582.51	2,414.22	37,164.03	2,328.03	1,901.59	96,518.17	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
			315.21	*64.80%*	*10.00%*	*5,648.90%*	*75.98%*	*14.29%*	*20.17%*	*670.35*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	375.68	VLF	118,416.67	18,274.97	2,445.89	5,648.90	91,017.01	8,436.12	7,598.51	251,838.07	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
			17,920.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*22,559.20*	
USR Structural Steel(Vehicular Gate) TON	8.78	TON	157,337.60	0.00	0.00	0.00	40,732.19	0.00	0.00	198,069.79	
(Note: assumed $5,600 per ton(from RSM 051223772000). Add 100% contingency for rollers, hardware, botmmisc. steel, etc. material - $11,200/ton Add 60% for installation: $11,200/ton * 1.6 = $17,920 / TON)											
			90.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	99.17	EA	8,924.85	0.00	0.00	0.00	2,310.50	0.00	0.00	11,235.35	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
			8.33	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*14.29%*	*20.17%*	*20.61*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	99.17	BCY	825.61	450.38	54.61	0.00	348.88	188.32	175.83	2,043.63	
			700.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*1,380.48*	
USR Coal Tar Epoxy Coating	22.07	TON	15,449.00	0.00	0.00	1,028.32	13,989.97	0.00	0.00	30,467.29	
(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Deployable Flood Barrier Sheet Pile (NZ26) 27.90 TN / 80 ft = 0.34875 ton/ft (Assume 60% coating. Assuming extends 5ft below concrete). micropile casing tonnage 24.60 TN / 80 ft = 0.3075 tn/ft (Assume 40% coating. Assuming extends 5ft below concrete). Structural Steel 17.56 TN / 80 ft = 0.2195 tn/ft (Assume 100% coating). Epoxy Q*(0.34875*0.6+0.3075*0.4+0.2195*1))											
			5,555.02	*981.73%*	*135.02%*					*11,900.18*	
0007 Floodwall (north)	**238.00**	**LF**	**1,322,095.15**	**233,651.07**	**32,135.81**	**56,287.44**	**958,923.19**	**122,345.00**	**106,804.90**	**2,832,242.56**	
(Note: Assemblies makeup and quantities based on "QTO_Draft_20250610 Rev1 MN" Reinforced Concrete for Floodwall 2.69 CY Steel Sheet Pile (NZ26) 0.31 TN Excavation 2.20 CY Micropile (12") 0.33 EA Micropile casing tonnage 0.26 TN Micropile grout volume 0.86 CY)											
			587.49	*64.80%*	*10.00%*	*11,676.41%*	*75.98%*	*14.29%*	*21.89%*	*1,368.18*	
USR 033053406300	640.22	CY	376,123.06	109,046.20	16,371.76	11,676.41	243,332.74	66,286.80	53,099.73	875,936.70	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
Structural concrete, in place, cantilever retaining wall (3000 psi), 8' high, level backfill loading, includes forms(4 uses), Grade 60 rebar, concrete (Portland cement Type I), placing and finishing											
(Note: Initial Material Cost = $260/CY. From RSM 033113350400 $198.00/CY for 5000psi concrete. From RSM 033113350150 $184.00/CY for 3500psi concrete. Increse material cost by $14/CY to $274/CY.)											
			3,335.35	*64.80%*	*10.00%*	*12,768.55%*	*75.98%*	*14.29%*	*21.89%*	*6,930.47*	
RSM 314116100300 Sheet piling, steel, 27 psf, 20' excavation, per ton, left in place, excludes wales	73.78	TON	246,082.19	29,615.91	3,080.83	12,768.55	196,556.44	12,312.68	10,913.41	511,330.02	
(Note: References RSM 314116100300 and 314116100600. Interpolate using 27 psf(1.6188ton/hr) and 38(2.3750) psf to obtain crew output for NZ 26 30.99lb/sf. (2.3750-1.6188)/(38-27)=(X-1.6188)/(30.99-27), X=1.804ton/hr)											
			90.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*113.30*	
USR IDW-DISPOSE IDW Disposal Fee	523.60	EA	47,124.00	0.00	0.00	0.00	12,199.65	0.00	0.00	59,323.65	
(Note: Does not include haul. Engineering judgement based on USACE Green Brook Flood Risk Management project. Task details based on engineering judgement of the Cost Estimator.)											
			8.33	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*14.29%*	*21.89%*	*20.76*	
RSM 312316130110 Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 4' to 6' deep, excavator, excludes sheeting or dewatering	523.60	BCY	4,359.30	2,378.06	288.35	0.00	1,842.12	994.33	1,007.42	10,869.57	
			315.21	*64.80%*	*10.00%*	*28,626.57%*	*75.98%*	*14.29%*	*21.89%*	*672.07*	
USR 316333105040 Concrete-filled steel piles, pressure grouted pin pile, cased, end bearing, up to 50 ton, 5" diameter, less than 20' long, priced using 200 piles, 60' long, unless specified otherwise, excludes pile caps or mobilization	1,903.81	VLF	600,092.59	92,610.91	12,394.87	28,626.57	461,241.11	42,751.19	41,784.34	1,279,501.59	
(Note: assume for vehicle gate foundation 24.60ton * 2000lb/ton / 65.48lb/lf / 32EA = 23.48 VLF/pile. for floodwall 0.26ton * 2000lb/ton / 65.48lb/lf / 0.33EA = 24.24 (5.563 in / 2)^2 *pi = 24.29 in3 (12.75 in / 2)^2 *pi = 127.61 in3 $43.0 *(127.61 in3 / 24.29 in3) = $225.90/VLF changed crew output from 20vlf/hr to 10vlf/hr)											
			700.00	*64.80%*	*10.00%*	*0.00%*	*75.98%*	*0.00%*	*0.00%*	*1,380.48*	
USR Coal Tar Epoxy Coating	69.02	TON	48,314.00	0.00	0.00	3,215.90	43,751.13	0.00	0.00	95,281.03	

