



lower manhattan
COASTAL RESILIENCY

TASK FORCE UPDATE – CB1
APRIL, 2017

MEETING GOALS

- **Re-cap project goals**
- **Highlight project considerations and challenges**
- **Identify tradeoffs through preliminary alignments and concepts**
- **Provide an update on data collection**
- **Discuss task force priorities for the upcoming public meeting**

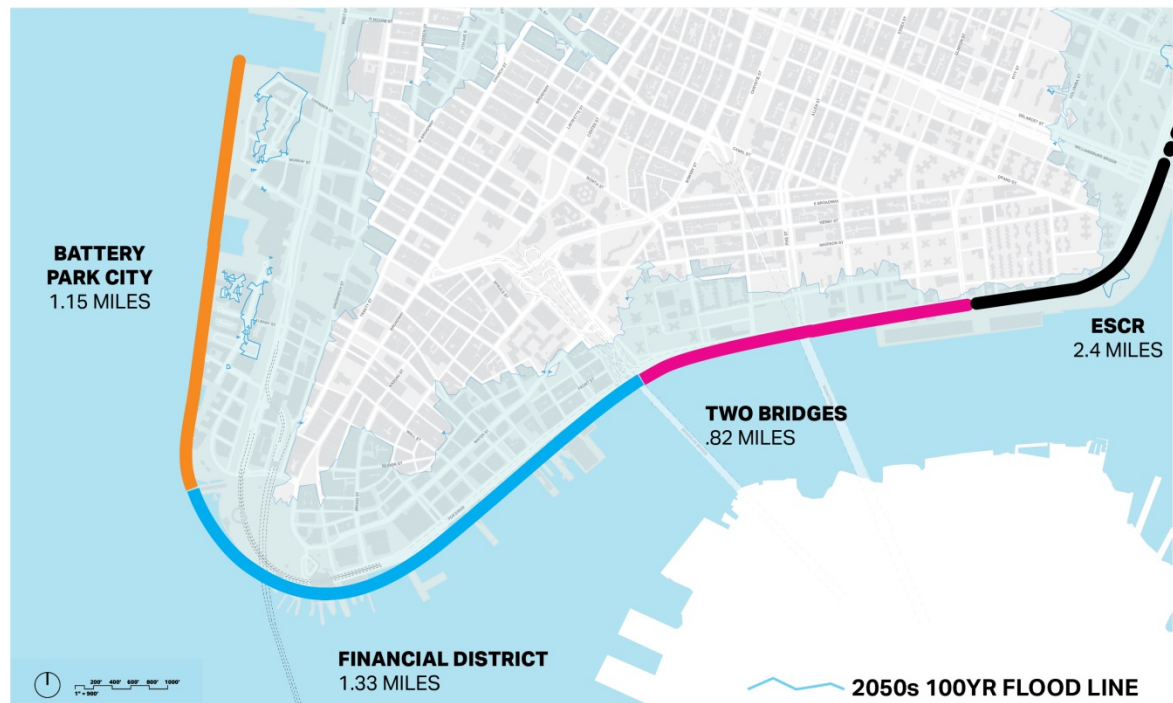
PROJECT OVERVIEW

Purpose of Study:

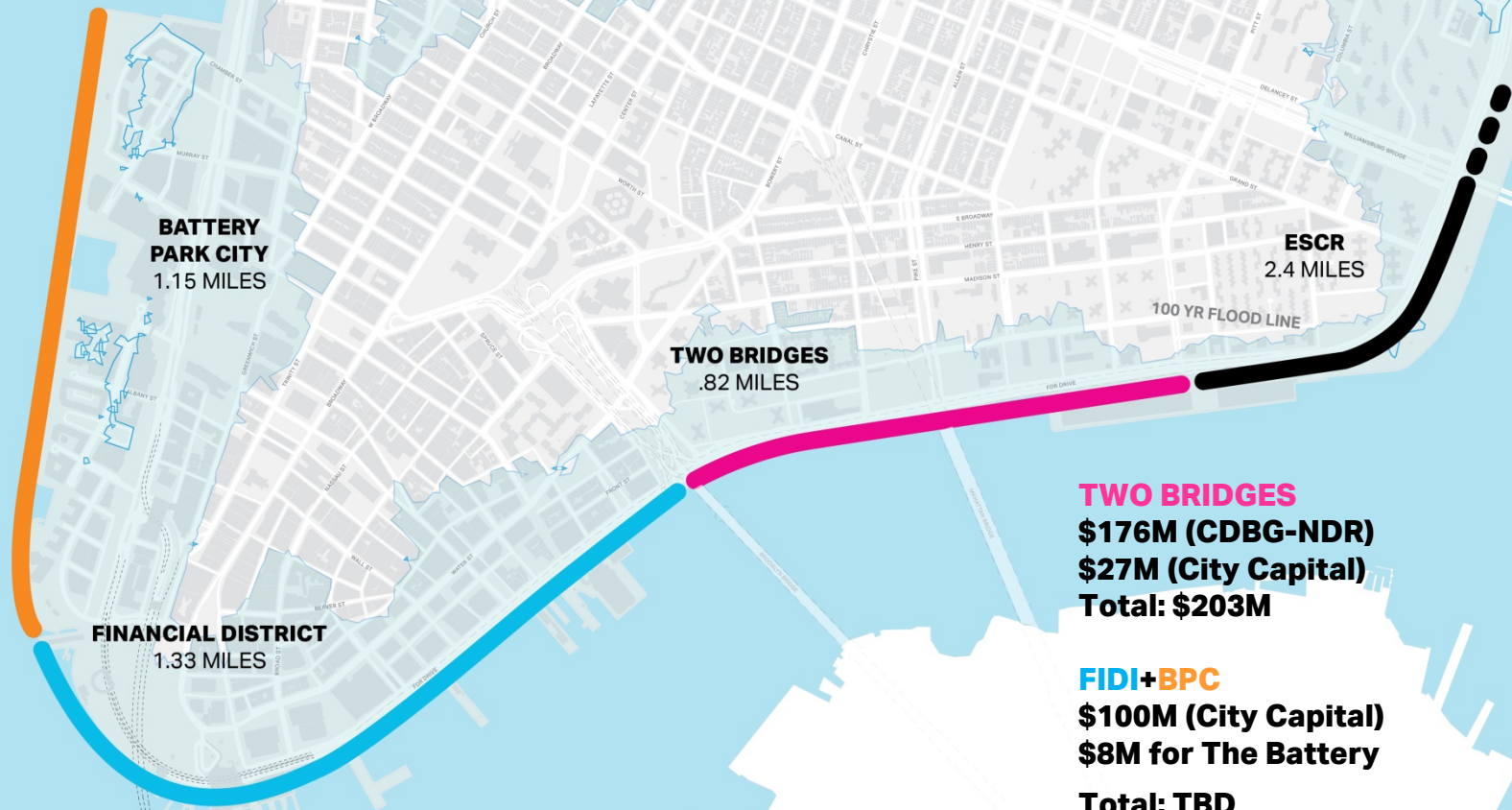
1. Develop long-term strategy and feasible concept design for all of Lower Manhattan
2. Prioritize project concepts toward implementation and conduct advanced planning when possible
3. Engage with community on core design principles and priorities

