



lower manhattan  
**COASTAL RESILIENCY**

**TWO BRIDGES PUBLIC MEETING # 3**  
**DECEMBER 19TH, 2017**

# MEETING OBJECTIVES

- Project Overview
- Alignment Update and Exercise
- Technical Analysis Update (Deployables)
- Community Partner (Trust for Public Land)
- Next Steps and Timeline

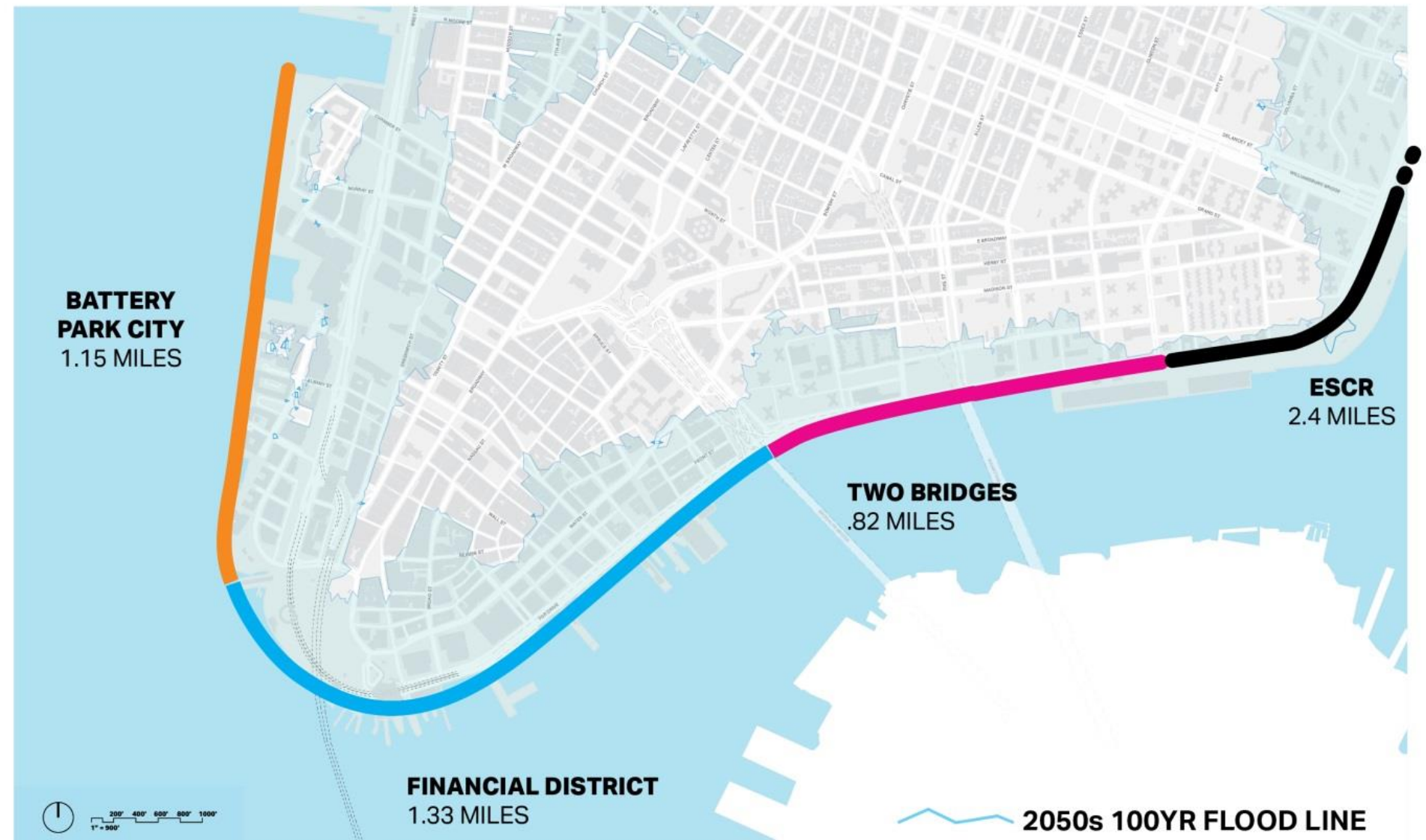
# PROJECT OVERVIEW

## Purpose of Study:

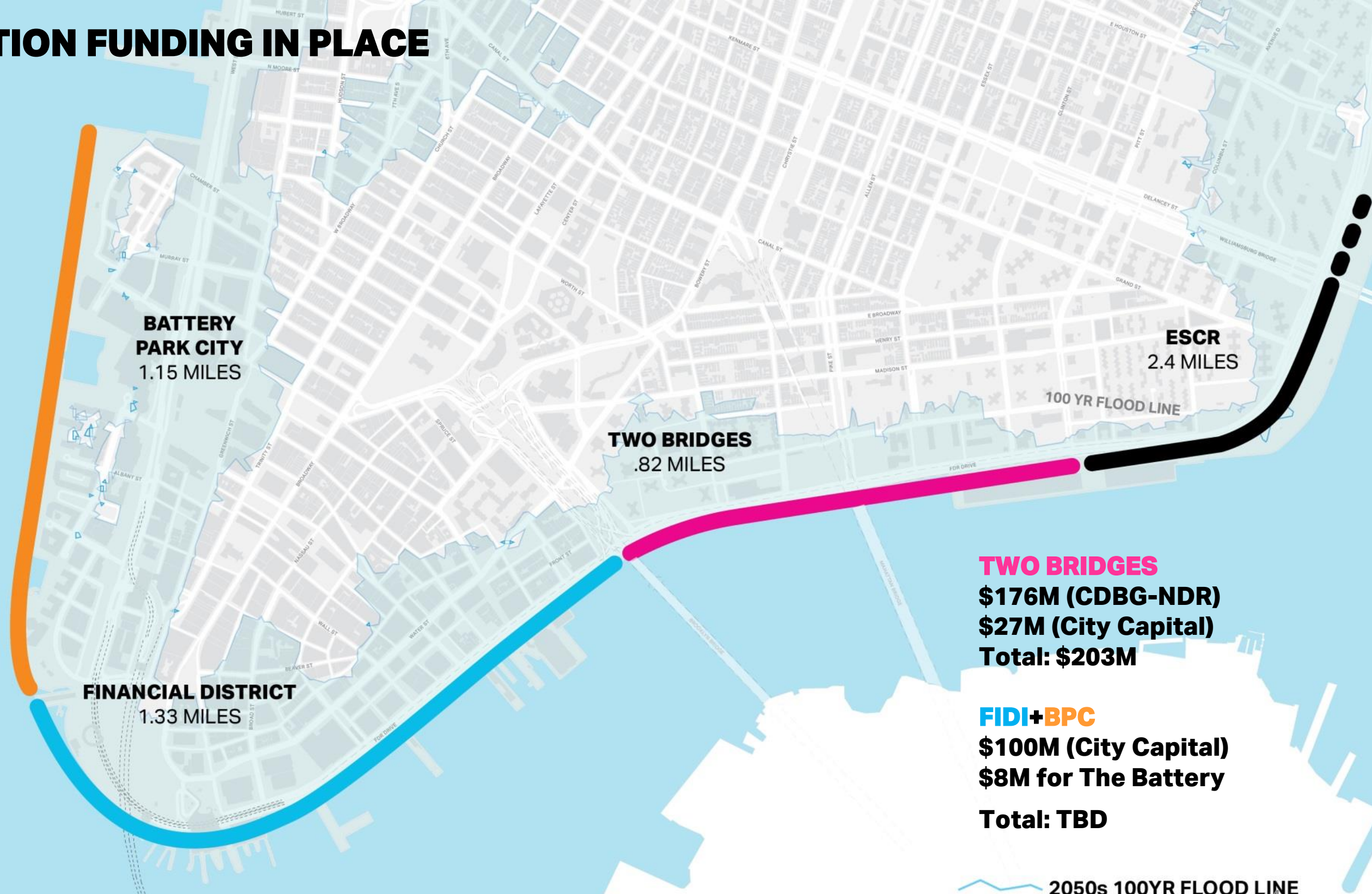
1. Develop long-term strategy and feasible concept design for all of Lower Manhattan
2. Prioritize project concepts toward implementation and conduct advanced planning when possible
3. Engage with community on core design principles and priorities

## Study Funding:

+ \$7.25M CDBG-DR  
(\$3.75M GOSR; \$3.5M NYC)



# IMPLEMENTATION FUNDING IN PLACE



**TWO BRIDGES**  
\$176M (CDBG-NDR)  
\$27M (City Capital)  
Total: \$203M

**FIDI+BPC**  
\$100M (City Capital)  
\$8M for The Battery  
Total: TBD

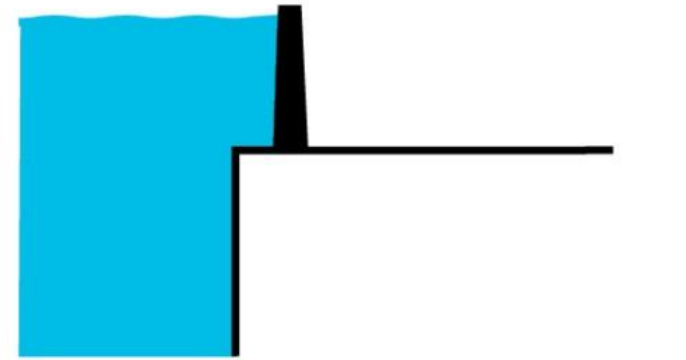
200' 600' 1000'