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O

(Note: assume $700/ton. Task details based on engineering judgement of the Cost Estimator. Floodwall Steel Sheet Pile (NZ26) 0.31 TN/lf (Assume 60% coating. Assuming extends 5ft below concrete). Micropile casing tonnage 0.26 TN/lf (Assume 40% coating. Assuming extends 5ft below concrete). Epoxy Q*(0.31*0.6+0.26*0.4))

Description	Quantity	UOM	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectUserCost	DirectShip	DirectCost	C/O
Job Office Overhead Direct Cost Report										

Description	Quantity	UOM	BareCost	Productivity	Overtime	TaxAdj	MiscDirect	Payroll	WCI	DirectCost	C/O
Job Office Overhead Bare to Direct Report											

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
Crews (Bare Costs) by Contractor, Report		**9,209.65**			**108,431.78**	**12,733,054.59**	**21,035.74**	**1,889,578.10**	**14,622,632.70**
Prime	**LaborCost1**	**9,209.65**		**0.00**	**108,431.78**	**12,733,054.59**	**21,035.74**	**1,889,578.10**	**14,622,632.70**
					2.00	*245.34*	*1.00*	*66.87*	*312.21*
RSM B12F 1 Equip Oper Heavy + 1 Laborer + 1 hyd excavator, crawler, .75 CY	LaborCost1	28.79			57.58	7,063.37	28.79	1,925.23	8,988.60
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	1.00	169.01			
MIL B-LABORER Laborers, (Semi-Skilled)			Journeyman	76.33	1.00	76.33			
GEN H25Z3182 HYDRAULIC EXCAVATOR, CRAWLER, 30,600 LBS (13.9 MT), 0.69 CY (0.53 M3) BUCKET, 18.4' (5.6 M) MAX DIGGING DEPTH			EP / Average	66.87			1.00	66.87	
					8.00	*998.09*	*3.00*	*193.40*	*1,191.49*
RSM B19 5 Pile Driver + 2 Equip Oper Heavy + 1 crane, crawler, 50 ton + 1 pile hammer, 18,100 FT-LBS w Lead	LaborCost1	1,864.57			14,916.53	1,861,004.61	5,593.70	360,603.17	2,221,607.78
MIL B-PILEDRVR Pile Drivers			Foreman	106.98	1.00	106.98			
MIL B-PILEDRVR Pile Drivers			Journeyman	105.38	4.00	421.52			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	2.00	338.02			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
EP C90MX001 CRANES, MECHANICAL, LATTICE BOOM, TRUCK MTD, 30 TON, 50' BOOM, DRAGLINE/CLAMSHELL CAPABLE, 6X4			EP / Average	153.60			1.00	153.60	
GEN P10Z4840 PILE HAMMER ACCESSORIES, PILE LEADS, SWING, 8" X 26" X 84' (20 CM X 66 CM X 25.6 M)			EP / Average	13.44			1.00	13.44	
GEN P20Z4880 PILE HAMMER, SINGLE ACTING, DIESEL, 31,320 FT-LBS (42.4 KJ) (ADD LEADS & CRANE)			EP / Average	26.35			1.00	26.35	
					8.00	*998.09*	*2.00*	*328.48*	*1,326.57*
RSM B40 5 Pile Drivers + 1 crane, crawler, 50 ton w pile hammer + leads + 1 generator	LaborCost1	3,580.94			28,647.50	3,574,097.66	7,161.87	1,176,277.52	4,750,375.18
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
MIL B-PILEDRVR Pile Drivers			Foreman	106.98	1.00	106.98			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	2.00	338.02			
MIL B-PILEDRVR Pile Drivers			Journeyman	105.38	4.00	421.52			