Study Funding:

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



IMPLEMENTATION FUNDING IN PLACE

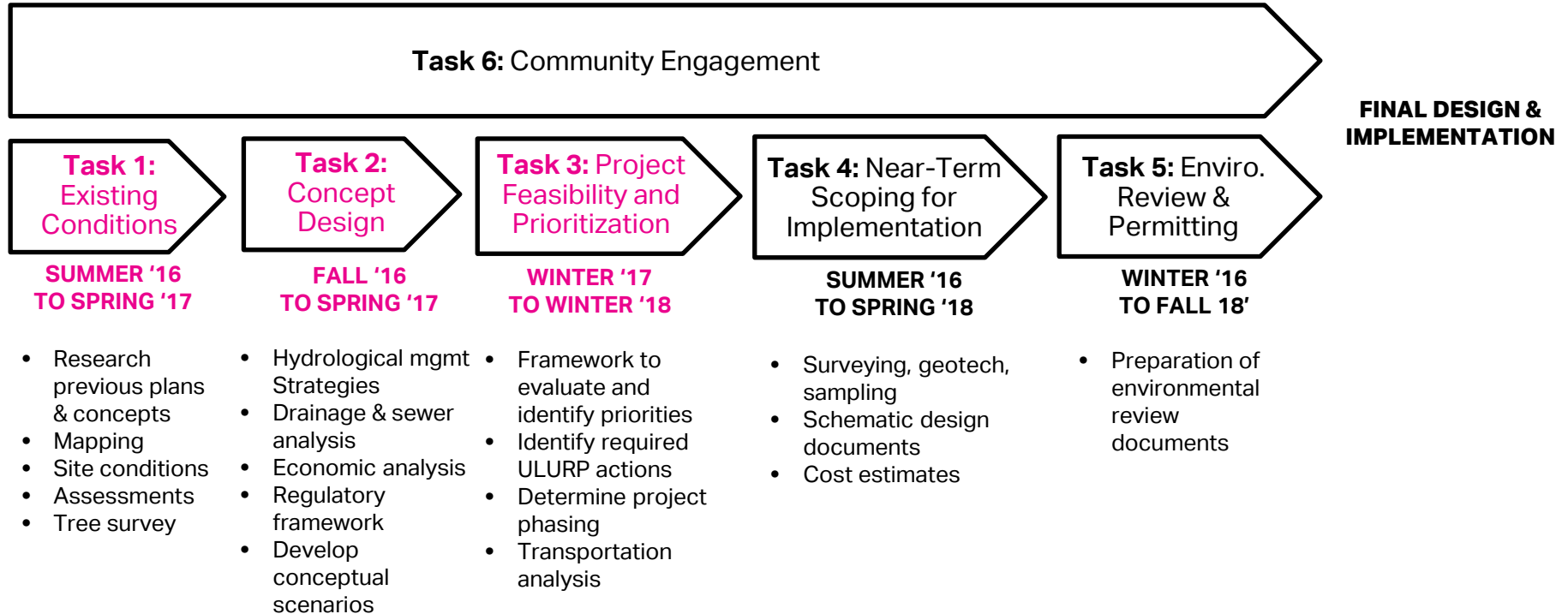


TWO BRIDGES
\$176M (CDBG-NDR)
\$27M (City Capital)
Total: \$203M

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

2050s 100YR FLOOD LINE

PROJECT PROCESS




2050s 100YR FLOODPLAIN

BATTERY PARK CITY
1.15 MILES

TWO BRIDGES
0.82 MILES

FINANCIAL DISTRICT
1.33 MILES

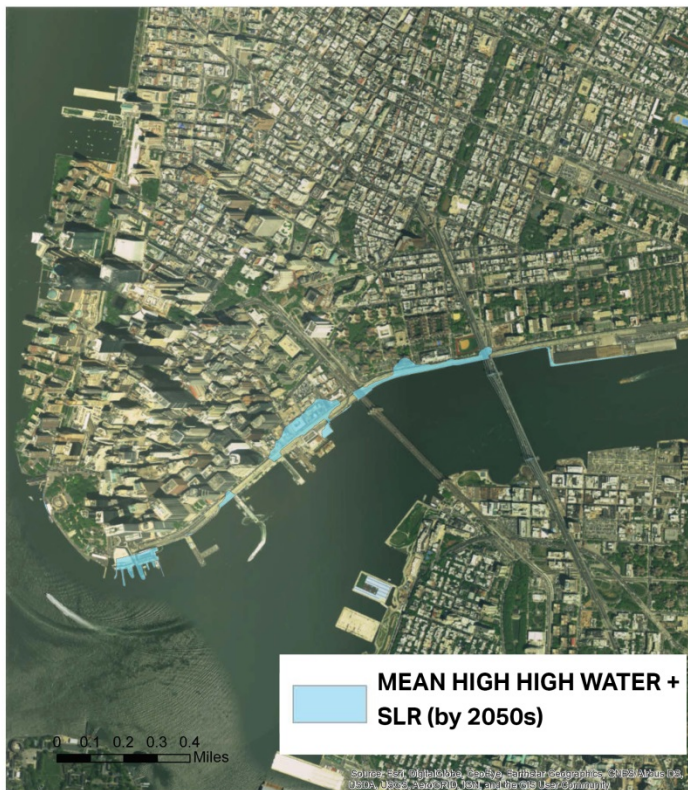
100YR  2050s FLOODPLAINS¹
 BUILDINGS IN FLOODPLAIN²

