THE BIG U FROM CONCEPT TO REALIZATION

VISUAL OVERVIEW OF MANHATTAN'S COASTAL RESILIENCE PROJECT

Todays Presenter

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REBUILD BY DESIGN - BIG U Proposal

HUD - Rebuild by Design

BIG TEAM

UNPRECEDENTED IMPACT HURRICANE SANDY

- $65 BILLION in damages and economic loss
- At least 159 FATALITIES
- 8.5 MILLION customers left without power
- 650,000 HOMES damaged or destroyed
- 25 PERCENT of cell sites out of service in 10 STATES

REBUILD BY DESIGN, COLLABORATIVE PUBLIC - PRIVATE EFFORT

Funders + Partners + Government

The Rockefeller Foundation

Deutsche Bank

The JPB Foundation

Hearst Foundations

Surdna Foundation

The New Jersey Recovery Fund

RPA Regional Plan Association

IPK institute for public knowledge

The Municipal Art Society of New York MASNYC

Van Alen Institute

NYC Mayor's Office of Recovery and Resiliency

NY Rising Governor's Office of Storm Recovery

New Jersey Office of Recovery and Rebuilding

U.S. Department of Housing and Urban Development

Connecticut Department of Housing

AWARDS: $930M USD

NEW YORK CITY:

- **$335M:** The BIG U in Manhattan, NY
- **$20M:** Lifelines in Hunts Point, Bronx, NY

NEW JERSEY:

- **$230M:** Resist, Delay, Store, Discharge in Hoboken, Weehawken, Jersey City, NJ
- **$150M:** New Meadowlands in Little Ferry, Moonachie, Carlstadt, Teterboro, NJ

NEW YORK STATE:

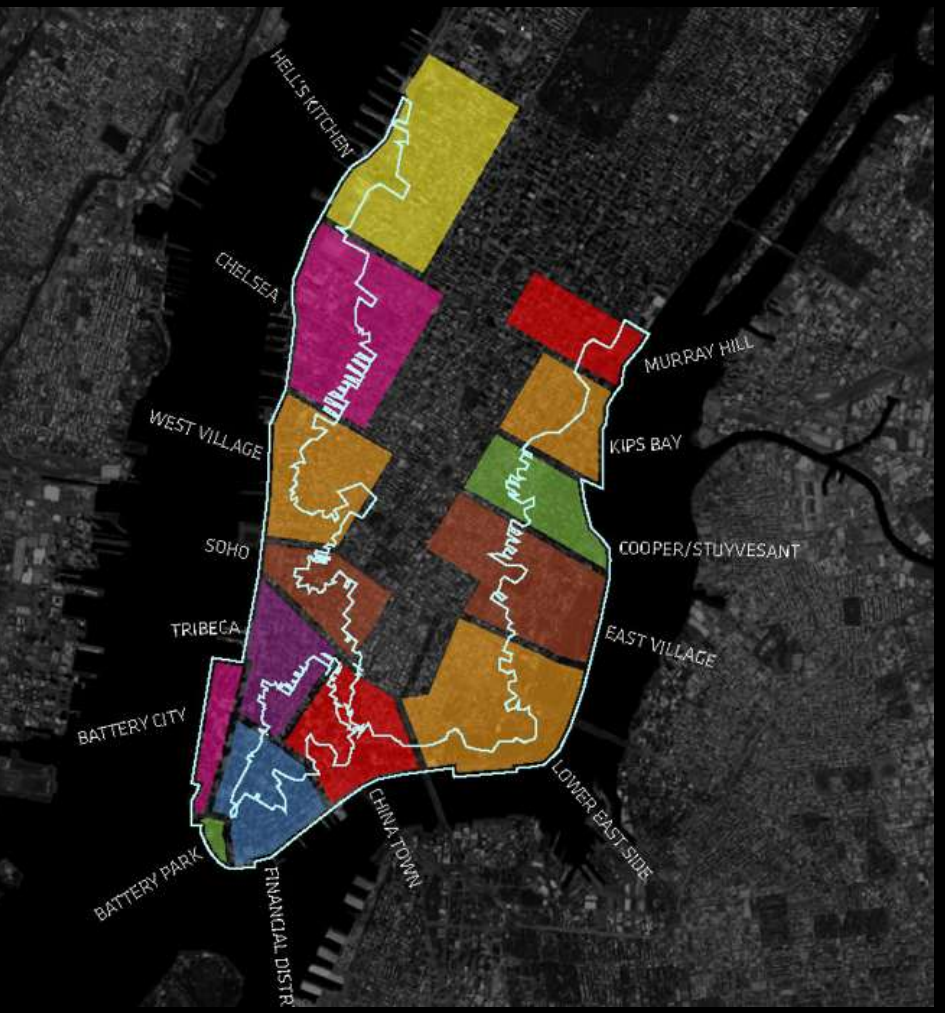
- **$125M**Living with the Bay in Nassau County, Long Island
- **$60M:** Living Breakwaters in Tottenville, Staten Island, NY

CONNECTICUIT

- **$10M**: Resilient Bridgeport in Bridgeport, CT

Protective alignment 10 subsequent compartments | First Phase Project Award HUD CDBG $330M

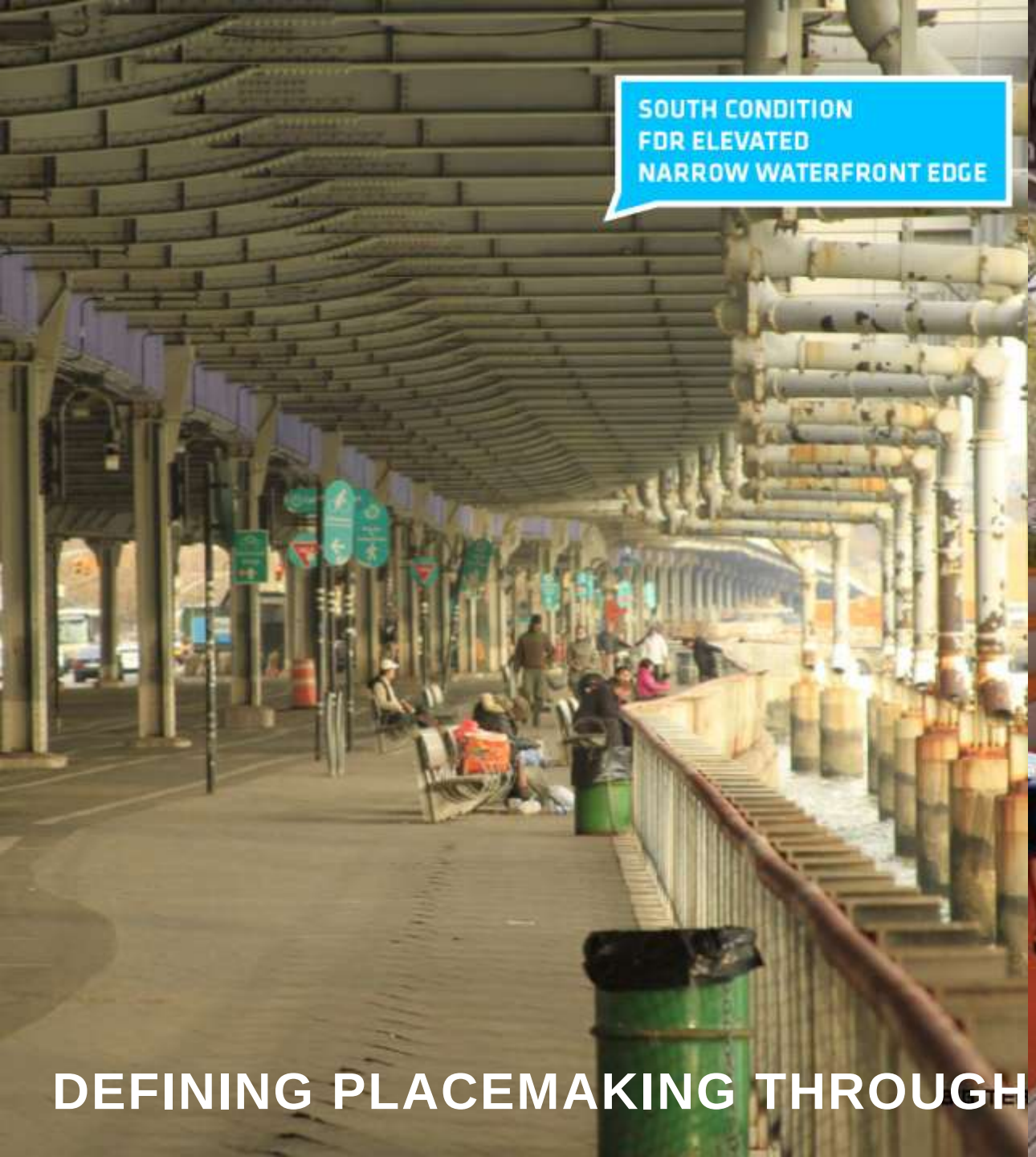
Community Engagement



Credit Rebuild by Design BIG Team

Rebuild by Design – Planning Process

Defining and mitigating obstacles while leveraging opportunities



DEFINING PLACEMAKING THROUGH COMMUNITY PLANNING

Credit Rebuild by Design BIG Team

SOCIAL INFRASTRUCTURE

Integrating flood protection with improved access and open spaces throughout East River Park and Stuyvesant Cove.

