RED HOOK

Integrated Flood Protection System (IFPS)

Public Meeting #3

Alignment Location Scenarios and Heights

October 13, 2016

#ONENYC

NYC Mayor's Office of Recovery & Resiliency

AGENDA

Welcome + Introduction: 6:30 – 7:00

- Feasibility Study Overview
- Stakeholder Engagement
- Questions & Answers

Coastal Flood Risks + Design Flood Elevation Scenarios: 7:00 - 7:35

- Presentation and Discussion

Alignment Scenarios and Analyses: 7:35 – 8:10

- Presentation and Discussion

Report Back, Conclusions, and Next Steps: 8:10 – 8:30

MEETING GOALS

- **Review Red Hook's risk to coastal flooding.**

- **Provide a framework to understand and review trade-offs with varying levels and locations of protection, and receive feedback.**

- **Answer outstanding questions.**

ANNOUNCEMENTS

Business Risk Assessments & Grants

Business PREP will be launching Risk Assessments & Grants late fall to help small businesses that were affected by Hurricane Sandy

The program will offer a one-on-one, on-site, **risk assessment**.

- As part of the assessment, experts will:
  - Review the business's operations, physical location, and insurance coverage.
  - Create a custom report that will recommend ways to improve preparedness and resiliency.
  - Return to the business to talk through the report and recommendations.
- Based on the assessment, the City will offer **grants** to reimburse each business up to **$3,000** for the purchase of recommended items or equipment.

Upcoming **Red Hook Business Continuity Workshop: 10/26 6-8pm, SBIDC**

For more information email: BusinessPREP@sbs.nyc.gov or visit www.nyc.gov/businessPREP

ANNOUNCEMENTS

FloodHelpNY.org

- Residents can look up their address to find their home on the flood maps.
- Use a free rate calculator and get a personalized estimate of flood insurance premiums.
- Learn about mitigation options for homes, including inexpensive steps to reduce damage from flooding.
- Renters can learn about their risk and flood insurance options.
- NYC residents in eligible neighborhoods (Red Hook is included) can apply for a free home resiliency assessment and customized report at FloodHelpNY.org.

INTRODUCTION AND FEASIBILITY STUDY OVERVIEW

Feasibility Study Overview

What is an IFPS?

An integrated flood protection system (IFPS) consists of various permanent and deployable features that integrate with the urban environment and work together to reduce flood risk from coastal flooding and sea level rise.

Such IFPS features could consist of a permanent wall, deployable gates, landscape features, drainage modifications, street elevations, and others.

Feasibility Study Overview

Where has this been done before?

Feasibility Study Overview

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Feasibility Study Overview

IFPS Project Goals

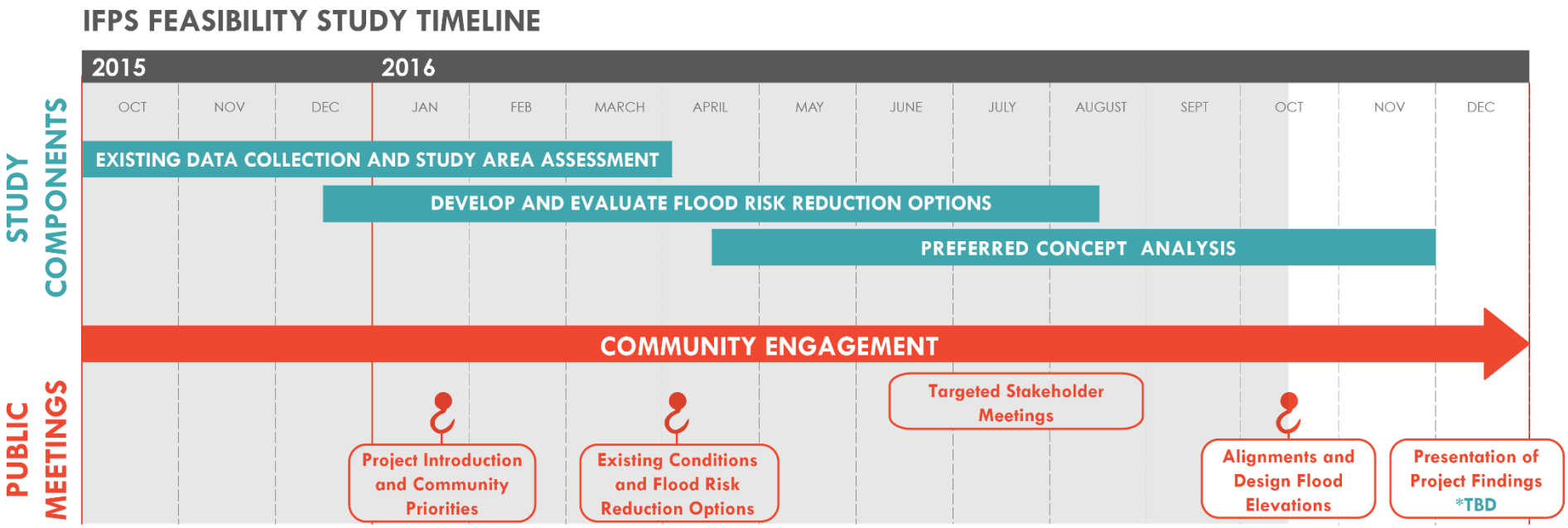
- Reduce Red Hook's coastal flood risk with minimal impact on the neighborhood when there isn't a storm.
- Incorporate community and stakeholder priorities and identify additional project goals.
- Build a flood protection system that is tailored to Red Hook and its unique waterfront.

What is a Feasibility Study?

- A feasibility study analyzes and evaluates a proposed project to see if it 1) is technically able to be built, 2) addresses community needs and goals, and 3) meets federal and other legal requirements.
- The feasibility study for the IFPS builds upon the important resiliency work that has already been done in Red Hook and the City as a whole.

Feasibility Study Overview

Where are we now?



Feasibility Study Overview

Feasibility Criteria

RELIABILITY

CONSTRUCTABILITY

OPERATIONS AND MAINTENANCE

ENVIRONMENTAL IMPACTS

COST

URBAN DESIGN

COMMUNITY PRIORITIES

Feasibility Study Overview

What are the study's expected outcomes?

A broader understanding of what comprehensive resiliency means.

A $100 million project for coastal flood risk reduction that is moved into design, environmental review, permitting, & construction.

Other feasible options for future flood risk reduction.

Feasibility Study Overview

Major Project Milestones

EXISTING DATA COLLECTION AND SITE ASSESSMENT

- Collect Reports and Maps
- Develop Modeling Tools
- Conduct Site Visits
- Map Existing Conditions
- Learn from Global Examples
- Develop Regulatory Framework

DEVELOP AND EVALUATE FLOOD PROTECTION OPTIONS

- Assess Vulnerability
- Develop Evaluation Criteria
- Identify Potential Flood Protection Alignments

PREFERRED CONCEPT ANALYSIS

- Analyze Costs
- Quantify Benefits
- Detailed Phasing Plan
- Conduct Benefit Cost Analysis
- Final Report with Recommendations

COMMUNITY ENGAGEMENT

Feasibility Study Overview

How is this project funded?

HUD CDBG-DR Action Plan Amendment

- The Red Hook IFPS was originally funded by HUD Community Development Block Grant - Disaster Recovery (CDBG-DR) funds and FEMA HMGP funds.
- The $50 million in HUD CDBG-DR funds have been fully replaced by $50 million in City Capital funding. The IFPS will move forward without gaps in funding.
- To learn more and submit comments, visit nyc.gov/cdbg or attend the upcoming public hearing:

October 20, 2016, 7PM
Coney Island Hospital Auditorium
2601 Ocean Parkway, Brooklyn

Feasibility Study Overview

The project must meet federal requirements

- Provide long-term and permanent solutions which protect against hazards and storm events
- Be a stand-alone project, which does not rely on any other planned projects to function
- Demonstrate that the project benefits equal or exceed its costs
- Document any potential environmental impacts and provide an associated mitigation strategy

Stakeholder Engagement

Stakeholder Engagement Goals

Collaboration with Red Hook residents, business owners, and other stakeholders is critical to make this a successful project.

- Generate community priorities for the implementation of an IFPS
- Engage stakeholders around input into design and engineering strategies
- Create opportunities for participation from diverse stakeholder groups
- Transparently discuss the project's opportunities and trade-offs

Stakeholder Engagement

What We've Presented So Far

- **1st Public Meeting**
- **January 21, 2016**

- We provided an overview of the project: including goals, funding, timelines, and process. We discussed previous resiliency planning initiatives, and community priorities for this project.

- **2nd Public Meeting**
- **April 7, 2016**

- We discussed Red Hook's risk of coastal flooding, and the different strategies that can be used to reduce the risk.

Stakeholder Engagement

Community Priorities

Public Meeting No. 1

What we heard:

- Maintain maritime capacity and enhance water-based assets
- Preserve neighborhood character
- Consider drainage issues
- Coordinate with and find connections to other local projects
- Provide jobs and job training for local residents for the construction and implementation of the IFPS
- Keep the community informed and engaged throughout the project, integrate previous local processes
- Empower the community by enhancing neighborhood preparedness for future storm events

January 2016 Public Meeting

Stakeholder Engagement

Community Priorities

Public Meeting No. 2

What we heard:

- Protect the neighborhood physically as much as possible
- Minimize interventions on residential streets
- Positive integration with the community - not just a wall
- Maintain and enhance the bike-friendly environment and integrate the system with the Brooklyn Greenway
- Don't impede traffic flow and avoid taking parking space
- Minimize impact on loading and unloading functions
- Use IFPS as an opportunity to improve pedestrian character in industrial areas
- Incorporate improvements to Red Hook Park

April 2016 Public Meeting

Stakeholder Engagement

Community Priorities

Summer 2016 Engagement Events

What we heard:

- Many residents were not aware of this project
- Many residents were not fully aware of their coastal flood risks and how we can reduce those risks
- Consider sea level rise in design scenarios
- Create a neighborhood wide map of other projects
- Provide more outreach and education, including increasing the project's presence in the community
- Concerns that the alignments can block access to neighborhood amenities
- Preserve the artistic heritage of the area
- Keep the neighborhood safe
- Permanent structures preferred over deployables