200' 600' 1000'

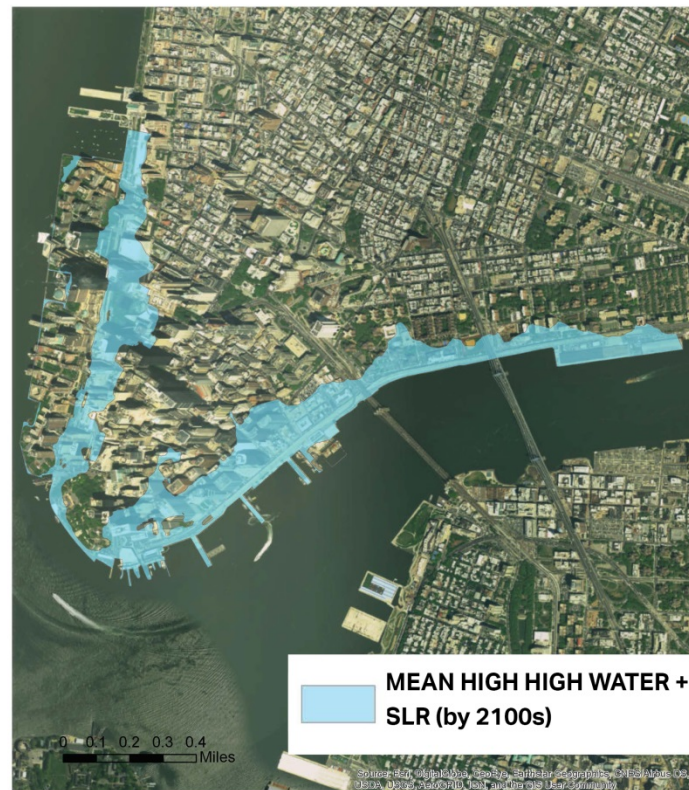


FUTURE TIDAL AND SEA LEVEL RISE INUNDATION

2050



2100

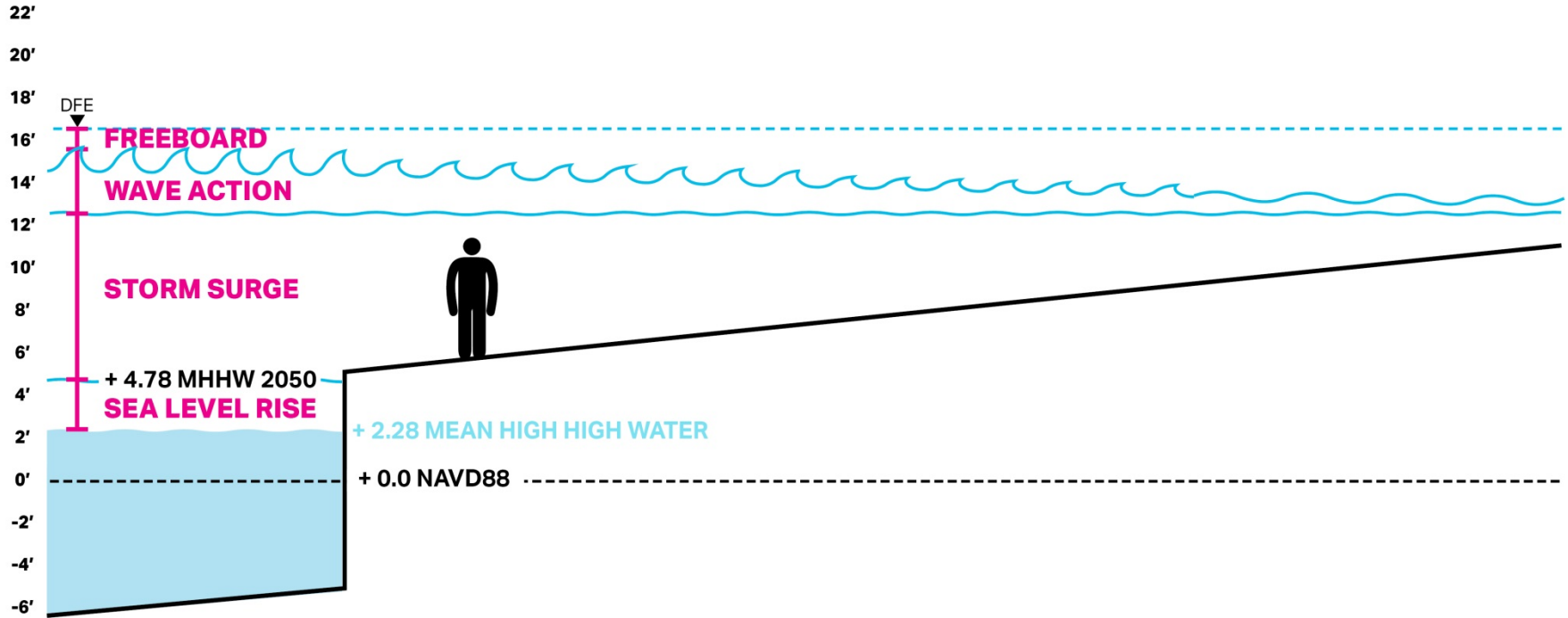


DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

DESIGN FLOOD ELEVATION - COMPONENTS

High tide + Sea Level Rise + 1% annual storm event + Associated wave action + Freeboard = **16.5' DFE**