CONCEPT BRANDING

Image Source: YouTube

LOWER MANHATTAN CONCEPT

Credit Rebuild by Design BIG Team

Credit Rebuild by Design BIG Team

THE BIG U
PHASE 1: EAST SIDE COASTAL RESILIENCY

NYC Mayor's Office of Recovery and Resiliency

NYC DDC Department of Design and Construction

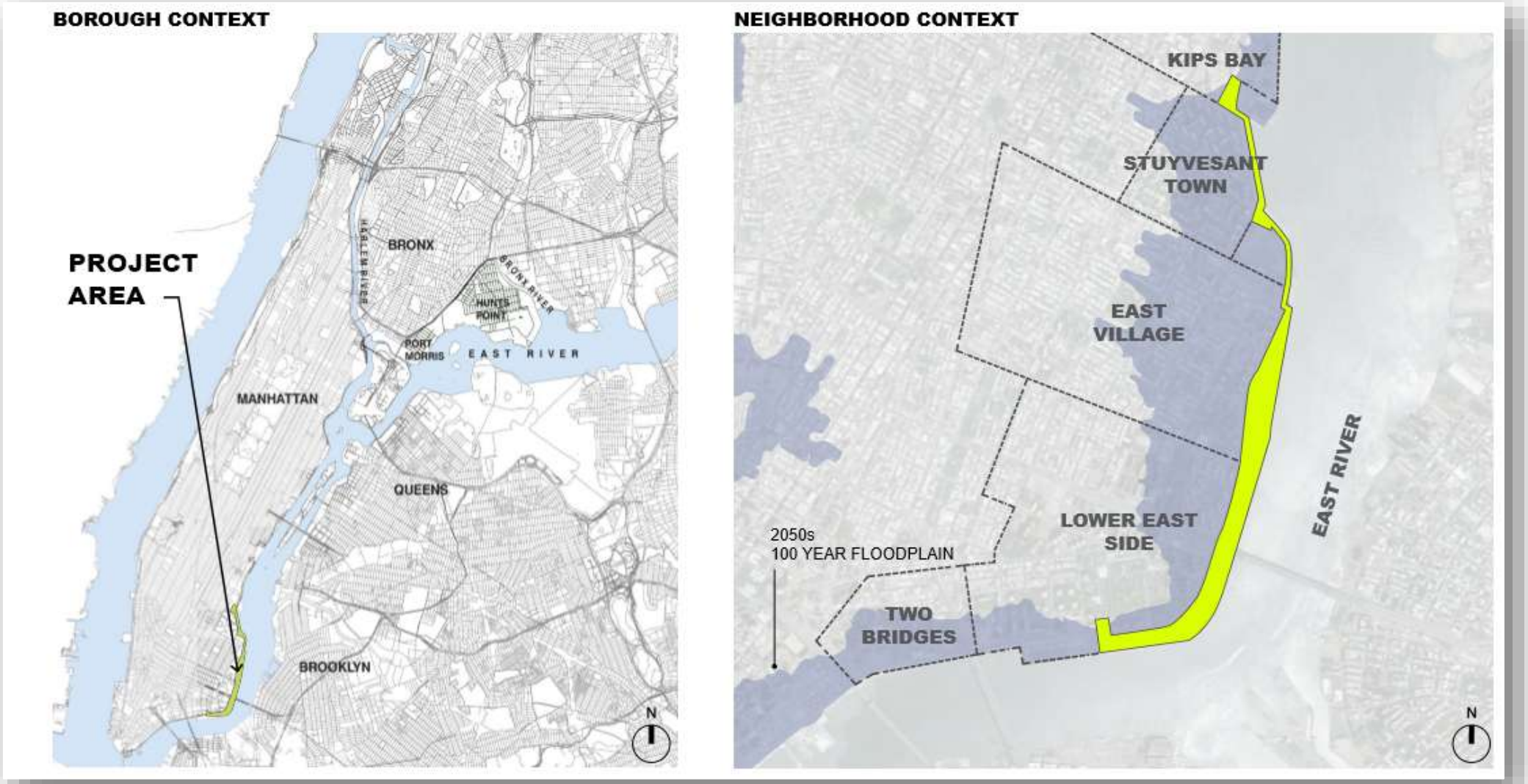
NYC Parks

NEW YORK CITY DOT

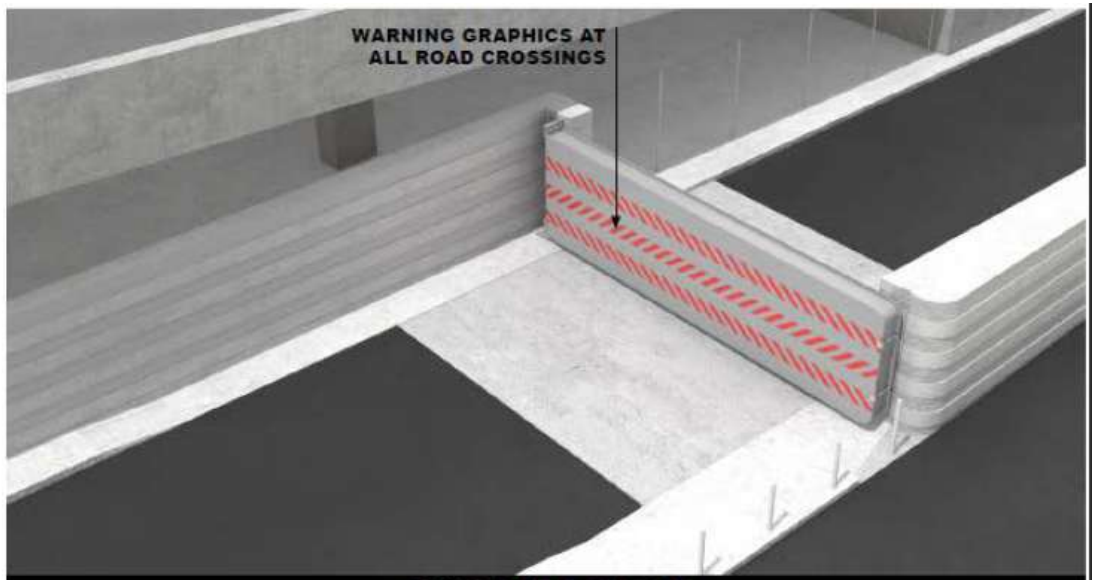
NYC Environmental Protection

EAST SIDE COASTAL RESILIENCE PROJECT

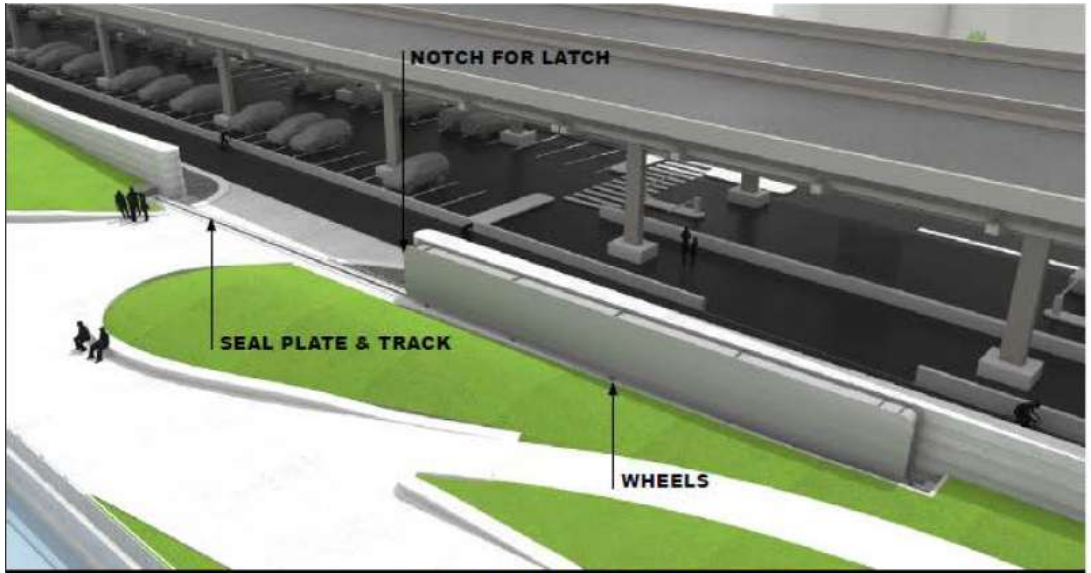
SITE STRATEGY LOCATIONS



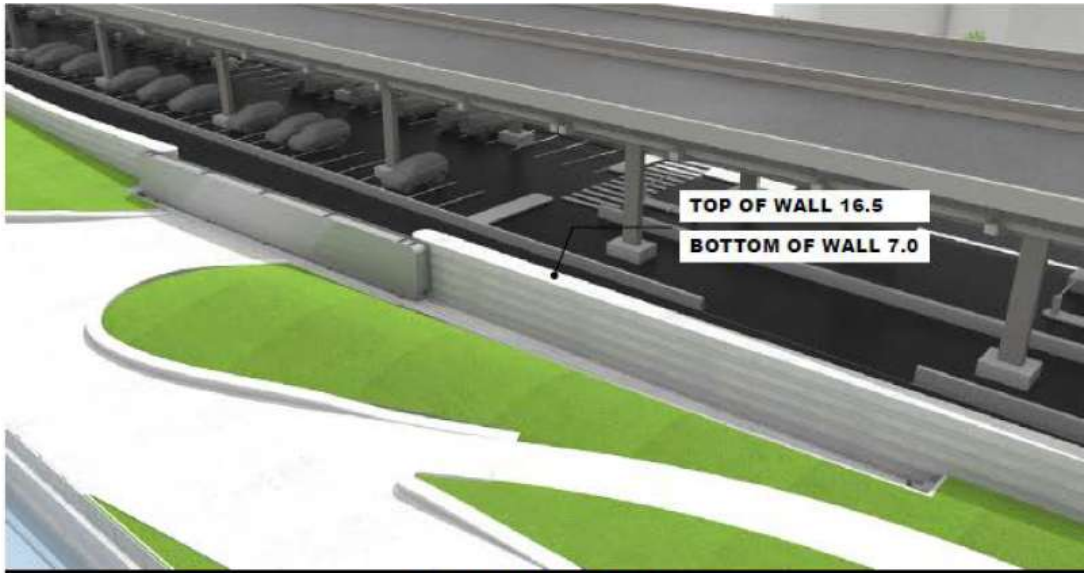
SWING GATE - OPEN



SWING GATE - CLOSED

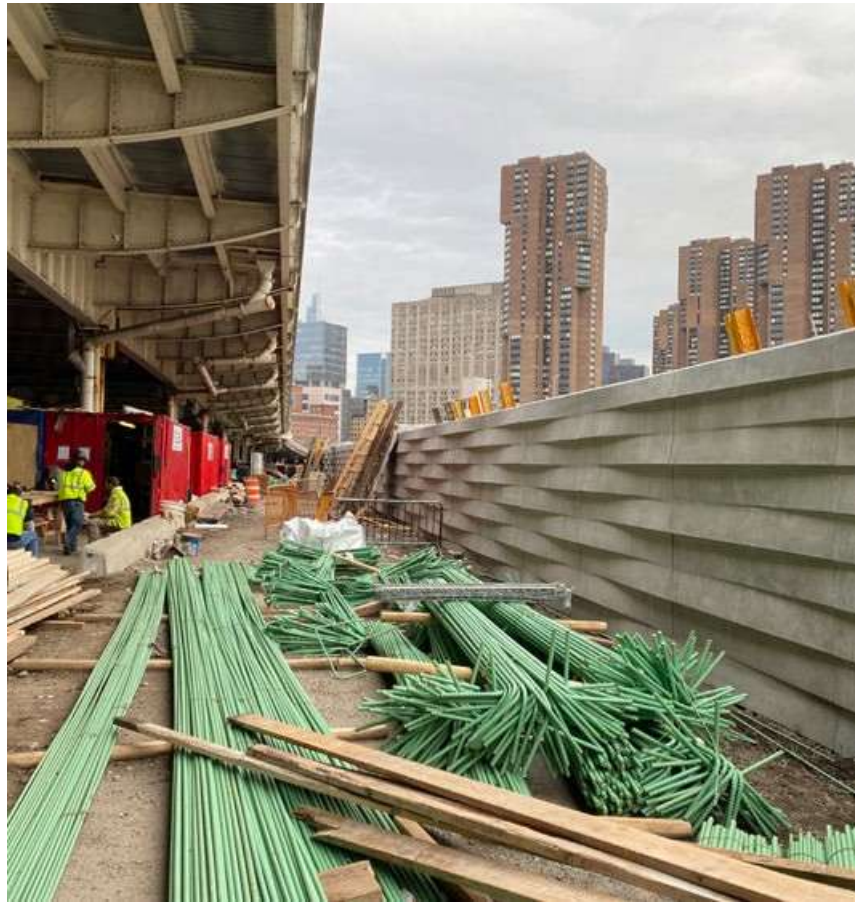


