

Gowanus Canal and Newtown Creek Storm Surge Barrier Studies for the New York City Economic Development Corp.

Presented at The Association of State Floodplain Managers



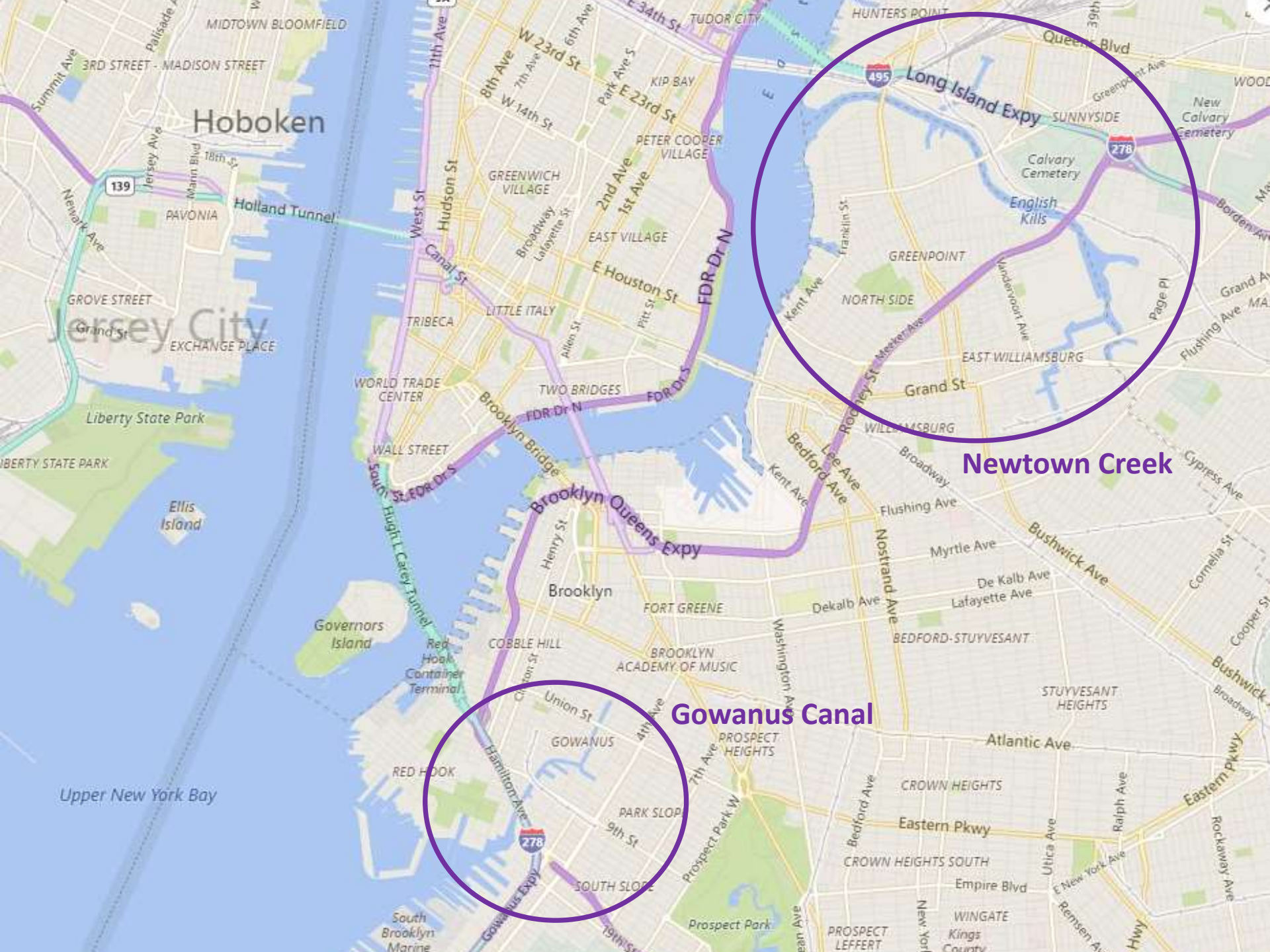
A3: Modeling a Wave of Coastal Conditions - L2:2503-A

May 1, 2017





New York



Hoboken

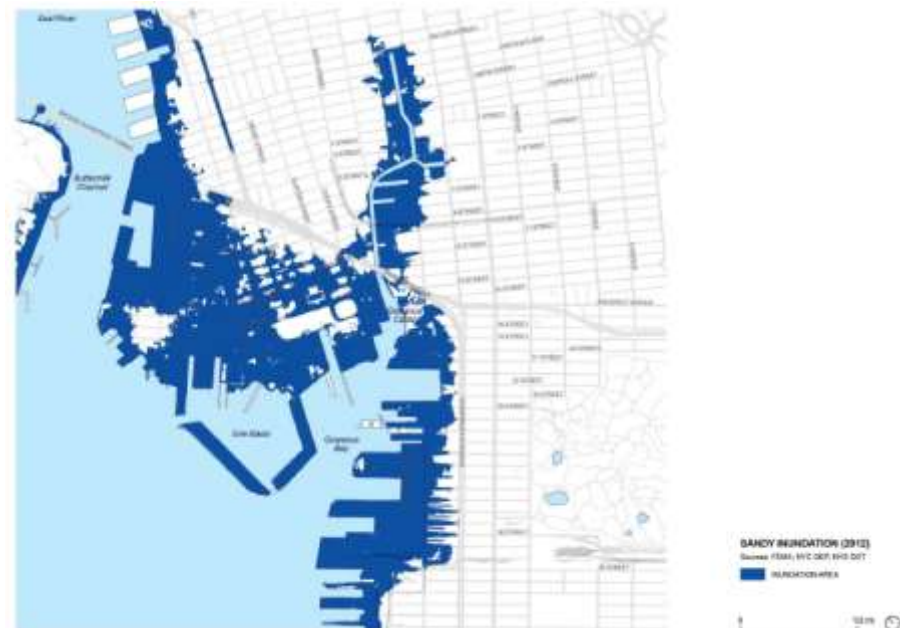
Jersey City

Newtown Creek

Gowanus Canal

Extent of Study Location Superstorm Sandy Flooding

- **Newtown Creek:**
 - Flooding as far inland as Maspeth, East Williamsburg
- **Gowanus Canal:**
 - Sunset Park, Red Hook and Gowanus inundated



Primary Project Goal

The primary goal of the study is to develop and evaluate storm risk reduction scenarios incorporating storm surge barriers.

Evaluation will include technical feasibility of the infrastructure as well as secondary impacts.

The study results should be suitable for presentation to local and federal agencies in a way that complements and informs their planning activities.