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
EP C90MX001 CRANES, MECHANICAL, LATTICE BOOM, TRUCK MTD, 30 TON, 50' BOOM, DRAGLINE/CLAMSHELL CAPABLE, 6X4			EP / Average	153.60			1.00	153.60	
GEN P30Z4920 PILE HAMMER, DRIVER/EXTRACTOR, VIBRATORY, 100 TON (890 KN)FORCE DRIVE (ADD CRANE)			EP / Average	174.88			1.00	174.88	
					7.00	*769.37*	*4.00*	*123.69*	*893.06*
RSM B48 4 Laborer + 1 Equip Oper Heavy + 1 Equip Oper Light + 1 centrifugal water pump, wheel, 6" + 1 suction hose + 1 discharge hose + 1 drill rig, truck mtd	LaborCost1	392.55			2,747.87	302,018.76	1,570.21	48,555.71	350,574.46
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
MIL B-EQOPRLT Equip. Operators, Light			Journeyman	162.47	1.00	162.47			
MIL B-LABORER Laborers, (Semi-Skilled)			Foreman	77.33	1.00	77.33			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	1.00	169.01			
MIL B-LABORER Laborers, (Semi-Skilled)			Journeyman	76.33	3.00	228.99			
GEN P50Z5095 PUMP HOSE, SUCTION, 6" (153 MM) DIA x 20' (6.1 M) LENGTH, W/COUPLING/SECTION			EP / Average	0.58			1.00	0.58	
GEN P50Z5099 PUMP HOSE, DISCH, 6" (15 CM) DIA X 50' (15M) WITH COUPLING (PER SECTION)			EP / Average	0.55			1.00	0.55	
GEN P60Z5410 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, 6" (15 CM) DIA, 1,825 GPM (6.9 M3M) @ 40' (12.2 M) HEAD (ADD HOSES)			EP / Average	2.95			1.00	2.95	
GEN D30Z2890 DRILL, EARTH / AUGER, MULTI-PURPOSE, 8" (20CM) DIA, 250' (76.2M) DEPTH, 7,000 FT-LBS (9.5KNM) TORQUE W/45KGVW (20.4MT) TRUCK (ADD COST FOR DRILL STEEL AND CUTTING EDGE WEAR)			EP / Average	119.62			1.00	119.62	
					25.00	*2,714.49*	*2.00*	*28.55*	*2,743.04*
RSM C14D 19 Carpenter + 2 Rodmen + 2 Laborer + 1 Cement Finisher + 1 Equip Oper Medium + 1 conc pump, 117 cy/hr, truck mtd + 1 conc vib, 2.5" dia w 7.5 HP generator	LaborCost1	2,087.50			52,187.57	5,666,505.06	4,175.01	59,599.02	5,726,104.08