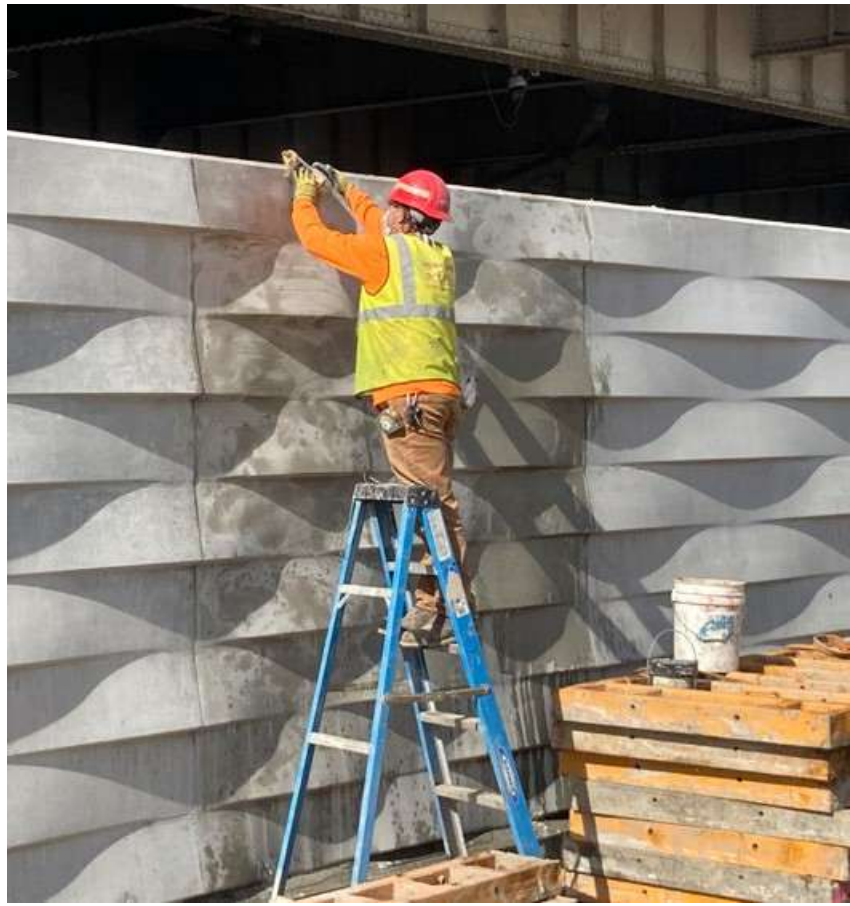
ROLLER GATE - OPEN



ROLLER GATE - CLOSED


WORK SAFE
PCC





- Flood walls typically supported by deep foundations.
- Foundations were designed for scalability: Wall stem can be raised 2 feet for future adaptability.
- Epoxy coated reinforcement for enhancing the design life.
- Formliners used to provide aesthetic wall finish.

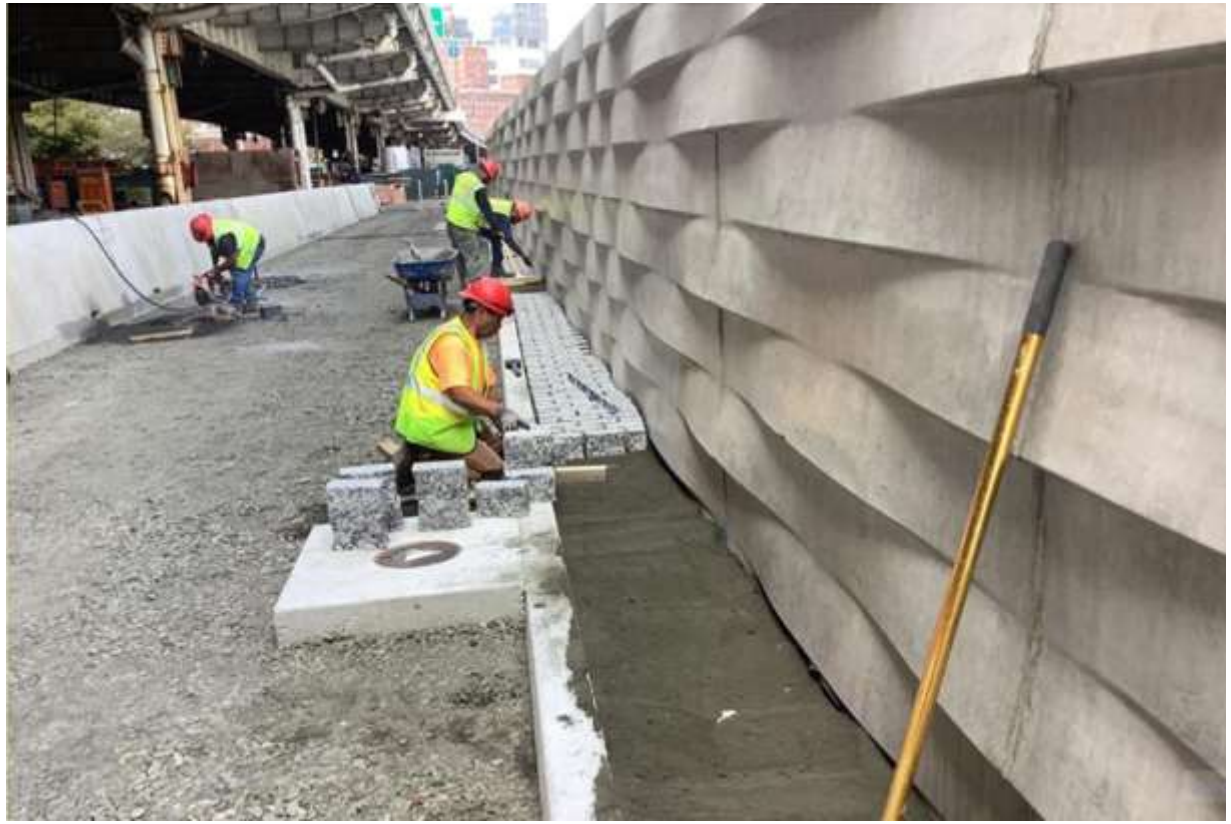
ESCR construction (photo by Dean Moses)

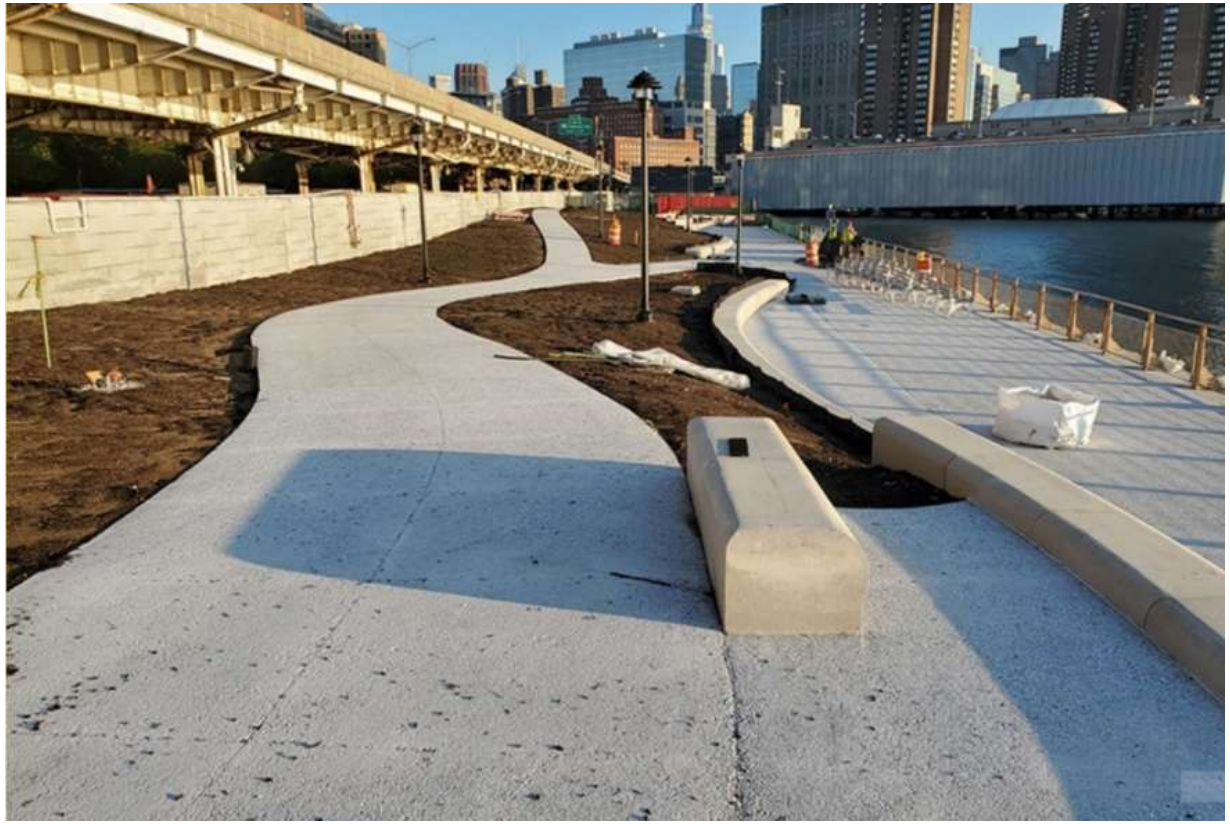
Typical Swing Gate

- Hinge-bolts were standardized in size and material type.
- Provided easily operable mechanical cranks for adjusting the bottom seal.
- Designed for 2ft of Sea Level Rise