Red Hook NY RISING CRP Committee

Red Hook Initiative Digital Stewards

Red Hook National Night Out

Red Hook Initiative Local Leaders

QUESTIONS & ANSWERS

PART I:
COASTAL FLOOD RISKS & DESIGN FLOOD ELEVATIONS

Review of Coastal Flood Risks

Hurricane Sandy Storm Surge Simulation

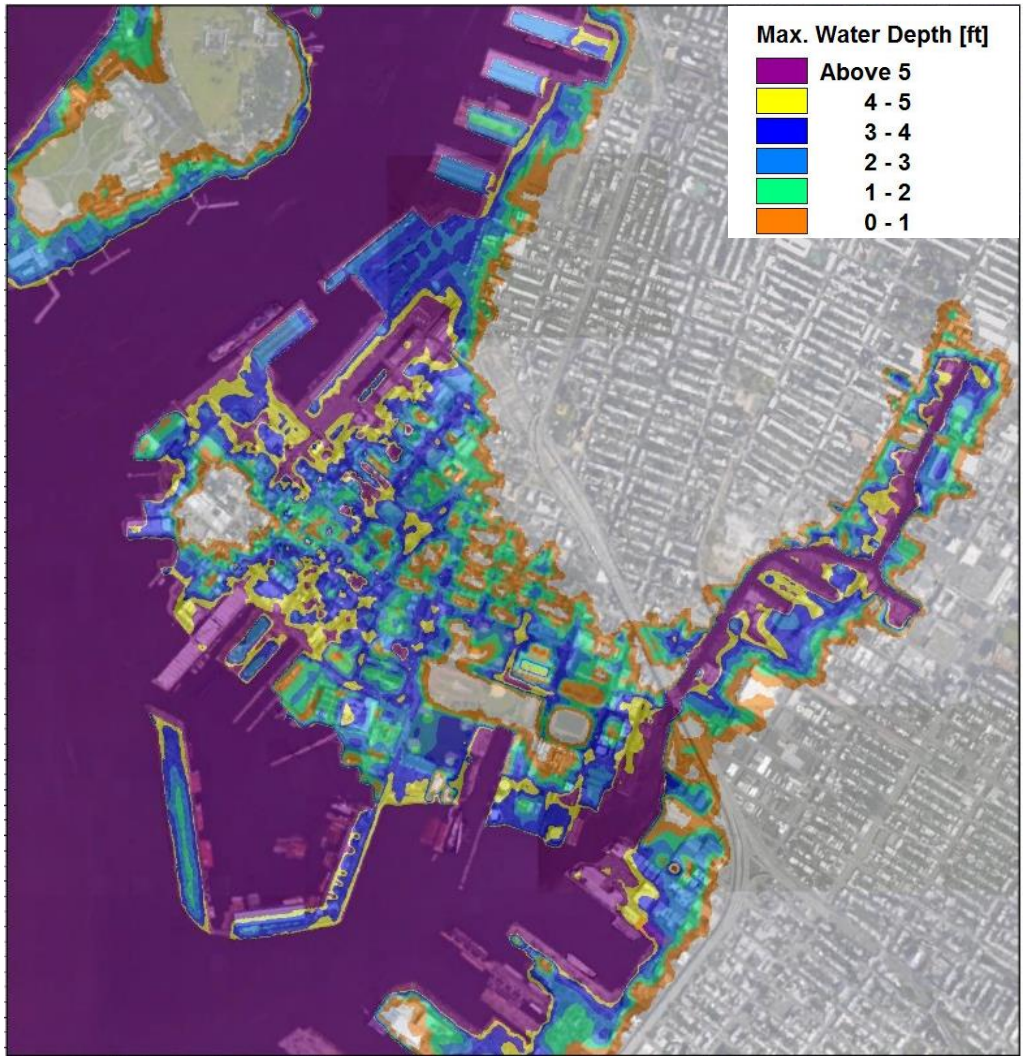
Hurricane Sandy Storm Surge Simulation that shows how coastal storm surge enters Red Hook

During a coastal storm surge event like Sandy, water enters into Red Hook through all sides – Gowanus Canal, Erie Basin and Atlantic Basin.

Review of Coastal Flood Risks

Hurricane Sandy

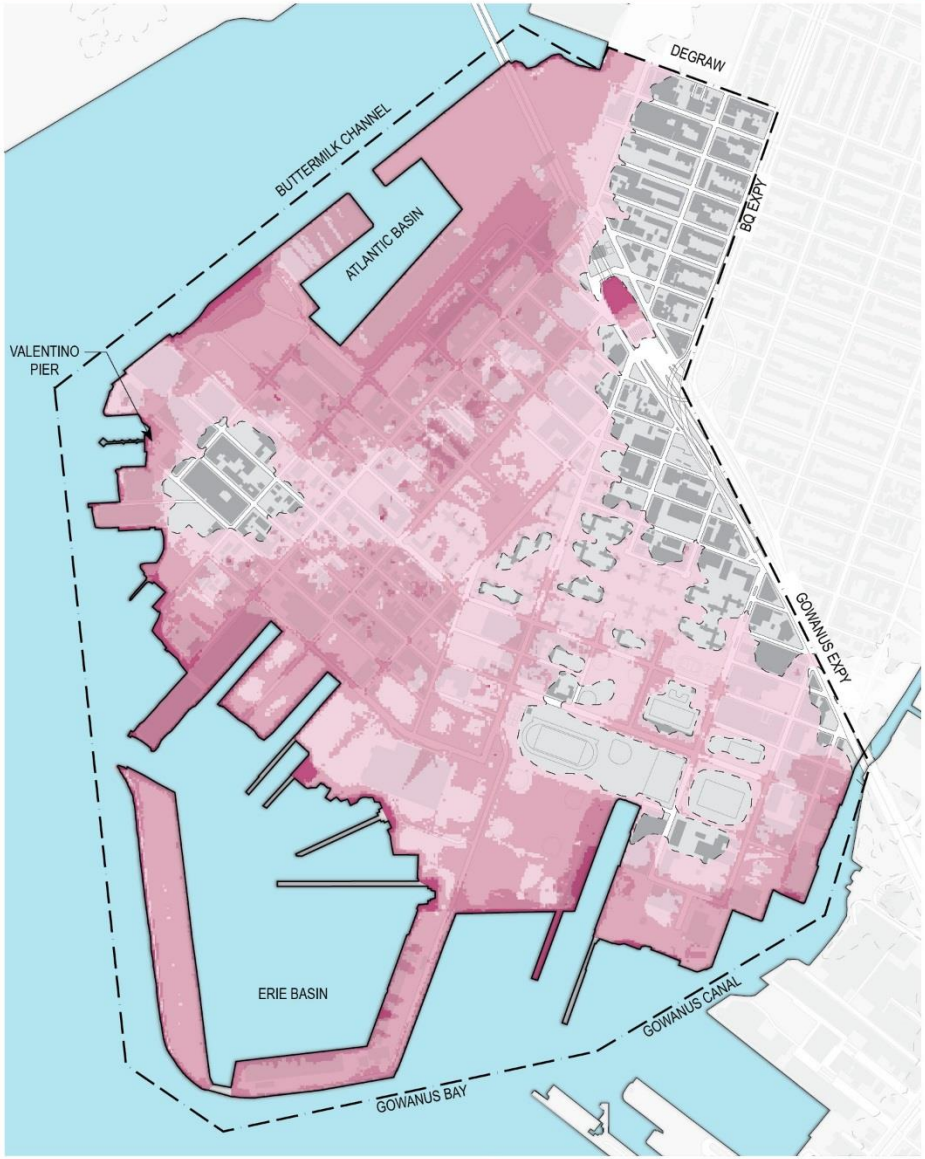
- This map shows the inundation and flood depth that occurred during Hurricane Sandy within the Red Hook study area
- Major inland portions of Red Hook had between 2-4 feet of water during Hurricane Sandy
- Hurricane Sandy flooding was similar to a 1% Annual Chance Storm Event (also referred to as a 100-Year Storm) which has 1 % chance of occurring in a given year



Review of Coastal Flood Risks

FEMA's Preliminary 1% Annual Chance Coastal Storm Flood Depths

- This map indicates the flood depth that occurs during a 1% annual chance coastal storm event (100-year)
- This map shows which areas of Red Hook experience the greatest flood depths during a 1% annual chance coastal storm event
- The 1% chance flood depths are typically higher at the waterfront than inland



Legend

---- 1% Annual Chance Flood

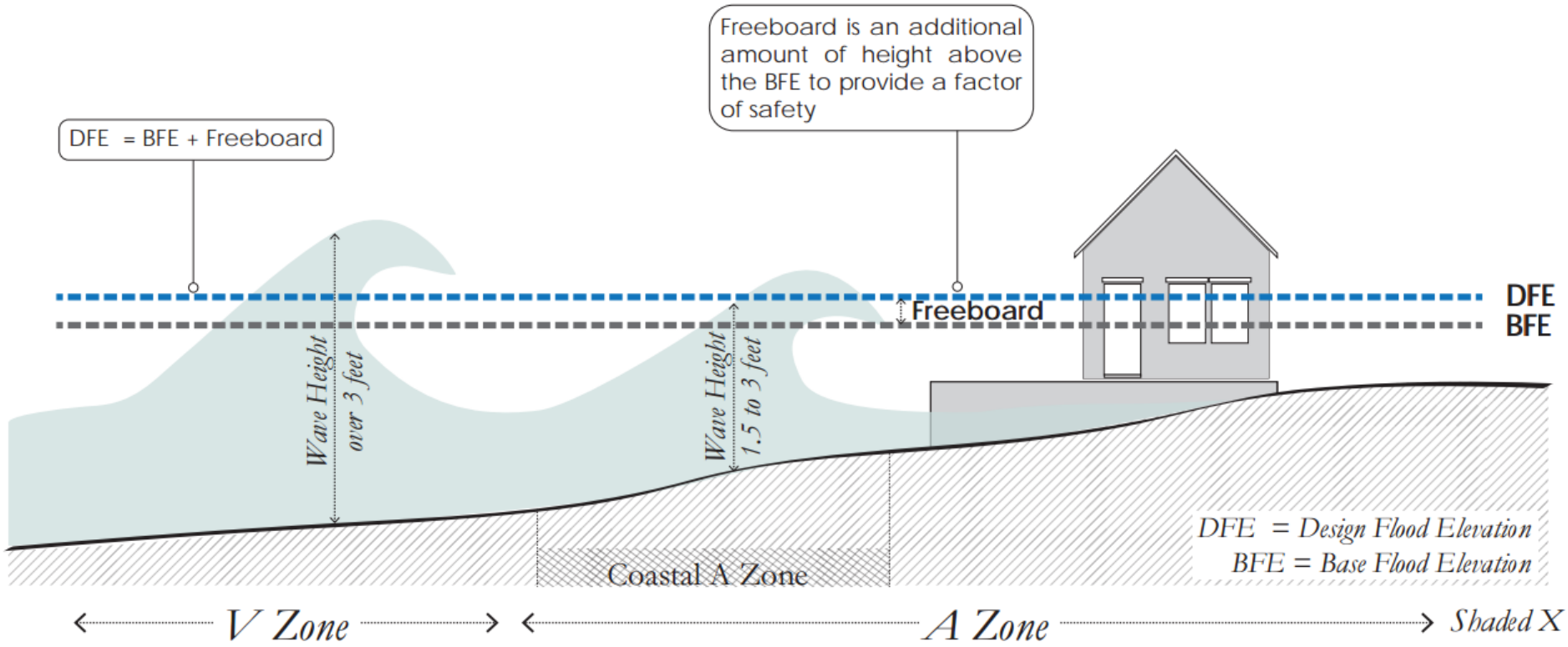
1% Annual Chance Flood Depths

- 0-3 FT
- 3-6 FT
- 6-9 FT
- >9 FT

Source: FEMA 2015 Preliminary FIRM

Design Flood Elevation Scenarios

What is Design Flood Elevation (DFE)?



Source – NYCDCP Resilient Neighborhoods Study

The Design Flood Elevation (DFE) corresponds to an elevation above sea level which an IFPS will have to be built up to. This elevation can change depending on the location of the IFPS.