2050s 100YR FLOOD LINE

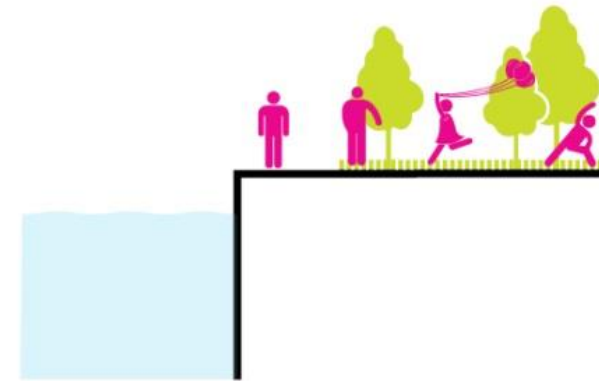


# CORE MISSION



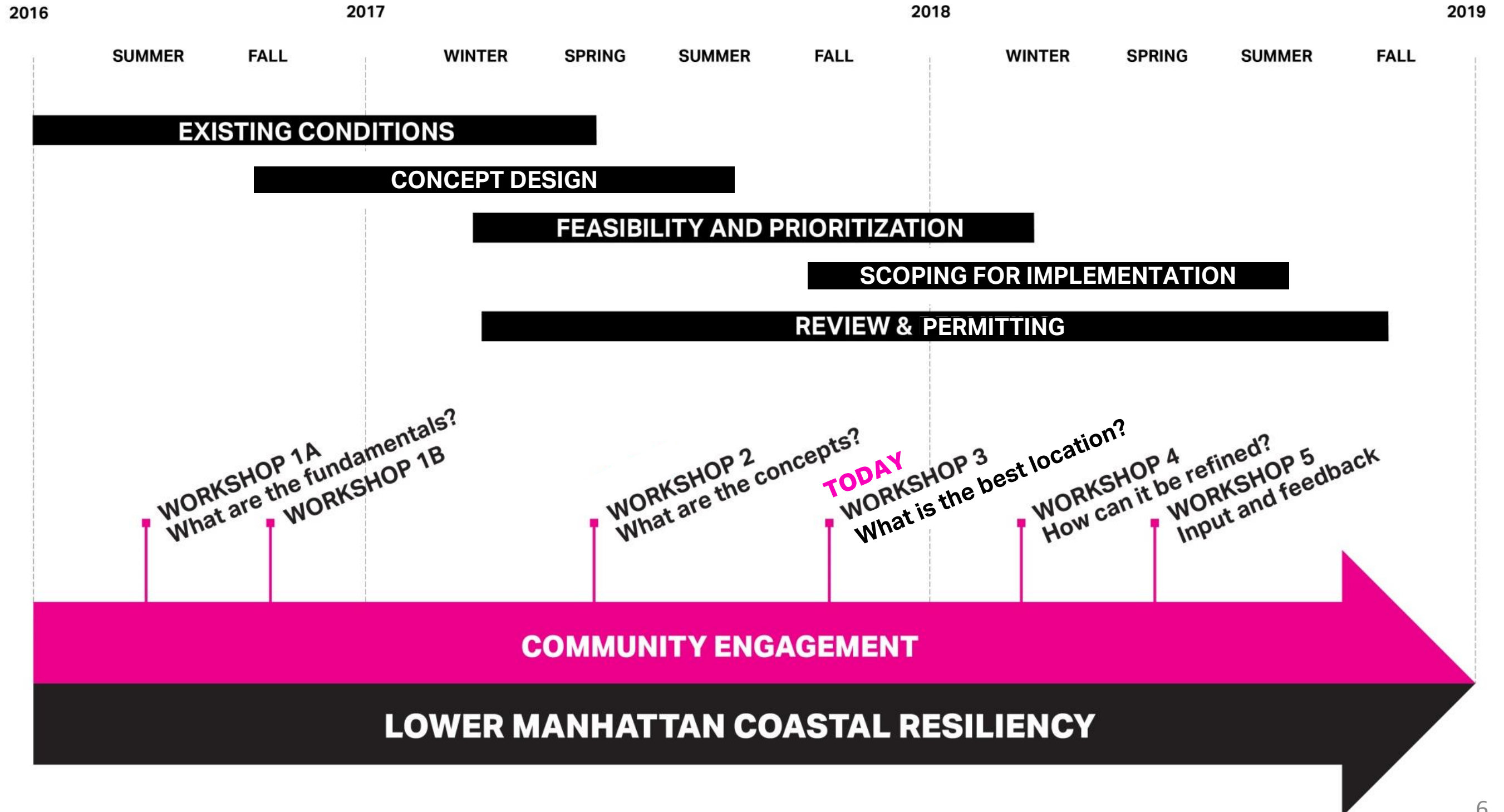
**FLOOD RISK REDUCTION**

+



**PUBLIC BENEFIT**

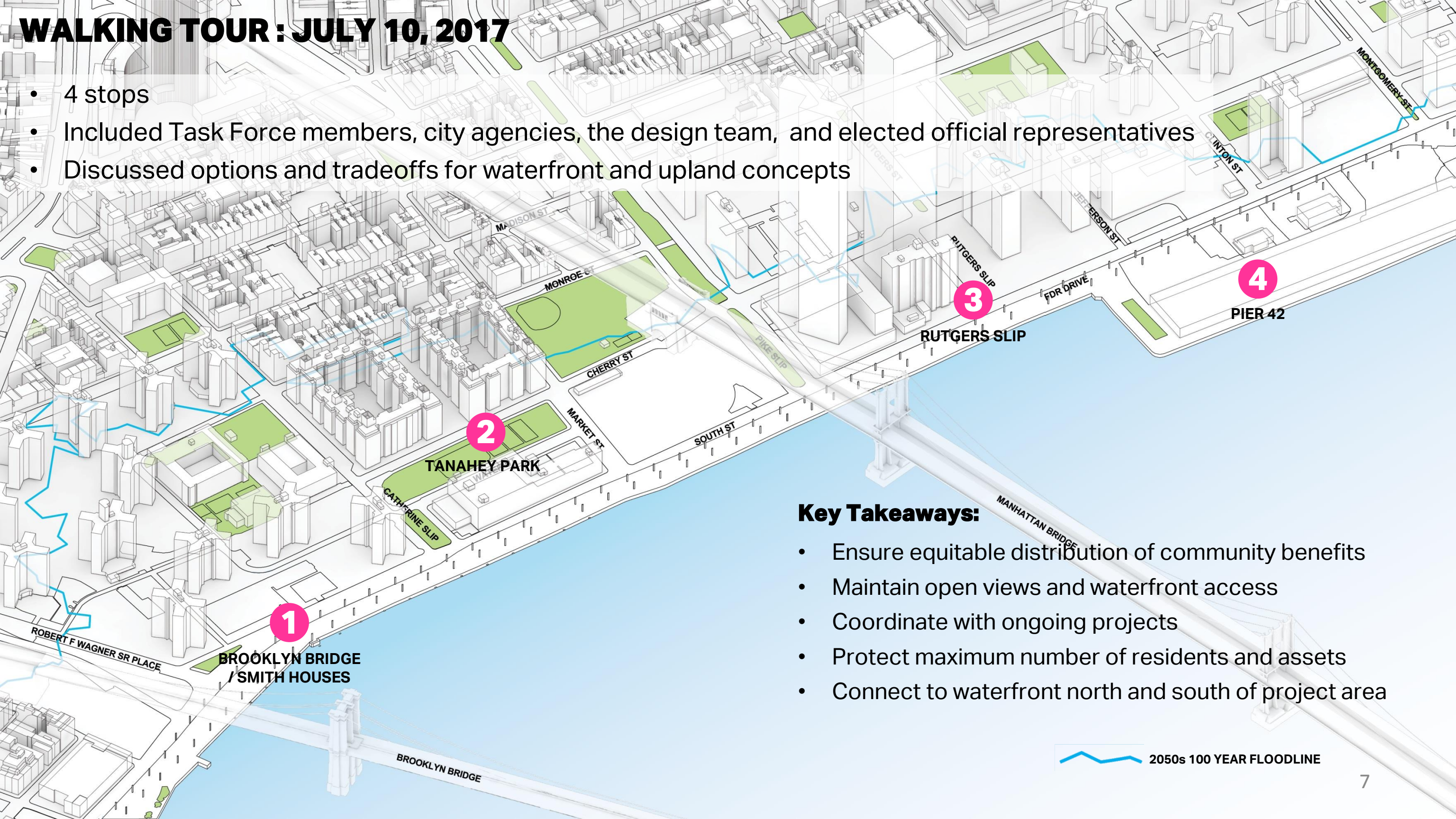
# PROJECT PROCESS





# WALKING TOUR: JULY 10, 2017

- 4 stops
- Included Task Force members, city agencies, the design team, and elected official representatives
- Discussed options and tradeoffs for waterfront and upland concepts



## Key Takeaways:

- Ensure equitable distribution of community benefits
- Maintain open views and waterfront access
- Coordinate with ongoing projects
- Protect maximum number of residents and assets
- Connect to waterfront north and south of project area

 2050s 100 YEAR FLOODLINE



# EVALUATION CRITERIA



## CONSTRUCTABILITY

- Cost
- Structural requirements
- Impacts on utilities
- Disruptions to existing structures and transportation
- Failure risk