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL B-LABORER Laborers, (Semi-Skilled)			Journeyman	76.33	2.00	152.66			
MIL B-CARPNTER Carpenters			Journeyman	105.38	18.00	1,896.84			
MIL B-RODMAN Rodmen, (Reinforcing)			Journeyman	149.22	2.00	298.44			
MIL B-EQOPRMED Equip. Operators, Medium			Journeyman	166.97	1.00	166.97			
MIL B-CEMTFINR Cement Finishers			Journeyman	92.60	1.00	92.60			
MIL B-CARPNTER Carpenters			Foreman	106.98	1.00	106.98			
EP C55MU001 CONCRETE PUMP, 25 CY/HR, SINGLE, TRAILER MTD			EP / Average	23.55			1.00	23.55	
GEN XMEZ9520 CONCRETE VIBRATOR, 2.5" (63.5 MM) DIA, W/7.5 HP (5.6 KW) GENERATOR			Non-EP / Average	5.00			1.00	5.00	
					7.00	*1,048.68*	*1.00*	*188.76*	*1,237.44*
RSM E2 5 Structural Steel Worker + 1 Equip Oper Heavy + 1 crane, lattice boom, 100 ton	LaborCost1	641.27			4,488.89	672,486.86	641.27	121,045.69	793,532.55
MIL B-STRSTEEL Structural Steel Workers			Foreman	151.22	1.00	151.22			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	1.00	169.01			
MIL B-STRSTEEL Structural Steel Workers			Journeyman	149.22	4.00	596.88			
GEN C80Z2190 CRANES, HYDRAULIC, TRUCK MTD, 80T (72.6MT), 128' (39M) BOOM, 8X4X4			EP / Average	188.76			1.00	188.76	
Sub	**LaborCost1**	**614.04**		**0.00**	**5,385.85**	**649,878.29**	**1,864.88**	**121,571.75**	**771,450.04**
					2.00	*245.34*	*1.00*	*66.87*	*312.21*
RSM B12F 1 Equip Oper Heavy + 1 Laborer + 1 hyd excavator, crawler, .75 CY	LaborCost1	8.16			16.32	2,002.40	8.16	545.79	2,548.18
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	1.00	169.01			
MIL B-LABORER Laborers, (Semi-Skilled)			Journeyman	76.33	1.00	76.33			
GEN H25Z3182 HYDRAULIC EXCAVATOR, CRAWLER, 30,600 LBS (13.9 MT), 0.69 CY (0.53 M3) BUCKET, 18.4' (5.6 M) MAX DIGGING DEPTH			EP / Average	66.87			1.00	66.87	
					8.00	*998.09*	*2.00*	*328.48*	*1,326.57*
RSM B40 5 Pile Drivers + 1 crane, crawler, 50 ton w pile hammer + leads + 1 generator	LaborCost1	23.87			190.93	23,821.13	47.73	7,839.81	31,660.94
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL B-PILEDRVR Pile Drivers			Foreman	106.98	1.00	106.98			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	2.00	338.02			
MIL B-PILEDRVR Pile Drivers			Journeyman	105.38	4.00	421.52			
EP C90MX001 CRANES, MECHANICAL, LATTICE BOOM, TRUCK MTD, 30 TON, 50' BOOM, DRAGLINE/CLAMSHELL CAPABLE, 6X4			EP / Average	153.60			1.00	153.60	
GEN P30Z4920 PILE HAMMER, DRIVER/EXTRACTOR, VIBRATORY, 100 TON (890 KN)FORCE DRIVE (ADD CRANE)			EP / Average	174.88			1.00	174.88	
					7.00	*769.37*	*4.00*	*123.69*	*893.06*
RSM B48 4 Laborer + 1 Equip Oper Heavy + 1 Equip Oper Light + 1 centrifugal water pump, wheel, 6" + 1 suction hose + 1 discharge hose + 1 drill rig, truck mtd	LaborCost1	115.95			811.65	89,208.93	463.80	14,342.16	103,551.09
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
MIL B-EQOPRLT Equip. Operators, Light			Journeyman	162.47	1.00	162.47			
MIL B-LABORER Laborers, (Semi-Skilled)			Foreman	77.33	1.00	77.33			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	1.00	169.01			
MIL B-LABORER Laborers, (Semi-Skilled)			Journeyman	76.33	3.00	228.99			
GEN P50Z5095 PUMP HOSE, SUCTION, 6" (153 MM) DIA x 20' (6.1 M) LENGTH, W/COUPLING/SECTION			EP / Average	0.58			1.00	0.58	
GEN P50Z5099 PUMP HOSE, DISCH, 6" (15 CM) DIA X 50' (15M) WITH COUPLING (PER SECTION)			EP / Average	0.55			1.00	0.55	
GEN P60Z5410 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, 6" (15 CM) DIA, 1,825 GPM (6.9 M3M) @ 40' (12.2 M) HEAD (ADD HOSES)			EP / Average	2.95			1.00	2.95	
GEN D30Z2890 DRILL, EARTH / AUGER, MULTI-PURPOSE, 8" (20CM) DIA, 250' (76.2M) DEPTH, 7,000 FT-LBS (9.5KNM) TORQUE W/45KGVW (20.4MT) TRUCK (ADD COST FOR DRILL STEEL AND CUTTING EDGE WEAR)			EP / Average	119.62			1.00	119.62	

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
					25.00	*2,714.49*	*2.00*	*28.55*	*2,743.04*
RSM C14D 19 Carpenter + 2 Rodmen + 2 Laborer + 1 Cement Finisher + 1 Equip Oper Medium + 1 conc pump, 117 cy/hr, truck mtd + 1 conc vib, 2.5" dia w 7.5 HP generator	LaborCost1	35.50			887.52	96,366.79	71.00	1,013.56	97,380.35
MIL B-LABORER Laborers, (Semi-Skilled)			Journeyman	76.33	2.00	152.66			
MIL B-CARPNTER Carpenters			Journeyman	105.38	18.00	1,896.84			
MIL B-RODMAN Rodmen, (Reinforcing)			Journeyman	149.22	2.00	298.44			
MIL B-EQOPRMED Equip. Operators, Medium			Journeyman	166.97	1.00	166.97			
MIL B-CEMTFINR Cement Finishers			Journeyman	92.60	1.00	92.60			
MIL B-CARPNTER Carpenters			Foreman	106.98	1.00	106.98			
EP C55MU001 CONCRETE PUMP, 25 CY/HR, SINGLE, TRAILER MTD			EP / Average	23.55			1.00	23.55	
GEN XMEZ9520 CONCRETE VIBRATOR, 2.5" (63.5 MM) DIA, W/7.5 HP (5.6 KW) GENERATOR			Non-EP / Average	5.00			1.00	5.00	
					10.00	*1,498.34*	*2.00*	*195.66*	*1,694.00*
RSM E5 7 Structural Steel Worker + 1 Equip Oper Heavy + 1 Welder + 1 crane, lattice boom, 100 ton + 1 welder, 300 amp	LaborCost1	17.48			174.82	26,194.41	34.96	3,420.61	29,615.02
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
MIL B-STRSTEEL Structural Steel Workers			Journeyman	149.22	5.00	746.10			
MIL B-STRSTEEL Structural Steel Workers			Foreman	151.22	2.00	302.44			
MIL B-WELDERS Welders, Structural Steel			Journeyman	149.22	1.00	149.22			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	1.00	169.01			
GEN C80Z2190 CRANES, HYDRAULIC, TRUCK MTD, 80T (72.6MT), 128' (39M) BOOM, 8X4X4			EP / Average	188.76			1.00	188.76	
GEN W35Z8640 WELDER, ENGINE DRIVEN, DIESEL, DC-CC, 300 AMP, 3 KW			EP / Average	6.90			1.00	6.90	
					8.00	*998.09*	*3.00*	*228.55*	*1,226.64*
USR B19 5 Pile Driver + 2 Equip Oper Heavy + 1 crane, crawler, 50 ton + 1 pile hammer, 18,100 FT-LBS w Lead (changed to 100 ton crane)	LaborCost1	413.07			3,304.59	412,284.63	1,239.22	94,409.82	506,694.45