Secondary Project Goals

Enhance water quality and ecology

Increase public access to and recreational enjoyment of the waterfront

Strengthen physical connections between neighborhoods

Promote appropriate development of upland areas

The Team

CH2M

- Prime consultant; modeling lead

WXY

- Urban planning and architecture

Tetra Tech

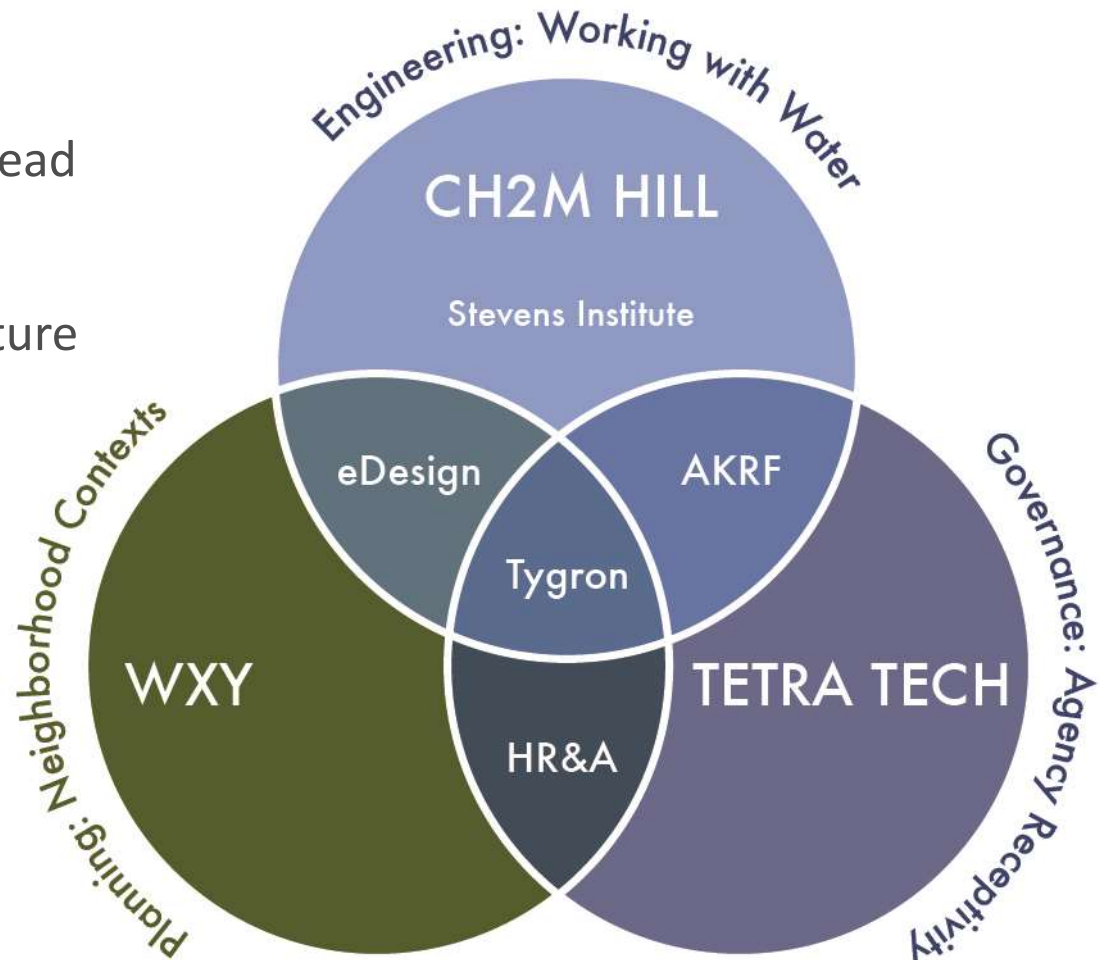
- FEMA and ACOE expertise

AKRF

- Environmental permitting

HR&A

- Economics



Evaluation Criteria

Planning

- Neighborhood Contexts

Governance

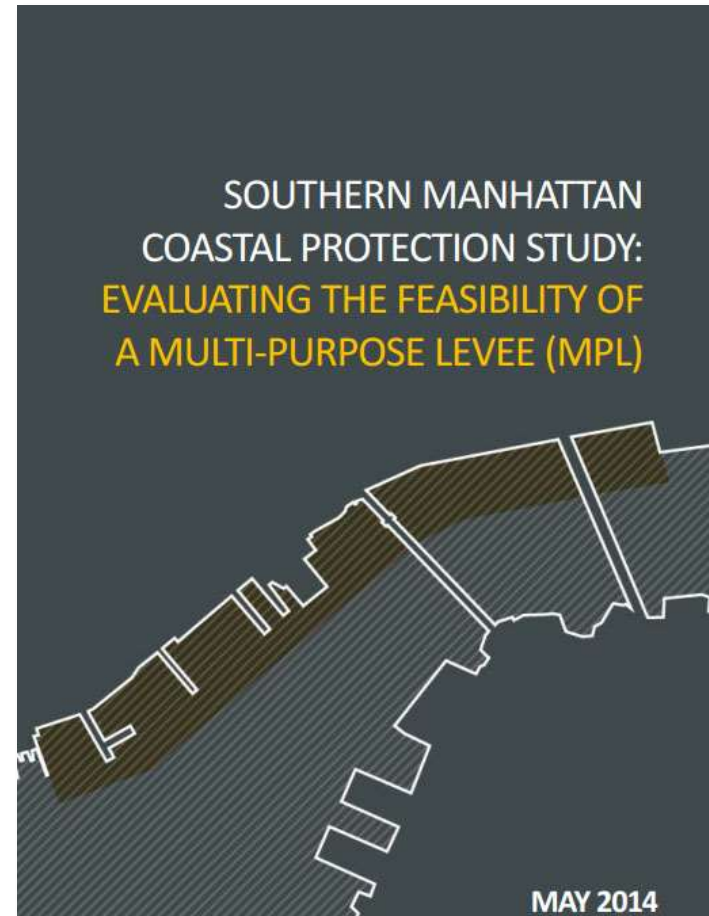
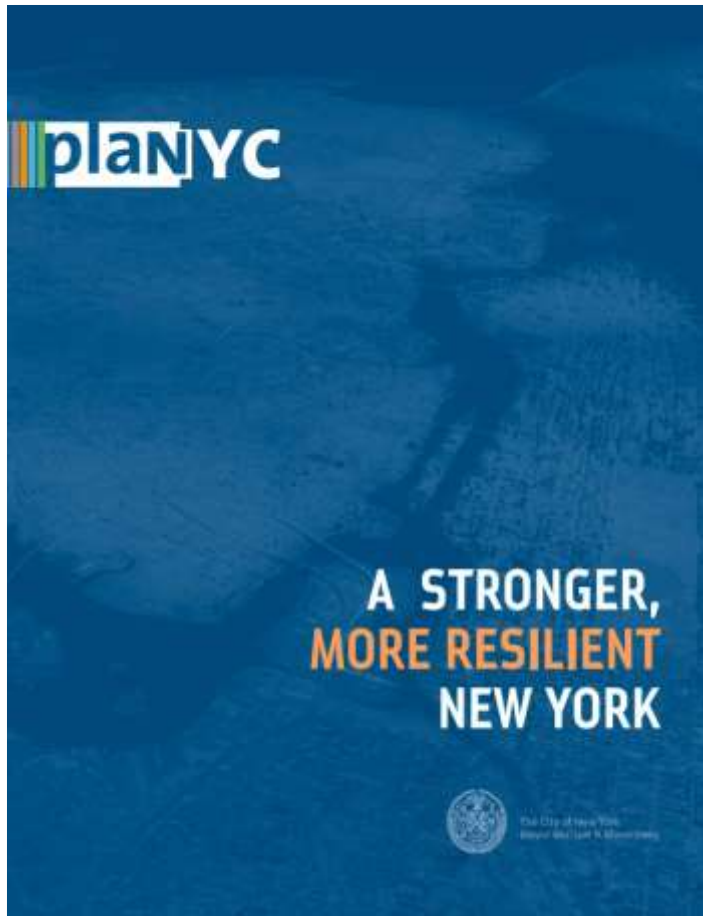
- Agency Receptivity

Engineering

- Working with Water



References



Planning Approach

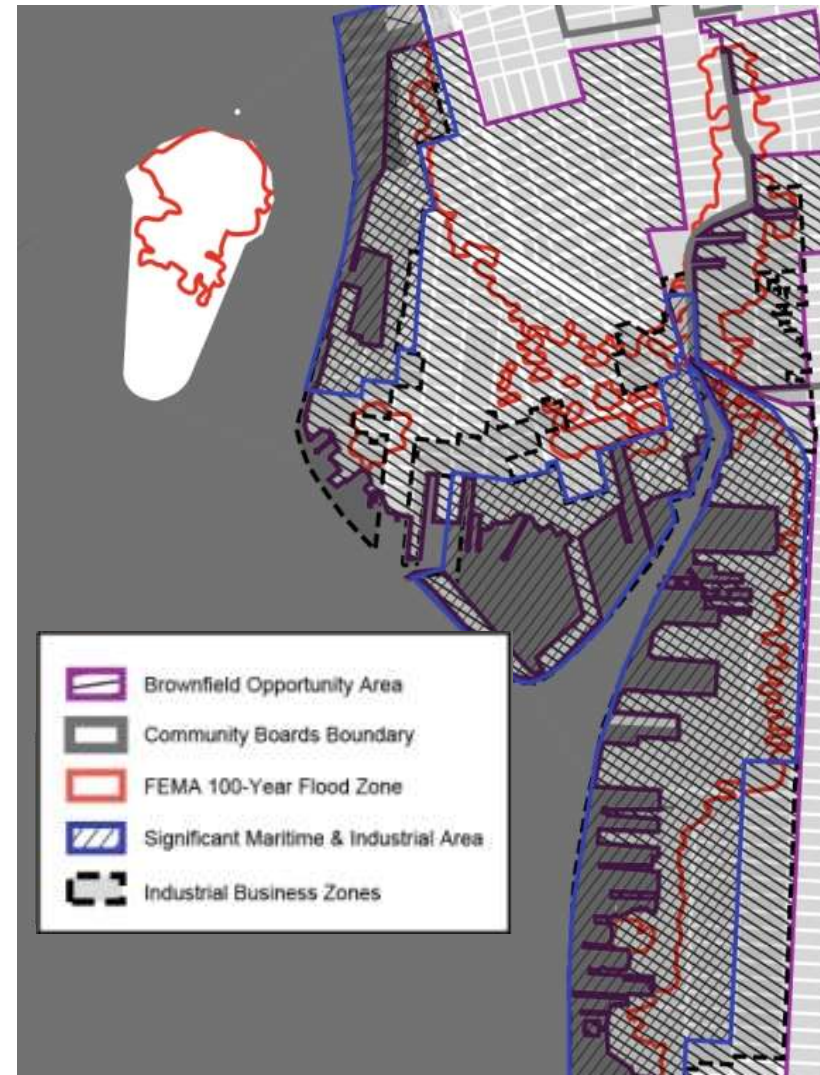


Planning Approach

Neighborhood Contexts

- History
- Potential future development
- Geography
- Ecology and habitat
- Ownership and zoning
- Community and connectivity
- Maritime operations
- IBZ, SMIA, and BOAs
- Superfund and FEMA ABFEs

...a comprehensive, holistic, and contextually-sensitive strategy to leverage investment for area-wide value generation and economic development.



Planning Approach

Governance – Agency Receptivity



...exploring the potential of partnering with a federal agency based on demonstrating a feasible and cost-effective means of risk reduction.

Planning Approach

Governance – Agency Receptivity

- Permitting, legal, and regulatory issues
- Federal programs and practice
 - USACE Project Planning
 - Reconnaissance → Feasibility
 - USACE damage and cost models
 - Levee certification

*Elliott Bay Seawall converted from
a non federal project into a
federal project*



Planning Approach

Engineering

- Engineering: Working with Water
 - Barriers
 - In-water gates and barriers
 - Upland walls and levees
 - Concept Development
 - Design and operational criteria
 - Site conditions
 - Analyses
 - Storm surge and inundation
 - Damage and damage reduction
 - Water quality and habitat improvements



...barrier and levee expertise is essential, but project success hinges on concentrating resources on planning strong, vibrant communities.

Planning Approach

Study Areas

- Limits of Study Area
 - Baseline Impacts Area
 - Such as FEMA 100-year flood zone
 - Assess baseline “without project” damages
 - Study Sub-Areas
 - Barrier locations
 - Maritime activity
 - Connectivity
 - Land uses and ownership
 - Critical facilities
 - Potential for flood risk reduction

...it will be essential to consider impacts outside the study sub-areas such as increased water levels or flood risk resulting from water diversion.

Determining the Design Elevations

Flood defenses – levees, flood walls	
100 year FEMA flood elevation	+12 ft NAVD88 (both sites)
Freeboard (required by FEMA)	3 ft
Design elevation	+15 ft NAVD88
Sea level rise allowance	2 ft
Design elevation (with SLR)	+17 ft NAVD88

Barriers – Design elevation
500 year flood elevation
Freeboard
Sea level rise allowance (USACE NACCS 3ft)

Sea level rise

NYC Panel on climate change:

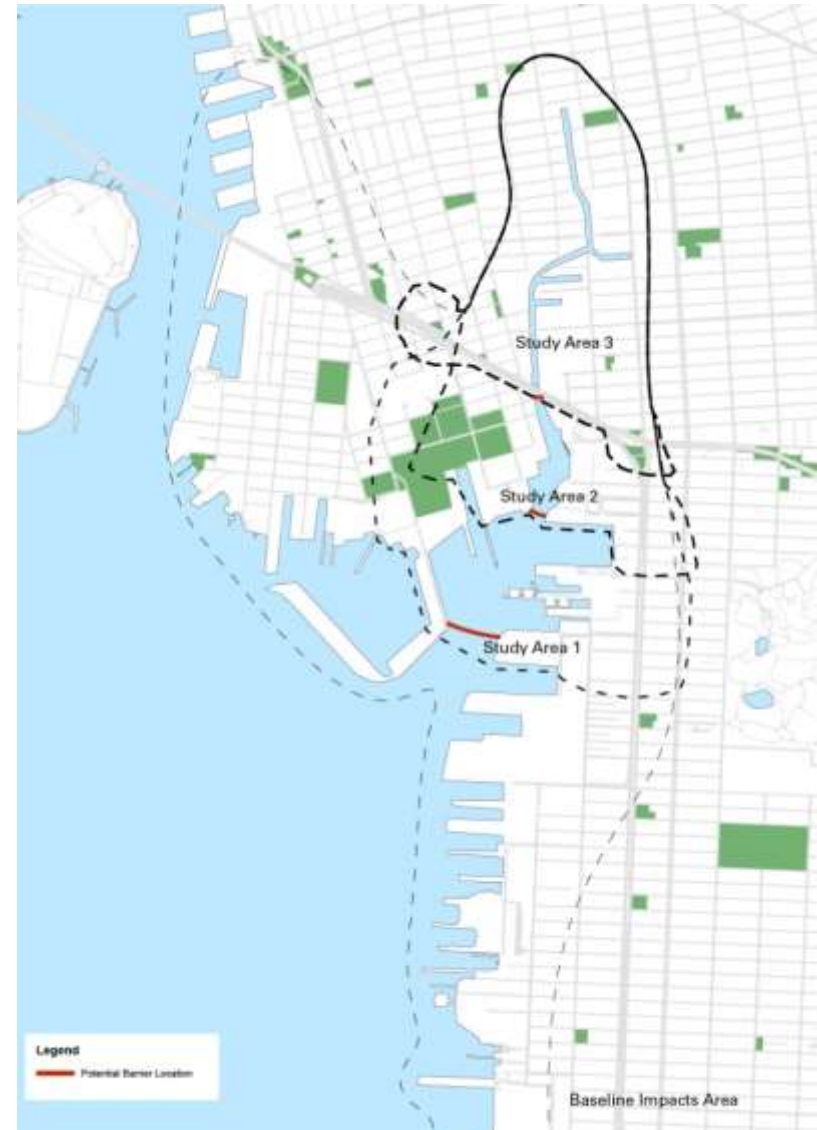
- By 2020s, mid range 4-8 in, high 11 in
- By 2050s, mid range 11-24 in, high 31 in

Design life – 100-120 years

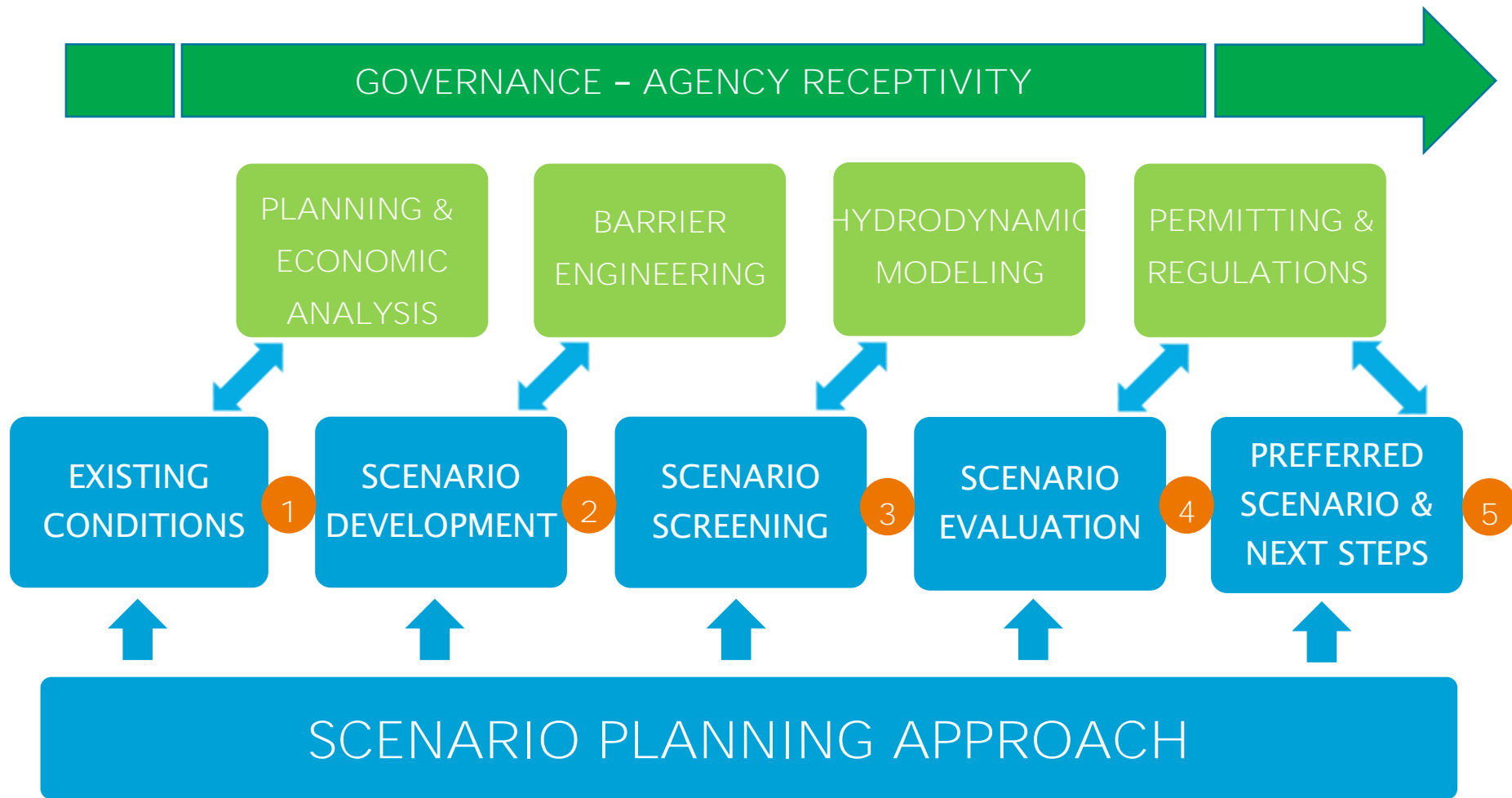
Integrated Approach

Study Areas

- Study Area 1
 - maximizes protected area
- Study Area 2
 - facilitates a tie-in with future Red Hook Integrated Flood Protection Scheme
- Study Area 3
 - minimizes barrier size



Planning Approach Methodology



● Client/stakeholder
charrette

Planning Approach

Workshops and Charrettes

SCENARIO PLANNING STEPS

1) Documentation of Existing Conditions, Study Areas, and Evaluation Criteria

2) Development of Alternative Flood Risk Reduction Scenarios

3) Initial Scenarios Evaluation and Screening

4) Detailed Evaluation of Final Flood Risk Reduction Scenarios

5) Recommendations and Implementation Strategies

PLANNING CHARRETTES

Charrette #1: Agreement on Limits of Study areas and Evaluation Criteria

Charrette #2: Option Development and Screening with Stakeholders

Charrette #3: Review of and Agreement on Options for Detailed Study

Charrette #4: Review Results of Detailed Evaluation with Stakeholders

Charrette #5: Presentation and Approval of Study Recommendations & Funding Strategies

Planning Approach

Stakeholders

- **Community boards:**
 - Newtown Creek: Brooklyn CB 1, Queens CB 2 and 5
 - Gowanus Canal; Brooklyn CB 6 and 7
- **Community groups such as tenant associations:**
 - Newtown Creek: Newtown Creek Alliance, Riverkeeper, Newtown Monitoring Committee, SWIM
 - Gowanus Canal: Friends of Brooklyn CB6, Wyckoff Gardens, Bridging Gowanus, Gowanus Canal Conservancy, Gowanus Houses
- **City, State and Federal elected officials:**
 - Newtown Creek: Congresswoman Nydia Velazquez, NYS Assemblyman Joseph Lentol, Brooklyn Borough President Eric Adams, NYC Councilmember Stephen Levin, Congresswoman Carolyn Maloney
 - Gowanus Canal: Council Member Brad Lander, Council Member Stephen Levin, Council Member Carlos Menchaca, Brooklyn Borough President Eric Adams, Congresswoman Nydia Velazquez, State Senator Velmanette Montgomery, Assemblywoman Joan Millman
- **City, State and Federal agencies:**
 - NYC: DCP, DEP, DOT, EDC, OLTPS
 - NYS: DOT, Parks, NY Rising, MTA
 - Federal: HUD Rebuild by Design, USACE, DOT, EPA, FEMA
- **Major property owners, local institutions and businesses in the study areas:**
 - Newtown Creek: Kickstarter, Con Edison, Time Warner Cable, Fresh Direct, FritoLay,
 - Gowanus Canal: GBX Gowanus Bay Terminal, South Brooklyn Marine Terminal, Gowanus Industrial Arts Complex
- **Advocacy organizations at the local, city-wide, regional and national level that focus on issues relevant to the study area, including: business, industrial, environmental, waterfront and open space groups:**
 - Newtown Creek: Greenpoint Manufacturing and Design Center, Riverkeeper, Newtown Creek Alliance, Greenpoint Waterfront Association for Parks and Planning, Newtown Monitoring Committee
 - Gowanus Canal: Pratt Center, SBIDC, Gowanus Canal CDC, Gowanus Canal Conservancy

Detailed Approach

Existing Conditions – Gowanus Canal



Flood Zones
(2050)