## SCHEDULE

- Regulatory actions
- Environmental impacts
- Jurisdictional coordination



## RESILIENCE

- Buildings, residents, and infrastructure protected
- Adaptability



## OPERATIONS & MAINTENANCE

- Accessibility
- O&M requirements

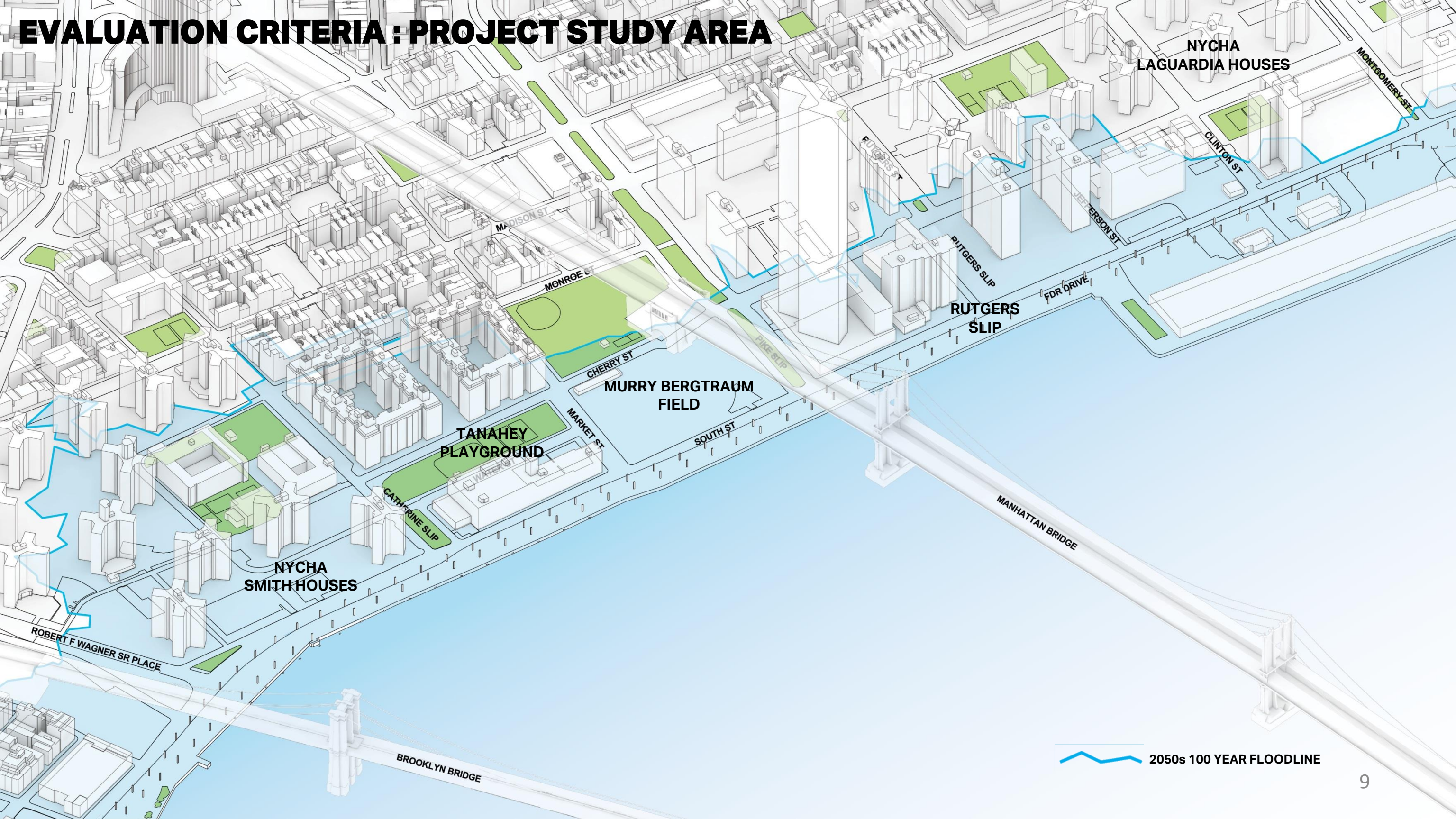


## PUBLIC REALM BENEFITS

- Community amenities
- Placemaking and urban design opportunities



# EVALUATION CRITERIA: PROJECT STUDY AREA

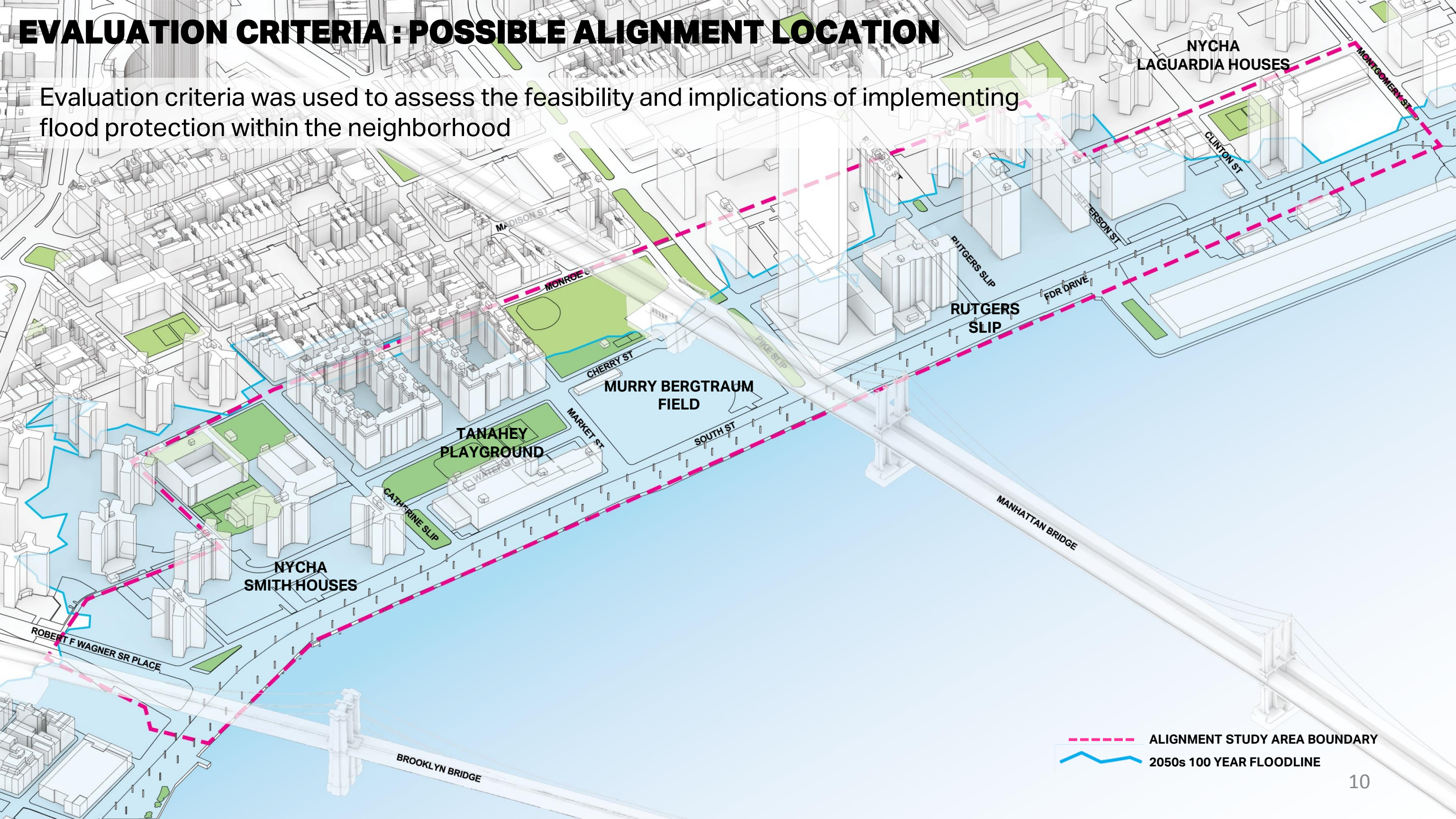


 2050s 100 YEAR FLOODLINE



# EVALUATION CRITERIA: POSSIBLE ALIGNMENT LOCATION

Evaluation criteria was used to assess the feasibility and implications of implementing flood protection within the neighborhood

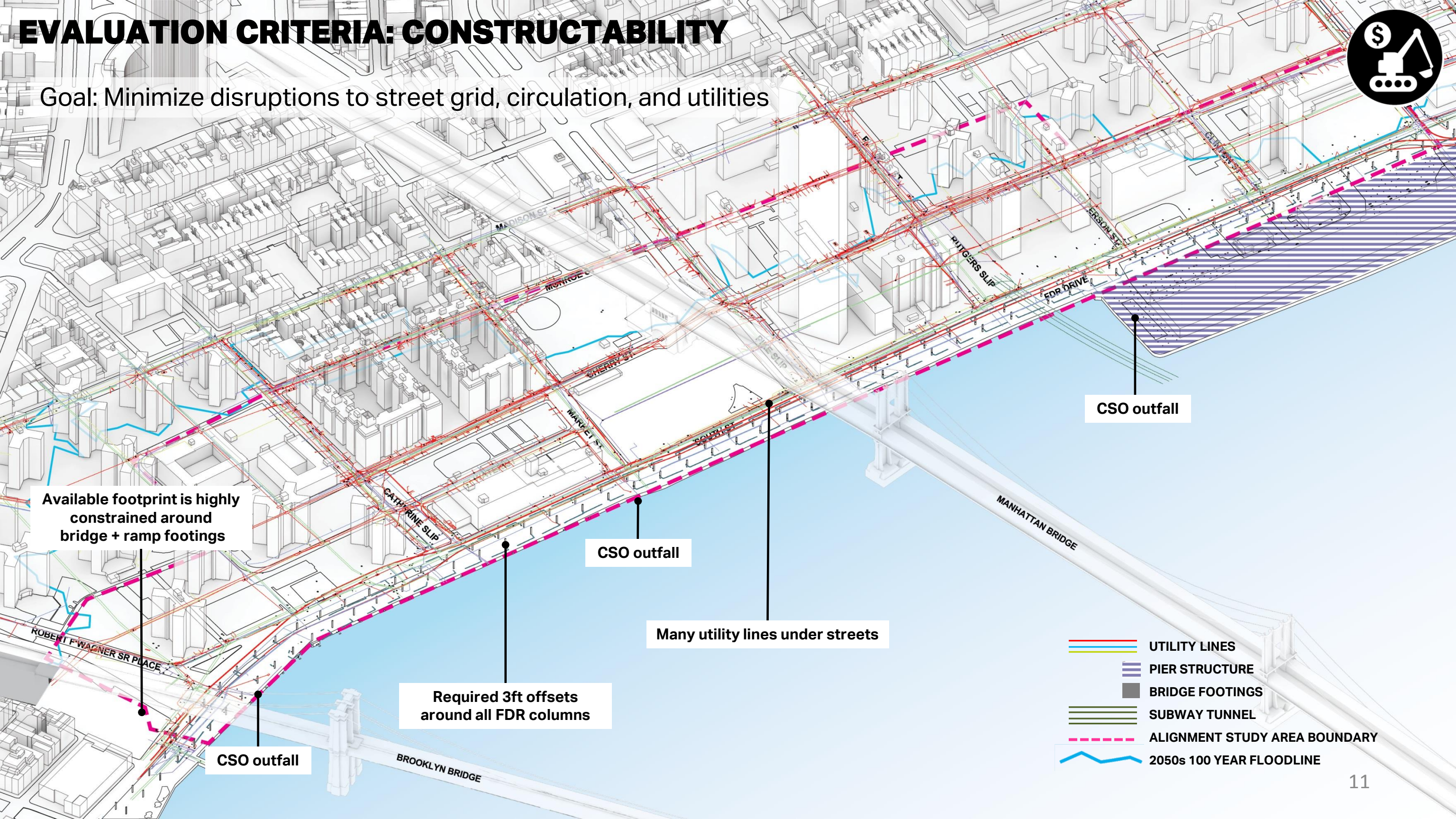




# EVALUATION CRITERIA: CONSTRUCTABILITY



Goal: Minimize disruptions to street grid, circulation, and utilities



Available footprint is highly constrained around bridge + ramp footings

CSO outfall

CSO outfall

Many utility lines under streets

Required 3ft offsets around all FDR columns

CSO outfall

- UTILITY LINES
- PIER STRUCTURE
- BRIDGE FOOTINGS
- SUBWAY TUNNEL
- ALIGNMENT STUDY AREA BOUNDARY
- 2050s 100 YEAR FLOODLINE



# EVALUATION CRITERIA: SCHEDULE



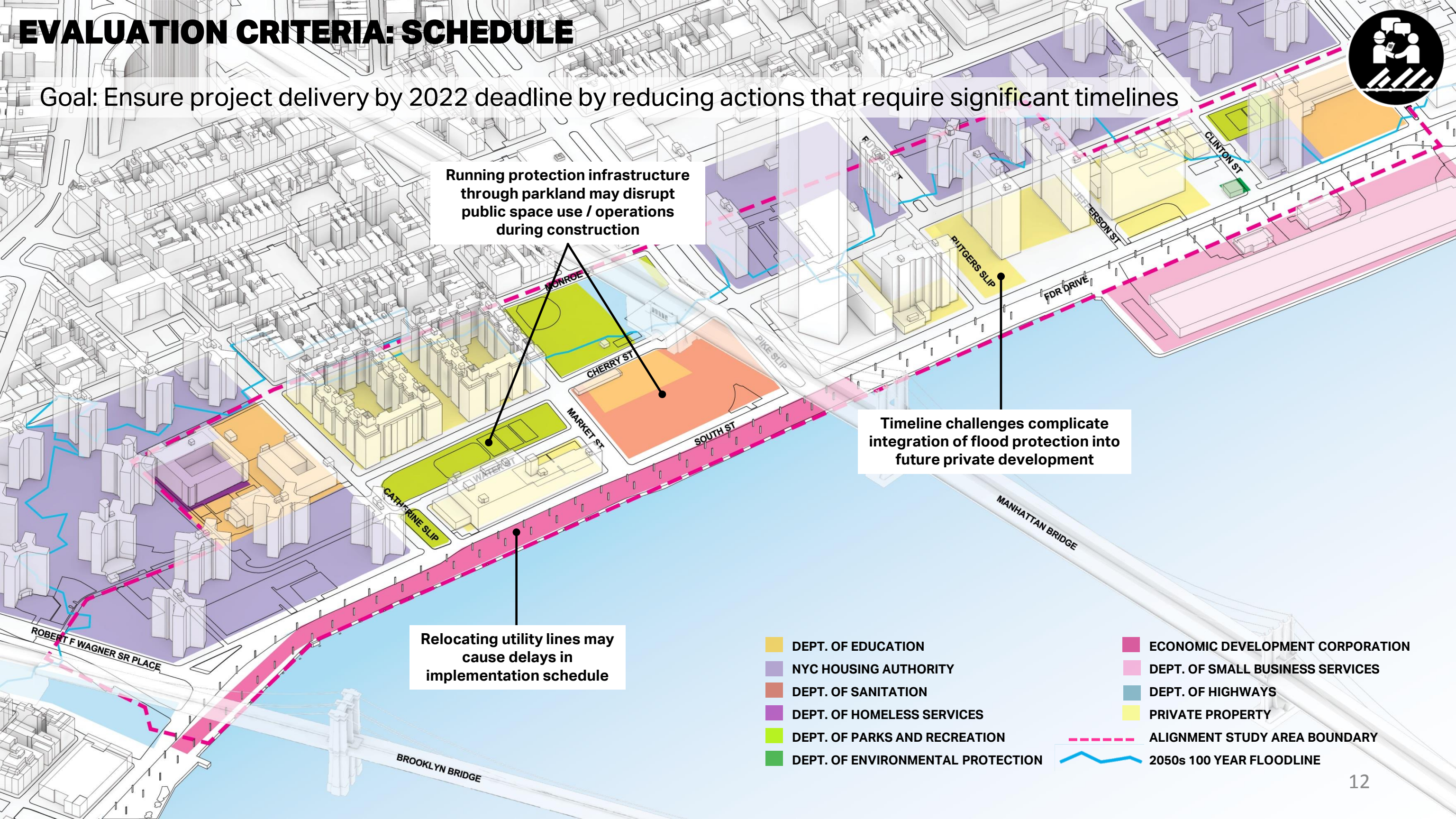
Goal: Ensure project delivery by 2022 deadline by reducing actions that require significant timelines

Running protection infrastructure through parkland may disrupt public space use / operations during construction

Timeline challenges complicate integration of flood protection into future private development