INSTALLATION OF NORTHERN CLOSURE GATE

WALL ALIGNMENT AND NEW PARK AT EAST 23RD STREET

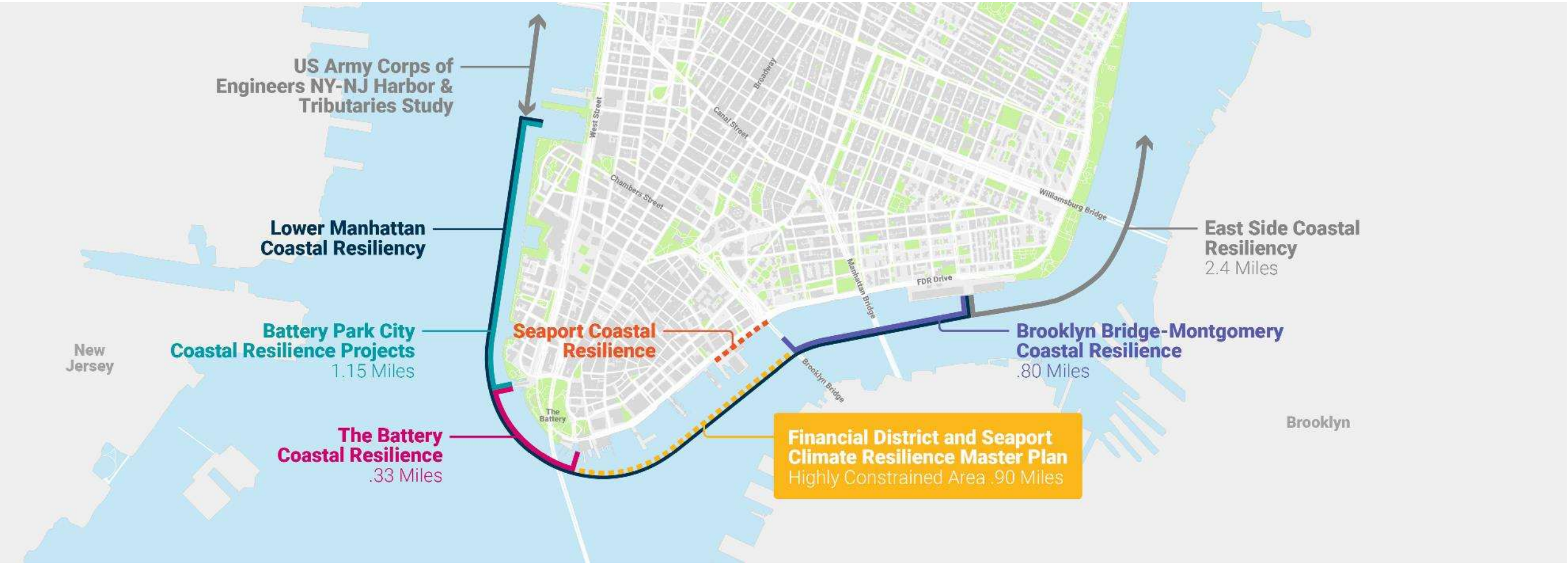




FiDi and Seaport

Climate Resilience Plan

Through Lower Manhattan Coastal Resiliency efforts, over $1.7B of capital investments in climate adaptation projects have been committed. The Financial District and Seaport Climate Resilience Master Plan will fill a missing link in comprehensive flood defense infrastructure.



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Lessons Learned:

Navigating Complex Infrastructure:

Worked around dense underground utilities, transportation systems, and critical infrastructure, requiring careful coordination to design resilient flood protection without disrupting essential city operations.

Extending the Shoreline:

Faced with limited space on-land in which to site flood protection, we balanced engineering feasibility, maritime navigation, constructability, and regulatory considerations to develop an integrated design approach.

Steering Ecological Assessments through ARAC:

Established the Aquatic Resources Advisory Committee (ARAC) to guide biological and habitat sampling, ensuring ecological impacts were understood and incorporated into environmentally sensitive design solutions.

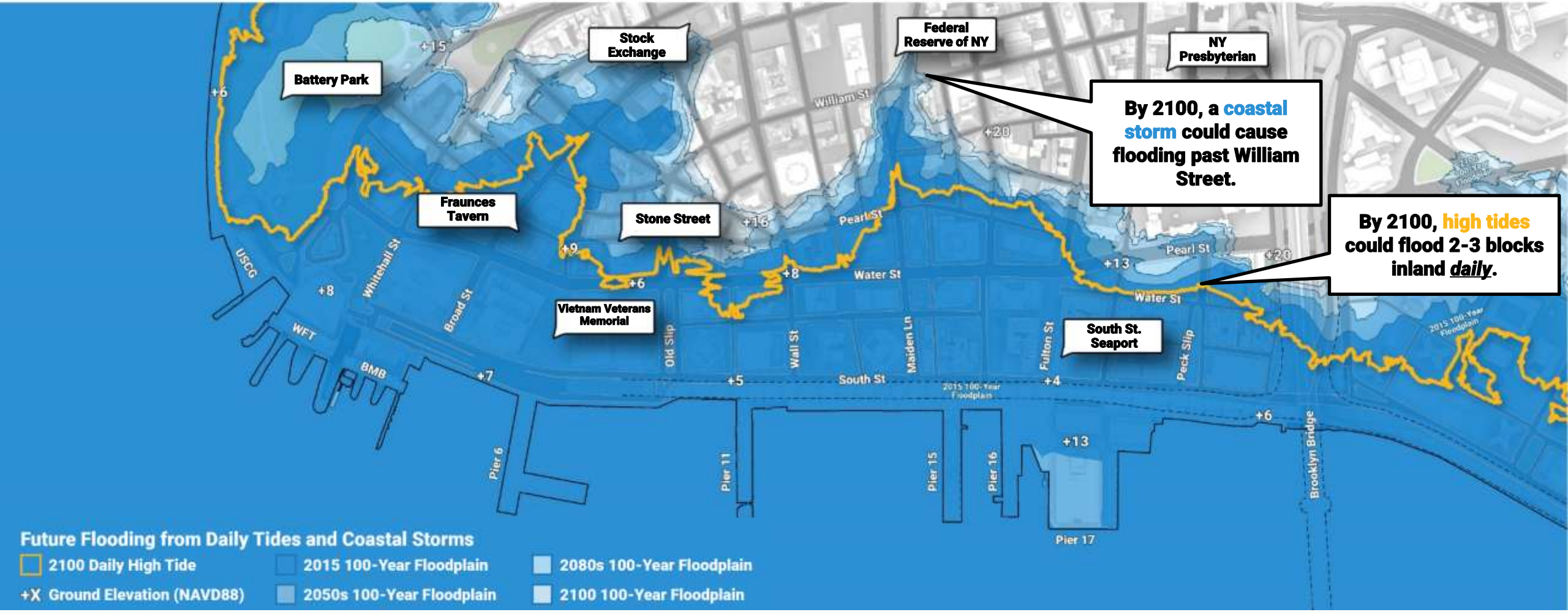
Hurricane Sandy – October 2012 – Battery Park Underpass

Sunny Day Conditions

Rainfall Event – Sept 2023 – FDR Drive in Manhattan near the Williamsburg Bridge

Highly-Urban Area with Numerous Shoreline Uses – Space-limited

The Master Plan will protect the Financial District & Seaport from two types of flood hazards – daily tidal flooding and coastal storms.



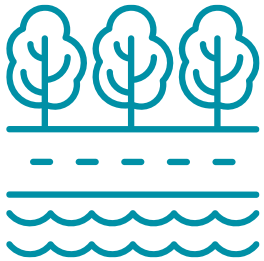
NYC EDC

NYC Mayor's Office of Climate & Environmental Justice

The master plan aimed to establish a resilience strategy for Lower Manhattan, designed to achieve the following goals:

Protect Lower Manhattan from daily tidal flooding and coastal storms

Integrate our climate resilience infrastructure into the city



Enhance the public waterfront experience

Ingredients

Flood Defense

Stormwater Management

+

Resilient Maritime Infrastructure

Access and Circulation

Energy & Sustainability

+

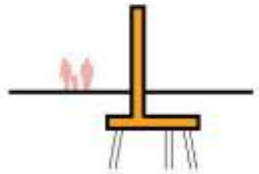
Existing Public Destinations

Multi-level Waterfront Experiences

New Community Amenities

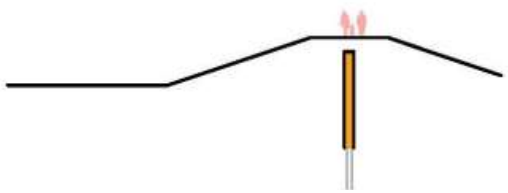
ARCADIS

Siting Coastal Defense Infrastructure



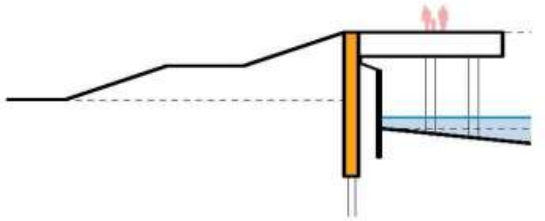
Floodwall

Dimensions: 10-15 feet foundation width; approximately 18-20 feet clearance to construct. 15 feet on each side of the floodwall is recommended for access, maintenance & inspections, with exceptions for short stretches.



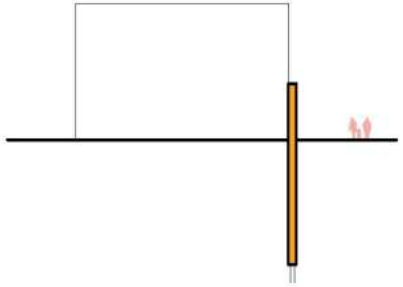
Buried Floodwall

Dimensions: Approximately 50 feet width based on average shoreline elevation (10-foot crown [top on levee] with 3:1 (H:V) slopes recommended). 15 feet on each side of the floodwall is recommended for access, maintenance & inspections, with exceptions for short stretches.



Bulkhead (or Caisson)

Dimensions: Approximately 35 feet width when including sheet pile at water's edge and anchors and tiebacks to stabilize the structure. Recommend maintaining access across the whole tieback system and with option for visual inspection and maintenance from waterside.