Design Flood Elevation Scenarios

Coastal DFE Scenarios

- The coastal flood risk/vulnerability for various storm conditions were used as a starting guide to develop three Design Flood Elevation (DFE) scenarios.
  - **DFE A:** equivalent to the 10% annual chance flood (also referred to as the 10-year storm) + 2.5' Sea Level Rise* + 6" of Freeboard
  - **DFE B:** equivalent to the 2% annual chance flood (also referred to as the 50-year storm) + 2.5' Sea Level Rise* + 6" of Freeboard.
  - **DFE C:** equivalent to the 1% annual chance flood (also referred to as the 100-year storm) + 2.5' Sea Level Rise* + 1' of Freeboard.

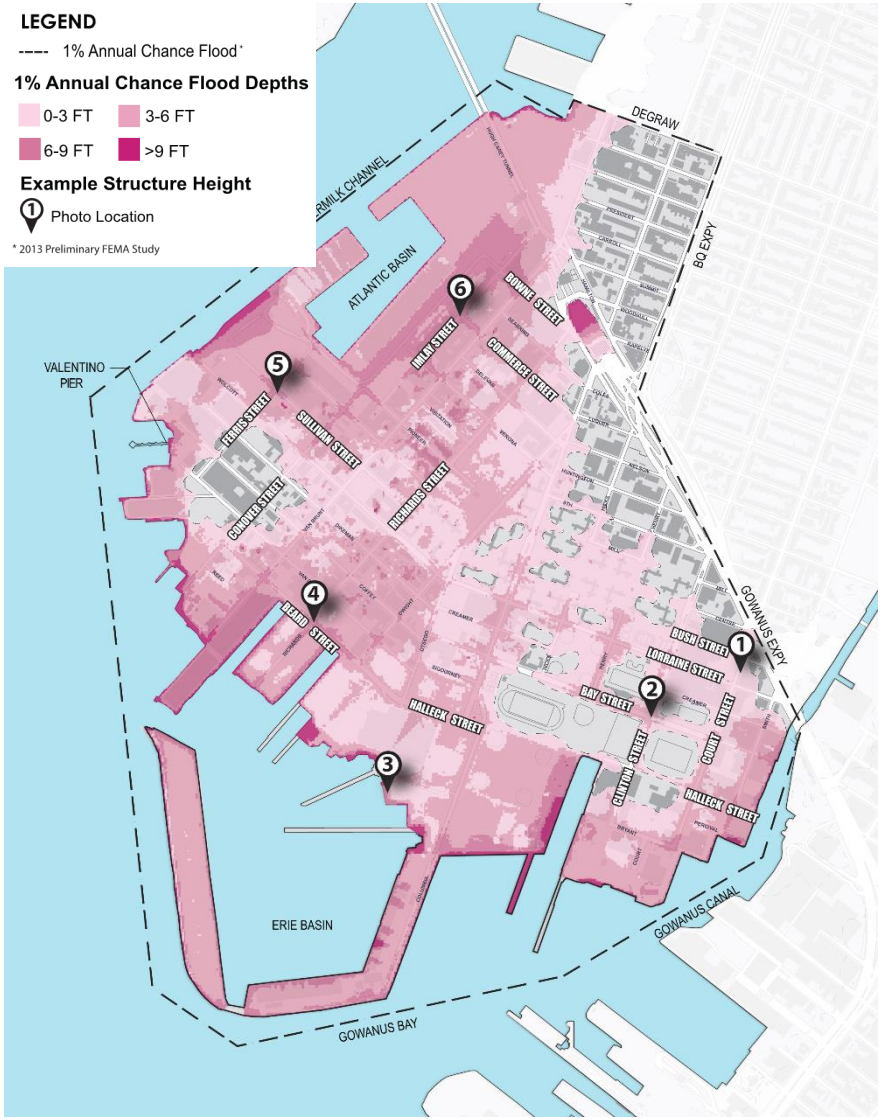
Notes:
*Source: New York City Panel on Climate Change (NPCC) 2050s High End Sea Level Rise Projections

Design Flood Elevation Scenarios

Example Heights for DFE Scenarios

- The points on this map indicate six locations with images showing how high the structures would have to be from the existing ground level for the three Design Flood Elevation Scenarios

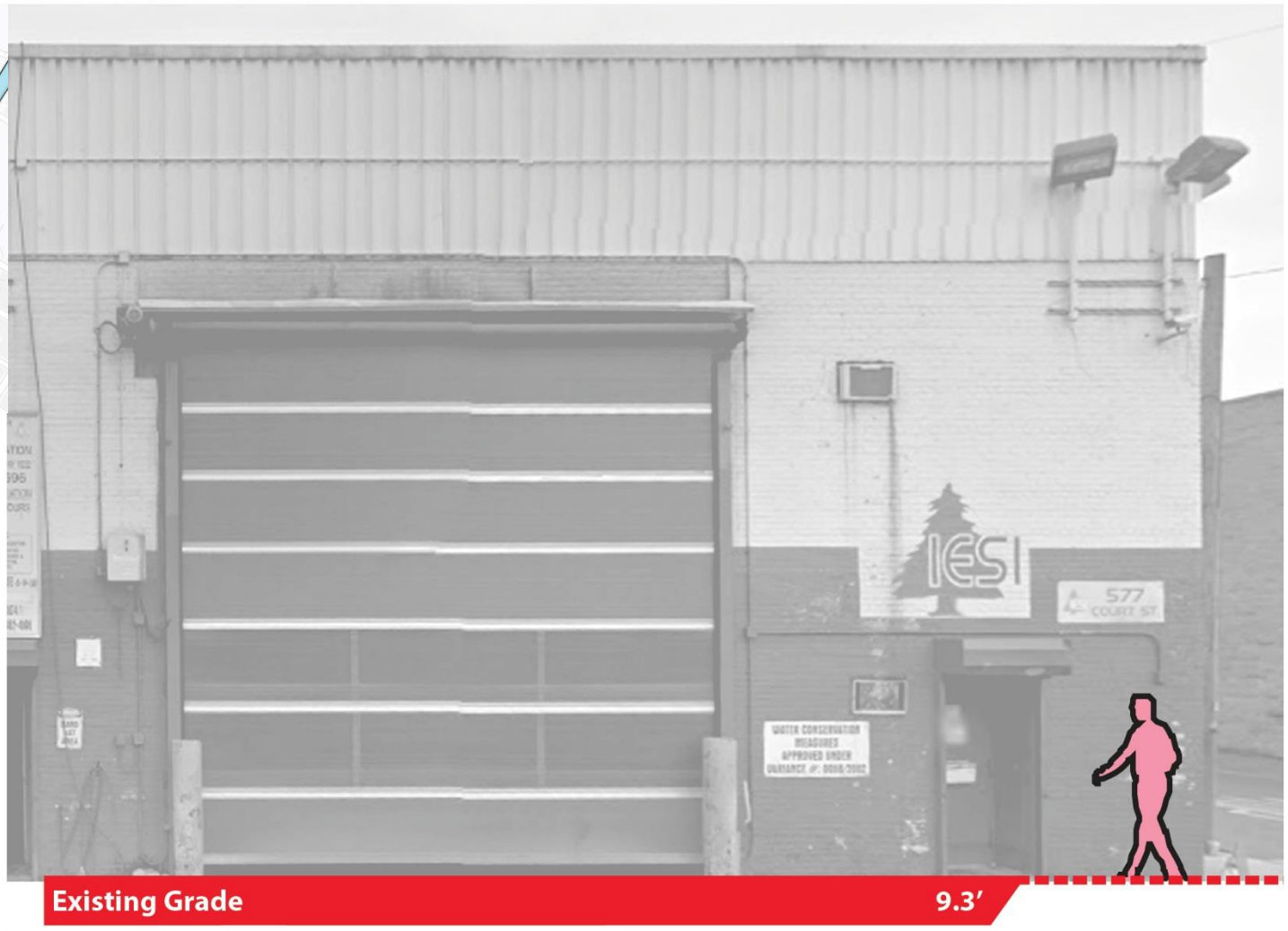
- Generally, the structure height on the waterfront is higher than a structure located further inland



Design Flood Elevation Scenarios

Example Height: Court St between Bush St and Lorraine St

1. Court Street between Bush Street and Lorraine Street



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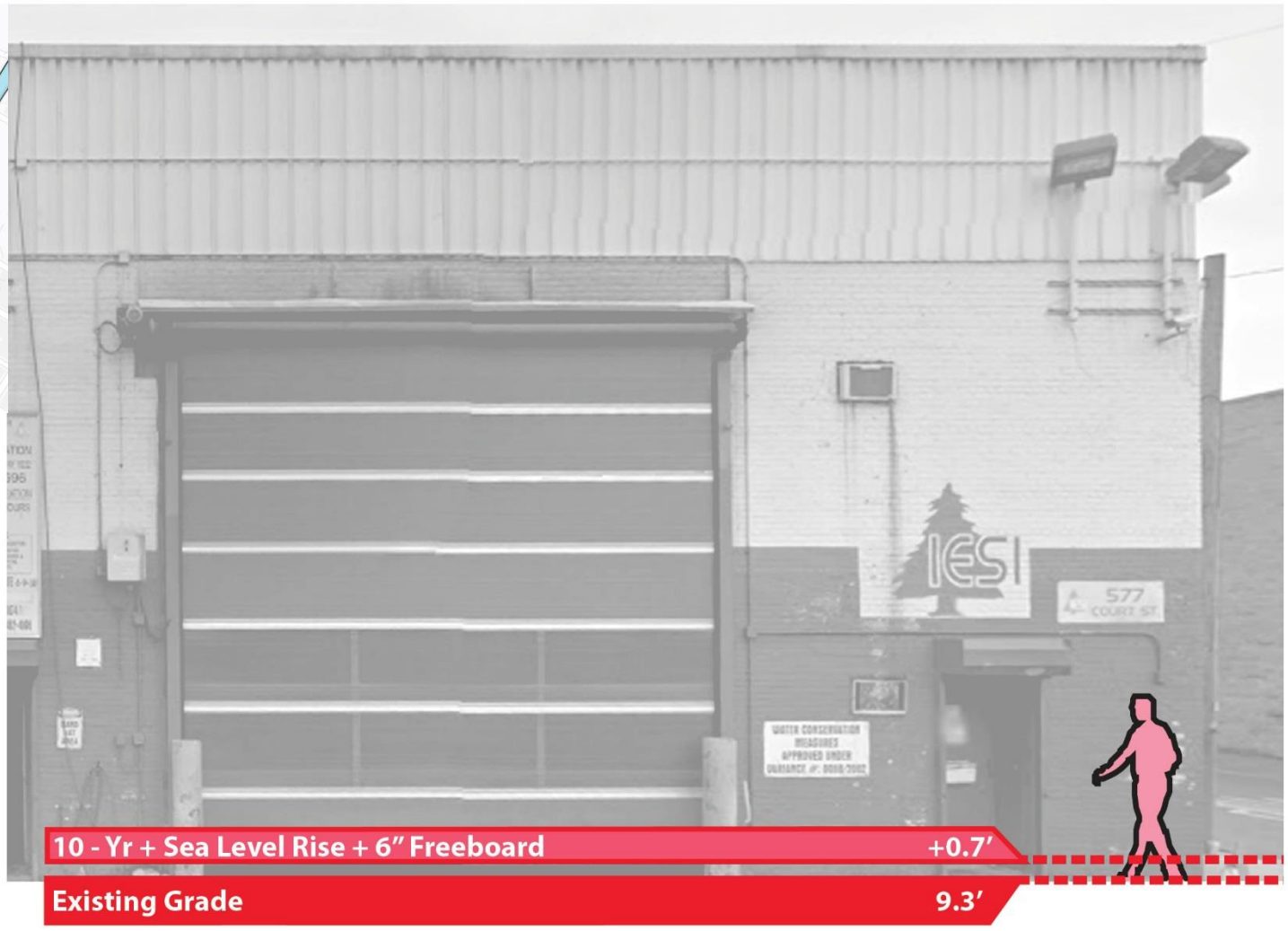