Detailed Approach

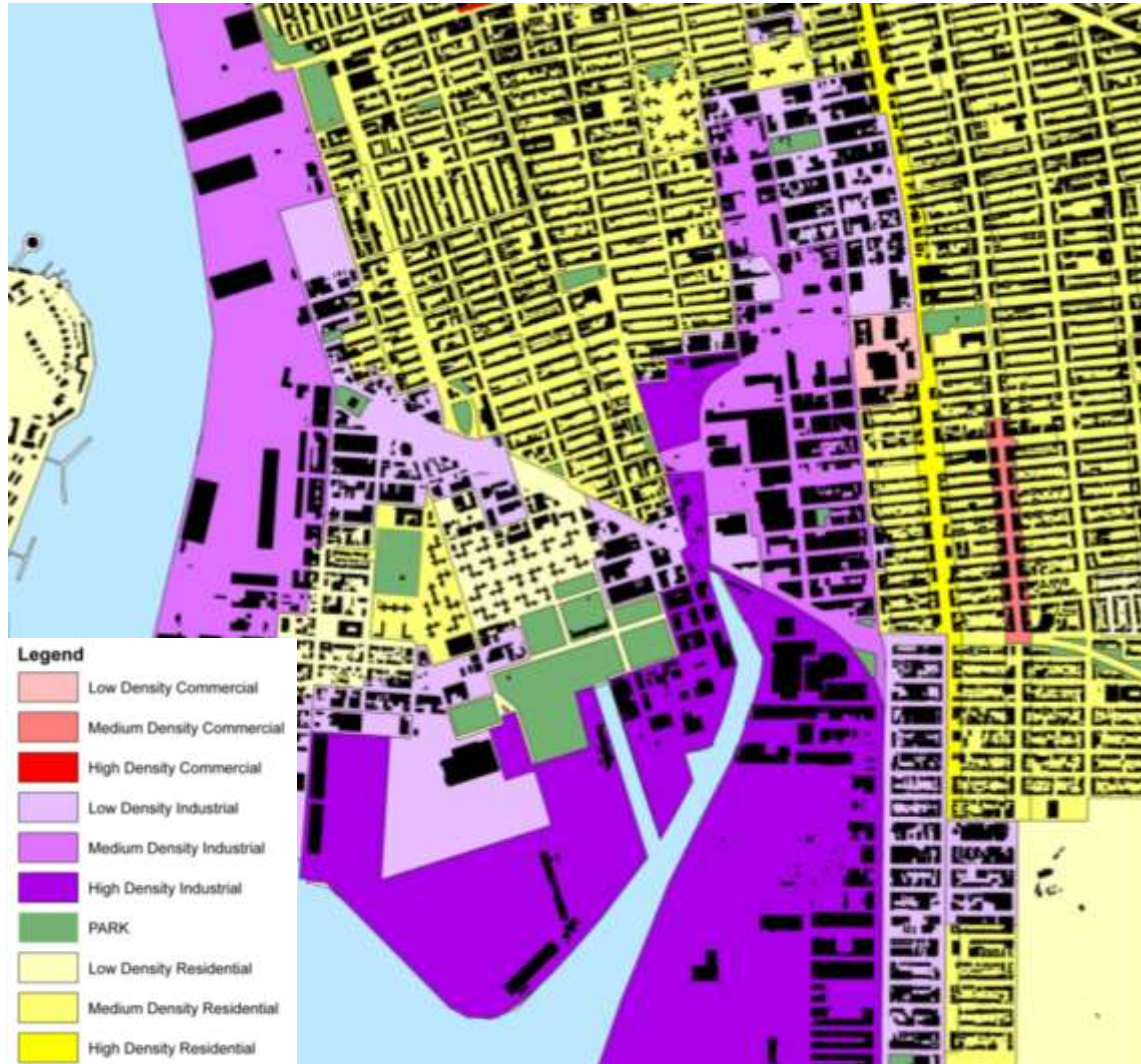
Existing Conditions – Gowanus Canal



Ownership

Detailed Approach

Existing Conditions – Gowanus Canal



Zoning

Detailed Approach

Existing Conditions – Newtown Creek



Flood Zones
(2050)

Detailed Approach

Existing Conditions – Newtown Creek



Ownership

Detailed Approach

Existing Conditions – Newtown Creek

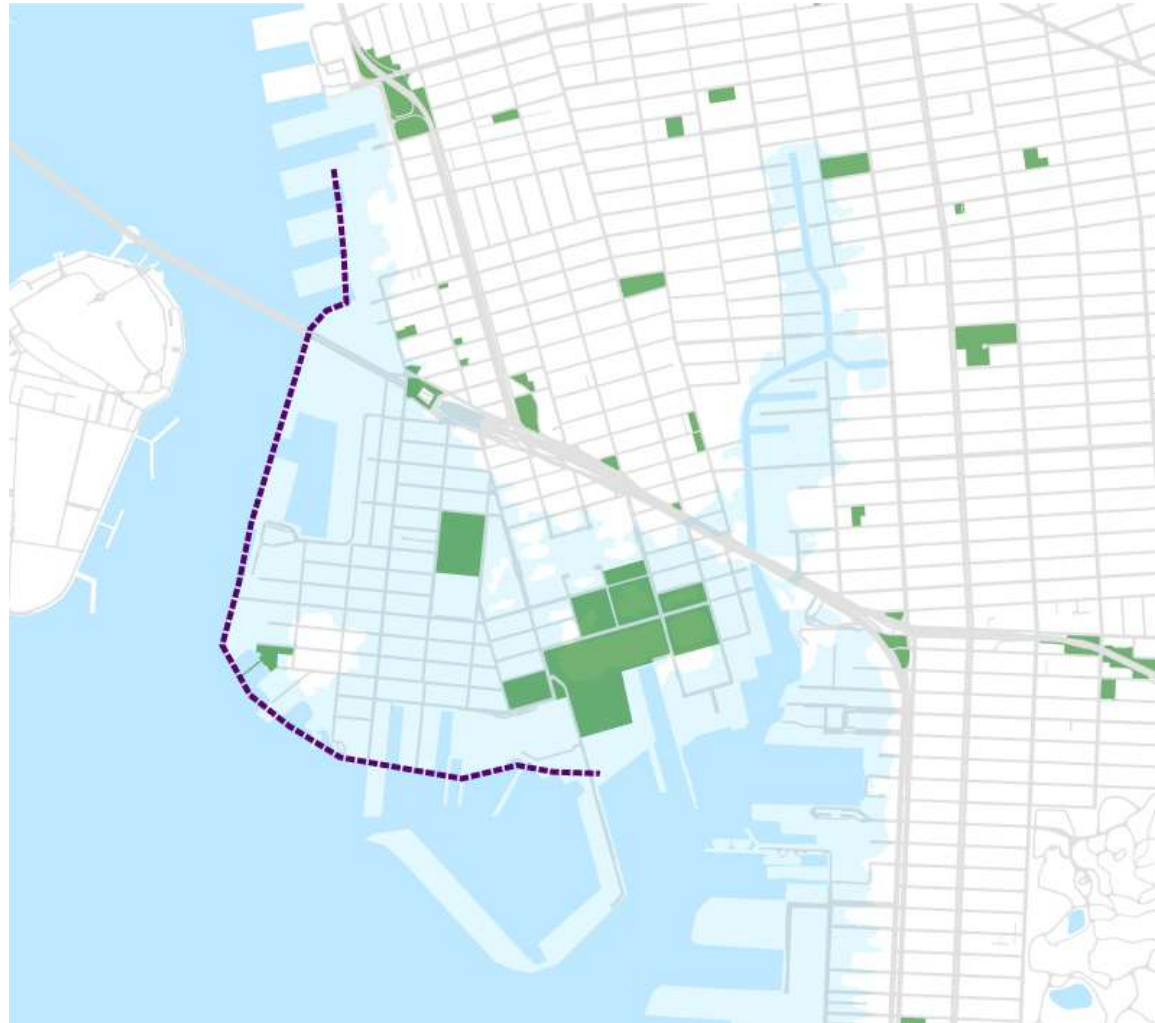


Zoning

Detailed Approach

Scenario Development – Gowanus Canal

Red Hook IFPS
(Planned
Integrated Flood
Protection System)