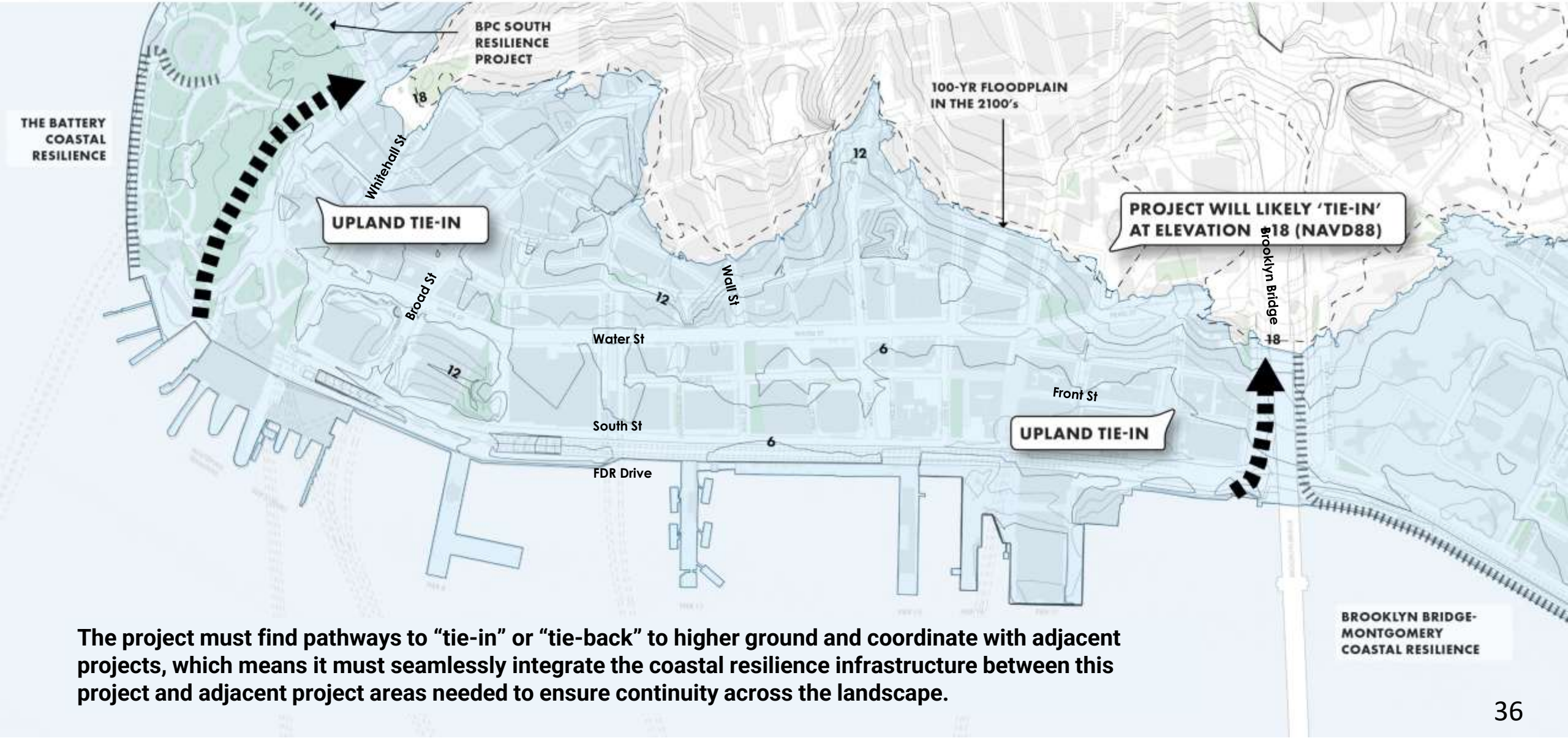
Integrated with Buildings / Infrastructure

Dimensions: assumes either floodwall or buried floodwall type system. Challenges with maintaining 15 feet on each side for maintenance, but access on at least one side (15 feet) would be required.

The Project Area is not conducive to these traditional coastal defense infrastructure solutions due to both above and below ground infrastructure conflicts and the need to provide access to the waterfront.

ARCADIS

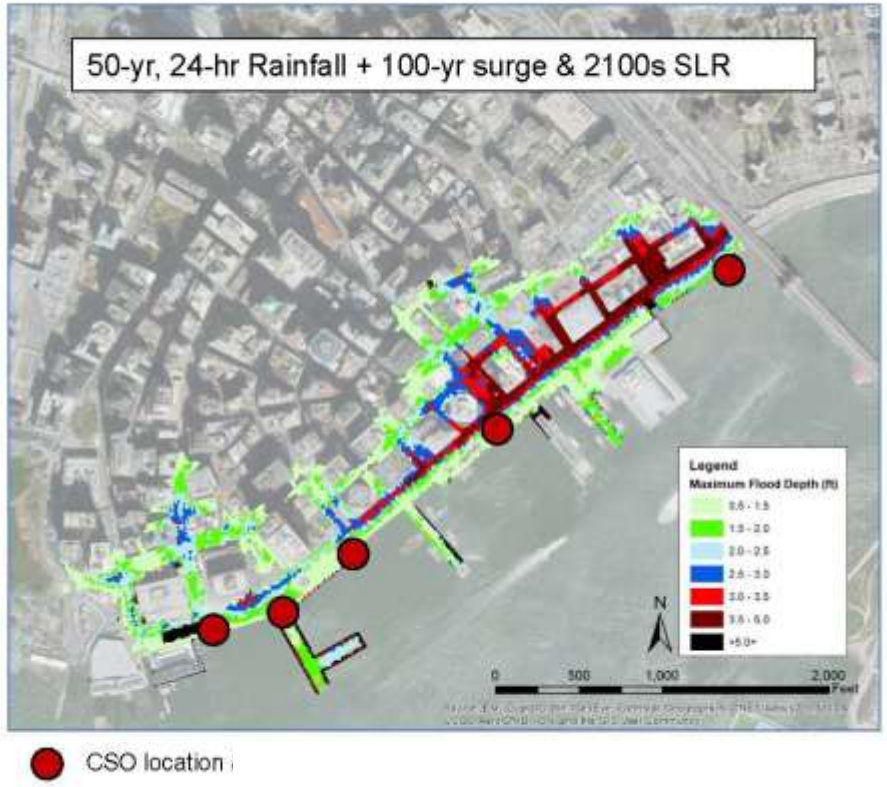
Tie-Ins to Higher Ground

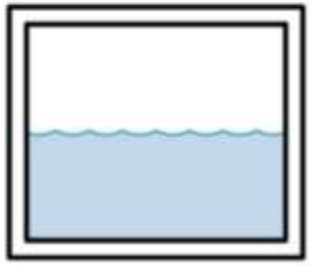


The project must find pathways to "tie-in" or "tie-back" to higher ground and coordinate with adjacent projects, which means it must seamlessly integrate the coastal resilience infrastructure between this project and adjacent project areas needed to ensure continuity across the landscape.

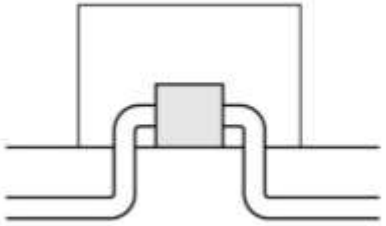
Drainage

Large scale drainage infrastructure will be required for our flood protection system to work. This will likely include a combination of pumping and storage to manage stormwater volumes.





Storage



Pump Station

Additional study is underway to optimize the use of both pumps and storage features, as well as site drainage infrastructure.

Water to be Managed:

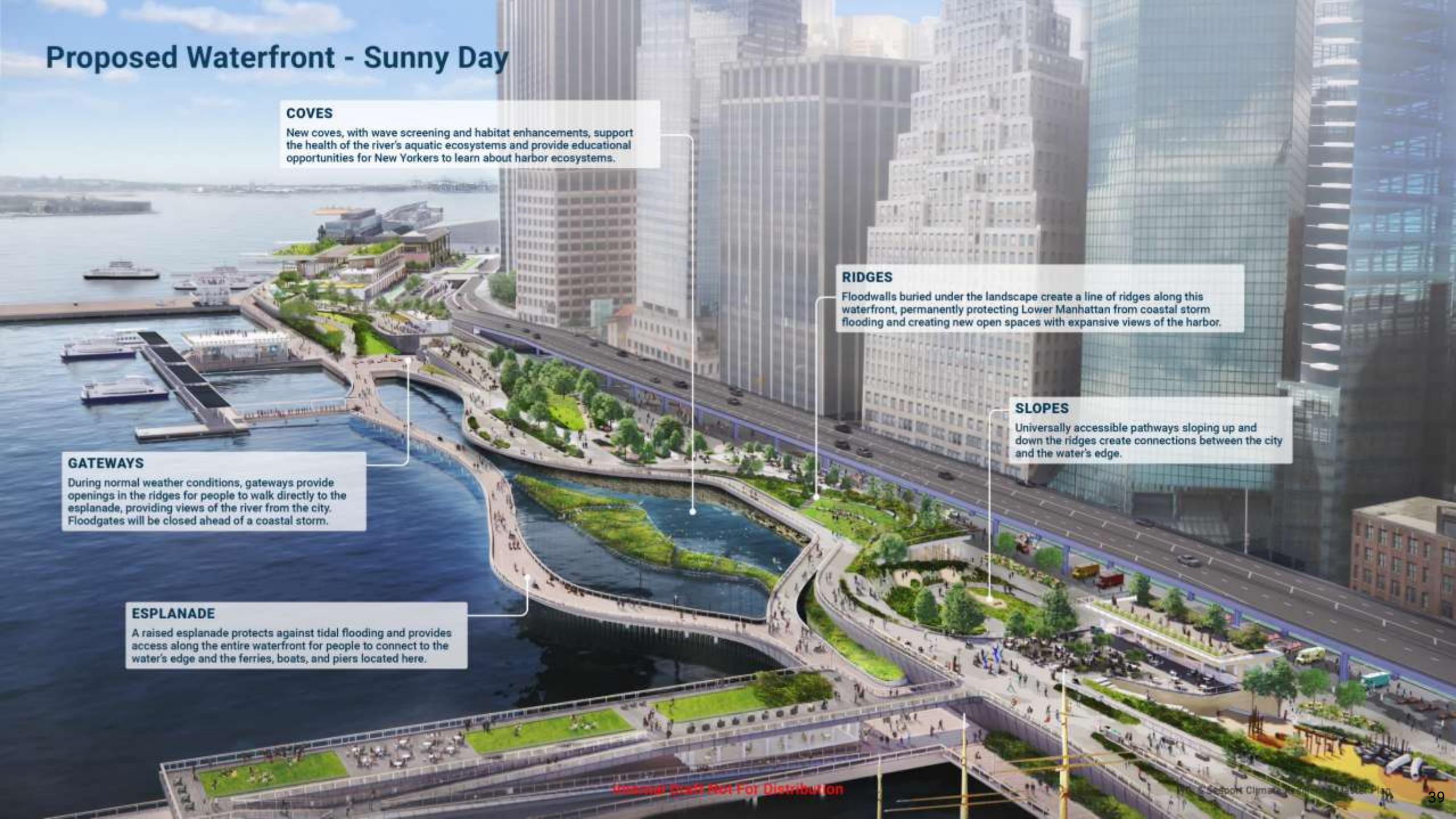
- 47 MG of water must be managed across the study area across the six CSO outfall locations (50-year, 24-hour rainfall + 100-year surge and 2100s SLR)

Drainage Infrastructure Options

- A pump station footprint may vary in size from 15,000 SF to up to 100,000 SF (a full city block) and is largely above ground
- One centralized pump station or multiple smaller pump stations are being considered based on feedback and coordination with NYC DEP
- A storage tank would be sized in direct proportion to the amount of water to be stored, requiring significant above or below ground space
- There is limited space available to site the facilities that would be required

The Master Plan

Proposed Waterfront - Sunny Day



COVES

New coves, with wave screening and habitat enhancements, support the health of the river's aquatic ecosystems and provide educational opportunities for New Yorkers to learn about harbor ecosystems.