A SIGNIFICANT INTERVENTION

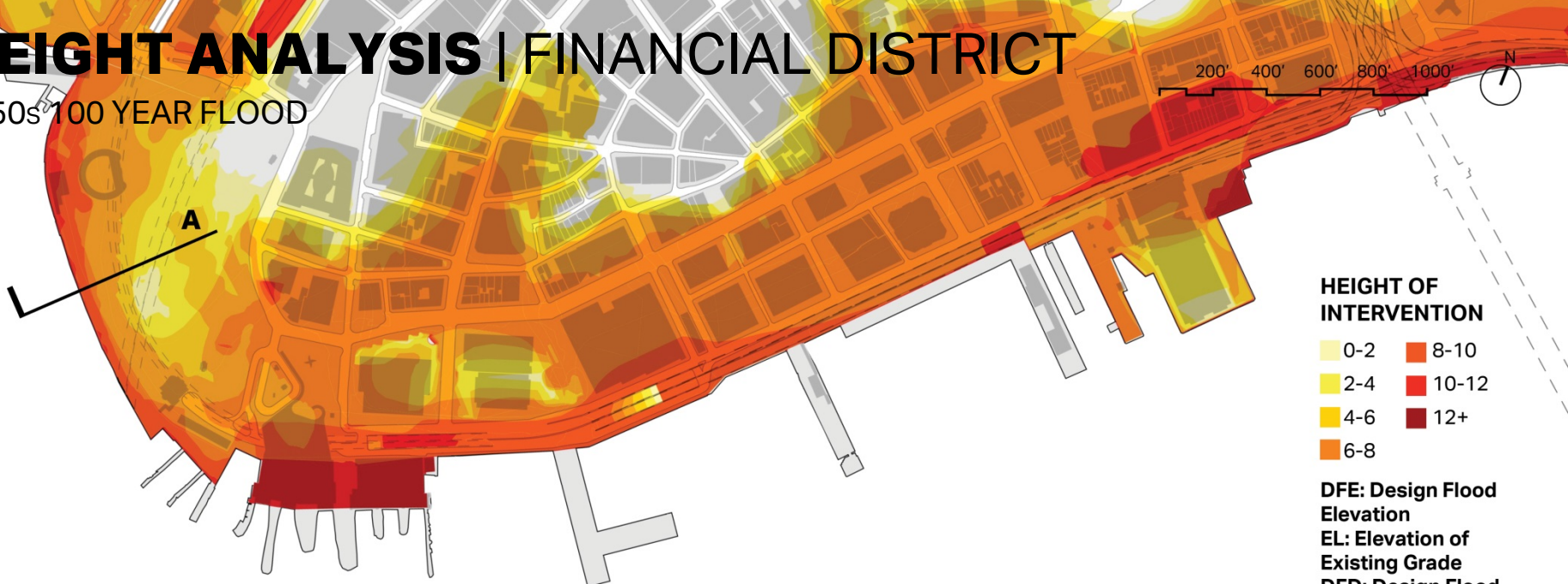


DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

HEIGHT ANALYSIS | FINANCIAL DISTRICT

2050s 100 YEAR FLOOD

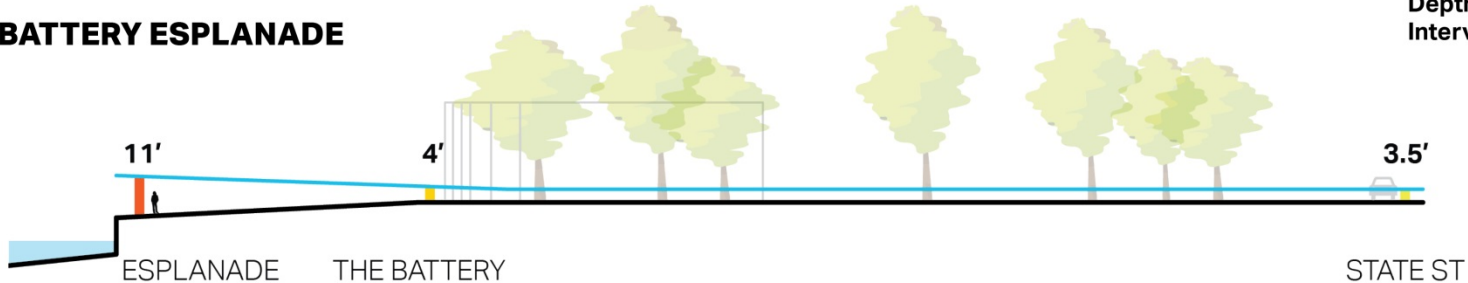


HEIGHT OF INTERVENTION

- 0-2
- 2-4
- 4-6
- 6-8
- 8-10
- 10-12
- 12+

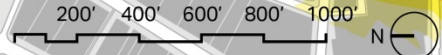
DFE: Design Flood Elevation
 EL: Elevation of Existing Grade
 DFD: Design Flood Depth (Height of Intervention)

A THE BATTERY ESPLANADE

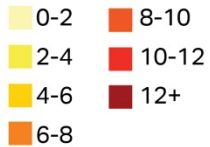


HEIGHT ANALYSIS | BATTERY PARK CITY

2050s 100 YEAR FLOOD



HEIGHT OF INTERVENTION



DFE: Design Flood Elevation
 EL: Elevation of Existing Grade
 DFD: Design Flood Depth (Height of Intervention)