Relocating utility lines may cause delays in implementation schedule

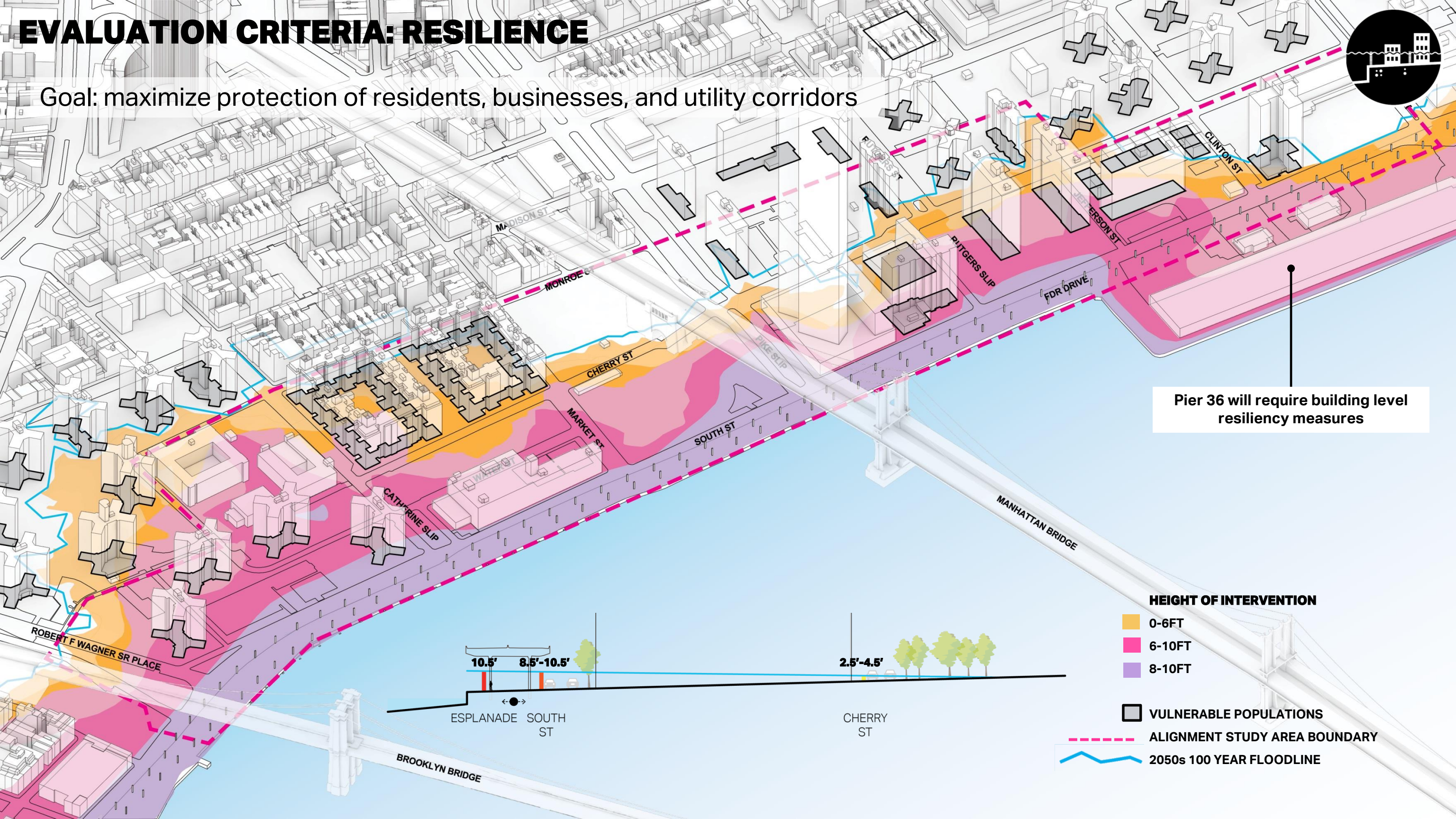
- DEPT. OF EDUCATION
- ECONOMIC DEVELOPMENT CORPORATION
- NYC HOUSING AUTHORITY
- DEPT. OF SMALL BUSINESS SERVICES
- DEPT. OF SANITATION
- DEPT. OF HIGHWAYS
- DEPT. OF HOMELESS SERVICES
- PRIVATE PROPERTY
- DEPT. OF PARKS AND RECREATION
- ALIGNMENT STUDY AREA BOUNDARY
- DEPT. OF ENVIRONMENTAL PROTECTION
- 2050s 100 YEAR FLOODLINE





# EVALUATION CRITERIA: RESILIENCE

Goal: maximize protection of residents, businesses, and utility corridors



Pier 36 will require building level resiliency measures

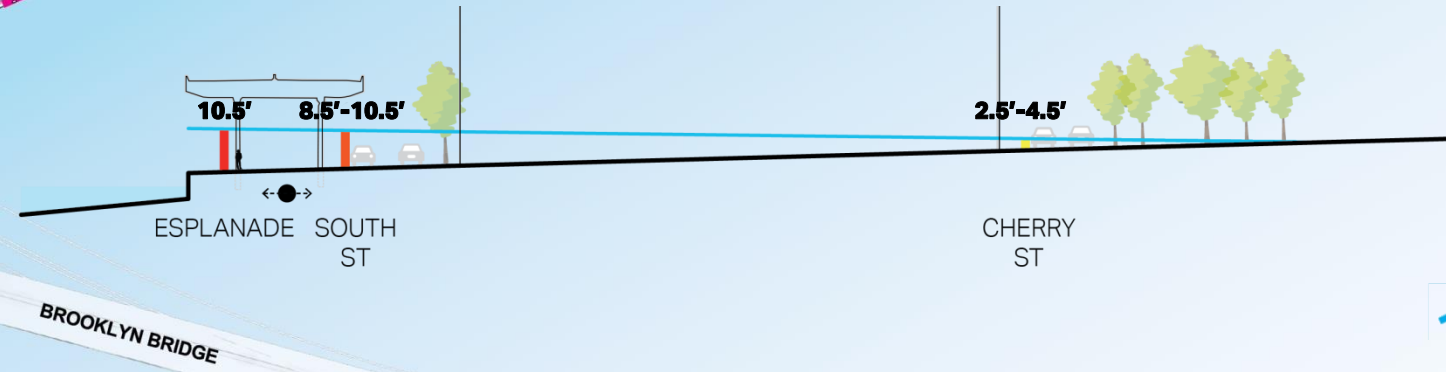
### HEIGHT OF INTERVENTION

- 0-6FT
- 6-10FT
- 8-10FT

VULNERABLE POPULATIONS

ALIGNMENT STUDY AREA BOUNDARY

2050s 100 YEAR FLOODLINE





# EVALUATION CRITERIA: OPERATIONS AND MAINTENANCE

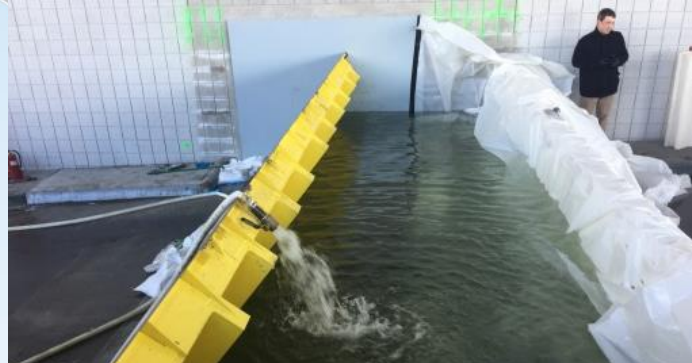


Goal: Minimize potential disruptions to street crossings, driveways, and building entries

Coordinating closures of driveways and building access adds significant complication

Tie-backs have potential impacts on emergency access during deployment

Deployables are required when crossing streets



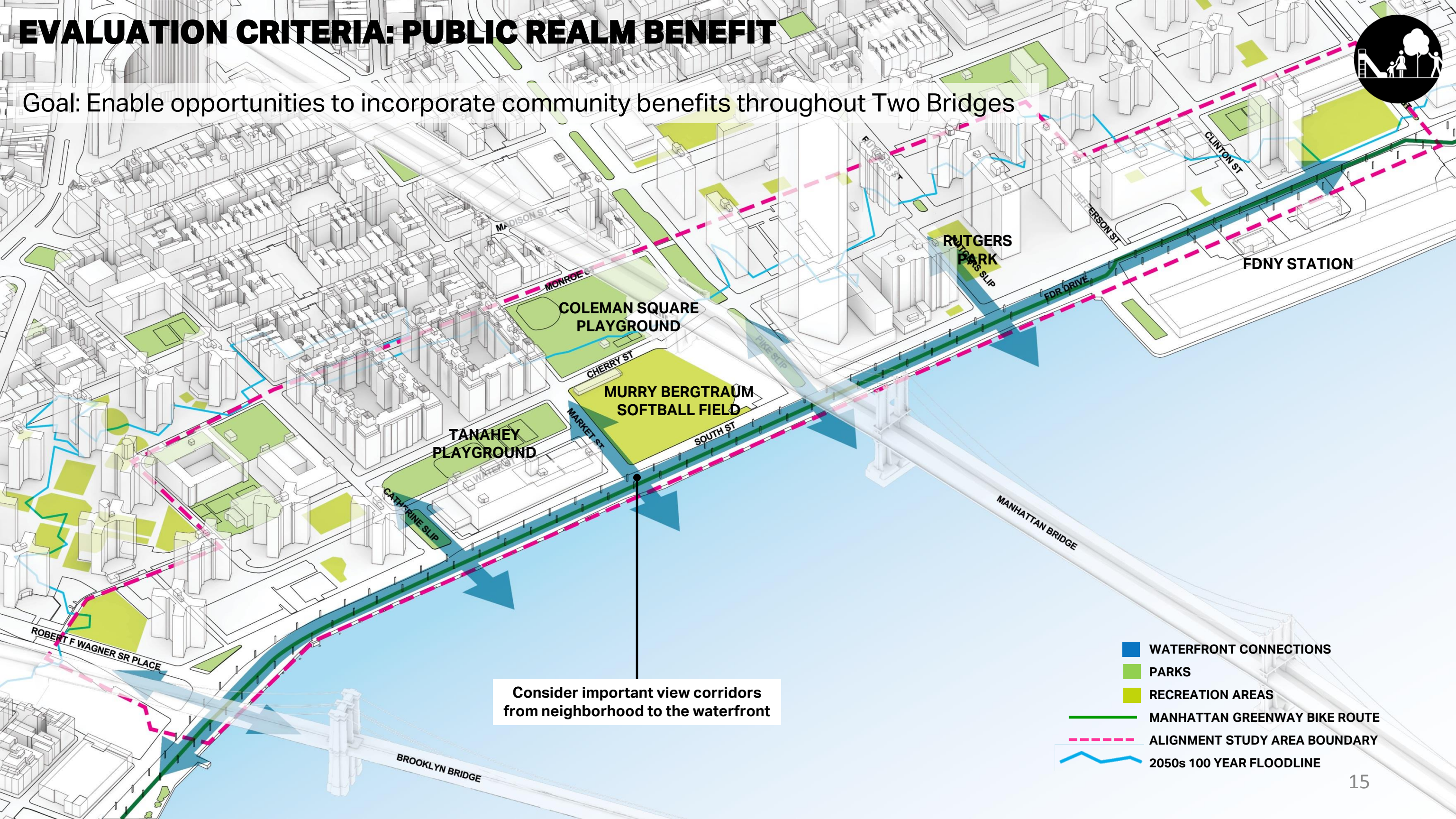
--- ALIGNMENT STUDY AREA BOUNDARY  
~ 2050s 100 YEAR FLOODLINE



# EVALUATION CRITERIA: PUBLIC REALM BENEFIT



Goal: Enable opportunities to incorporate community benefits throughout Two Bridges



Consider important view corridors from neighborhood to the waterfront

- WATERFRONT CONNECTIONS
- PARKS
- RECREATION AREAS
- MANHATTAN GREENWAY BIKE ROUTE
- - - ALIGNMENT STUDY AREA BOUNDARY
- ~ 2050s 100 YEAR FLOODLINE



# PREFERRED PROJECT FOOTPRINT

A refined working envelope allows the team to shift focus to technical analysis of baseline infrastructure. This includes testing different deployable types into various configurations and locations throughout the alignment area.