RIDGES

Floodwalls buried under the landscape create a line of ridges along this waterfront, permanently protecting Lower Manhattan from coastal storm flooding and creating new open spaces with expansive views of the harbor.

SLOPES

Universally accessible pathways sloping up and down the ridges create connections between the city and the water's edge.

GATEWAYS

During normal weather conditions, gateways provide openings in the ridges for people to walk directly to the esplanade, providing views of the river from the city. Floodgates will be closed ahead of a coastal storm.

ESPLANADE

A raised esplanade protects against tidal flooding and provides access along the entire waterfront for people to connect to the water's edge and the ferries, boats, and piers located here.

Proposed Waterfront - Storm Event

Implementation Roadmap

Implementing this project will require securing approvals, seeking multiple funding sources, and timely construction.

Regulatory

- Coordinating with key agencies through the Aquatic Resources Advisory Committee
- Estimating potential in-water footprint and mitigation needs

Construction

- Development of technically feasible and constructable project design
- Estimating project timeline and development of phasing strategy

Funding and Financing

- Exploring wide range of new and existing funding sources
- Identification of implementation pathways for prioritized sources
- Ongoing delivery coordination with the U.S. Army Corps of Engineers

ARCADIS

Turner de Cruz
a joint venture

North/West Battery Park City Resiliency Project

US Army Corps New England District Lessons Learned

April 30, 2025

A Piece of a Connected & Resilient Waterfront

TRIBECA

SEAPORT

FINANCIAL DISTRICT

NORTH/WEST BATTERY PARK CITY RESLIENCE PORJECT

SOUTH BATTERY PARK CITY RESILIENCE PROJECT

THE BATTERY COASTAL RESILIENCE
.33 MILES

THE FINANCIAL DISTRICT AND SEAPORT CLIMATE RESILIENCE MASTERPLAN
HIGHLY CONSTRAINED AREA
.90 MILE

BROOKLYN BRIDGE - MONTGOMERY COASTAL RESILIENCE
.80 MILES

EAST SIDE COASTAL RESILIENCY

ARMY CORPS OF ENGINEERS NY-NJ HARBOR AND TRIBUTARIES STUDY

NEW YORK STATE OF OPPORTUNITY | Battery Park City Authority

Turner-KRUZ ARCADIS SCAPE BIG WSP

Flood Barrier System Alignment

Future Flood Risk

NEW YORK STATE OF OPPORTUNITY | Battery Park City Authority

Turner · CRUZ ARCADIS SCAPE BIG WSP

Project Site

NEW YORK STATE OF OPPORTUNITY | Battery Park City Authority

Turner CRUZ ARCADIS SCAPE BIG WSP

Delivery Method

- Progressive Design Build
  - Client: Battery Park City Authority (NY State Authority)
  - Turner EE Cruz JV prime contractor
  - Arcadis – lead designer
- Phase 1 Design / Phase 2 Construction
- Guaranteed Maximum Price (GMP) will be at 90% design
- Design kick-off fall of 2022
- Currently in the 90% Design Phase
- Environmental approvals expected summer 2025
- GMP Fall of 2025
- Construction:
  - Early / Prep Work Late Fall 2025
  - Main Project Winter 2026

Project Team

CLIENT TEAM:

CLIENT:

NEW YORK STATE OF OPPORTUNITY. | Battery Park City Authority

ADVISORS:

AECOM

one architecture

CONSULTANTS:

AKRF

EIS CONSULTANT

DESIGN-BUILD TEAM:

PRIMARY CONTRACT:

Turner | de la CRUZ

CONSTRUCTION

CONSULTANT:

ARCADIS

CIVIL / STRUCTURAL ENGINEERING

SUB-CONSULTANTS:

BIG

URBAN DESIGN

SCAPE

LANDSCAPE ARCHITECTURE

wsp

GEOTECHNICAL

Delivery Method – Lessons Learned

- From Design Perspective
- Schedule Driven
  - Good for fast track
  - Some rework has been needed due to late stakeholder input
  - Keeping stakeholders / agencies “on schedule” is challenging
- Owner was not sure what they wanted – PDB was the right choice
- Owner retained environmental approvals – might not be the most efficient split of responsibilities
- Shared responsibility (owner / contractor / designer) to manage costs

Lessons Learned – Urban Integration

- Stakeholder Input will be mixed
- Need for flood protection will be questioned
- Desire to maintain everything as is
- Invisible, Inexpensive, Instant solutions are preferred (☺)

South Cove | View of Lower Ramp

Existing

+ 9.50'

+ 5.75'

+ 7.00'

South Cove | View of Lower Ramp

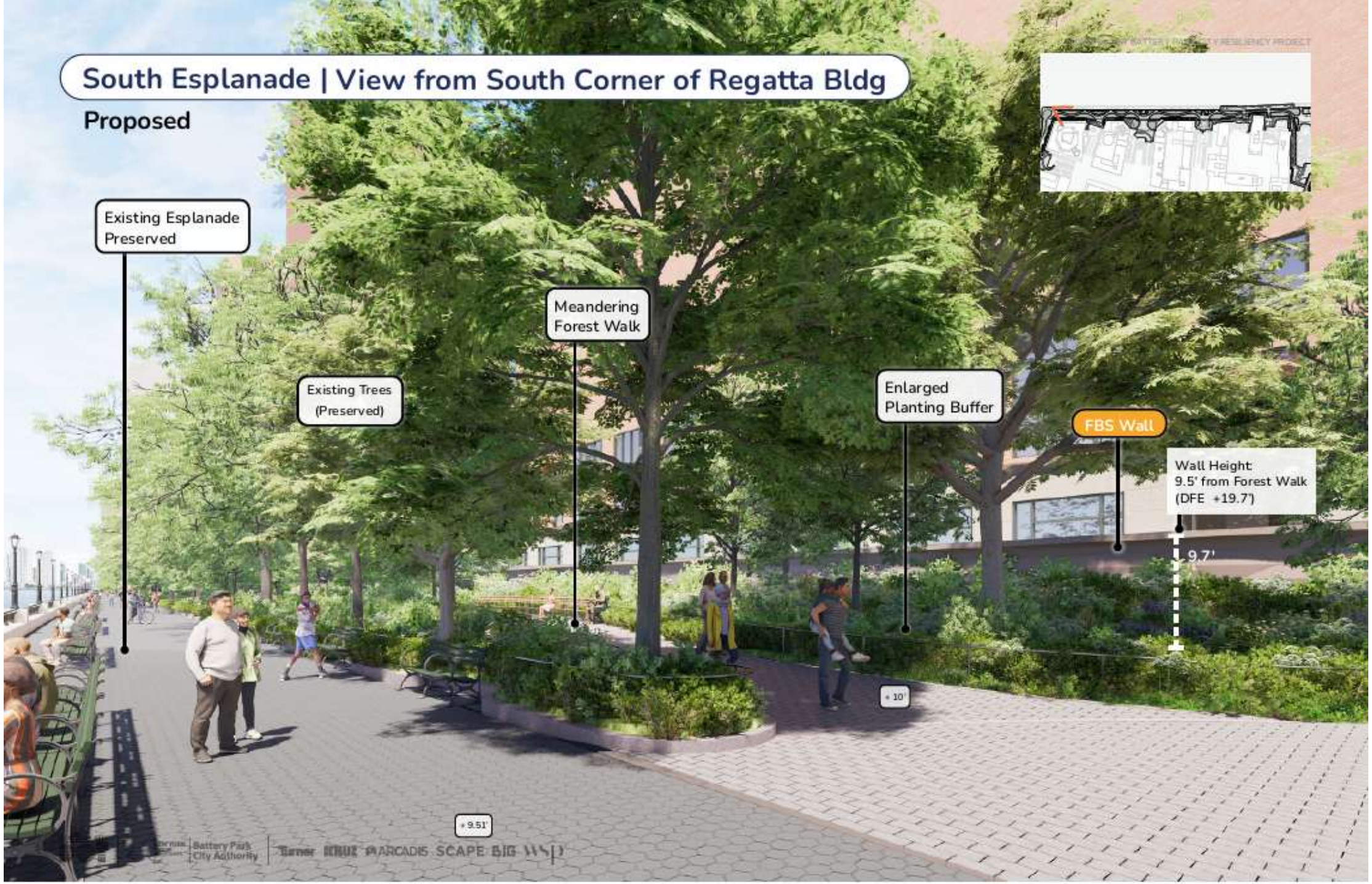
Proposed

South Esplanade | View from South Corner of Regatta Bldg

Existing

+ 9.51'

Battery Park City Authority | Turner | KRUZ | ARCADIS | SCAPE | BIG | WSP


South Esplanade | View from South Corner of Regatta Bldg
Proposed
Existing Esplanade Preserved
Existing Trees (Preserved)
Meandering Forest Walk
Enlarged Planting Buffer
FBS Wall
Wall Height
9.5' from Forest Walk
(DFE +19.7')
9.7'
+ 10'
+ 9.51'