Design Flood Elevation Scenarios

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Design Flood Elevation Scenarios

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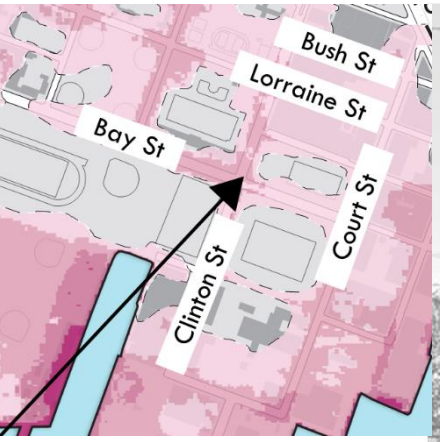
Design Flood Elevation Scenarios

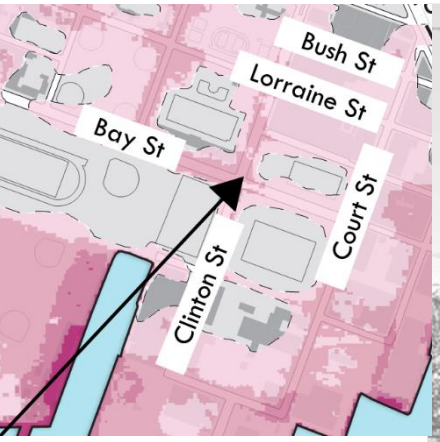
Example Height: Bay Street at Clinton Street



2. Bay Street at Clinton Street

Design Flood Elevation Scenarios

Example Height: Bay Street at Clinton Street



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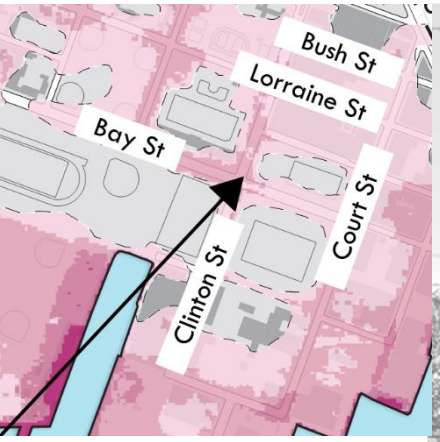

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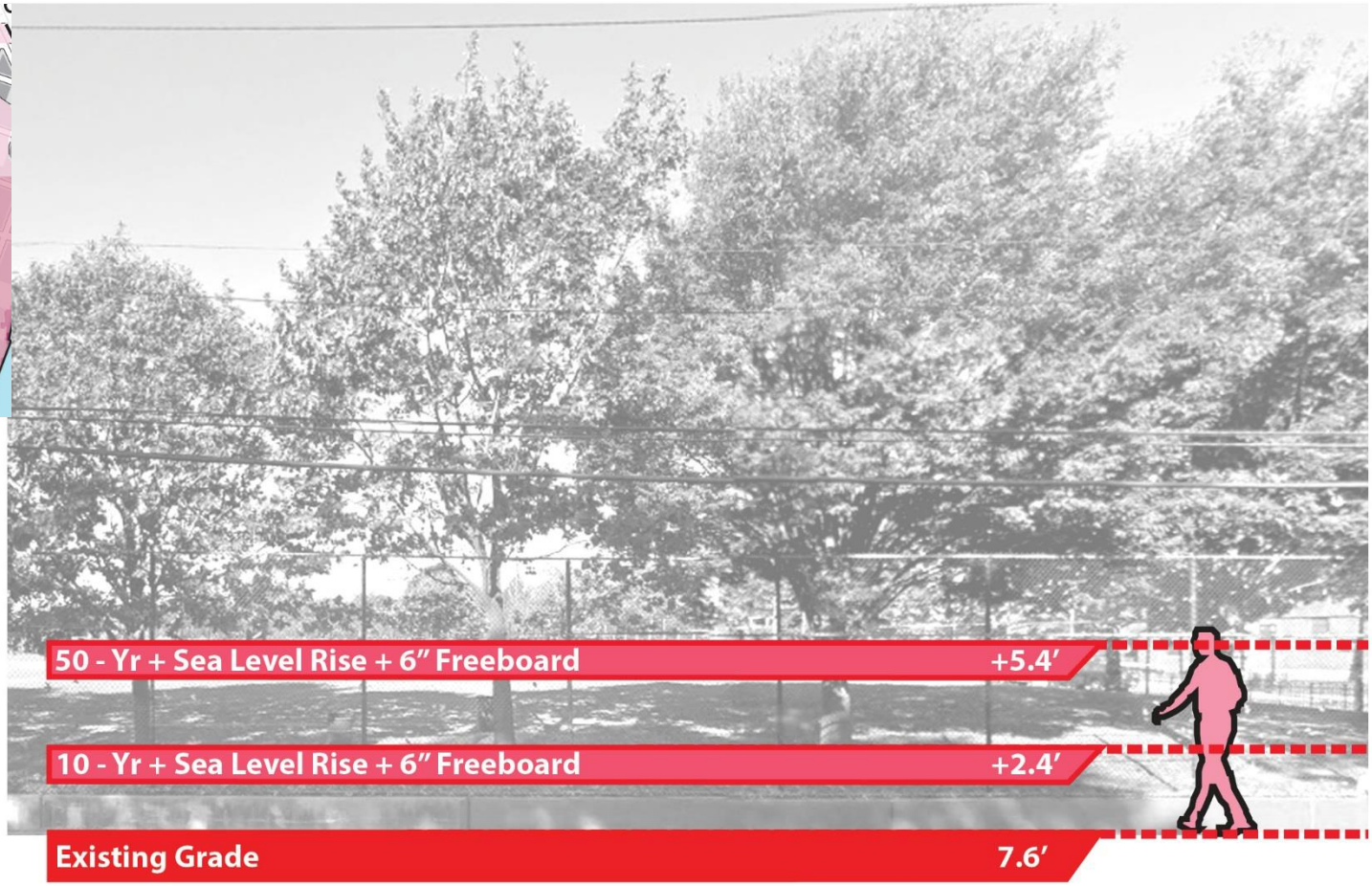

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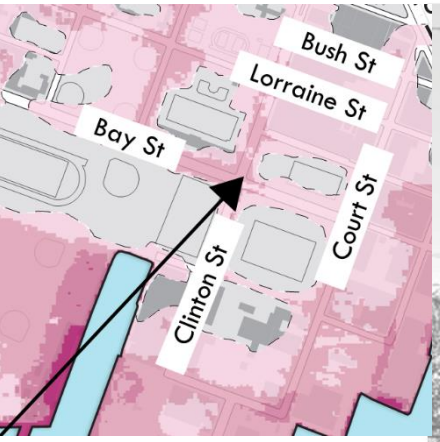
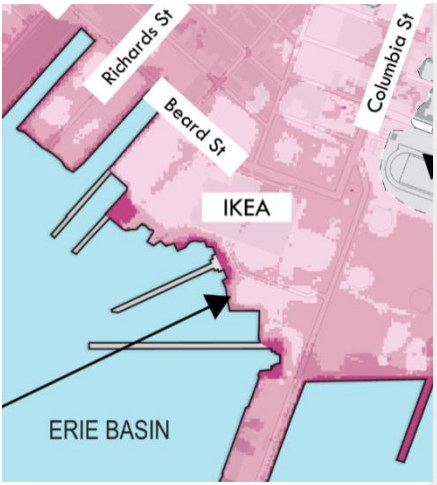


2. Bay Street at Clinton Street

Design Flood Elevation Scenarios

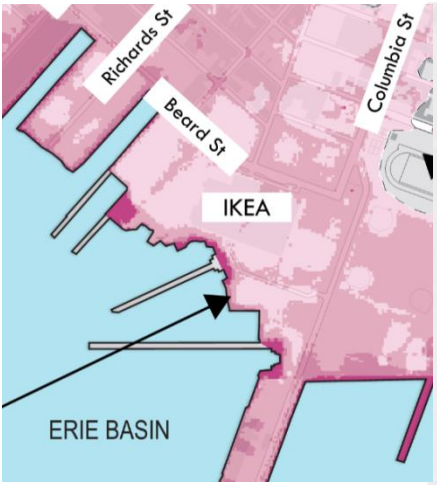
Example Height: IKEA Waterfront



3. IKEA Waterfront Walkway

Design Flood Elevation Scenarios

Example Height: IKEA Waterfront



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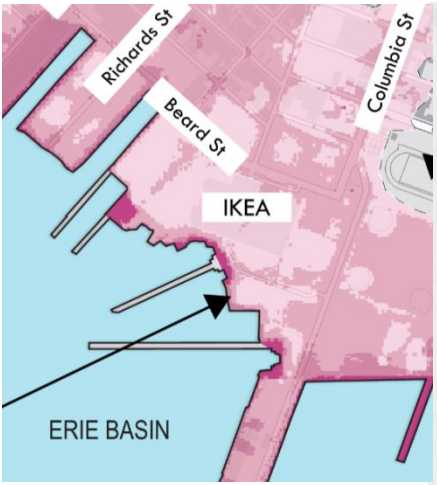
Design Flood Elevation Scenarios

Example Height: IKEA Waterfront



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Design Flood Elevation Scenarios

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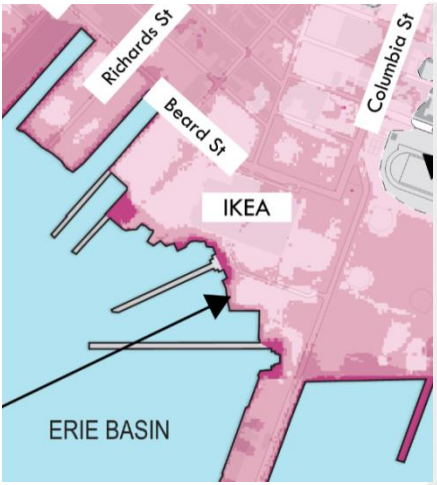

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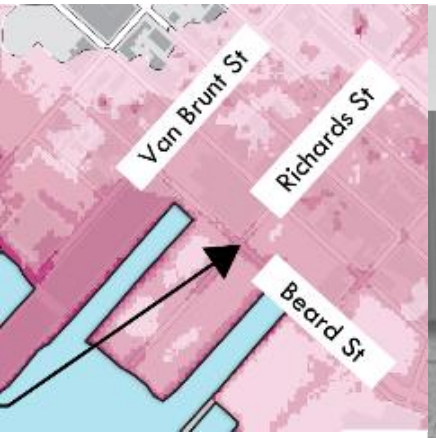
Design Flood Elevation Scenarios