Waterfront alignment would offer a continuous experience with public benefit being evenly dispersed across the neighborhood

Coordination needed for integration with East River Esplanade packages 3 + 4

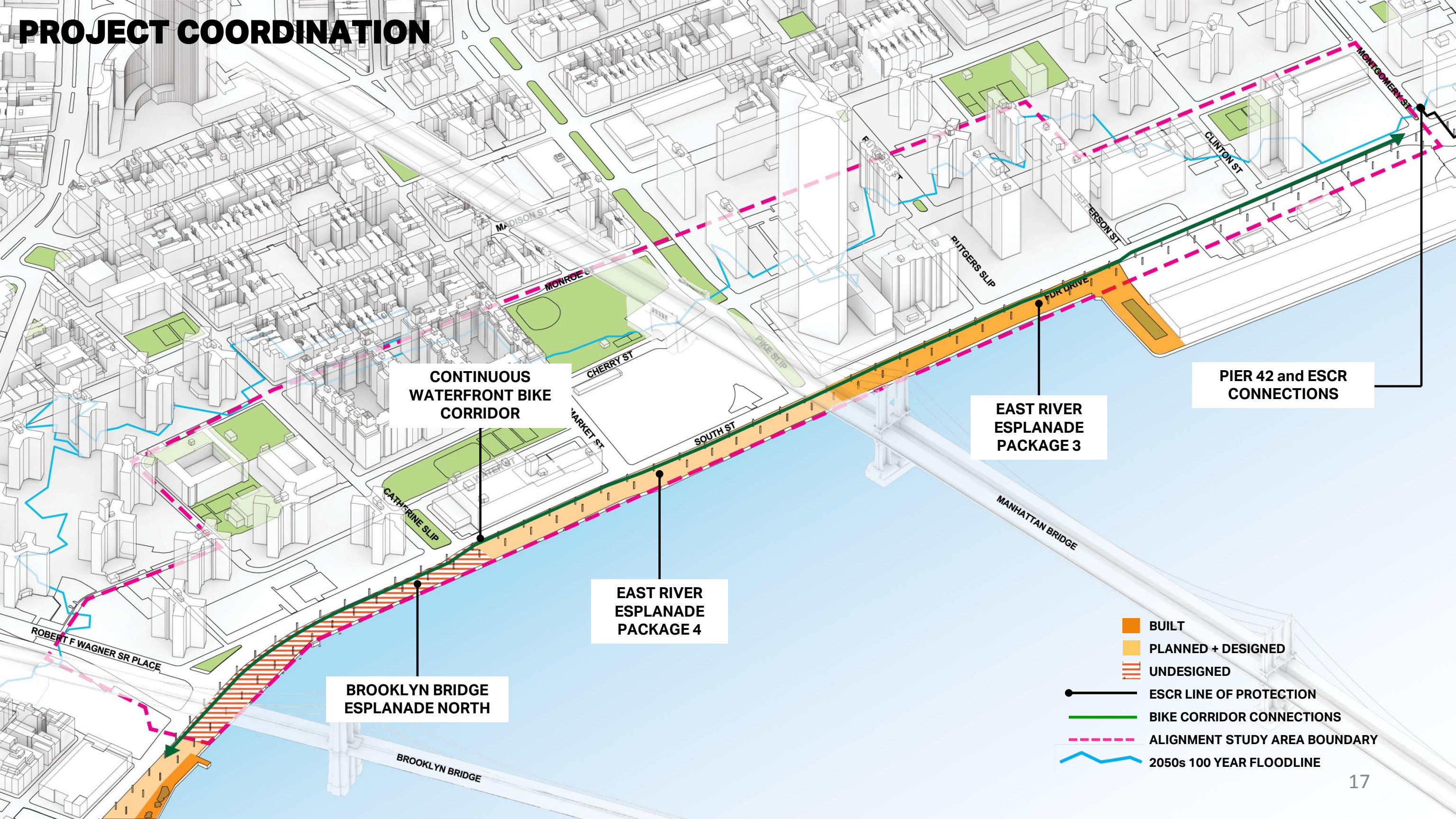
Water main runs in middle of esplanade

7ft wide sewage interceptor dips into back of esplanade

- REFINED ALIGNMENT STUDY AREA
- ALIGNMENT STUDY AREA BOUNDARY
- 2050s 100 YEAR FLOODLINE



# PROJECT COORDINATION

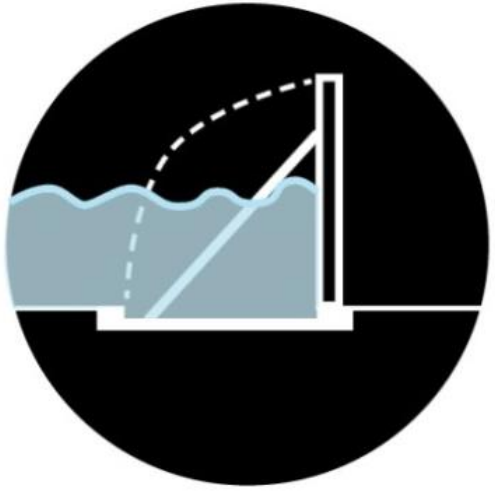




# **TECHNICAL ANALYSIS UPDATE**

# EVALUATION CRITERIA : DEPLOYABLE TYPES

The project team is exploring numerous deployable flood protection technologies and manufacturers, and vetting their potential feasibility across project locations.