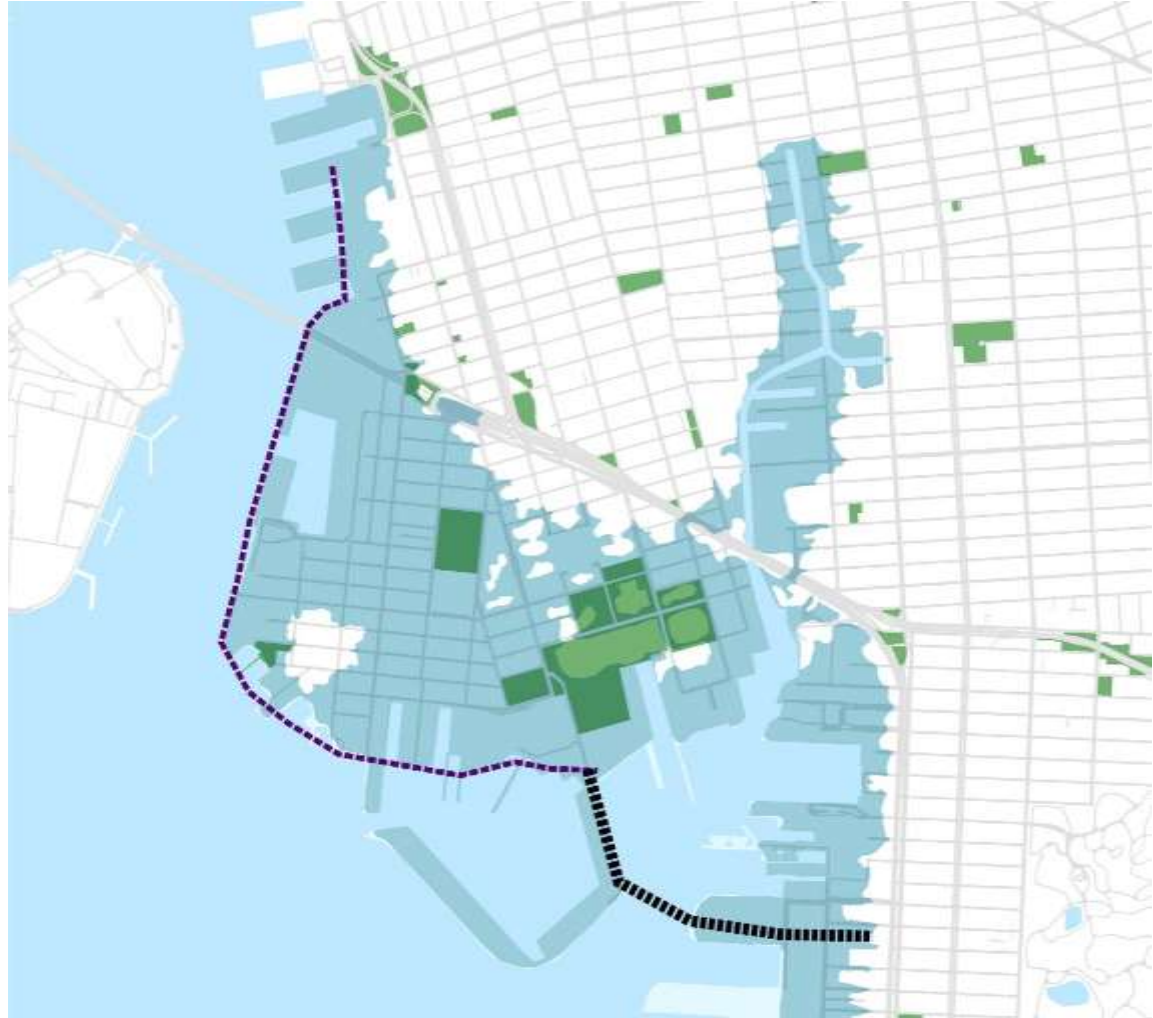


Detailed Approach

Scenario Development – Gowanus Canal

Study Area 1 Barrier Location

Barrier over longest and deepest part of canal/bay

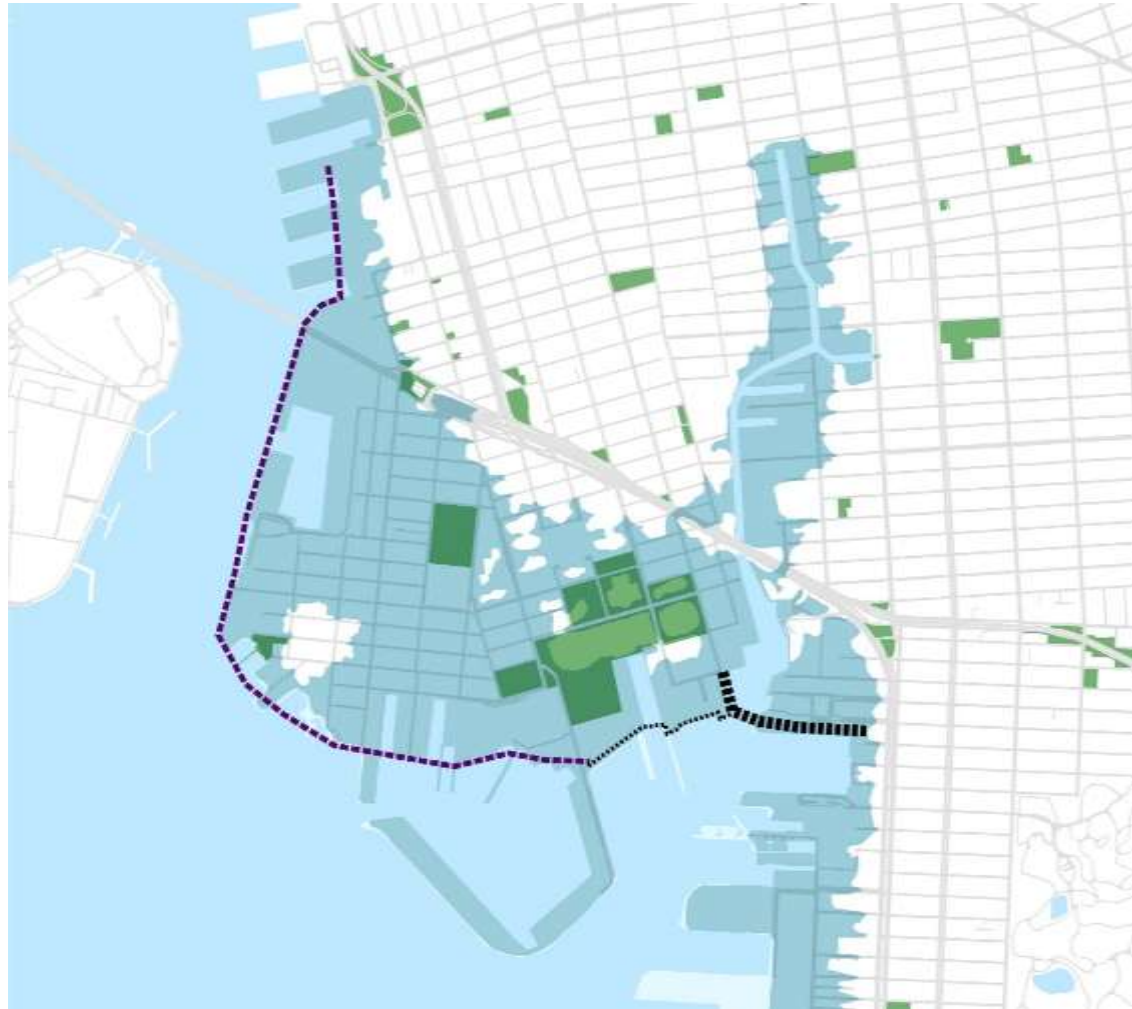


Detailed Approach

Scenario Development – Gowanus Canal

Study Area 2 Barrier Location

Requires coordination of barge activity and acquisition of private property

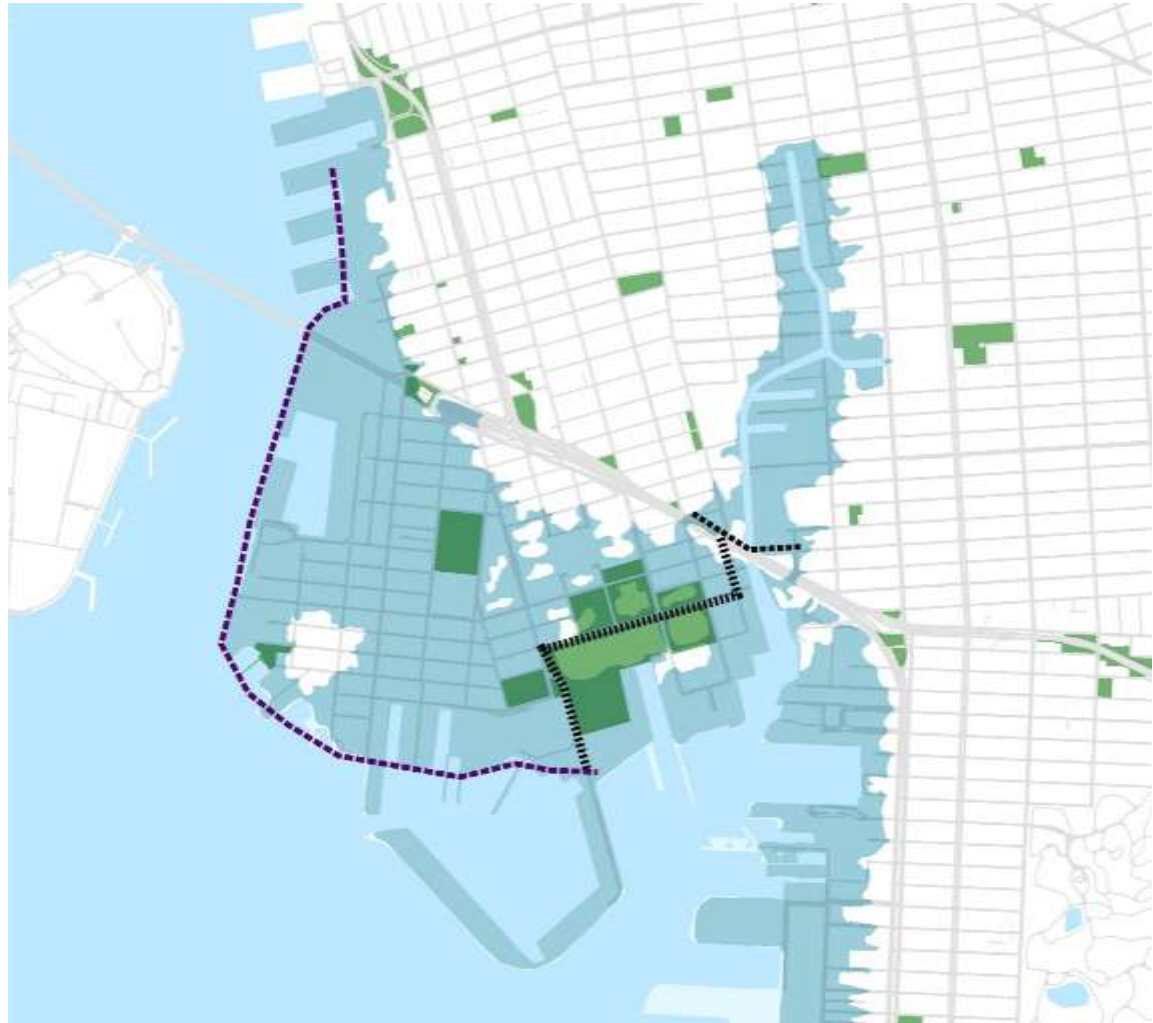


Detailed Approach

Scenario Development – Gowanus Canal

Study Area 3 Barrier Location A

Must allow for traffic
while providing flood
protection



Detailed Approach

Scenario Development – Gowanus Canal

Study Area 3 Barrier
Location B

Challenges involved in
allowing flood protect



Detailed Approach

Scenario Development – Newtown Creek

Study Area 1 Barrier Location

Barrier over widest and deepest part of creek



Detailed Approach

Scenario Development – Newtown Creek

Study Area 2 Barrier Location

Integrating barrier with grade changes at city-owned sites



Detailed Approach

Scenario Development – Newtown Creek

Study Area 3 Barrier Location

Protection along creek for adjacent and upland buildings



Detailed Approach

Scenario Development – Economic Issues

Investments in flood protection will generate numerous neighborhood and Citywide benefits.

Neighborhood Impacts

Existing Development:

- Reduced property damage
- Lower insurance costs

New Development:

- Reduced need for onsite resiliency investment

Community Benefits

- Open space, connectivity

Citywide Impacts

Existing Development:

- Higher property values & taxes from current properties

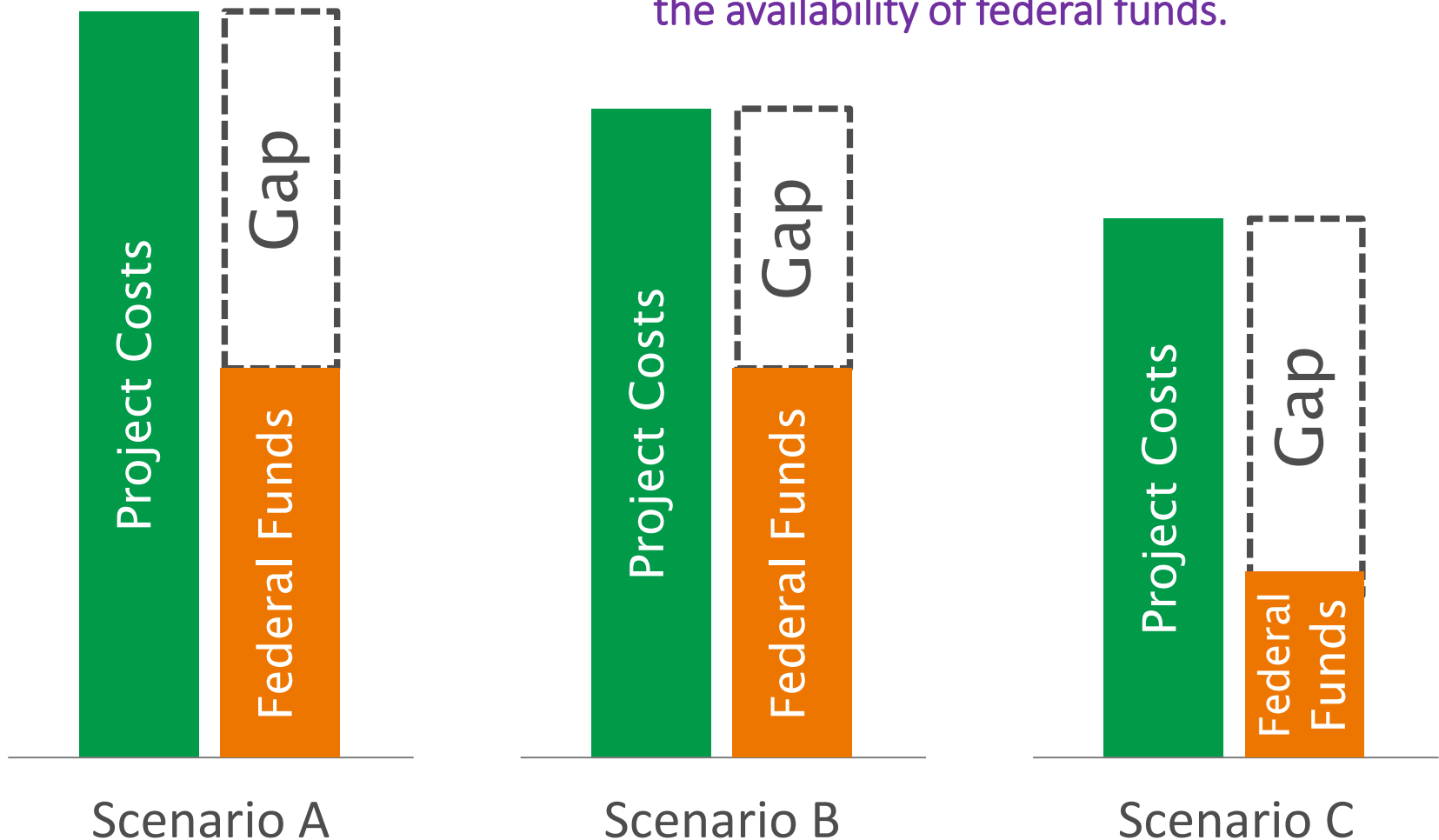
New Development:

- **Economic Impact:** Employment & economic output (construction & permanent)
- **Fiscal Impact:** Income, business, sales, property and other taxes from new residents & workers

Detailed Approach

Scenario Development – Economic Issues

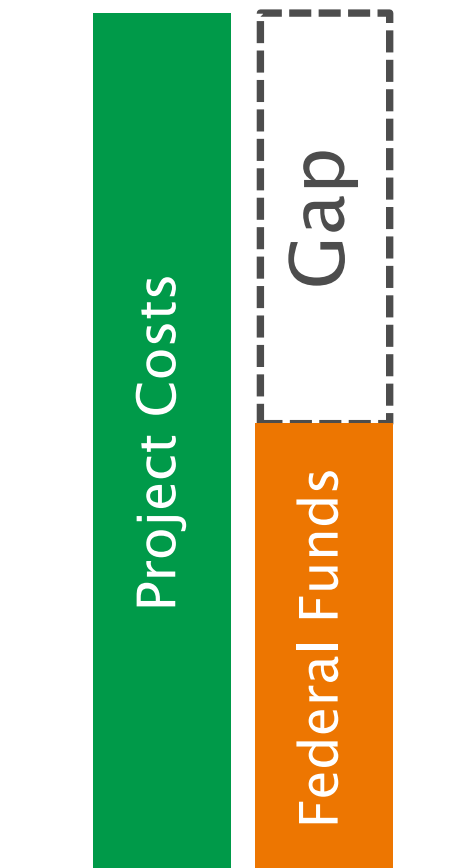
Scenarios may differ both in the magnitude of costs and the availability of federal funds.



Detailed Approach

Scenario Development – Economic Issues

Scenarios will also generate a range of benefits, some of which could be tapped to support project financing.



City Capital Funding (GO Bonds)

- GO bonds, potentially aligned with tax generation from projects

Value Capture Strategies

- **Real Estate Development:** Revenue bonds funded by new development (PILOT/PILOMRT/DIB)
- **Insurance Savings:** District levy or other mechanism capturing portion of property owners' savings

Detailed Approach

Scenario Development – Barrier Engineering

PROJECT LOCATIONS:

- Gowanus Canal – Erie Basin to 29th Street
- Mouth of Newtown Creek



St. Petersburg, Russia



Outer Harbor Barrier, New York



Intercoastal Waterway,
New Orleans

- Flood elevations
- Navigation
- Location and land ownership

- Neighborhood impact
- Potential future projects
- Effect of diverted waters

- Operations and maintenance
- Life cycle cost

Detailed Approach

Scenario Development – Barrier Engineering

PROJECT LOCATIONS:

- Gowanus Canal – Halleck St to 16th Street
- Newtown Creek – 2nd St to Franklin St



Tees Barrage, England



Farrell's Gateway, London



Hull Impoundment, England

- Flood elevations
- Navigation
- Location and land ownership

- Neighborhood impact
- Potential future projects
- Effect of diverted waters

- Operations and maintenance
- Life cycle cost

Detailed Approach

Scenario Development – Barrier Engineering

PROJECT LOCATIONS:

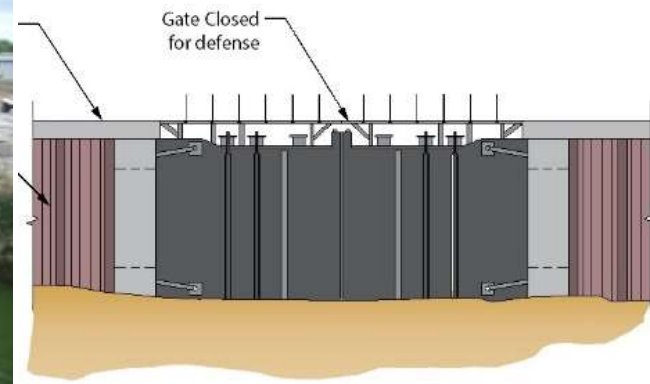
- Gowanus Canal – Hamilton Ave Bridge
- Newtown Creek – Vernon Blvd to Manhattan Ave



Tilbury Flood Gate, Essex, England



Ipswich Wet Dock, England



Howard Beach, Queens

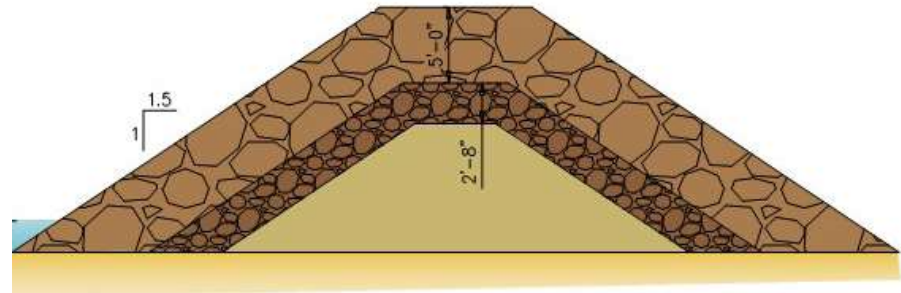
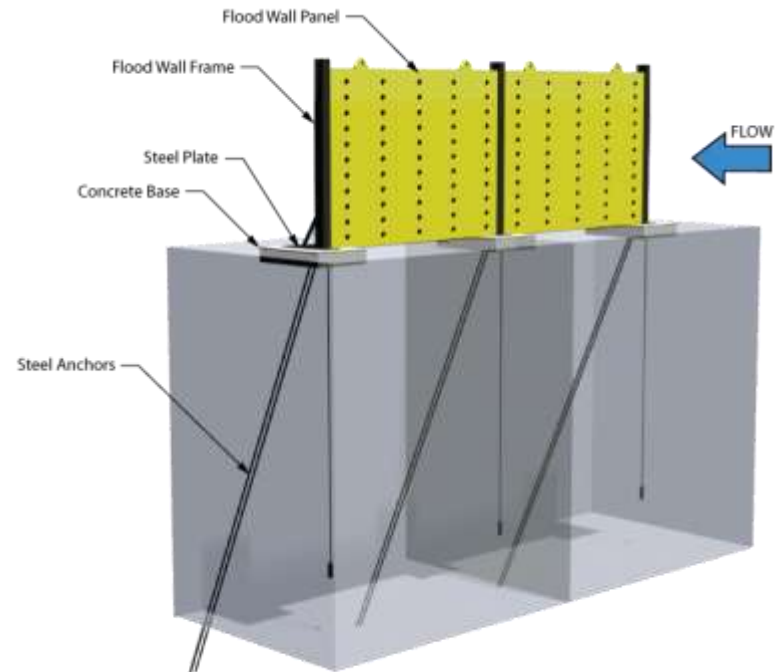
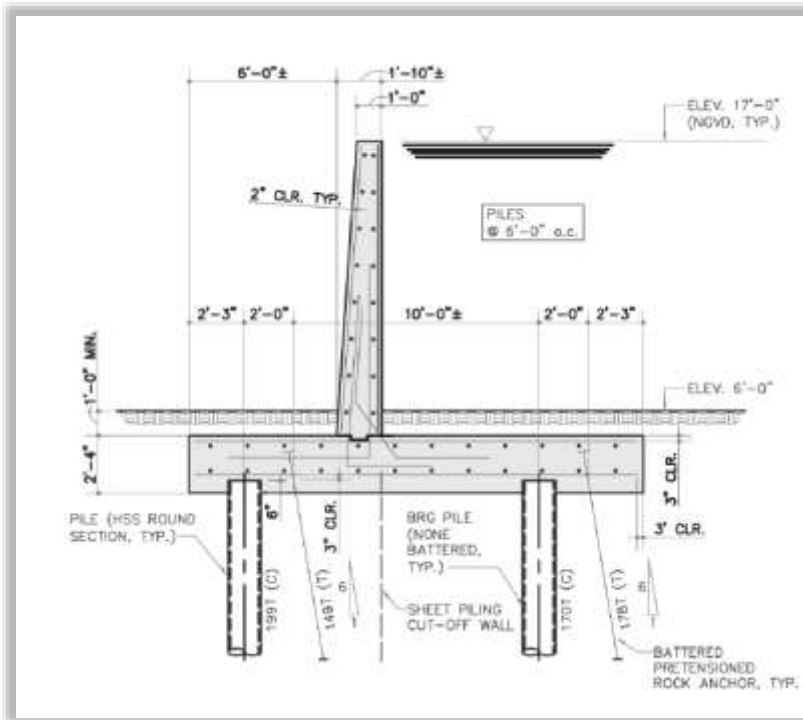
- Flood elevations
- Navigation
- Location and land ownership

- Neighborhood impact
- Potential future projects
- Effect of diverted waters

- Operations and maintenance
- Life cycle cost

Detailed Approach

Scenario Development – Levee Engineering



Detailed Approach

Addressing Governance

- Governance: Agency Receptivity
 - Permitting, legal, and regulatory issues
 - Federal programs and practice
 - USACE Project Planning Stages – 3x3x3
 - Reconnaissance Study
 - Feasibility Study (non-federal sponsor cost share)
 - Pre-construction engineering and design
 - Construction
 - Federal appropriations required
 - President's civil works budget

...exploring the potential of partnering with a federal agency based on demonstrating a feasible and cost-effective means of risk reduction.