Description	LaborRate	CrewHours	MemberType	MemberRate	ManHours	LaborCost	EQHours	EQCost	CrewCost
MIL B-PILEDRVR Pile Drivers			Journeyman	105.38	4.00	421.52			
MIL B-EQOPRCRB Equip. Operators Crane with Boom Pay			Journeyman	169.01	2.00	338.02			
MIL B-EQOPROIL Equip. Operators, Oilers / Grade Checker			Journeyman	131.57	1.00	131.57			
MIL B-PILEDRVR Pile Drivers			Foreman	106.98	1.00	106.98			
GEN P10Z4840 PILE HAMMER ACCESSORIES, PILE LEADS, SWING, 8" X 26" X 84' (20 CM X 66 CM X 25.6 M)			EP / Average	13.44			1.00	13.44	
GEN P20Z4880 PILE HAMMER, SINGLE ACTING, DIESEL, 31,320 FT-LBS (42.4 KJ) (ADD LEADS & CRANE)			EP / Average	26.35			1.00	26.35	
GEN C80Z2190 CRANES, HYDRAULIC, TRUCK MTD, 80T (72.6MT), 128' (39M) BOOM, 8X4X4			EP / Average	188.76			1.00	188.76	

Description Contractors Labor Payroll Markup Report	SUIExperience	SUIRate	FICA	FUIRate	PayrollTax	State	ContractorClass	WCIBaseRate	WCIExperience	WCIRate
1 Prime	**80.00**	**5.84**	**7.65**	**0.80**	**14.29**	**NY**	**Concrete Work -- NOC**	**25.75**	**85.00**	**21.89**
1.1 Sub	**80.00**	**5.84**	**7.65**	**0.80**	**14.29**	**NY**	**Steel Erection -- NOC**	**23.73**	**85.00**	**20.17**

Description	LaborRate	LaborType	ManHours	BaseWage	Travel	TaxableFringe	NonTaxFringe	Subsistence	Payroll	WCI	Overtime	Total
Labor by Contractor, Report												
Prime												
				57.05	*0.00*	*48.33*	*0.00*	*0.00*				*140.23*
Carpenters	LaborCost1	Journeyman	37,575.05	2,143,656.47	0.00	1,816,002.05	0.00	0.00	626,000.92	469,192.81	214,365.65	5,269,217.89
				58.65	*0.00*	*48.33*	*0.00*	*0.00*				*142.62*
Carpenters	LaborCost1	Foreman	2,087.50	122,432.03	0.00	100,889.00	0.00	0.00	35,348.86	26,797.31	12,243.20	297,710.41
				57.72	*0.00*	*34.88*	*0.00*	*0.00*				*125.86*
Cement Finishers	LaborCost1	Journeyman	2,087.50	120,490.65	0.00	72,812.09	0.00	0.00	31,004.76	26,372.39	12,049.07	262,728.96
				94.76	*0.00*	*36.95*	*0.00*	*37.30*				*225.28*
Equip. Operators Crane with Boom Pay	LaborCost1	Journeyman	11,953.62	1,132,725.00	0.00	441,686.25	0.00	445,870.01	311,462.39	247,925.18	113,272.50	2,692,941.33
				88.22	*0.00*	*36.95*	*0.00*	*37.30*				*210.07*
Equip. Operators, Light	LaborCost1	Journeyman	392.55	34,631.06	0.00	14,504.85	0.00	14,642.24	7,640.90	7,579.87	3,463.11	82,462.01
				92.72	*0.00*	*36.95*	*0.00*	*37.30*				*217.67*
Equip. Operators, Medium	LaborCost1	Journeyman	2,087.50	193,553.25	0.00	77,133.22	0.00	77,863.85	44,113.53	42,363.97	19,355.32	454,383.14
				57.32	*0.00*	*36.95*	*0.00*	*37.30*				*166.40*
Equip. Operators, Oilers / Grade Checker	LaborCost1	Journeyman	6,479.33	371,394.99	0.00	239,411.11	0.00	241,678.87	107,256.48	81,289.08	37,139.50	1,078,170.03
				49.28	*0.00*	*27.05*	*0.00*	*0.00*				*106.42*
Laborers, (Semi-Skilled)	LaborCost1	Journeyman	5,381.46	265,198.12	0.00	145,568.37	0.00	0.00	77,337.35	58,045.24	26,519.81	572,668.89
				50.28	*0.00*	*27.05*	*0.00*	*0.00*				*105.31*
Laborers, (Semi-Skilled)	LaborCost1	Foreman	392.55	19,737.58	0.00	10,618.57	0.00	0.00	4,690.90	4,320.06	1,973.76	41,340.87
				58.65	*0.00*	*48.33*	*0.00*	*0.00*				*142.37*
Pile Drivers	LaborCost1	Foreman	5,445.50	319,378.76	0.00	263,181.17	0.00	0.00	90,901.41	69,904.03	31,937.88	775,303.24
				57.05	*0.00*	*48.33*	*0.00*	*0.00*				*140.00*
Pile Drivers	LaborCost1	Journeyman	21,782.01	1,242,663.82	0.00	1,052,724.67	0.00	0.00	357,790.22	271,988.04	124,266.38	3,049,433.14
				58.45	*0.00*	*90.77*	*0.00*	*0.00*				*190.82*
Rodmen, (Reinforcing)	LaborCost1	Journeyman	4,175.01	244,029.06	0.00	378,965.23	0.00	0.00	95,875.01	53,411.86	24,402.91	796,684.07
				60.45	*0.00*	*90.77*	*0.00*	*0.00*				*192.97*
Structural Steel	LaborCost1	Foreman	641.27	38,764.76	0.00	58,208.06	0.00	0.00	14,411.37	8,484.64	3,876.48	123,745.30