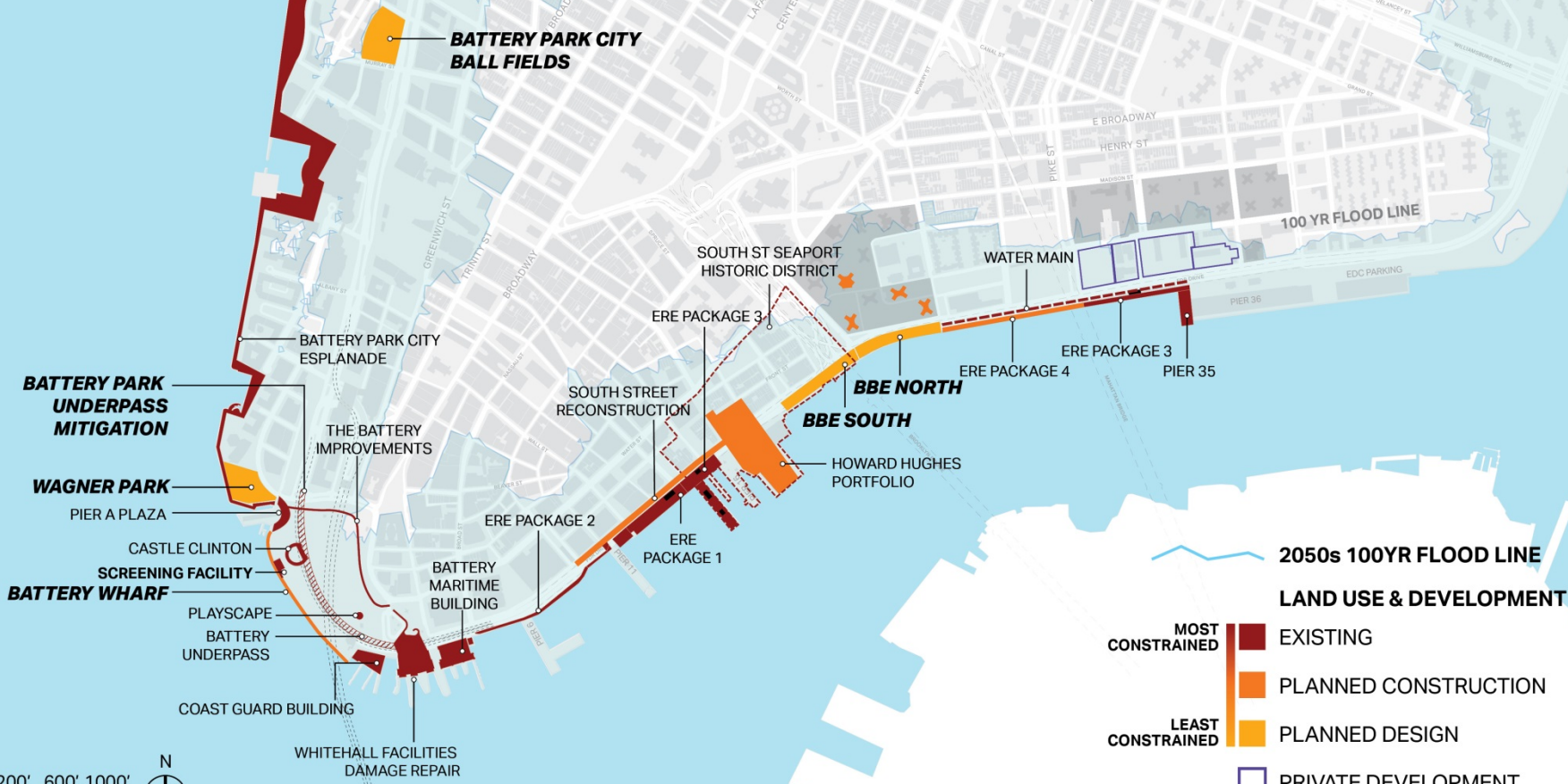
A WEST STREET AT BMCC



DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

ENGINEERING DFE ASSUMPTIONS COMPARED AGAINST 2' CONTOURS (DOITT 2006)

ONGOING COORDINATION



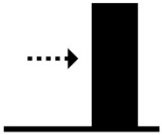
200' 600' 1000'



DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

DESIGN CONSIDERATIONS



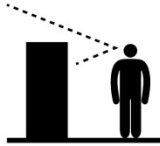
RELIABILITY

- Design Flood Height
- Passive/Deployable
- Wave Attenuation
- Stormwater Management



URBAN BENEFITS

- Waterfront Access
- Placemaking
- Safety
- Community Amenities
- Ecology
- Transportation Improvements



VISUAL & PHYSICAL IMPACT

- Height
- Footprint
- Design



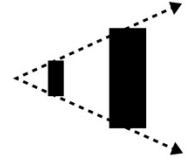
ASSETS PROTECTED

- Location of Protection
- Critical Infrastructure
- Property at Risk



FEASIBILITY

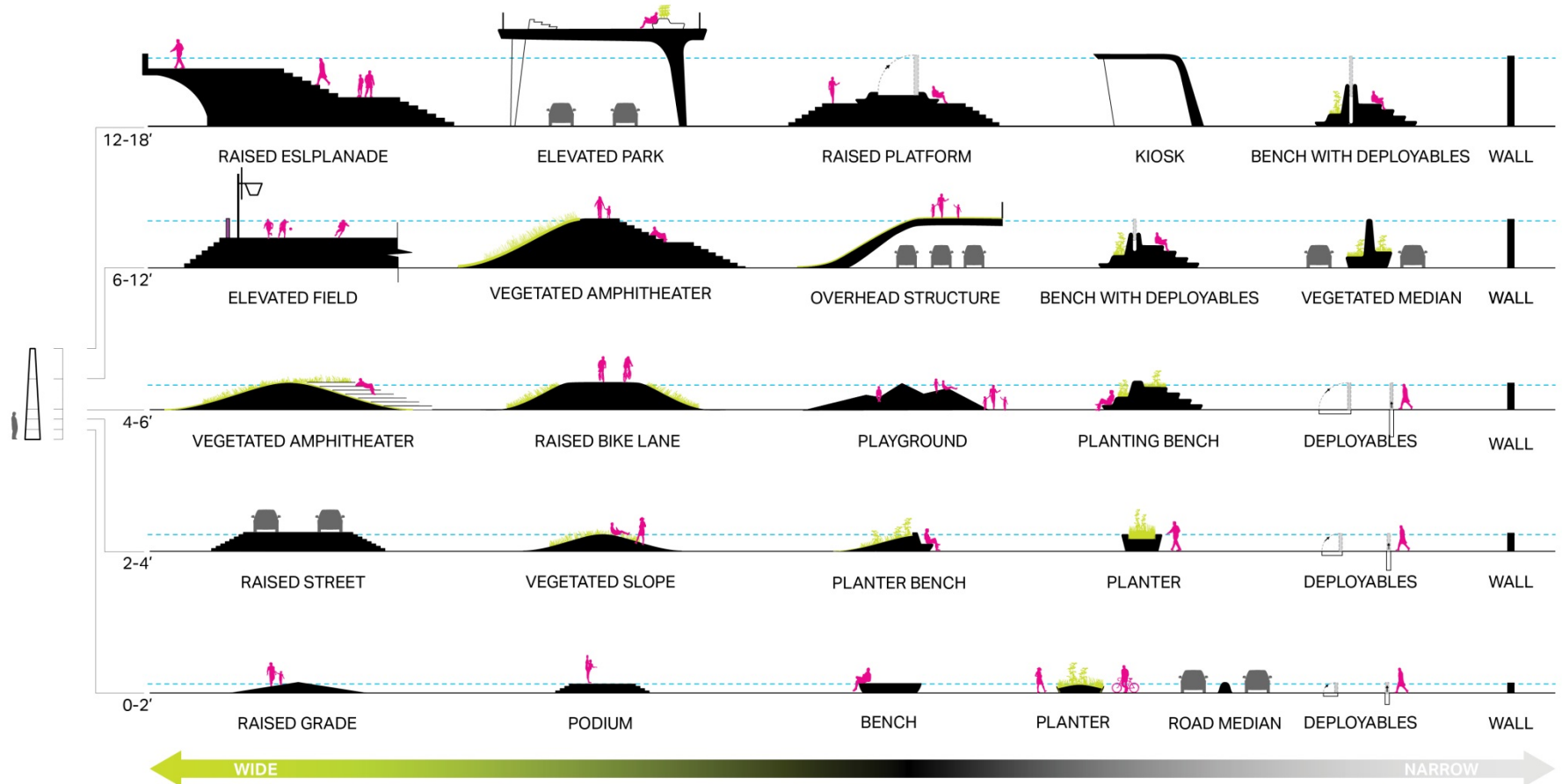
- Cost
- Constructibility
- Ownership/Siting
- Transportation Disruption
- Regulatory Approvals
- Operations and Maintenance
- Speed of Implementation
- FEMA Certification