## STRUCTURAL REQUIREMENTS

- Foundation size and depth
- Impacts on utilities
- Storage needs

## COST

## MAINTENANCE

- Frequency + extent of maintenance
- System lifespan

## DEPLOYMENT

- Accessibility
- Labor – manpower
- Labor – hours

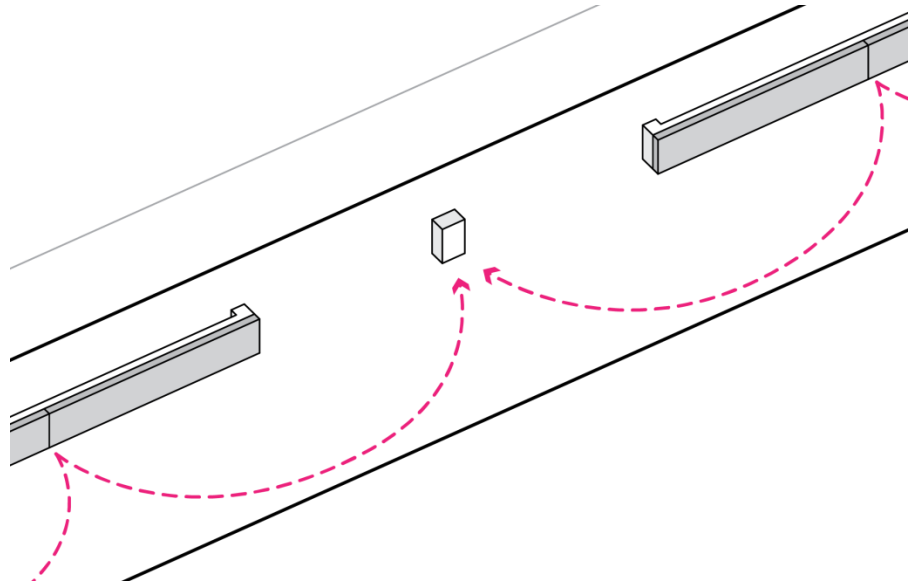
## URBAN DESIGN IMPACTS

- Placemaking and urban design opportunities
- Preservation of view corridors

# INFRASTRUCTURE TOOLKIT

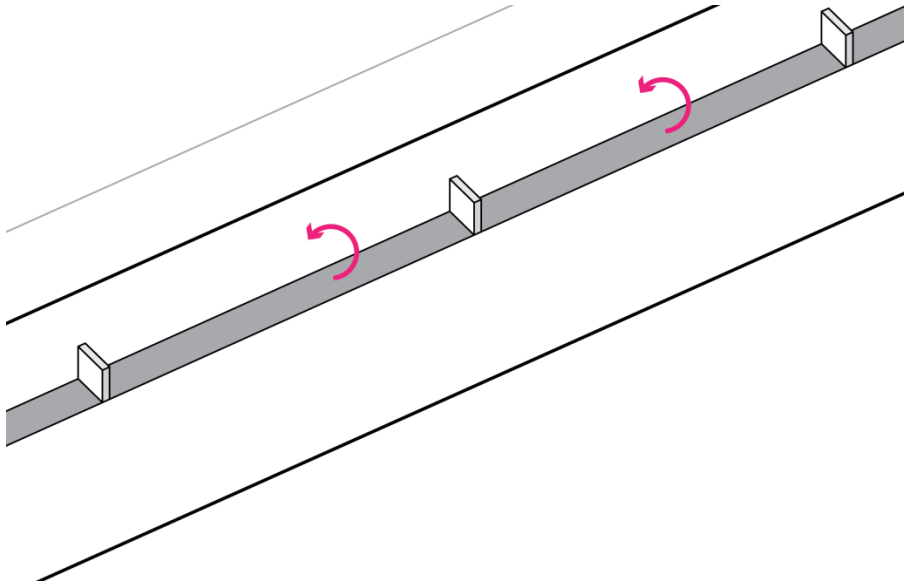
## GATES VISIBLE WHEN STORED

### SWING GATES

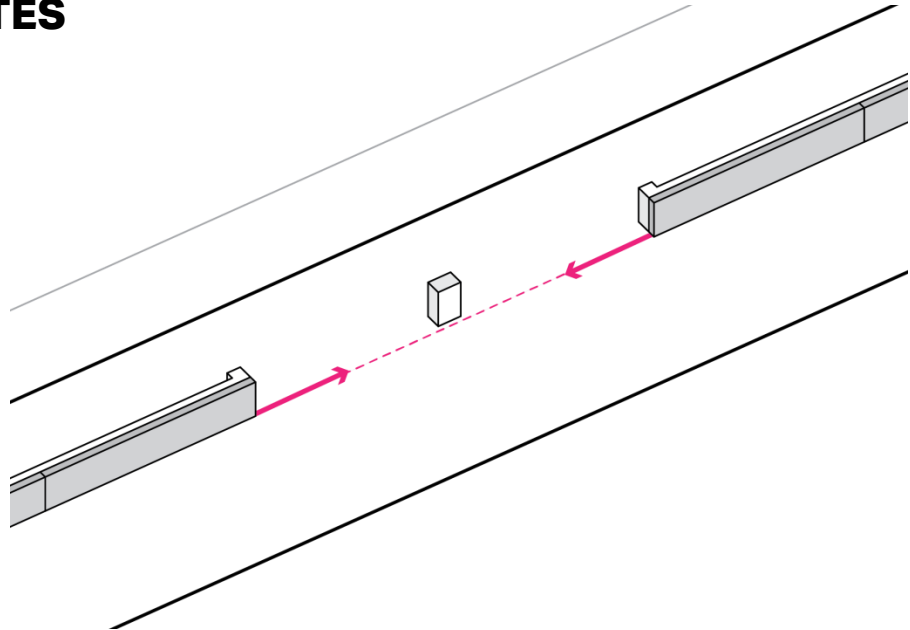


## GATES HIDDEN WHEN STORED

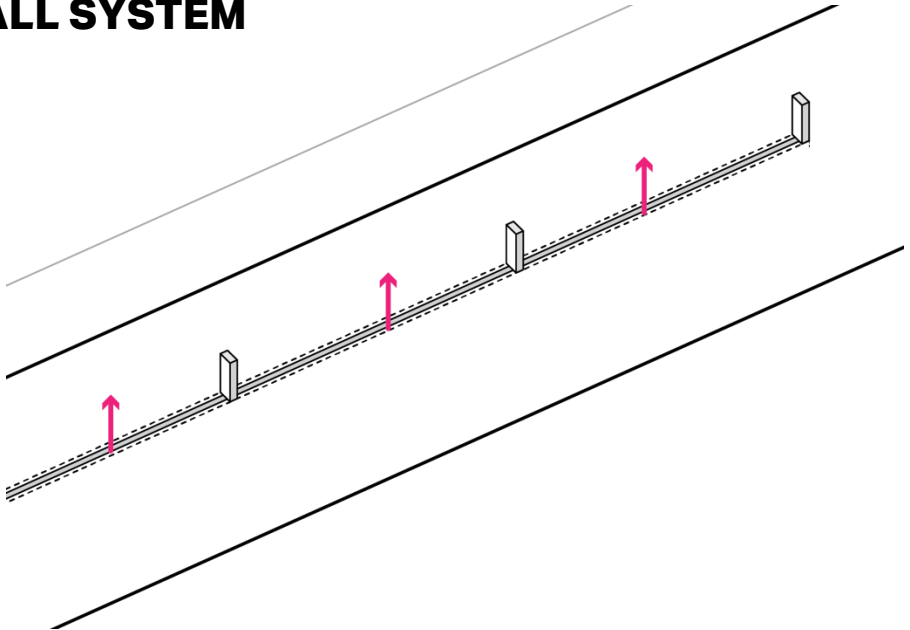
### FLIP UP BARRIER



### ROLLER GATES



### FLEX WALL SYSTEM

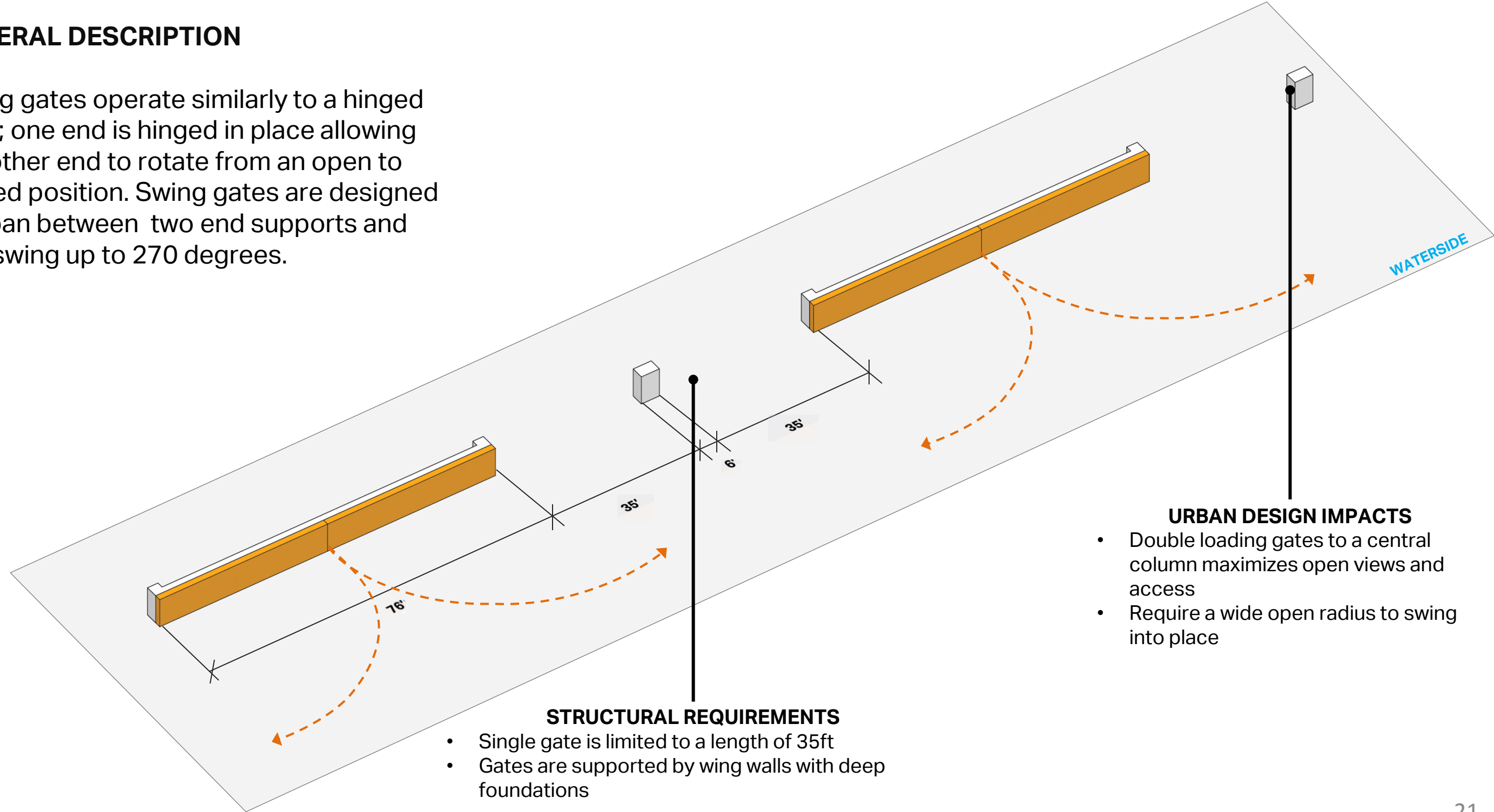




# SWING GATES : BLUE SKY

## GENERAL DESCRIPTION

Swing gates operate similarly to a hinged door; one end is hinged in place allowing the other end to rotate from an open to closed position. Swing gates are designed to span between two end supports and can swing up to 270 degrees.



### STRUCTURAL REQUIREMENTS

- Single gate is limited to a length of 35ft
- Gates are supported by wing walls with deep foundations

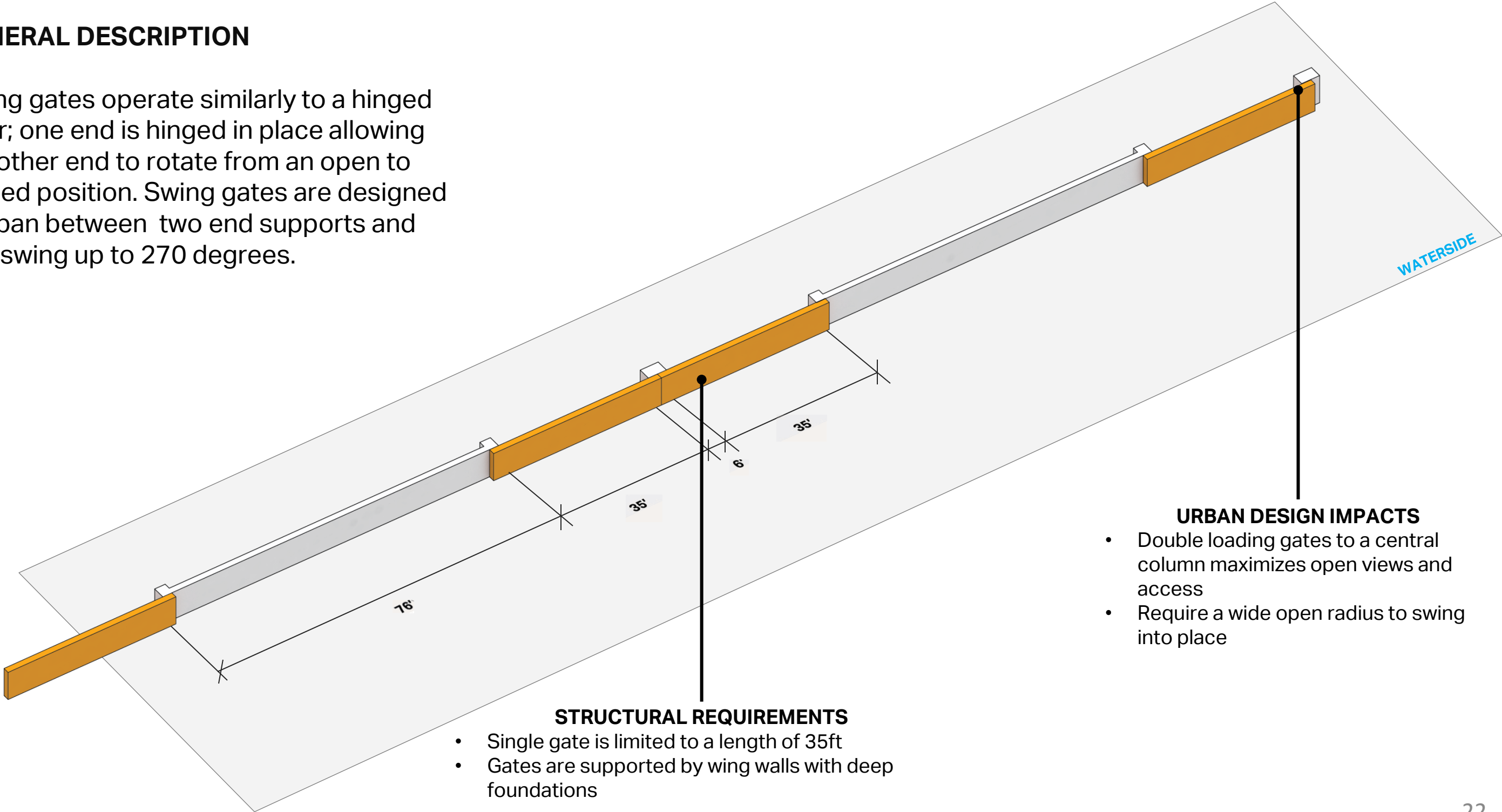
### URBAN DESIGN IMPACTS

- Double loading gates to a central column maximizes open views and access
- Require a wide open radius to swing into place

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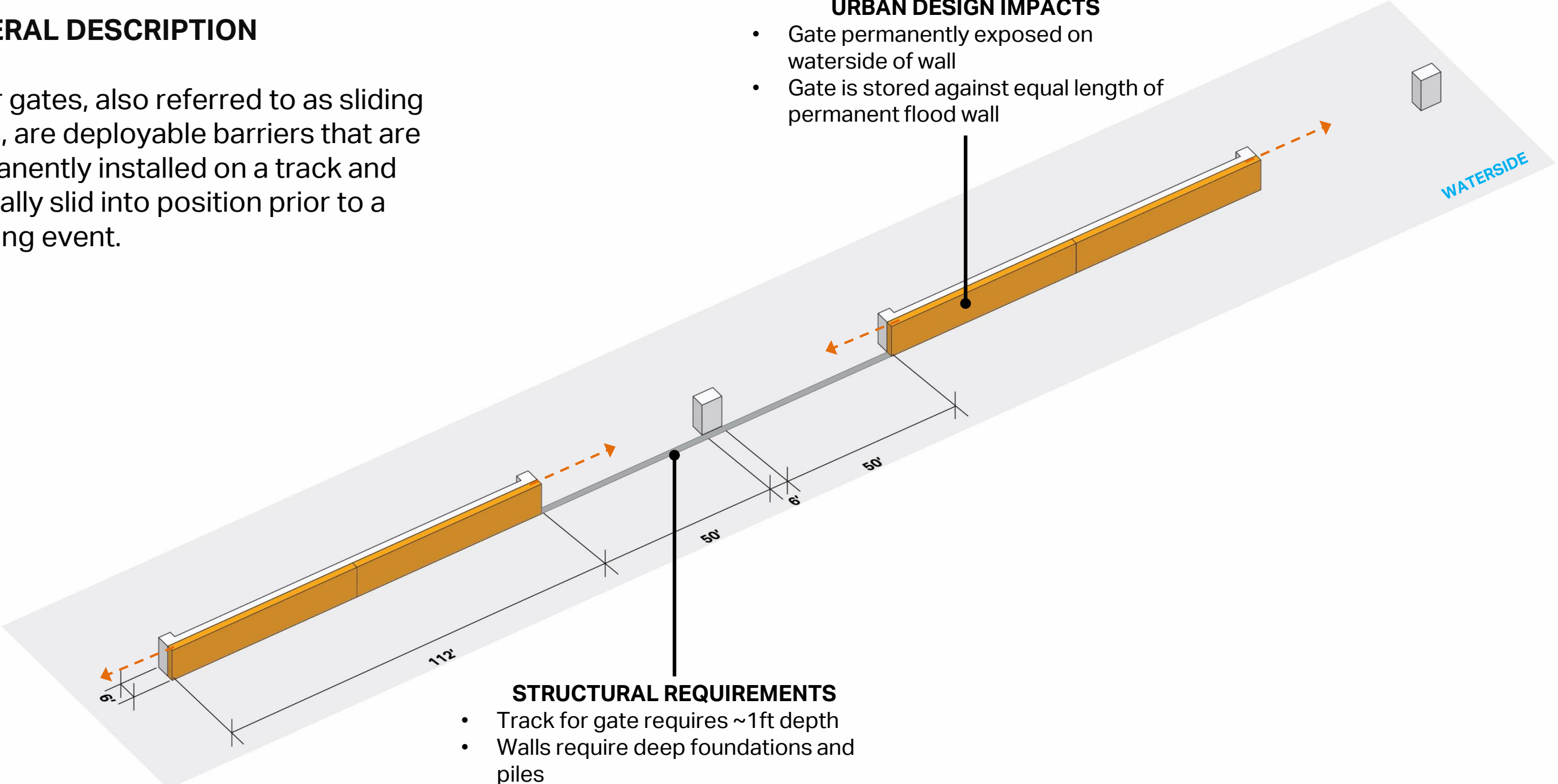
# ROLLER GATES : BLUE SKY

## GENERAL DESCRIPTION

Roller gates, also referred to as sliding gates, are deployable barriers that are permanently installed on a track and manually slid into position prior to a flooding event.