Detailed Approach

Addressing Governance

Federal Implementation

- Criteria – USACE Design Guidelines/
FEMA NFIP Certification
- Benefit Cost analysis
 - $BCR \gg 1$
- Environmental Stewardship – NEPA Analysis
- Local Support – non-federal sponsor
- Federal Budget
- Paths to USACE
 - NACCS (North Atlantic Comprehensive Coastal Study)
 - Traditional cost share study
 - WRRDA 14 (non-federal feasibility study)



Detailed Approach

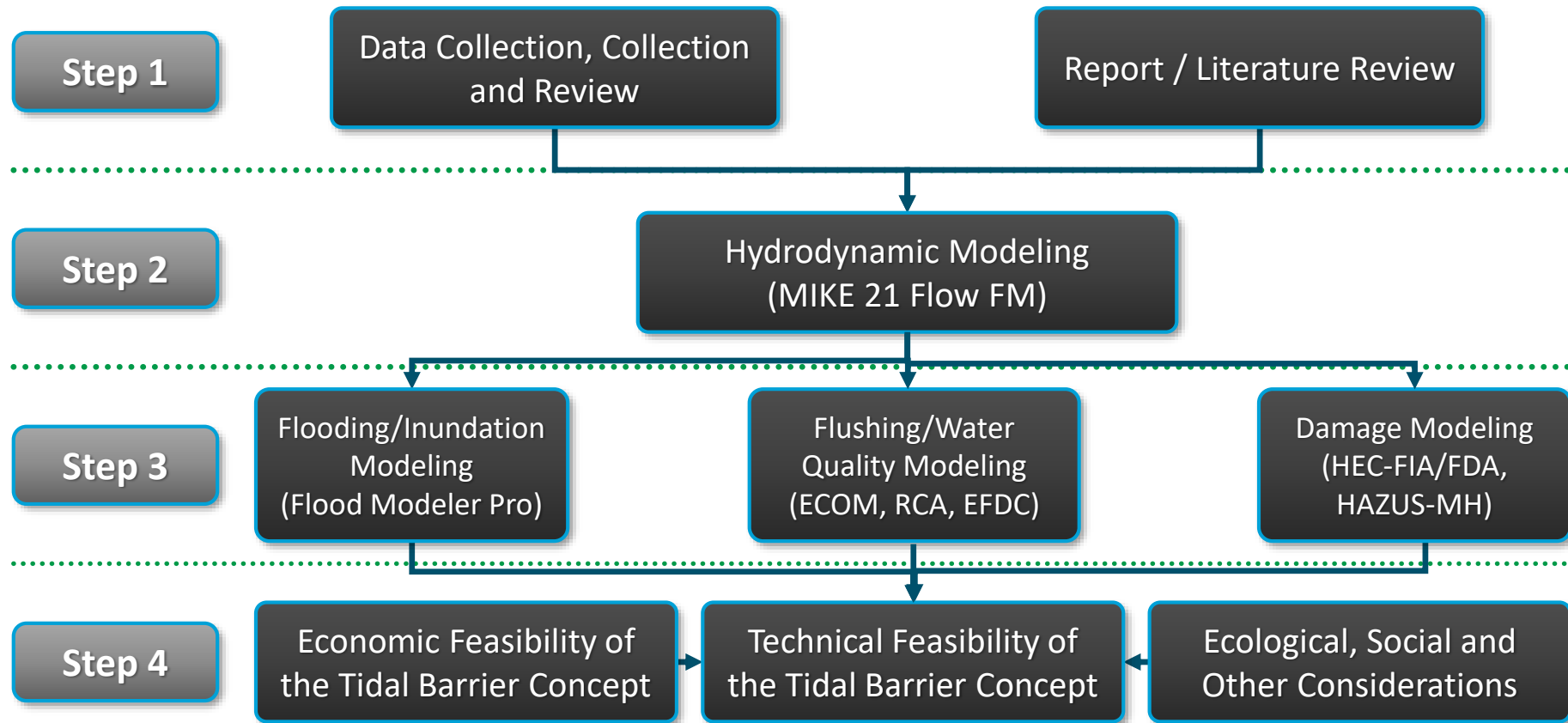
Scenario Evaluation – Environmental and Permitting

- Superfund sites
- Phase I ESAs
- Water quality and habitat improvement
- Legal/regulatory framework
 - Zoning
 - Land acquisition
 - Financing
 - Environmental Permits
 - Navigation
 - CEQR/SEQRA/NEPA
 - Legislative



Detailed Approach

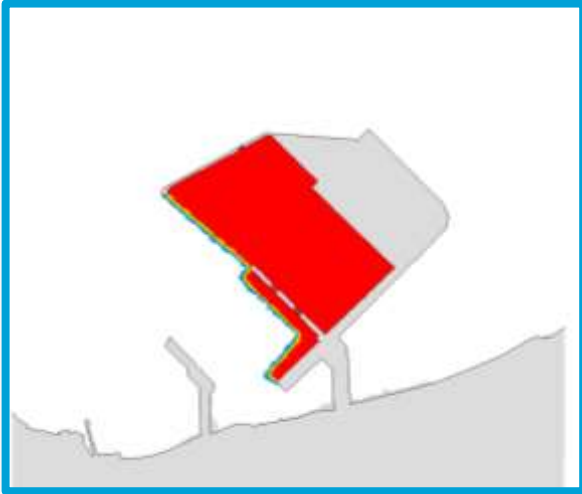
Scenario Evaluation Modeling



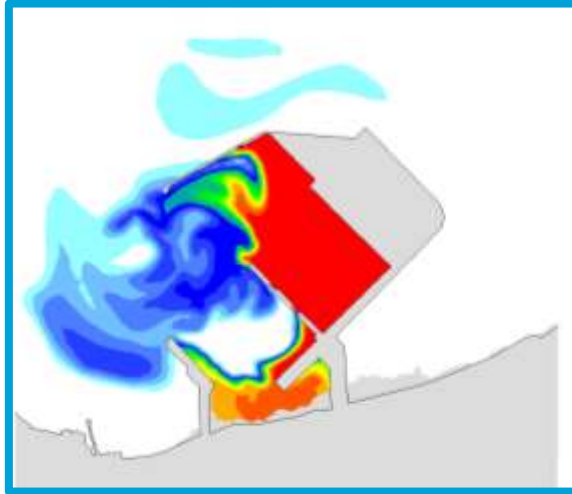
Detailed Approach

Scenario Evaluation – Water Quality Modeling

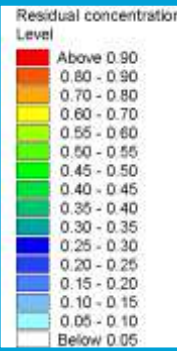
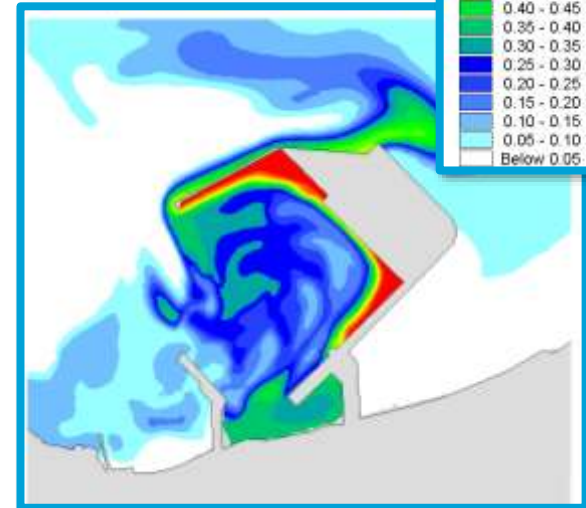
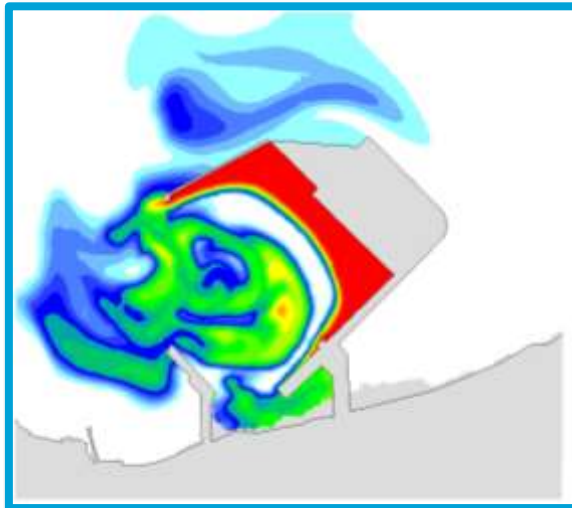
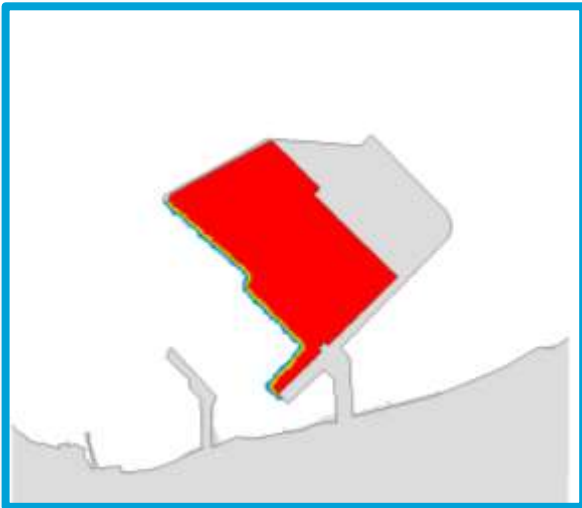
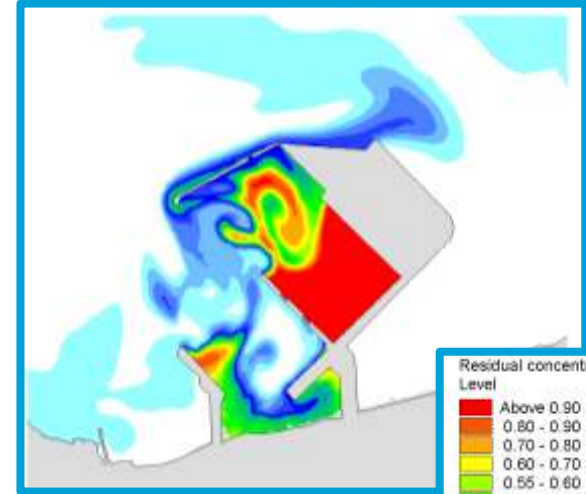
Day 0