Description	LaborRate	LaborType	ManHours	BaseWage	Travel	TaxableFringe	NonTaxFringe	Subsistence	Payroll	WCI	Overtime	Total
Workers												
				58.45	*0.00*	*90.77*	*0.00*	*0.00*				*190.02*
Structural Steel Workers	LaborCost1	Journeyman	2,565.08	149,928.89	0.00	232,832.25	0.00	0.00	56,839.05	32,815.69	14,992.89	487,408.77
Sub												
				57.05	*0.00*	*48.33*	*0.00*	*0.00*				*138.87*
Carpenters	LaborCost1	Journeyman	639.02	36,455.86	0.00	30,883.64	0.00	0.00	10,404.24	7,353.33	3,645.59	88,742.65
				58.65	*0.00*	*48.33*	*0.00*	*0.00*				*141.22*
Carpenters	LaborCost1	Foreman	35.50	2,082.13	0.00	1,715.76	0.00	0.00	587.35	419.98	208.21	5,013.42
				57.72	*0.00*	*34.88*	*0.00*	*0.00*				*124.48*
Cement Finishers	LaborCost1	Journeyman	35.50	2,049.11	0.00	1,238.27	0.00	0.00	513.69	413.32	204.91	4,419.30
				94.76	*0.00*	*36.95*	*0.00*	*37.30*				*225.77*
Equip. Operators Crane with Boom Pay	LaborCost1	Journeyman	1,015.48	96,226.44	0.00	37,521.81	0.00	37,877.23	28,609.47	19,409.35	9,622.64	229,266.94
				88.22	*0.00*	*36.95*	*0.00*	*37.30*				*208.86*
Equip. Operators, Light	LaborCost1	Journeyman	115.95	10,229.16	0.00	4,284.38	0.00	4,324.96	2,293.25	2,063.27	1,022.92	24,217.93
				92.72	*0.00*	*36.95*	*0.00*	*37.30*				*215.46*
Equip. Operators, Medium	LaborCost1	Journeyman	35.50	3,291.64	0.00	1,311.76	0.00	1,324.18	728.38	663.94	329.16	7,649.07
				57.32	*0.00*	*36.95*	*0.00*	*37.30*				*166.33*
Equip. Operators, Oilers / Grade Checker	LaborCost1	Journeyman	570.37	32,693.79	0.00	21,075.29	0.00	21,274.92	9,961.53	6,594.50	3,269.38	94,869.42
				49.28	*0.00*	*27.05*	*0.00*	*0.00*				*104.78*
Laborers, (Semi-Skilled)	LaborCost1	Journeyman	427.02	21,043.32	0.00	11,550.77	0.00	0.00	5,798.68	4,244.54	2,104.33	44,741.64
				50.28	*0.00*	*27.05*	*0.00*	*0.00*				*104.63*
Laborers, (Semi-Skilled)	LaborCost1	Foreman	115.95	5,830.00	0.00	3,136.46	0.00	0.00	1,406.27	1,175.94	583.00	12,131.67
				57.05	*0.00*	*48.33*	*0.00*	*0.00*				*140.28*
Pile Drivers	LaborCost1	Journeyman	1,747.76	99,709.78	0.00	84,469.30	0.00	0.00	30,911.94	20,111.96	9,970.98	245,173.96
				58.65	*0.00*	*48.33*	*0.00*	*0.00*				*142.66*
Pile Drivers	LaborCost1	Foreman	436.94	25,626.55	0.00	21,117.33	0.00	0.00	7,860.09	5,169.00	2,562.65	62,335.62
				58.45	*0.00*	*90.77*	*0.00*	*0.00*				*189.43*
Rodmen,	LaborCost1	Journeyman	71.00	4,150.05	0.00	6,444.83	0.00	0.00	1,602.97	837.09	415.01	13,449.94