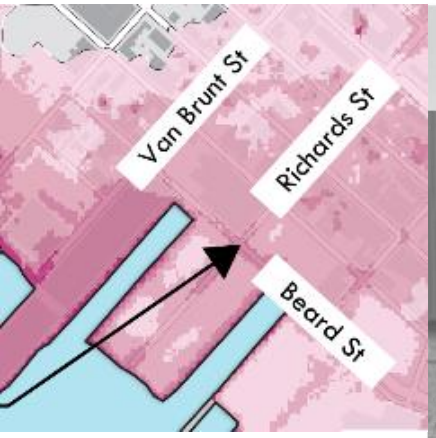
Example Height: Beard Street at Richards Street



4. Beard Street at Richards Street Intersection

Design Flood Elevation Scenarios

Example Height: Beard Street at Richards Street



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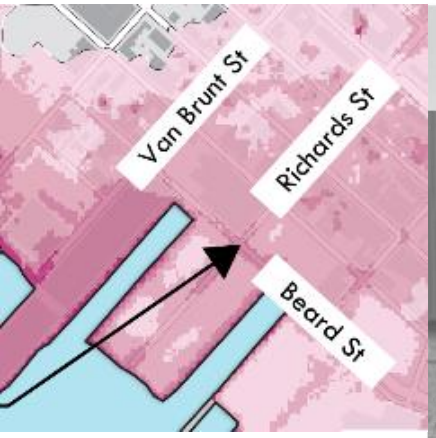

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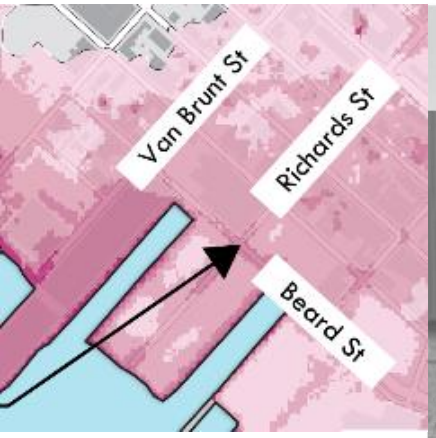

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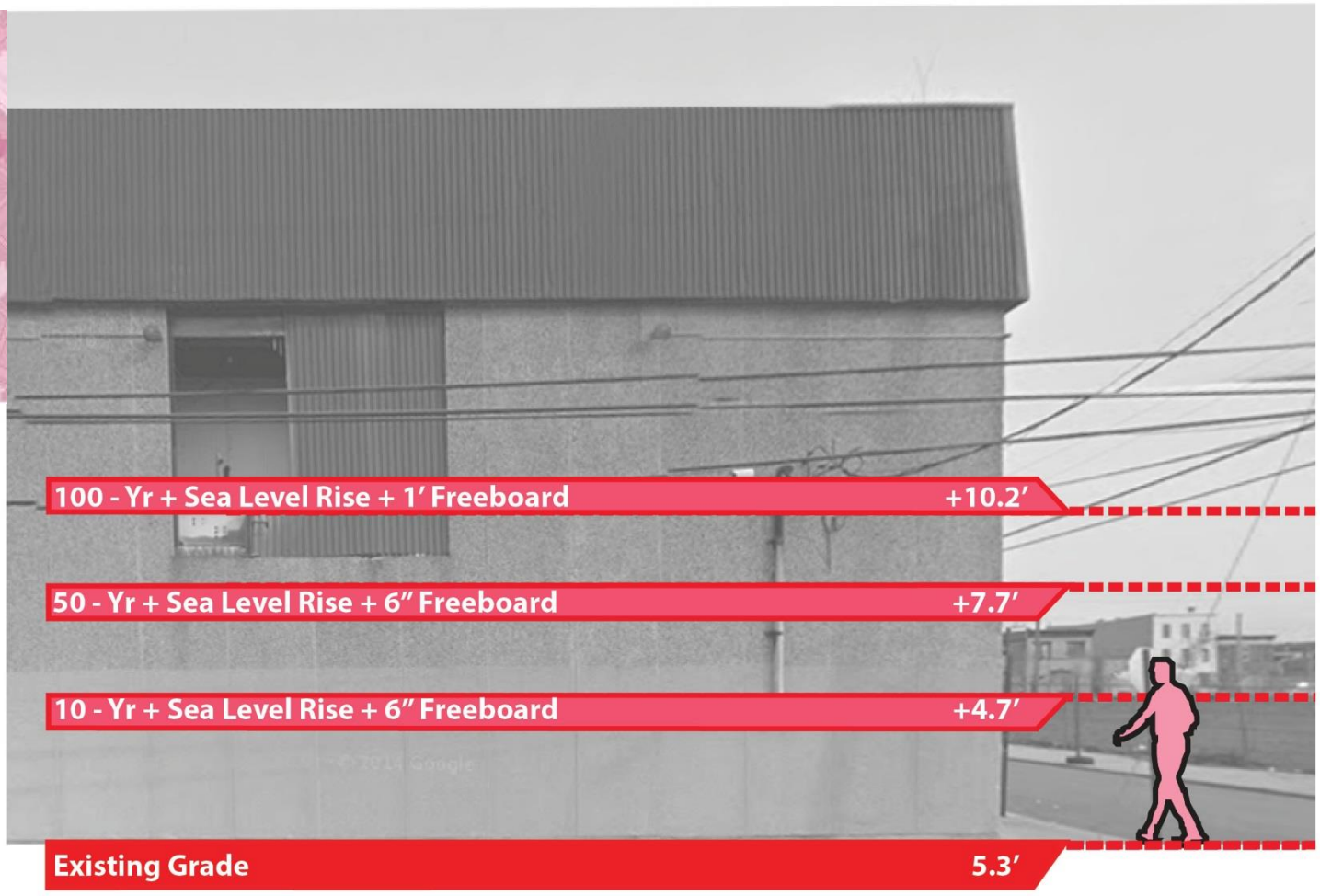
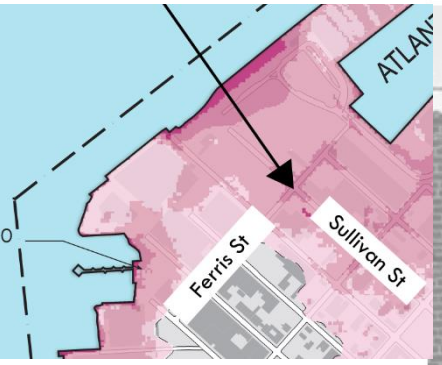


Design Flood Elevation Scenarios

Example Height: Ferris Street at Sullivan Street



5. Ferris Street at Sullivan Street – Canal Sanitation Building (39 Ferris Street)

Design Flood Elevation Scenarios

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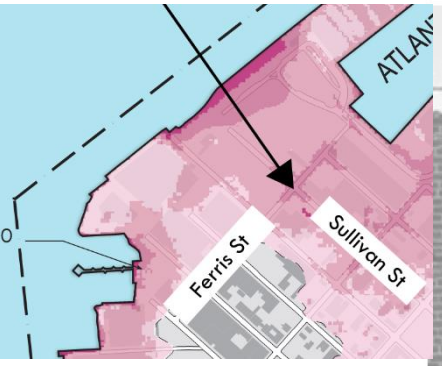

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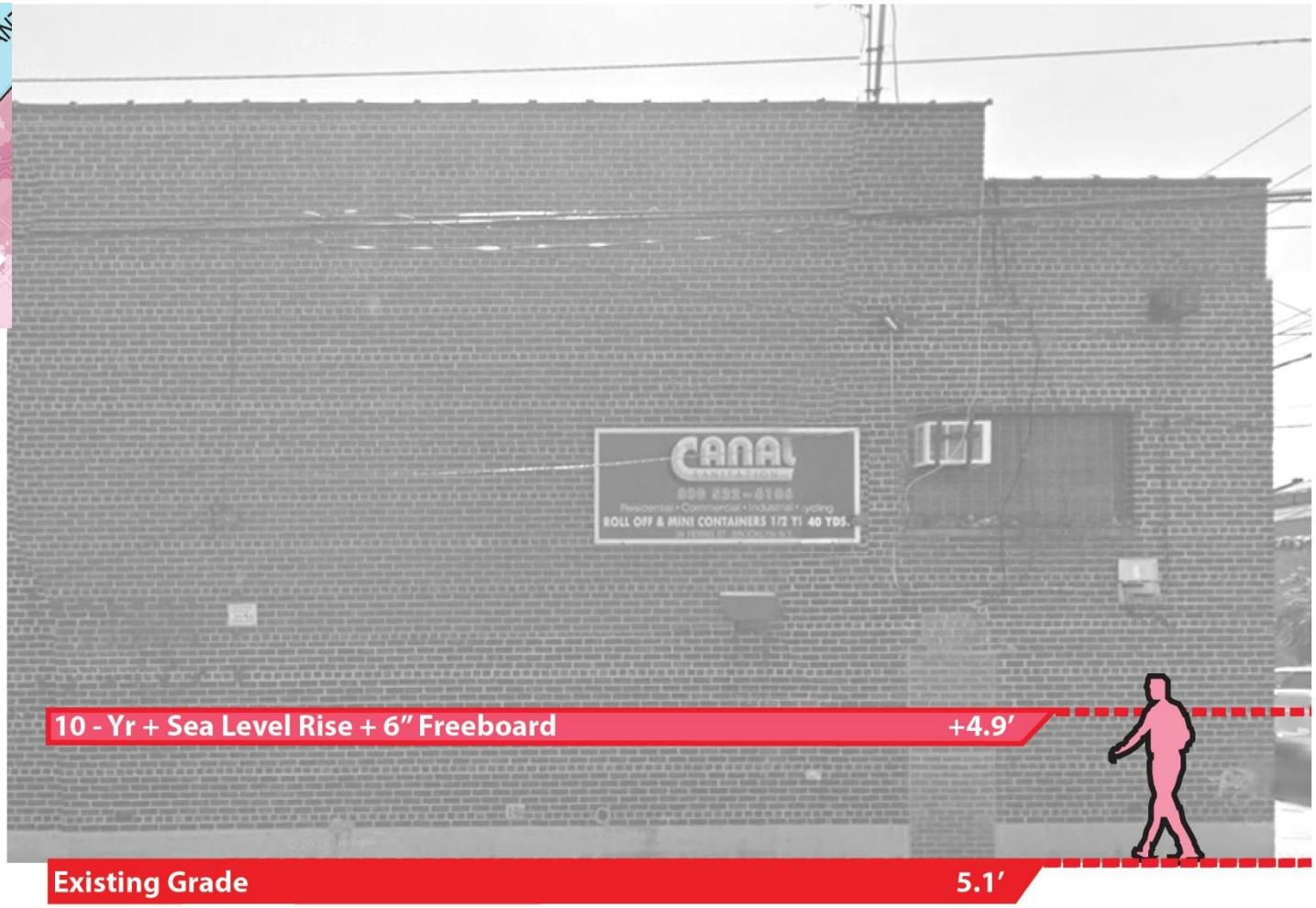