FUTURE-FLEXIBLE

- Phasing
- Long-term Vision
- Future-proofing
- Climate Change Adaptation
- Future Urban Needs

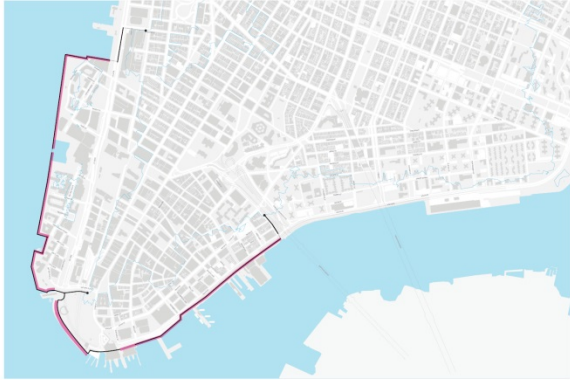
INFRASTRUCTURE TOOLKIT



DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

POTENTIAL ALIGNMENT FRAMEWORK



EDGE

~95% PROJECT AREA PROTECTED



UPLAND

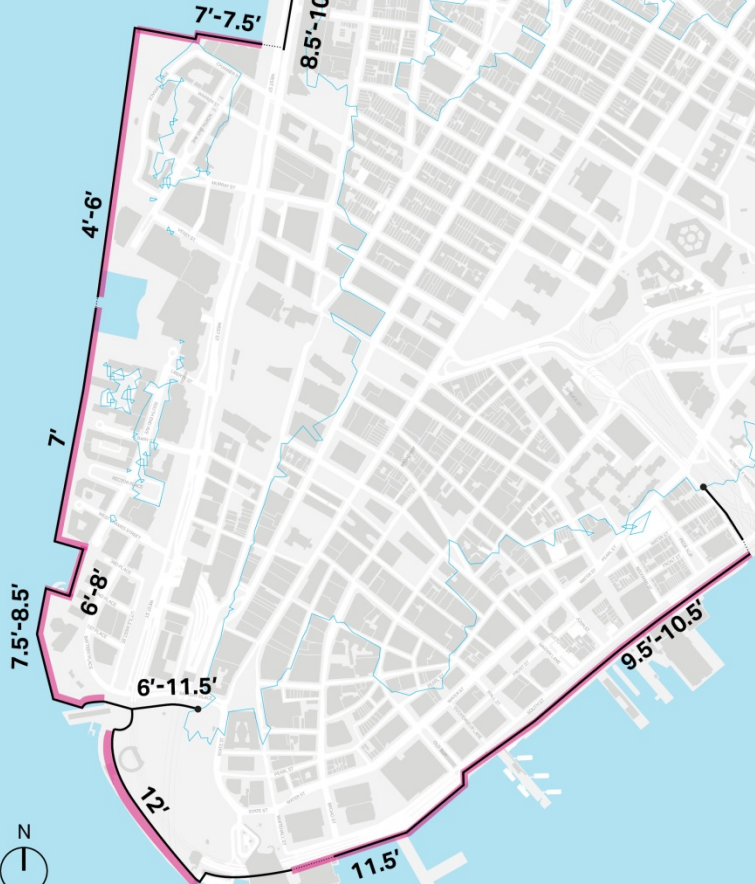
~75% PROJECT AREA PROTECTED



HYBRID

~85% PROJECT AREA PROTECTED

EDGE ALIGNMENT.