Day 7



Day 14



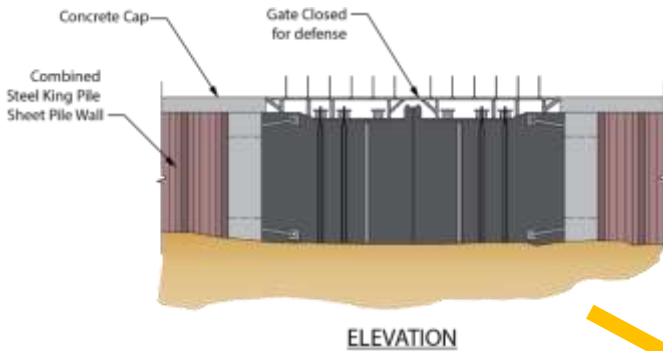
Detailed Approach

Hydrodynamic Modeling

- Calculate flood depth and extent for the existing no-barrier “baseline” condition. Use outputs for economic analysis model to determine baseline damages.
- Calculate flood depth and extent for the preferred barrier option in the closed position. Use outputs for economic analysis model to determine damages and damages avoided.
- Make a qualitative estimate of the barrier impact on water quality via flushing modeling.
- Estimate the impact of rainfall/surface water flooding on the land side of a closed barrier.

Detailed Approach

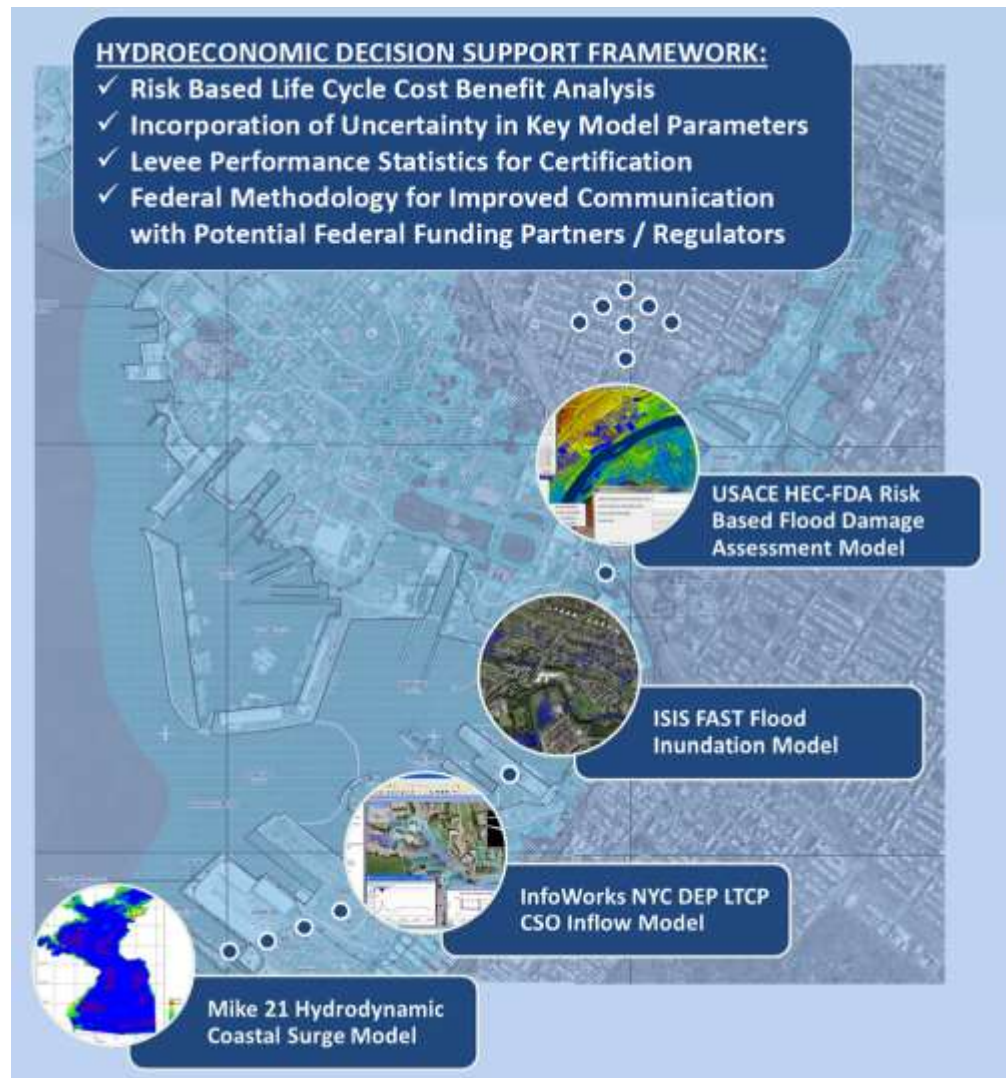
Scenario Evaluation – Hydrodynamic Modeling



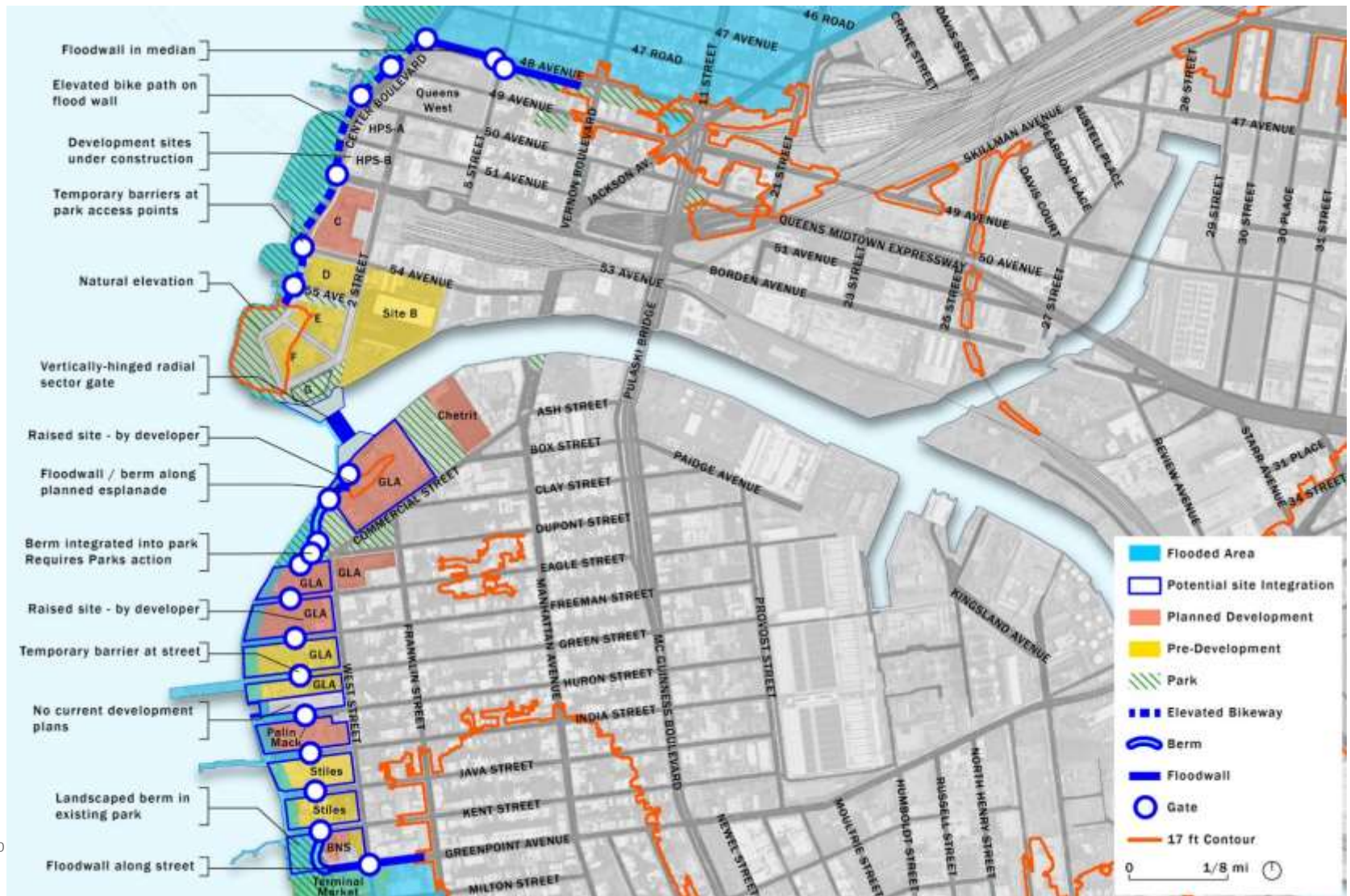
- Level of protection/ recurrence interval
 - 100/500-year storm
 - Sea level rise
- Inundation and damage
- Flood insurance costs
- Potential development
- Infrastructure costs
 - Capital cost
 - Operations and maintenance

Detailed Approach

Scenario Evaluation – Hydroeconomic Modeling



Newtown Creek Example Alignment Newtown Creek





New York

Storm Surge Working Group

...dedicated to the premise that reducing the risk to the greater Metropolitan Region of catastrophic flooding from ocean storm surges, climate change and rising sea levels can be best achieved through *a regional approach that transcends geographical and political boundaries.*

Interconnected coastal regions in three states are especially vulnerable due to their low, their densely developed urban infrastructure and the large populations at risk.

Questions and Answers