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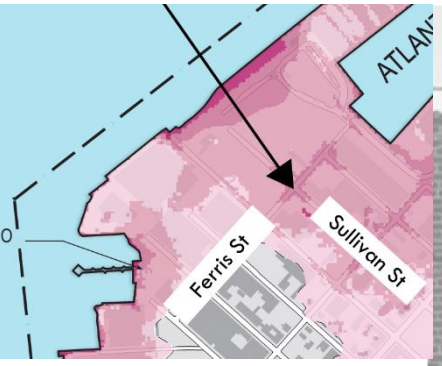

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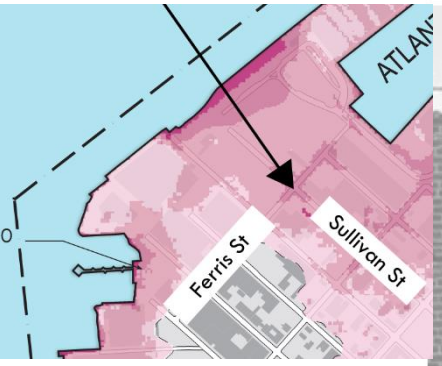

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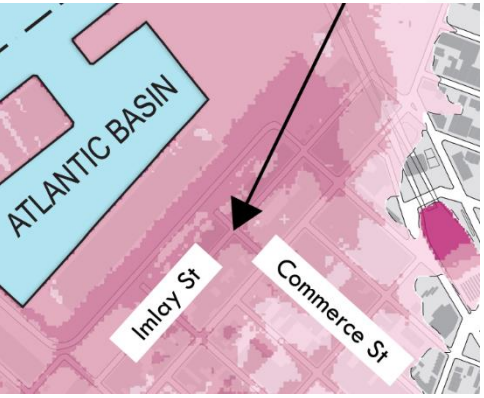
Design Flood Elevation Scenarios

Example Height: Commerce Street at Imlay Street



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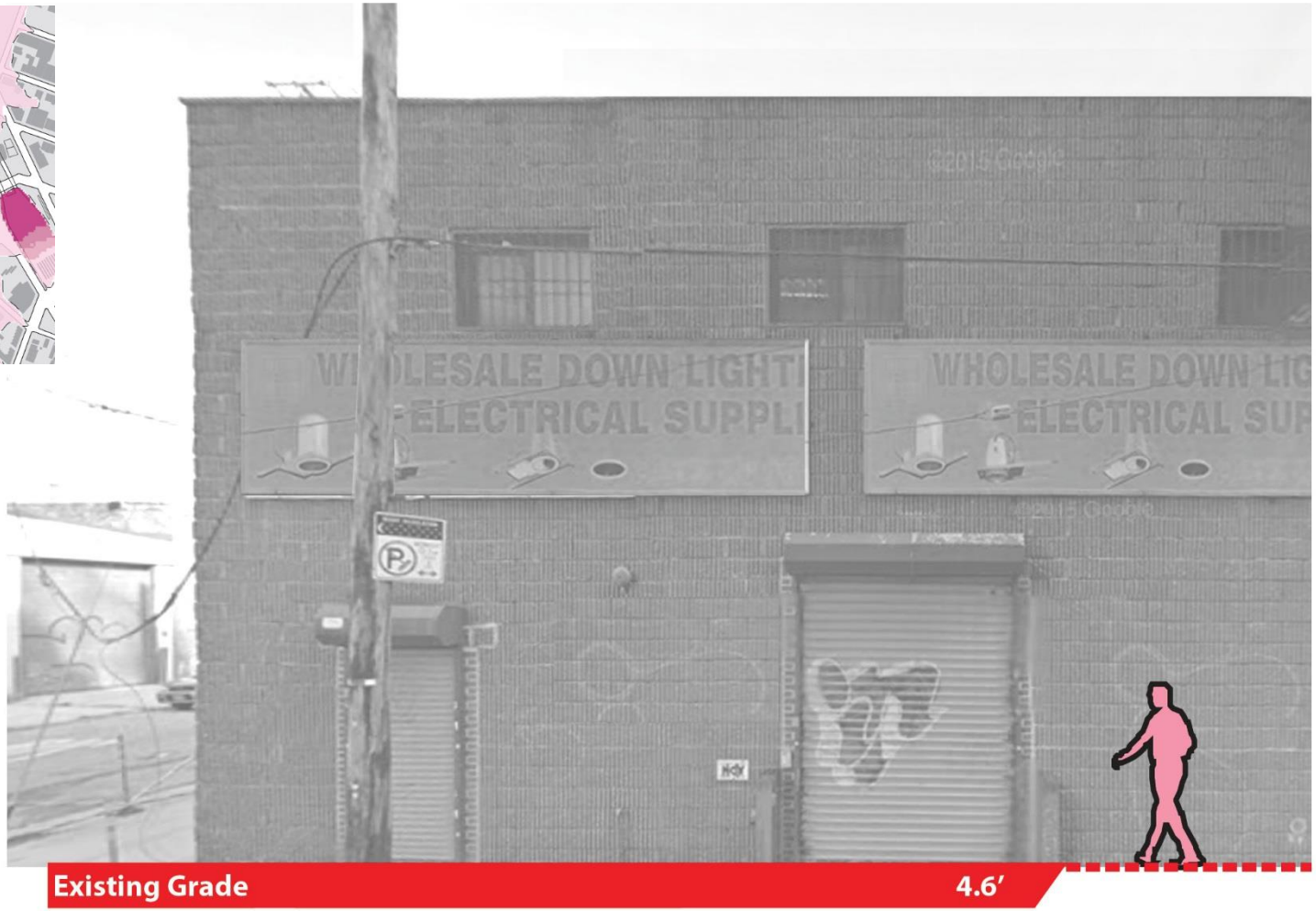

Design Flood Elevation Scenarios

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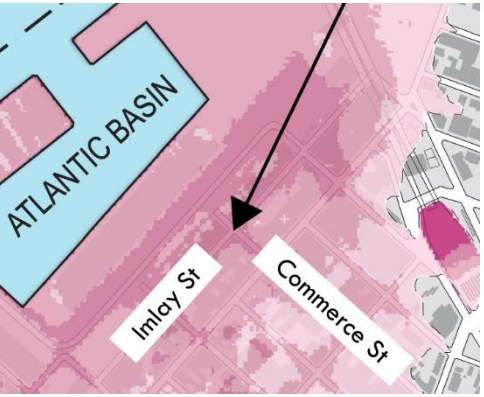

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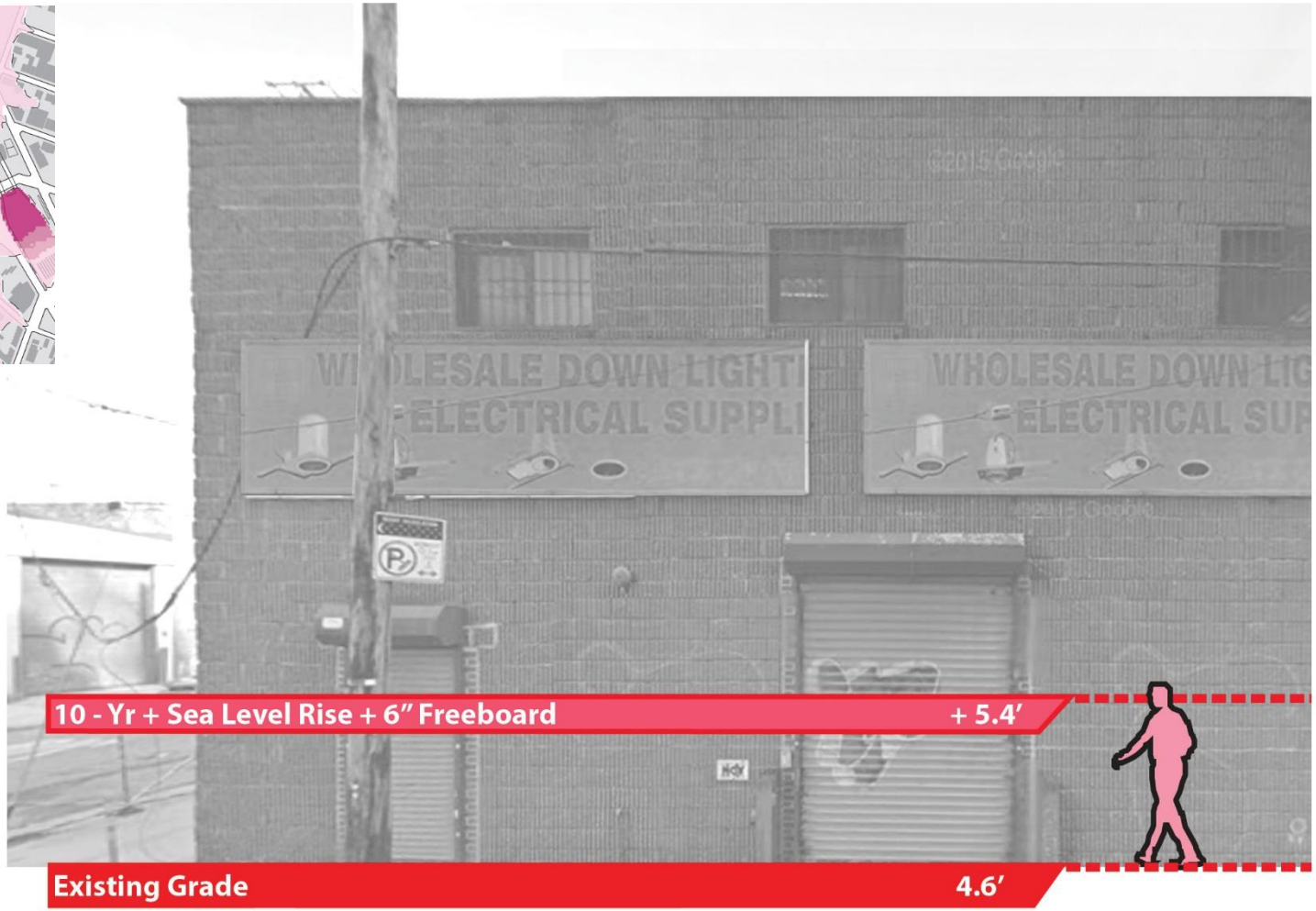

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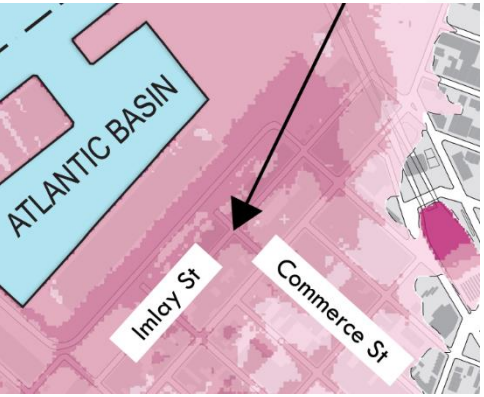