Description	LaborRate	LaborType	ManHours	BaseWage	Travel	TaxableFringe	NonTaxFringe	Subsistence	Payroll	WCI	Overtime	Total
(Reinforcing)												
				58.45	*0.00*	*90.77*	*0.00*	*0.00*				*189.01*
Structural Steel Workers	LaborCost1	Journeyman	87.41	5,109.20	0.00	7,934.34	0.00	0.00	1,936.93	1,030.55	510.92	16,521.94
				60.45	*0.00*	*90.77*	*0.00*	*0.00*				*191.93*
Structural Steel Workers	LaborCost1	Foreman	34.96	2,113.61	0.00	3,173.73	0.00	0.00	785.76	426.33	211.36	6,710.79
				58.45	*0.00*	*90.77*	*0.00*	*0.00*				*189.01*
Welders, Structural Steel	LaborCost1	Journeyman	17.48	1,021.84	0.00	1,586.87	0.00	0.00	387.39	206.11	102.18	3,304.39

Description	CostType	ConditionType	Manufacturer	EQHours	Ownership	Operating	Total
Equipment by Contractor, Report				**21,035.74**	**604,275.77**	**1,256,640.67**	**1,860,916.43**
Prime				**21,035.74**	**604,275.77**	**1,256,640.67**	**1,860,916.43**
					5.47	*17.93*	*23.40*
EP C55MU001 CONCRETE PUMP, 25 CY/HR, SINGLE, TRAILER MTD	EP	Average	MU MULTIQUIP, INC.	2,087.50	11,413.39	37,432.37	48,845.76
					55.04	*95.22*	*150.26*
EP C90MX001 CRANES, MECHANICAL, LATTICE BOOM, TRUCK MTD, 30 TON, 50' BOOM, DRAGLINE/CLAMSHELL CAPABLE, 6X4	EP	Average	MX MANITEX	5,445.50	299,718.31	518,538.71	818,257.01
					66.73	*118.27*	*185.00*
GEN C80Z2190 CRANES, HYDRAULIC, TRUCK MTD, 80T (72.6MT), 128' (39M) BOOM, 8X4X4	EP	Average	GK GENERIC EQUIPMENT	641.27	42,792.87	75,844.15	118,637.02
					38.55	*79.45*	*118.00*
GEN D30Z2890 DRILL, EARTH / AUGER, MULTI-PURPOSE, 8" (20CM) DIA, 250' (76.2M) DEPTH, 7,000 FT-LBS (9.5KNM) TORQUE W/45KGVW (20.4MT) TRUCK (ADD COST FOR DRILL STEEL AND CUTTING EDGE WEAR)	EP	Average	GK GENERIC EQUIPMENT	392.55	15,132.66	31,188.24	46,320.90
					27.79	*38.05*	*65.85*
GEN H25Z3182 HYDRAULIC EXCAVATOR, CRAWLER, 30,600 LBS (13.9 MT), 0.69 CY (0.53 M3) BUCKET, 18.4' (5.6 M) MAX DIGGING DEPTH	EP	Average	GK GENERIC EQUIPMENT	28.79	800.22	1,095.59	1,895.81
					5.29	*7.98*	*13.27*
GEN P10Z4840 PILE HAMMER ACCESSORIES, PILE LEADS, SWING, 8" X 26" X 84' (20 CM X 66 CM X 25.6 M)	EP	Average	GK GENERIC EQUIPMENT	1,864.57	9,856.16	14,877.71	24,733.87
					6.36	*19.83*	*26.19*
GEN P20Z4880 PILE HAMMER, SINGLE ACTING, DIESEL, 31,320 FT-LBS (42.4 KJ) (ADD LEADS & CRANE)	EP	Average	GK GENERIC EQUIPMENT	1,864.57	11,854.05	36,979.28	48,833.33
					47.16	*126.51*	*173.66*
GEN P30Z4920 PILE HAMMER, DRIVER/EXTRACTOR, VIBRATORY, 100 TON (890 KN)FORCE DRIVE (ADD CRANE)	EP	Average	GK GENERIC EQUIPMENT	3,580.94	168,862.73	453,020.31	621,883.04
					0.18	*0.39*	*0.57*
GEN P50Z5095 PUMP HOSE, SUCTION, 6" (153 MM) DIA x 20' (6.1 M) LENGTH, W/COUPLING/SECTION	EP	Average	GK GENERIC EQUIPMENT	392.55	70.11	154.60	224.70
					0.17	*0.37*	*0.54*
GEN P50Z5099 PUMP HOSE, DISCH, 6" (15 CM) DIA X 50' (15M) WITH COUPLING (PER SECTION)	EP	Average	GK GENERIC EQUIPMENT	392.55	66.61	146.89	213.50
					0.89	*2.04*	*2.92*
GEN P60Z5410 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, 6" (15 CM) DIA, 1,825 GPM (6.9 M3M) @ 40' (12.2 M) HEAD (ADD HOSES)	EP	Average	GK GENERIC EQUIPMENT	392.55	347.88	799.61	1,147.49
					1.09	*3.90*	*4.99*
GEN XMEZ9520 CONCRETE VIBRATOR, 2.5" (63.5 MM) DIA, W/7.5 HP (5.6 KW) GENERATOR	Non-EP	Average	GK GENERIC EQUIPMENT	2,087.50	2,283.73	8,141.26	10,424.99
Sub				**1,864.88**	**41,077.05**	**78,421.96**	**119,499.01**