### URBAN DESIGN IMPACTS

- Gate permanently exposed on waterside of wall
- Gate is stored against equal length of permanent flood wall



### STRUCTURAL REQUIREMENTS

- Track for gate requires ~1ft depth
- Walls require deep foundations and piles



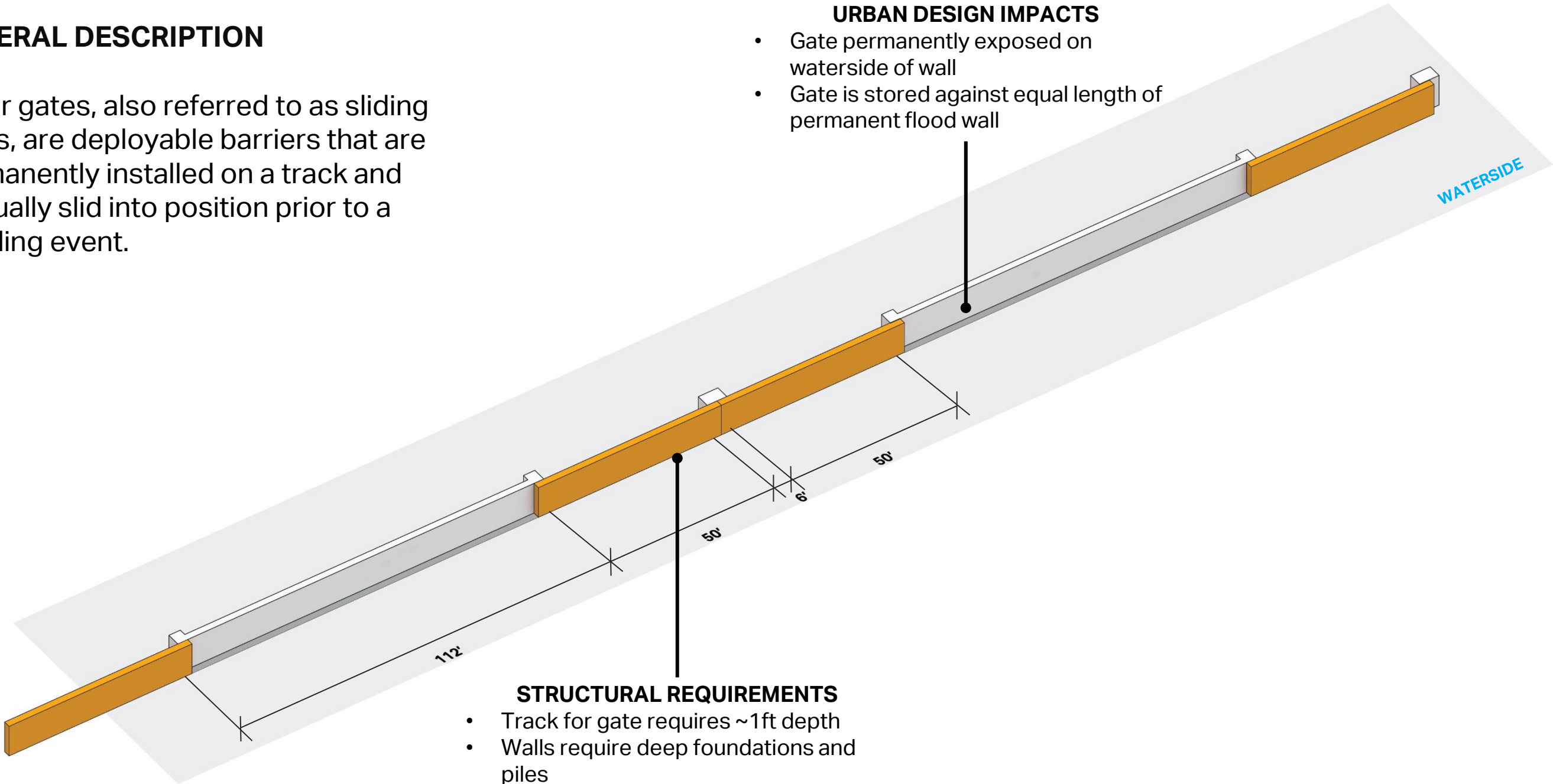
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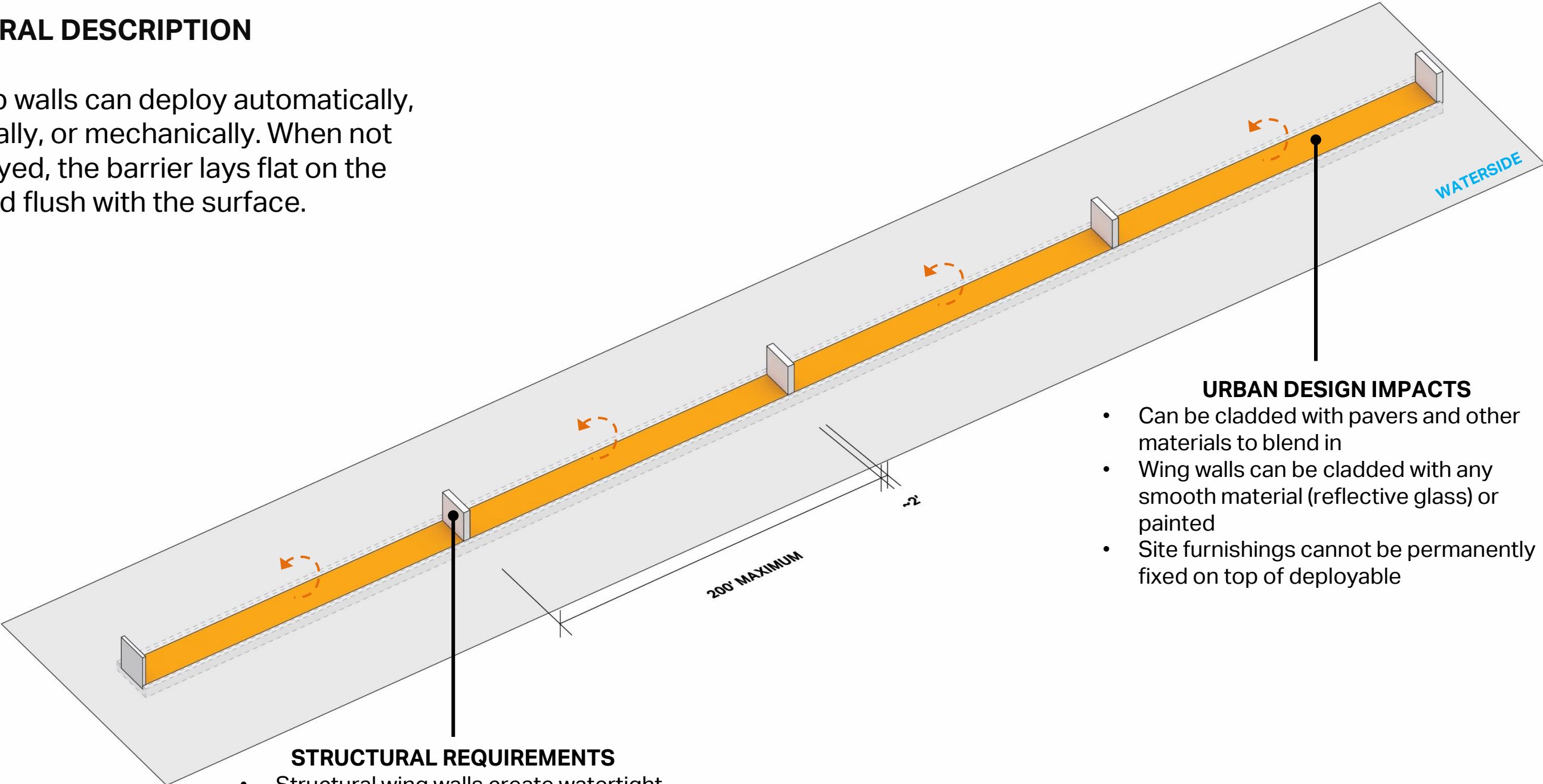
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# FLIP UP BARRIER : BLUE SKY

## GENERAL DESCRIPTION

Flip up walls can deploy automatically, manually, or mechanically. When not deployed, the barrier lays flat on the ground flush with the surface.



### STRUCTURAL REQUIREMENTS

- Structural wing walls create watertight seals
- 1ft deep trench houses the system below the ground

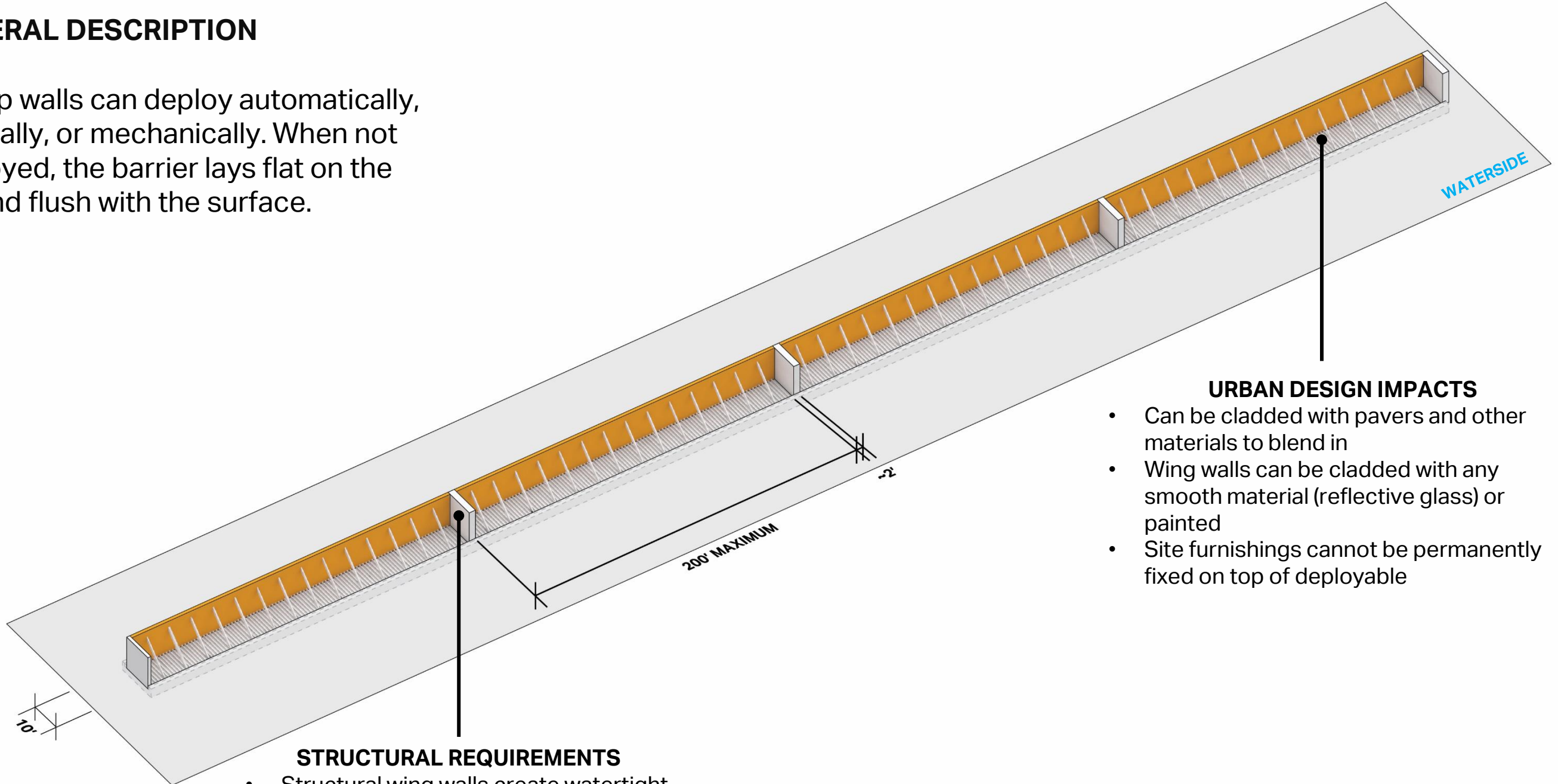
### URBAN DESIGN IMPACTS

- Can be cladded with pavers and other materials to blend in
- Wing walls can be cladded with any smooth material (reflective glass) or painted
- Site furnishings cannot be permanently fixed on top of deployable