Waterfront Plaza | View toward Wintergarden

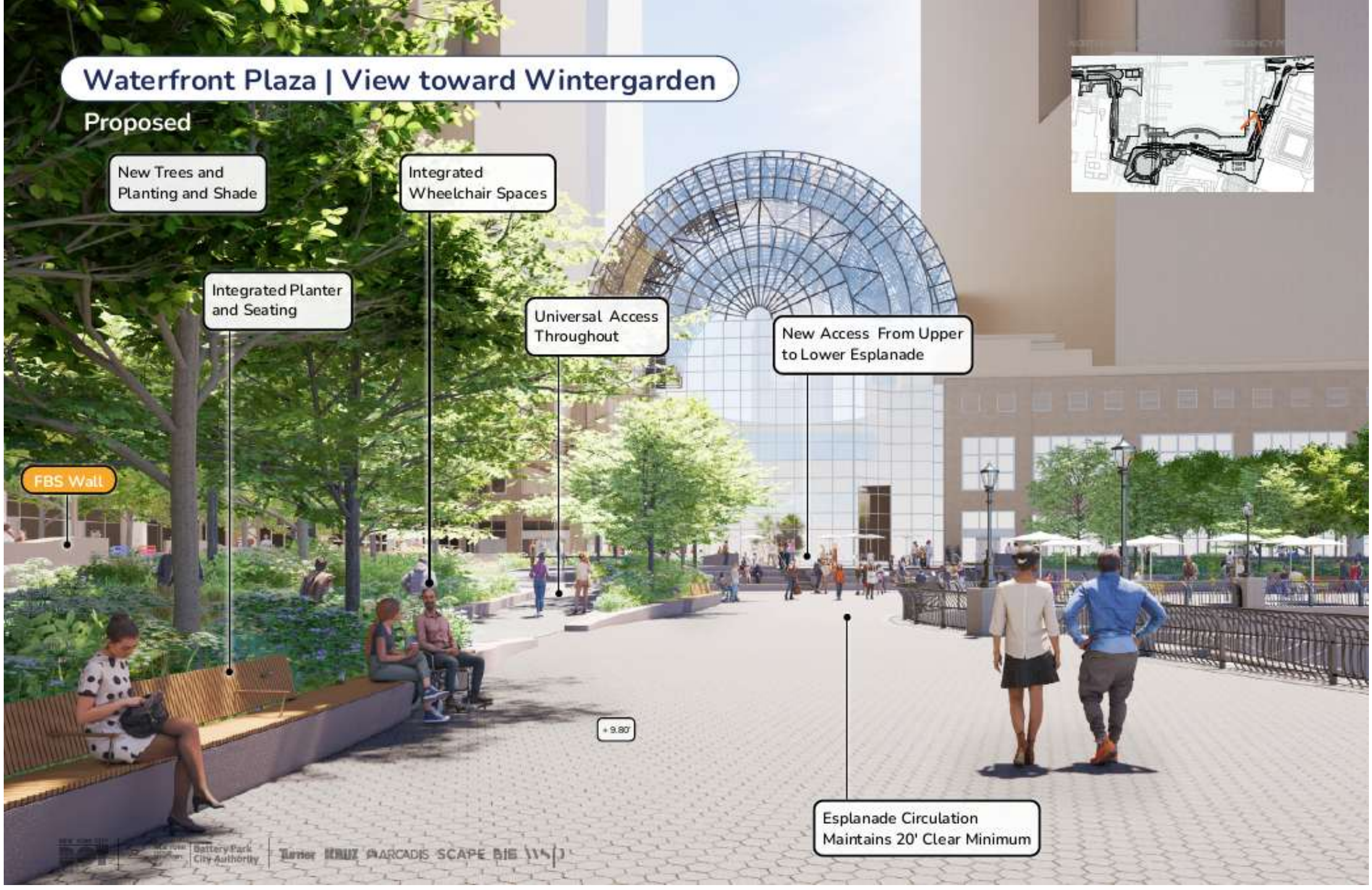
Existing

+ 9.80'

Battery Park City Authority | Turner | KRUZ | ARCADIS | SCAPE | BIG

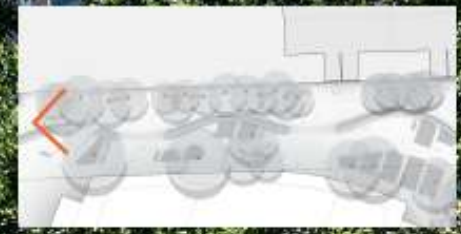
Waterfront Plaza | View toward Wintergarden

Proposed



Esplanade and Ferry Terminal | View to North

Existing

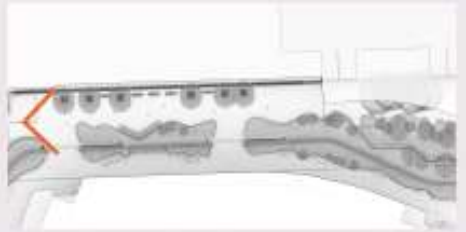


Wall height 4.5' from esplanade (el. +14')

+9.50'

Esplanade and Ferry Terminal | View to North

Proposed



Custom Lounge Seating

FBS Wall

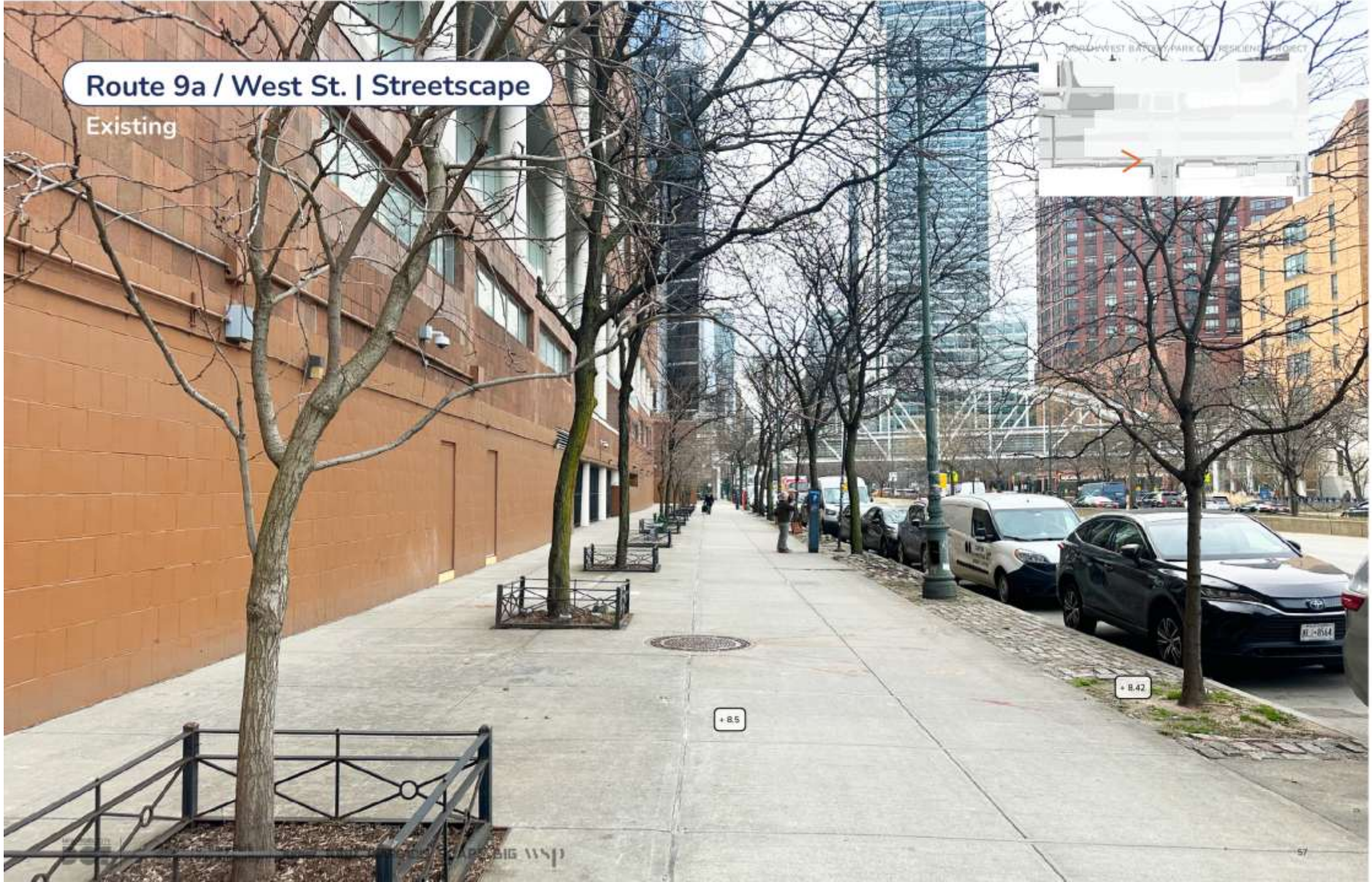
Wall height 4' from esplanade (DFE +16.5')

+12.50'

+12.50'

Route 9a / West St. | Streetscape

Existing




Route 9a / West St. | Streetscape
Proposed (Preliminary Submittal)
FBS Wall
Top of Wall:
+18'
FBS Offset
8 Ft Off of
BMCC Facade
New BMCC
Egress Stair
Trees and Planting Along
Street Edge Provides Protected
Pedestrian Experience
NYCDOT Bench and
Companion Seating
9.5'
+ 8.5

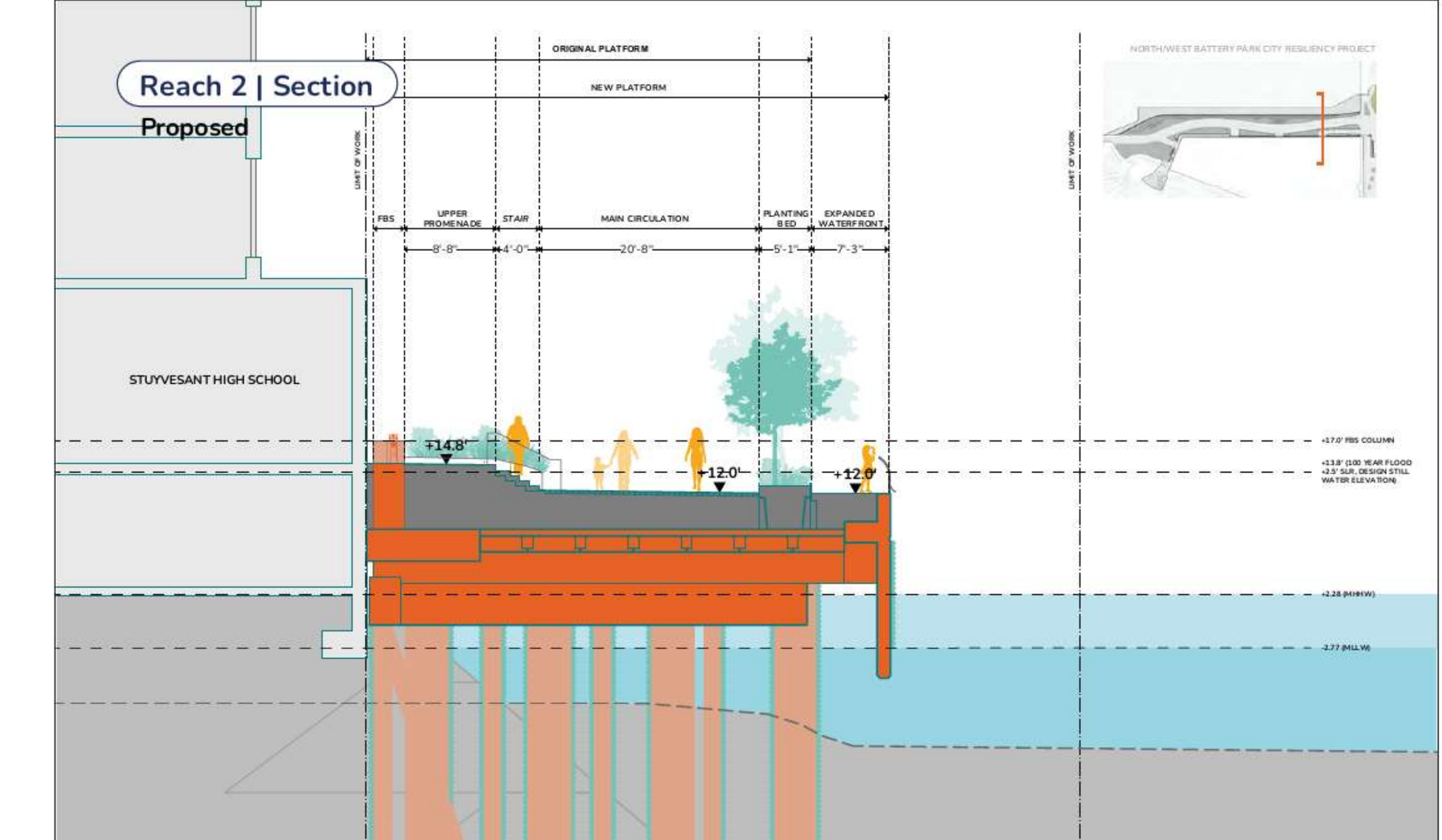
Integrated Flood Wall / Platform / Esplanade