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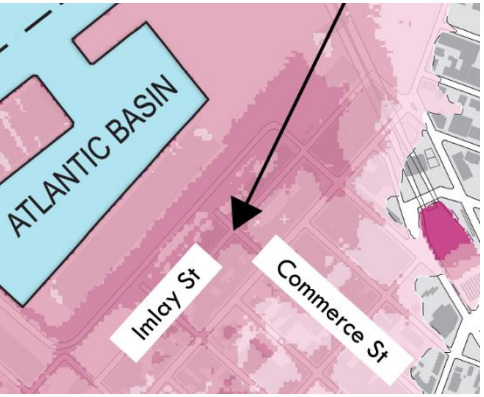


6. Commerce Street at Imlay Street

Part I: Small Group Discussion

PART 2: ALIGNMENT SCENARIOS AND ANALYSES

Alignment Scenarios and Analyses

Existing Conditions and Constraints

- There are various major constraints and existing conditions that pose significant challenges in placing an alignment
- The team considered the existing conditions that have the most significant potential to influence the feasibility and location of a flood protection system:

- Floodplain and flood depths
- Topography
- Property ownership
- Transportation routes
- Critical facilities
- Utilities
- Drainage system
- Zoning
- Land Use
- Waterfront Assessment

Alignment Scenarios and Analyses

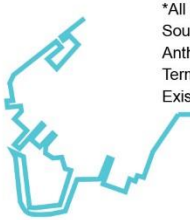
Topography

- Red Hook has several natural high points that are not as vulnerable to flooding
- The Red Hook IFPS will tie into the high points to increase the effectiveness of the system
- The natural high points are indicated by the white circles and connected by the white dotted lines

Legend

- (-49.0) - (-30.0) Elevation
- (-30.0) - (-10.0) Elevation
- (-10.0) - (0.0) Elevation
- (0.0) - (+7.0) Elevation
- (+7.0) - (+9.9) Elevation
- (+9.9) - (+11.4) Elevation
- (+11.4) - (+15.0) Elevation
- (+15.0) - (+20.0) Elevation
- (+20.0) - (+30.0) Elevation
- 1% Annual Chance Floodplain

*All elevations are in NAVD88 Datum
Source: USGS LiDAR 2013, Medina Consultants - Boundary Survey 2015, Erdman Anthony - PANYNJ Brooklyn Marine Terminal Survey 2013, South Brooklyn Marine Terminal Hydrographic Survey2015, Buttermilk Channel Survey USACE 2015, Gowanus Existing Conditions Bathymetry Map



Alignment Scenarios and Analyses

Evaluation Parameters

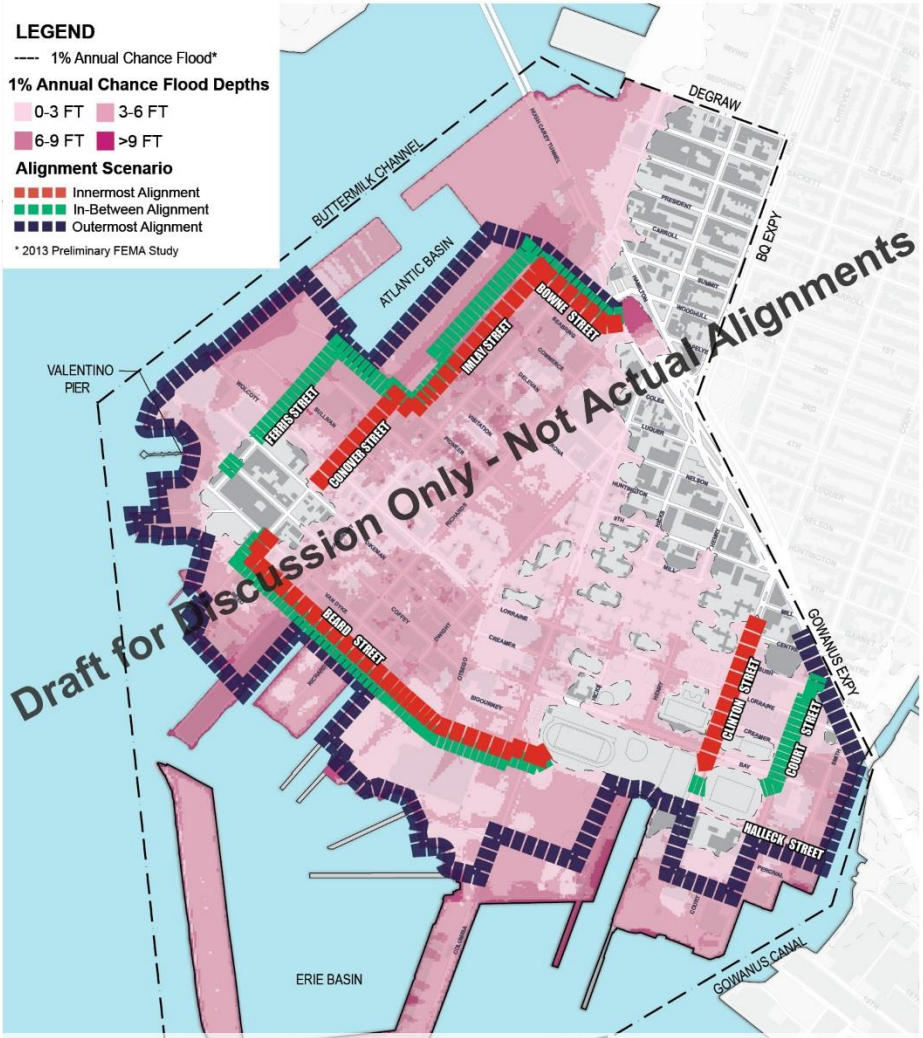
- Available areas for intervention
- Building openings
- Traffic and pedestrian circulation
- Infrastructure impacts (utilities, parking)
- Environmental impacts
- Urban design and community benefits
- Economic impacts
- Need for deployable systems

Alignment Scenarios and Analyses

Thought Process and Approach

- Considering the existing conditions and flood risks, the following three potential alignment scenarios were developed:
  - The Outermost Alignment: this alignment, for the most part, follows the Red Hook waterfront.
  - The In-Between Alignment: this alignment is located mostly on streets inland from the waterfront, with the exception of Beard Street.
  - The Innermost Alignment: a portion of this alignment is located further inland than the In-Between Alignment.

Portions of these alignments can be mixed and matched.



Note: The In-Between and Innermost Alignment Scenario lines are discontinuous because they tie into the natural topographic high points within Red Hook.

Alignment Scenarios and Analyses

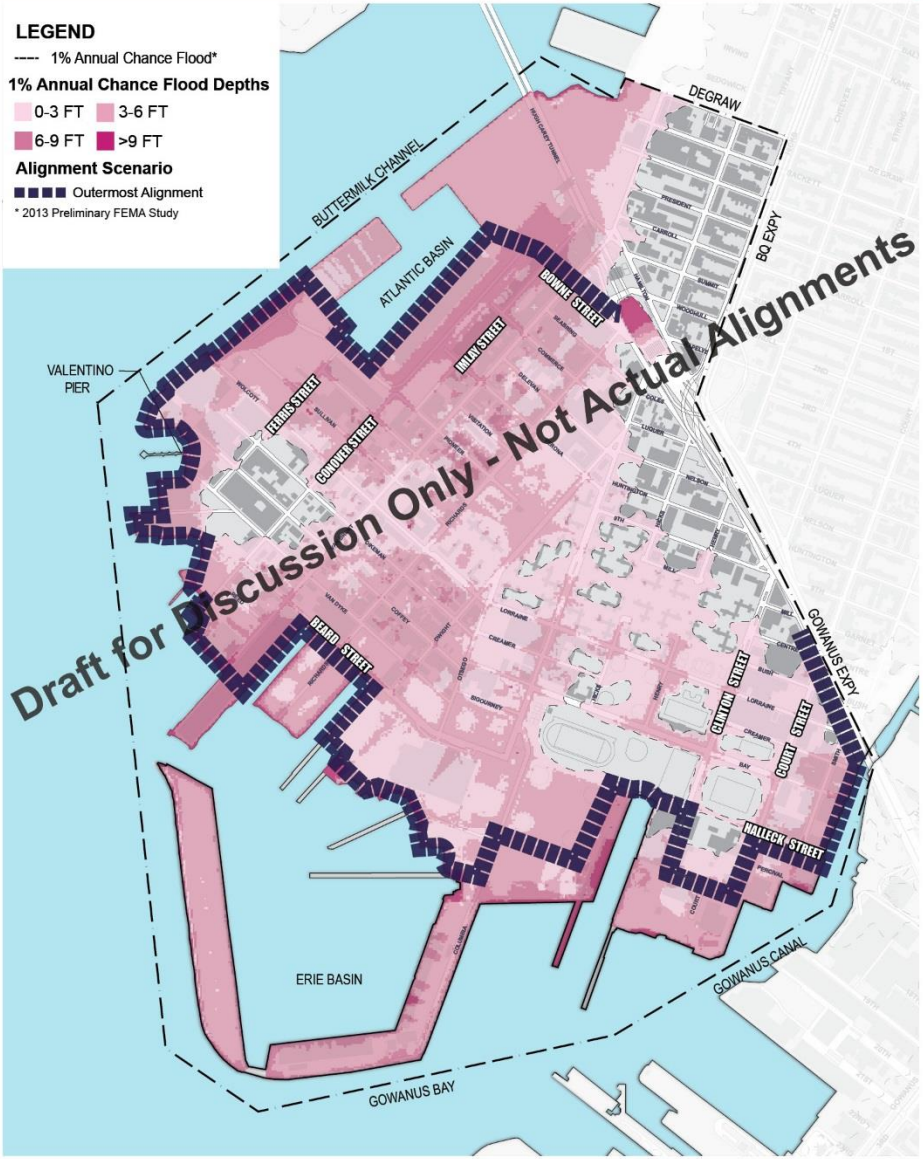
Outermost Alignment

Pros:

- Greatest amount of land protected by IFPS
- Fewer impacts to pedestrian and vehicular traffic than the other two alignments scenarios

Cons:

- Longer length
- Most expensive scenario
- Major impact to views
- Subject to wave action; higher design flood elevation
- Accessibility of the working waterfront would be impacted
- Potentially longest time to construct
- Most of the existing waterfront structures are in poor to fair condition
- Waterfront property is mostly privately owned