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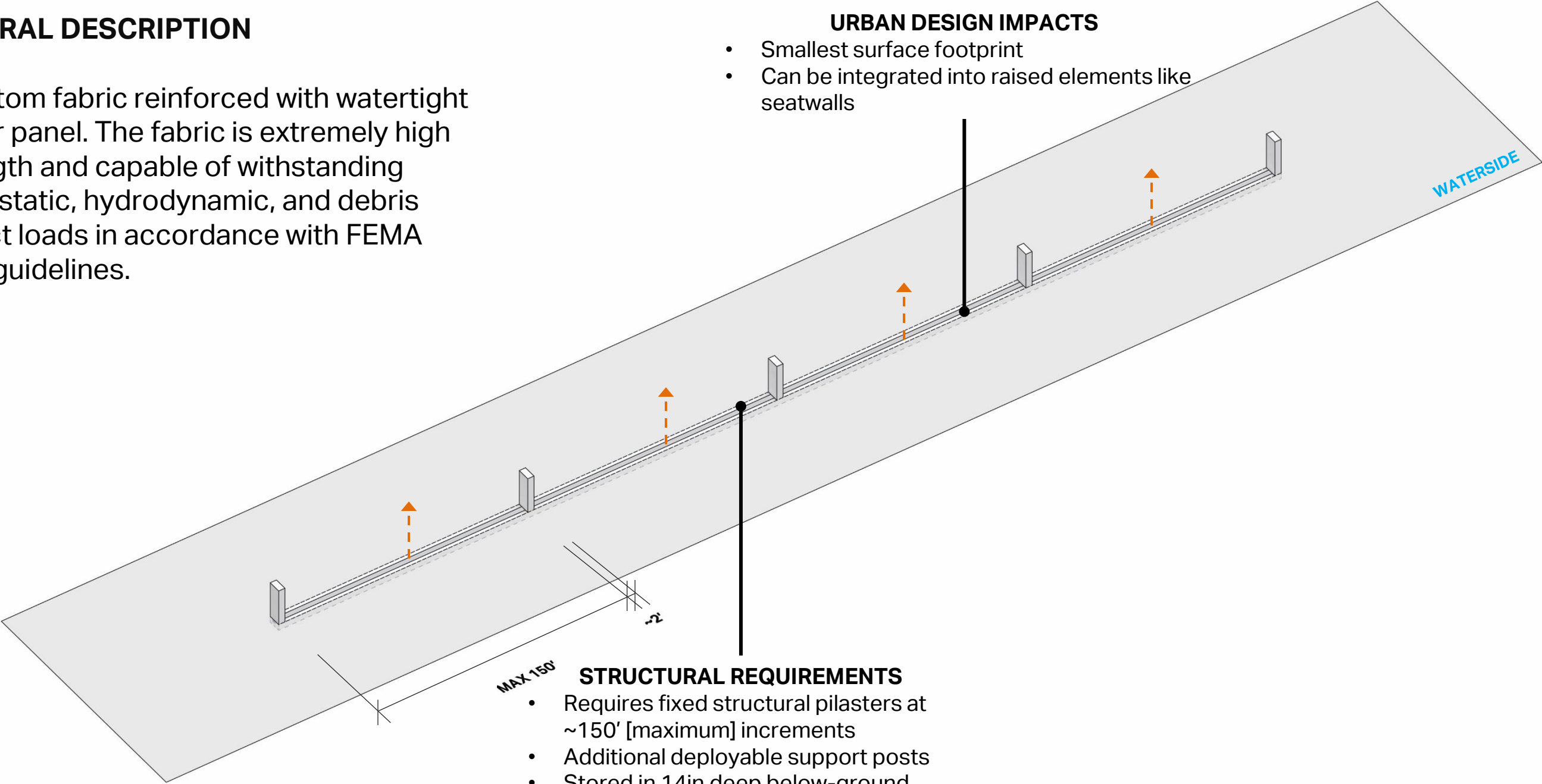
# FLEX WALLS : BLUE SKY

## GENERAL DESCRIPTION

A custom fabric reinforced with watertight Kevlar panel. The fabric is extremely high strength and capable of withstanding hydrostatic, hydrodynamic, and debris impact loads in accordance with FEMA P-55 guidelines.

## URBAN DESIGN IMPACTS

- Smallest surface footprint
- Can be integrated into raised elements like seatwalls



## STRUCTURAL REQUIREMENTS

- Requires fixed structural pilasters at ~150' [maximum] increments
- Additional deployable support posts
- Stored in 14in deep below-ground trench



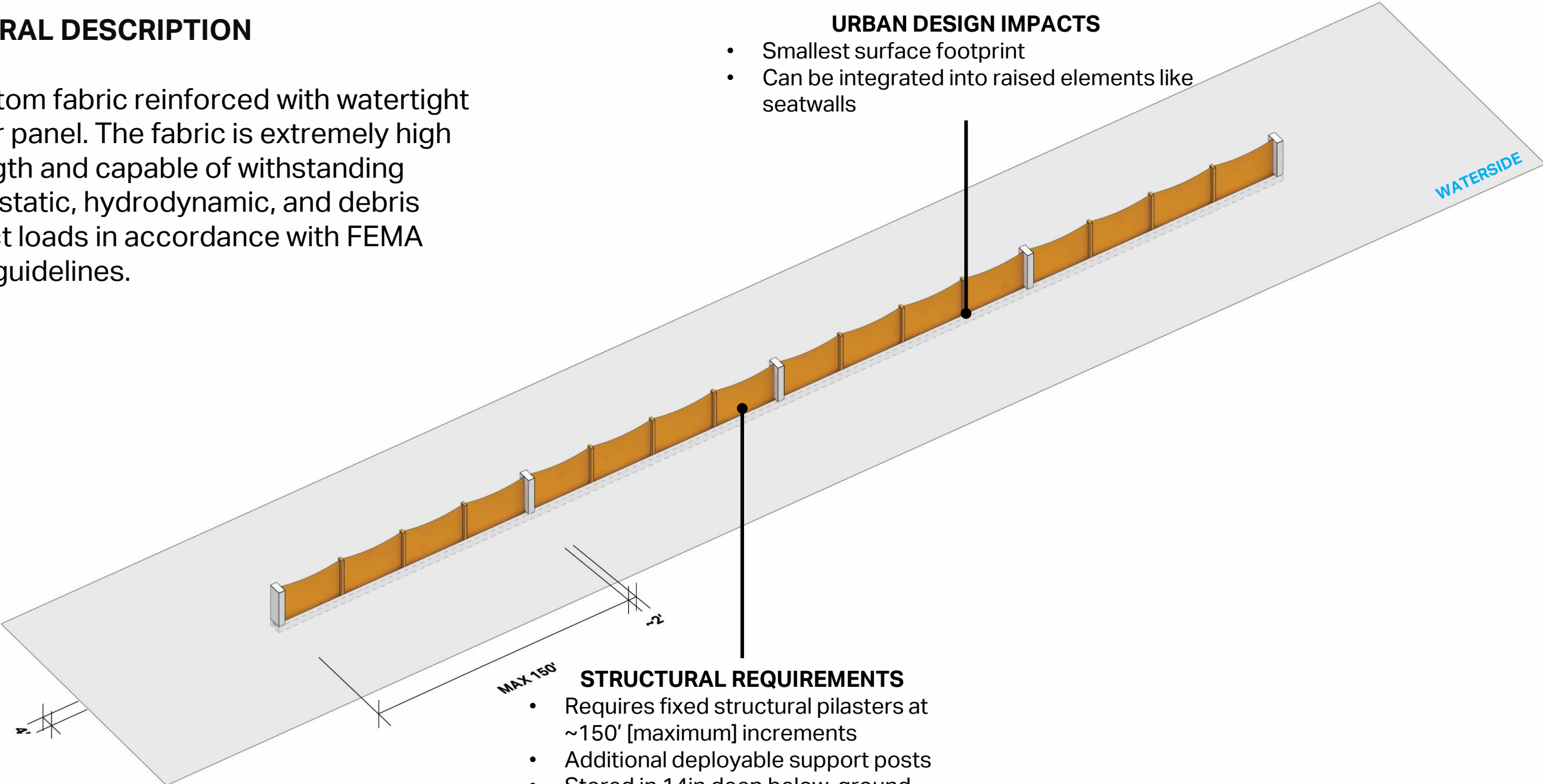
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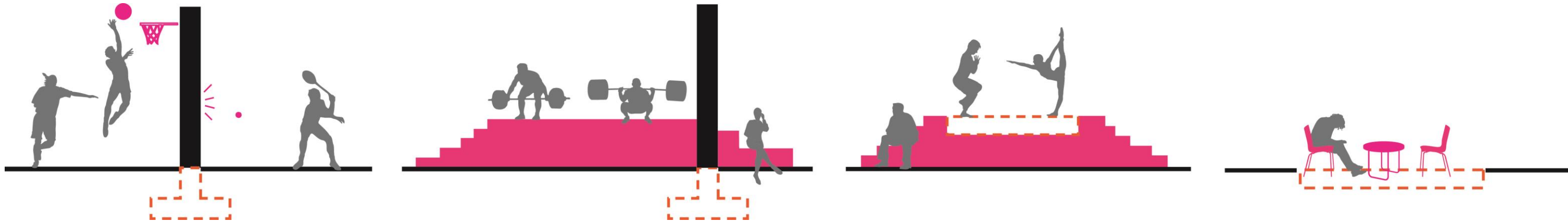
# **PLACEMAKING AND PROJECT DESIGN**



# ACTIVATION + INTEGRATION

## USING FLOODWALLS

## USING DEPLOYABLES



- The project team is investigating opportunities to activate the waterfront with site features that integrate flood protection infrastructure into programmatic amenities such as seating, sports courts, pavilions, and recreation spaces.
- These opportunities are dependent upon feasibility considerations such as foundation requirements, subsurface infrastructure, available funding, design flood elevation, maintenance requirements, etc.
- Programmatic amenities will consider planned and existing site features and community feedback.



# TRUST FOR PUBLIC LAND (PROJECT PARTNER)

## GREEN SCHOOLYARDS PROGRAM

- PS 184 (Shuang Wen)  
+ PS 2 (Meyer London)
- Participatory Design Process
- Traditional play (sports courts, running tracks, fitness equipment)
- Green Infrastructure (rain gardens, bioswales)



## **NEXT STEPS AND TIMELINE**

- Spring 2018 TF/ Public Meeting
  - Concept Design Progress
  - Drainage Management Update
  - Schematic Design/ Construction Contract Update



# APPENDIX