Description	CostType	ConditionType	Manufacturer	EQHours	Ownership	Operating	Total
					5.47	*17.93*	*23.40*
EP C55MU001 CONCRETE PUMP, 25 CY/HR, SINGLE, TRAILER MTD	EP	Average	MU MULTIQUIP, INC.	35.50	194.10	636.59	830.69
					55.04	*95.22*	*150.26*
EP C90MX001 CRANES, MECHANICAL, LATTICE BOOM, TRUCK MTD, 30 TON, 50' BOOM, DRAGLINE/CLAMSHELL CAPABLE, 6X4	EP	Average	MX MANITEX	23.87	1,313.61	2,272.67	3,586.28
					66.73	*118.27*	*185.00*
GEN C80Z2190 CRANES, HYDRAULIC, TRUCK MTD, 80T (72.6MT), 128' (39M) BOOM, 8X4X4	EP	Average	GK GENERIC EQUIPMENT	430.56	28,731.62	50,922.63	79,654.25
					38.55	*79.45*	*118.00*
GEN D30Z2890 DRILL, EARTH / AUGER, MULTI-PURPOSE, 8" (20CM) DIA, 250' (76.2M) DEPTH, 7,000 FT-LBS (9.5KNM) TORQUE W/45KGVW (20.4MT) TRUCK (ADD COST FOR DRILL STEEL AND CUTTING EDGE WEAR)	EP	Average	GK GENERIC EQUIPMENT	115.95	4,469.82	9,212.24	13,682.06
					27.79	*38.05*	*65.85*
GEN H25Z3182 HYDRAULIC EXCAVATOR, CRAWLER, 30,600 LBS (13.9 MT), 0.69 CY (0.53 M3) BUCKET, 18.4' (5.6 M) MAX DIGGING DEPTH	EP	Average	GK GENERIC EQUIPMENT	8.16	226.86	310.59	537.44
					5.29	*7.98*	*13.27*
GEN P10Z4840 PILE HAMMER ACCESSORIES, PILE LEADS, SWING, 8" X 26" X 84' (20 CM X 66 CM X 25.6 M)	EP	Average	GK GENERIC EQUIPMENT	413.07	2,183.52	3,295.99	5,479.51
					6.36	*19.83*	*26.19*
GEN P20Z4880 PILE HAMMER, SINGLE ACTING, DIESEL, 31,320 FT-LBS (42.4 KJ) (ADD LEADS & CRANE)	EP	Average	GK GENERIC EQUIPMENT	413.07	2,626.13	8,192.34	10,818.48
					47.16	*126.51*	*173.66*
GEN P30Z4920 PILE HAMMER, DRIVER/EXTRACTOR, VIBRATORY, 100 TON (890 KN)FORCE DRIVE (ADD CRANE)	EP	Average	GK GENERIC EQUIPMENT	23.87	1,125.46	3,019.35	4,144.81
					0.18	*0.39*	*0.57*
GEN P50Z5095 PUMP HOSE, SUCTION, 6" (153 MM) DIA x 20' (6.1 M) LENGTH, W/COUPLING/SECTION	EP	Average	GK GENERIC EQUIPMENT	115.95	20.71	45.66	66.37
					0.17	*0.37*	*0.54*
GEN P50Z5099 PUMP HOSE, DISCH, 6" (15 CM) DIA X 50' (15M) WITH COUPLING (PER SECTION)	EP	Average	GK GENERIC EQUIPMENT	115.95	19.68	43.39	63.06
					0.89	*2.04*	*2.92*
GEN P60Z5410 PUMP, WATER, CENTRIFUGAL, DEWATERING, WHEEL, 6" (15 CM) DIA, 1,825 GPM (6.9 M3M) @ 40' (12.2 M) HEAD (ADD HOSES)	EP	Average	GK GENERIC EQUIPMENT	115.95	102.76	236.19	338.94
					1.37	*5.48*	*6.85*
GEN W35Z8640 WELDER, ENGINE DRIVEN, DIESEL, DC-CC, 300 AMP, 3 KW	EP	Average	GK GENERIC EQUIPMENT	17.48	23.95	95.87	119.82
					1.09	*3.90*	*4.99*
GEN XMEZ9520 CONCRETE VIBRATOR, 2.5" (63.5 MM) DIA, W/7.5	Non-EP	Average	GK GENERIC	35.50	38.84	138.45	177.29

Description	CostType	ConditionType	Manufacturer	EQHours	Ownership	Operating	Total
HP (5.6 KW) GENERATOR			EQUIPMENT				