Alignment Scenarios and Analyses

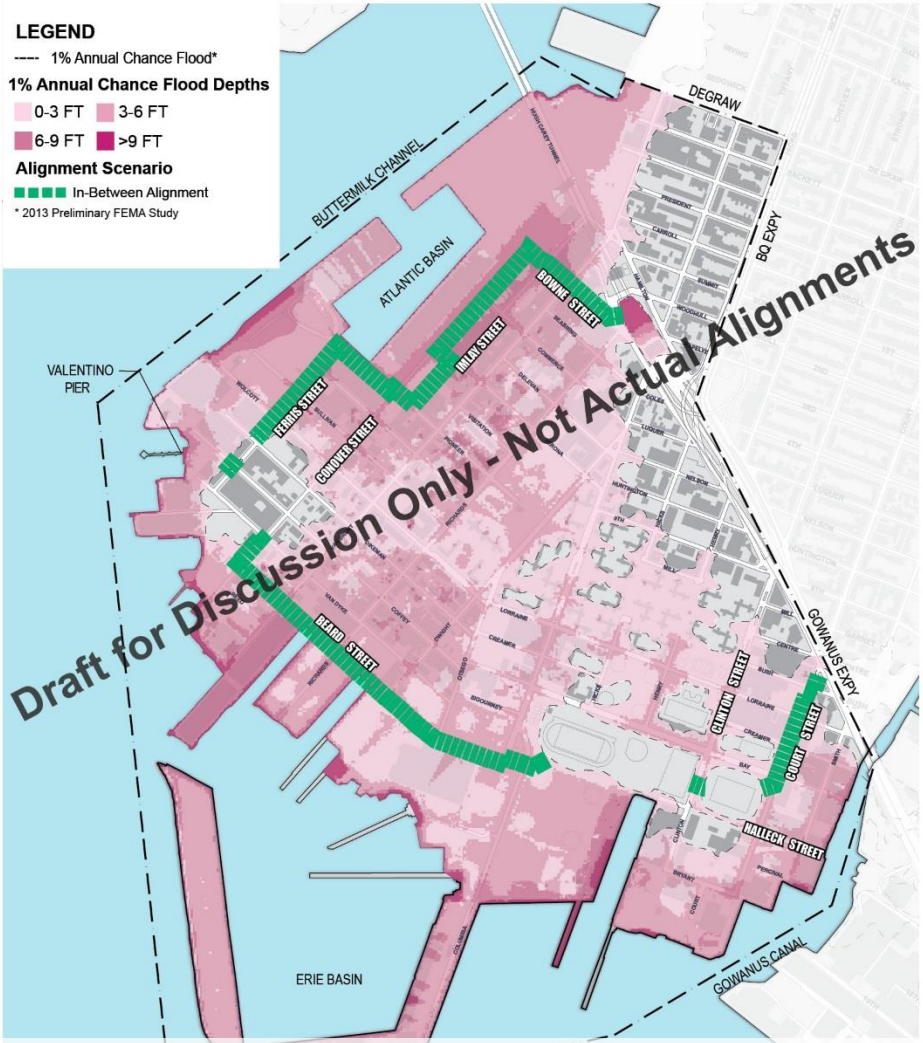
In-Between Alignment

Pros:

- No major impacts to working waterfront
- Not subject to wave action
- Lower Design Flood Elevation than outermost alignment
- Mostly public ownership

Cons:

- Potential impacts to traffic flow (truck and bus routes)
- Waterfront properties are outside of the IFPS
- Potential for impacts to views due to the relatively high DFE on Beard Street, Ferris Street, Bowne Street, and Imlay Street.



Note: The In-Between and Innermost Alignment Scenario lines are discontinuous because they tie into the natural topographic high points within Red Hook.

Alignment Scenarios and Analyses

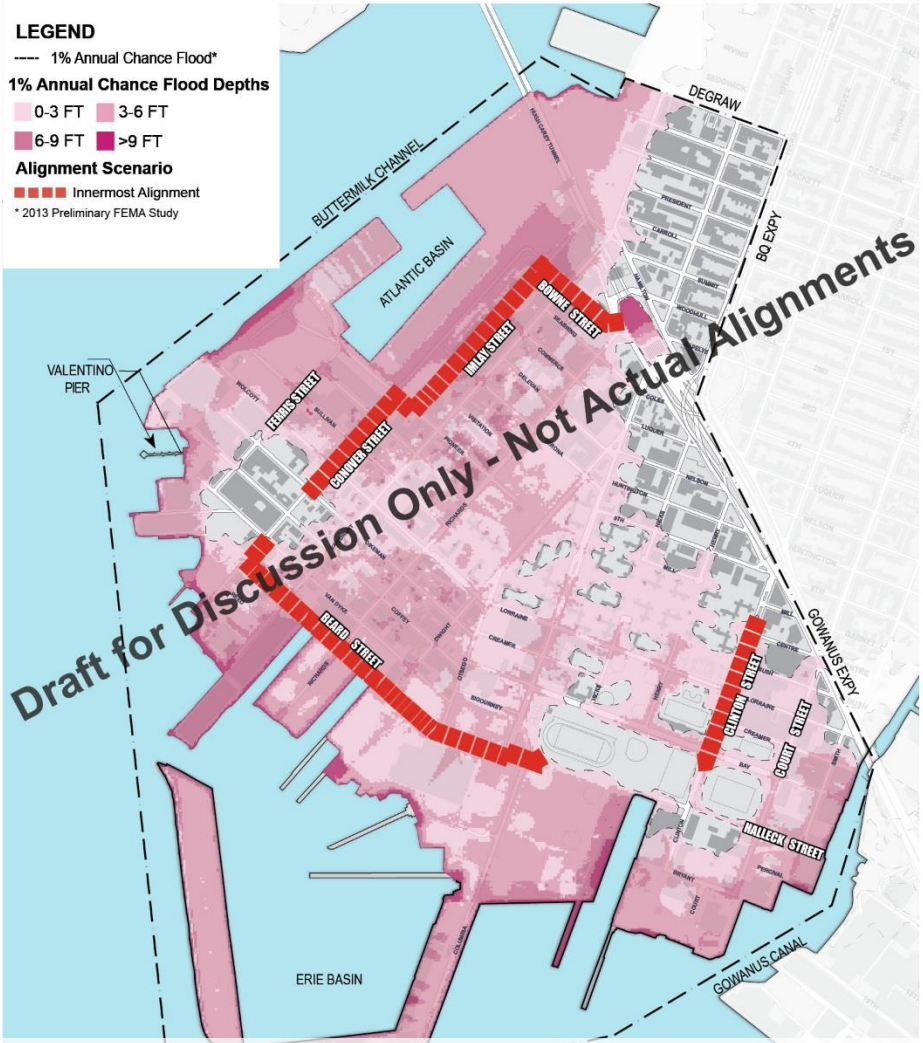
Innermost Alignment

Pros:

- No major impacts to working waterfront
- Not subject to wave action
- Lower Design Flood Elevation
- Mostly public ownership

Cons:

- Potential impacts to traffic flow (truck and bus routes) and pedestrian access
- Waterfront and some inland properties are not protected
- Potential for impacts to views due to the relatively high DFE on Beard Street, Ferris Street, Bowne Street and Imlay Street.
- Least amount of land included within IFPS

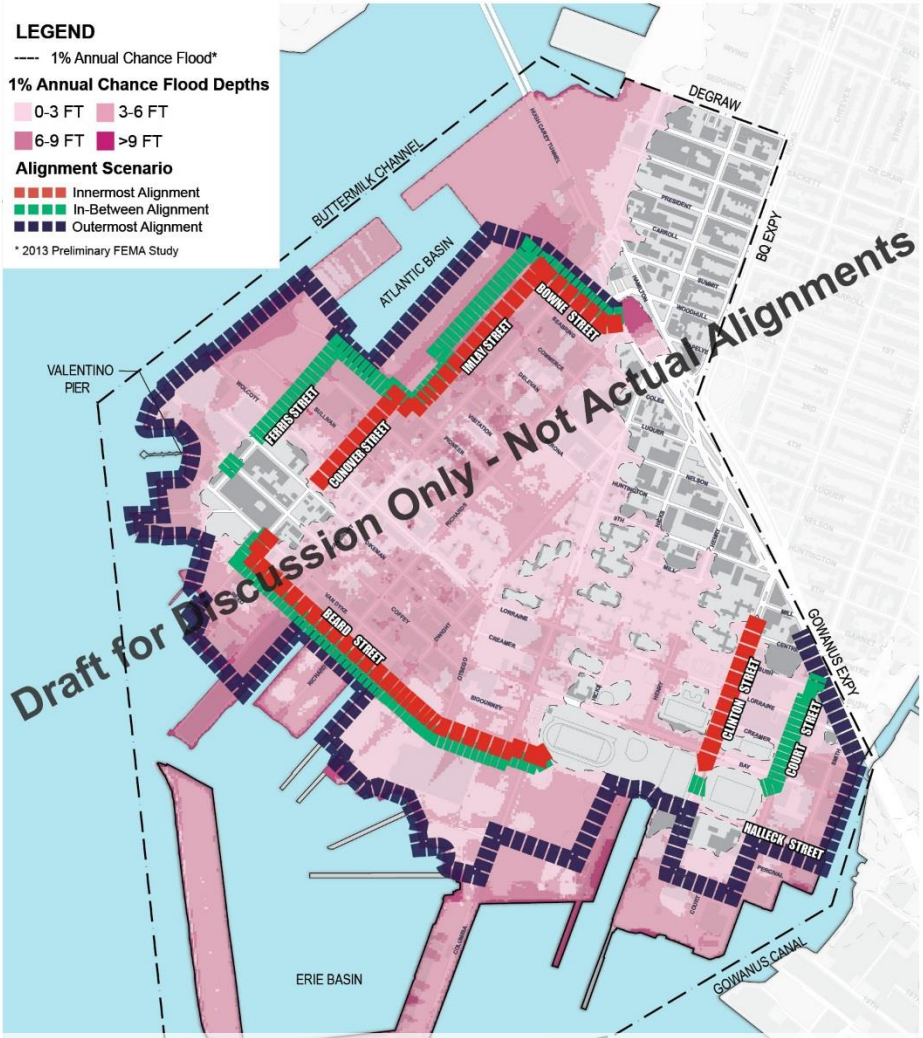


Note: The In-Between and Innermost Alignment Scenario lines are discontinuous because they tie into the natural topographic high points within Red Hook.

Alignment Scenarios and Analyses

Conclusions

- Outermost Alignment
  - Generally follows waterfront edge and includes greatest amount of area within IFPS
  - Potentially most expensive scenario
  - Highest DFE
  - Impacts to the working waterfront
  - Impacts to views
- In-Between Alignment
  - Provides moderate flood risk reduction benefits within the study area
  - Takes advantage of the natural topographic high points reducing the overall length of a built intervention system
- Innermost Alignment:
  - Provides the least area of protection
  - Least amount of length
  - Potentially lowest cost scenario



Note: The In-Between and Innermost Alignment Scenario lines are discontinuous because they tie into the natural topographic high points within Red Hook.

Part II: Small Group Discussion

REPORT BACK & CONCLUSIONS

Conclusions

- Each alignment presents its own set of unique challenges
- Greater intervention height provides greater flood risk reduction benefits and potential flood insurance reduction; however, greater height comes with potential impacts to the existing urban fabric of Red Hook
- There are various major constraints and existing conditions that pose significant challenges in placing an alignment

NEXT STEPS

Next Steps

- Incorporate feedback into developing a preferred alternative
- Explore other resiliency measures for Red Hook
- To learn more about the project and view updates, please visit: http://www.nycedc.com/project/red-hook-integrated-flood-protection-system.
- You can also email the project team with any questions at rhifps@edc.nyc, and follow us on twitter at twitter.com/nyclimate

Acronyms & Terms Reference

BFE – Base Flood Elevation

CSO – Combined Sewer Overflow

DCP – Department of City Planning

DFE – Design Flood Elevation

FEMA – Federal Emergency Management Agency

FB – Freeboard: an additional amount of height above the Base Flood Elevation to provide a factor of safety

IFPS – Integrated Flood Protection System

NFIP – National Flood Insurance Program

ROW – Right-of-Way

SLR – Sea Level Rise

USACE – United States Army Corp of Engineers