- Replace Existing Esplanade / Waterfront Platform with an Integrated Floodwall Structure
- Looked at this for several Boston locations


N Esplanade
Basketball Court at Harrison St
Empire State Trl
9A
N Esplanade
N Esplanade
N Esplanade
Rockefeller Park Corner Side
Tom Otterness Real World Sculptures
Sculpture Park
Chambers St
Stuyvesant High School
Main Building
West St

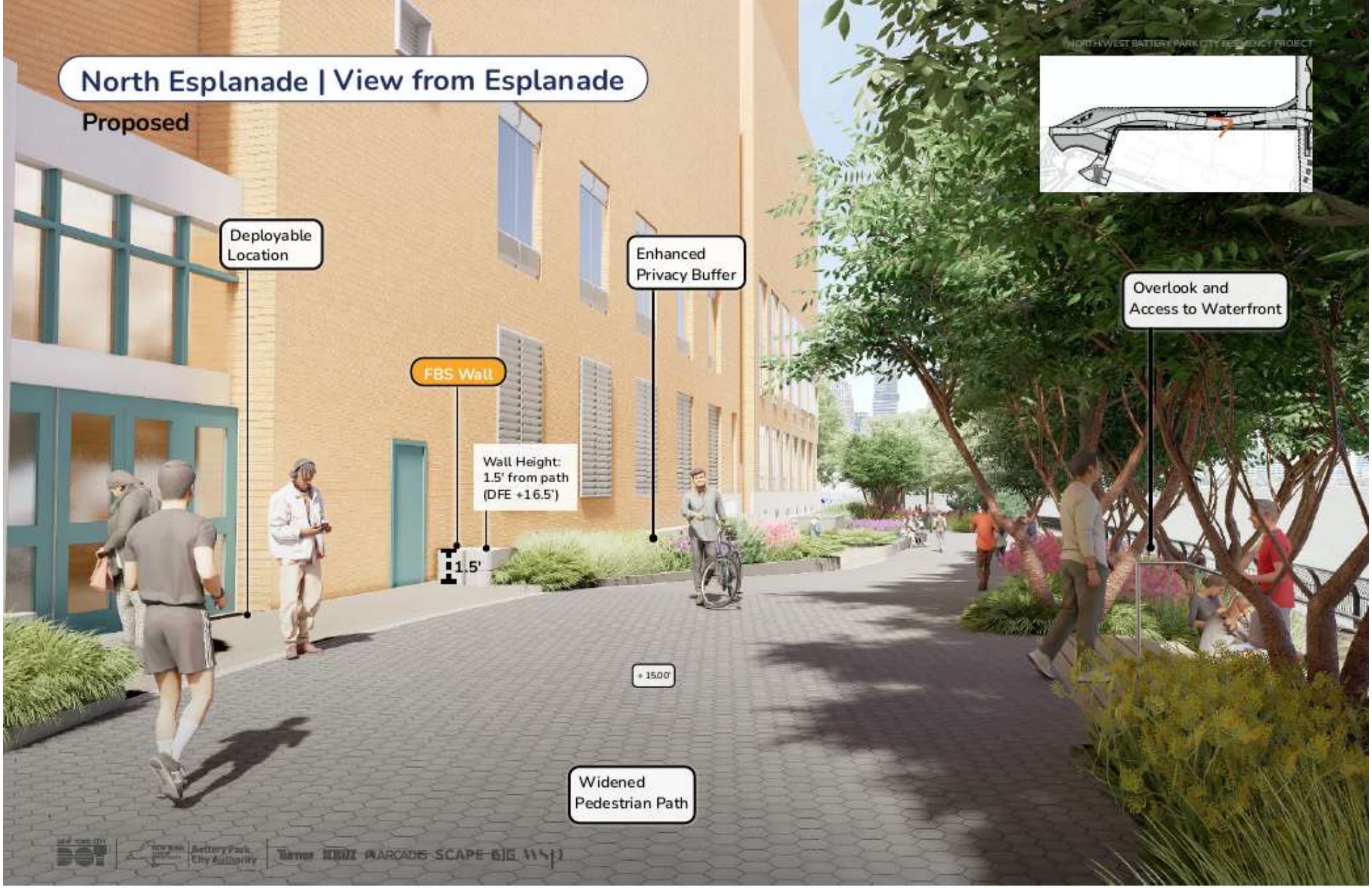
Reach 2 | Section

Proposed

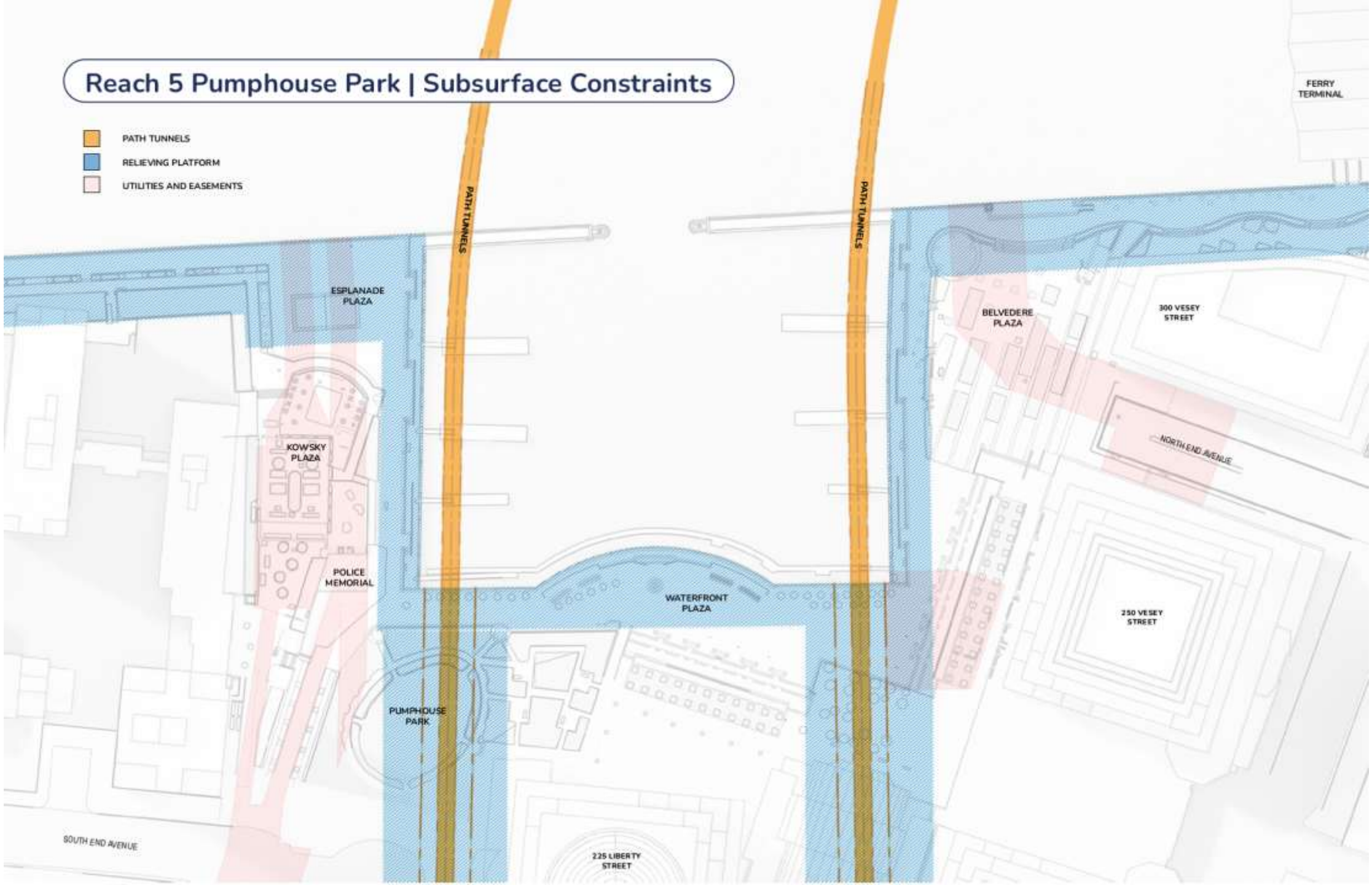


North Esplanade | View from Esplanade

Existing


North Esplanade | View from Esplanade
Proposed
NORTHWEST BATTERY PARK CITY RESILIENCY PROJECT
Deployable Location
Enhanced Privacy Buffer
Overlook and Access to Waterfront
FBS Wall
Wall Height: 1.5' from path (DFE +16.5')
1.5'
+ 15.00'
Widened Pedestrian Path

Reach 5 Pumphouse Park | Subsurface Constraints




Reach 5 | COMBINED
Move FBS 18'3.5" West
15' Offset
Current FBS alignment
NORTH/WEST BATTERY PARK CITY RESILIENCY PROJECT
TIES BACK INTO EXISTING FBS
DINNING AREA REDUCED BY 360 SQ FT
3 TREES IMPACTED
TIES BACK INTO FBS
NO TREES IMPACTED
FBS MOVED WEST 18'3.5"
CIRCULATION REDUCED 12.5'
Turner KRUZ ARCADIS SCAPE BIG

Bridging Structure Schematic