100 YR FLOOD LINE

*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

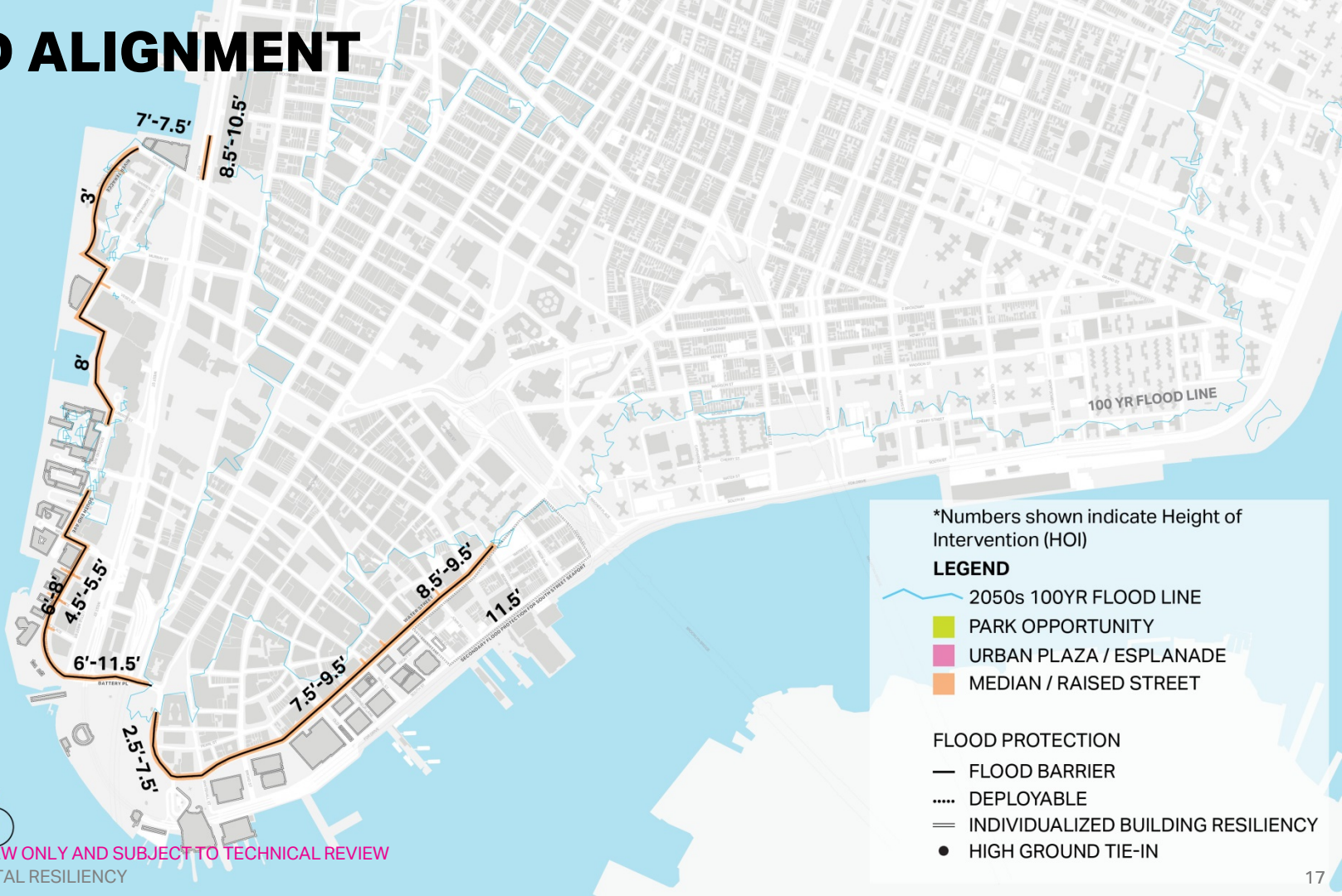
FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

200' 600' 1000'







UPLAND ALIGNMENT







*Numbers shown indicate Height of Intervention (HOI)

LEGEND

-  2050s 100YR FLOOD LINE
-  PARK OPPORTUNITY
-  URBAN PLAZA / ESPLANADE
-  MEDIAN / RAISED STREET

FLOOD PROTECTION

-  FLOOD BARRIER
-  DEPLOYABLE
-  INDIVIDUALIZED BUILDING RESILIENCY
-  HIGH GROUND TIE-IN

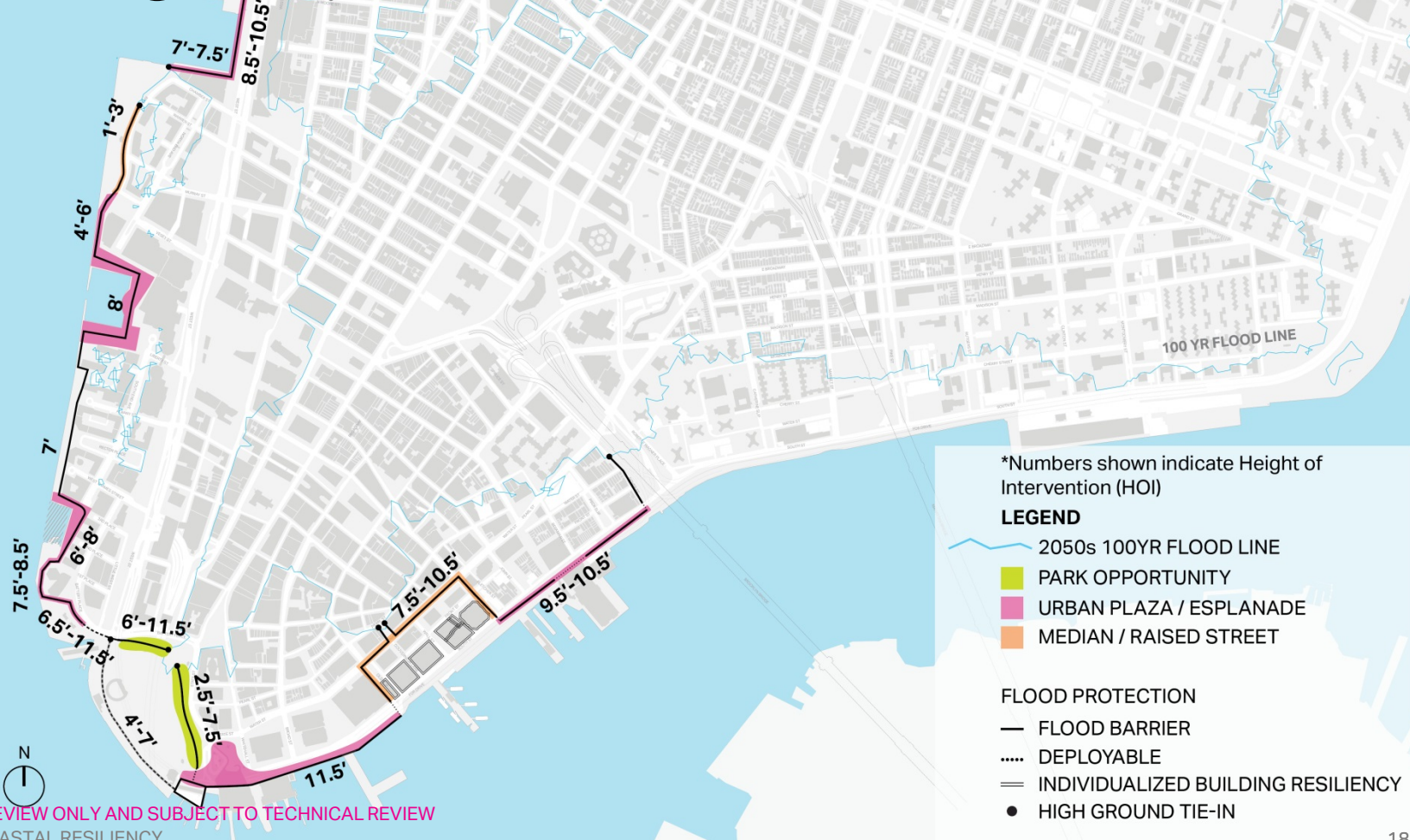
200' 600' 1000'



DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW





LOWER MANHATTAN COASTAL RESILIENCY

HYBRID ALIGNMENT







*Numbers shown indicate Height of Intervention (HOI)

LEGEND

-  2050s 100YR FLOOD LINE
-  PARK OPPORTUNITY
-  URBAN PLAZA / ESPLANADE
-  MEDIAN / RAISED STREET

FLOOD PROTECTION

-  FLOOD BARRIER
-  DEPLOYABLE
-  INDIVIDUALIZED BUILDING RESILIENCY
-  HIGH GROUND TIE-IN

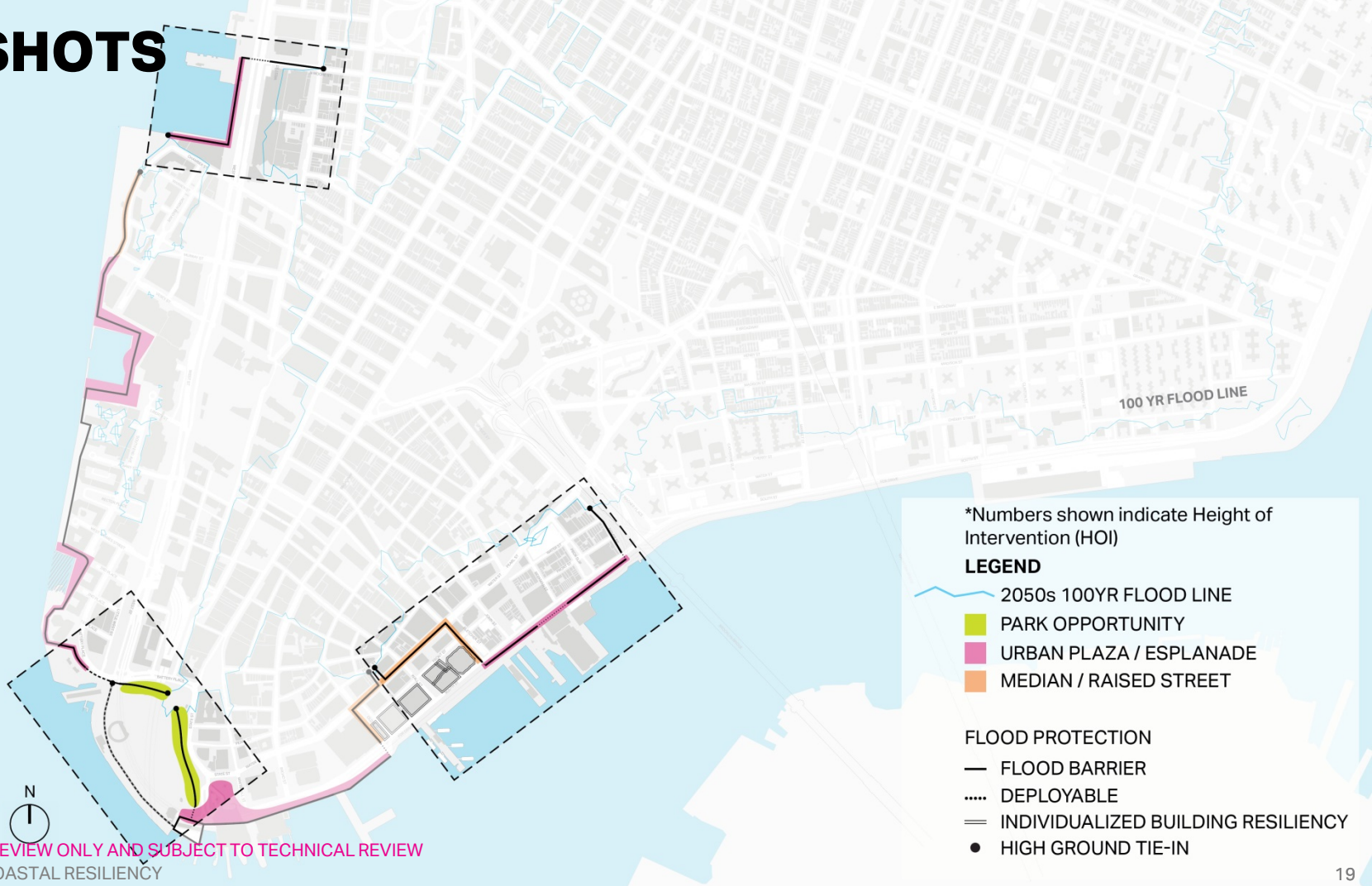
200' 600' 1000'



DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOTS



100 YR FLOOD LINE

*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

FLOOD PROTECTION

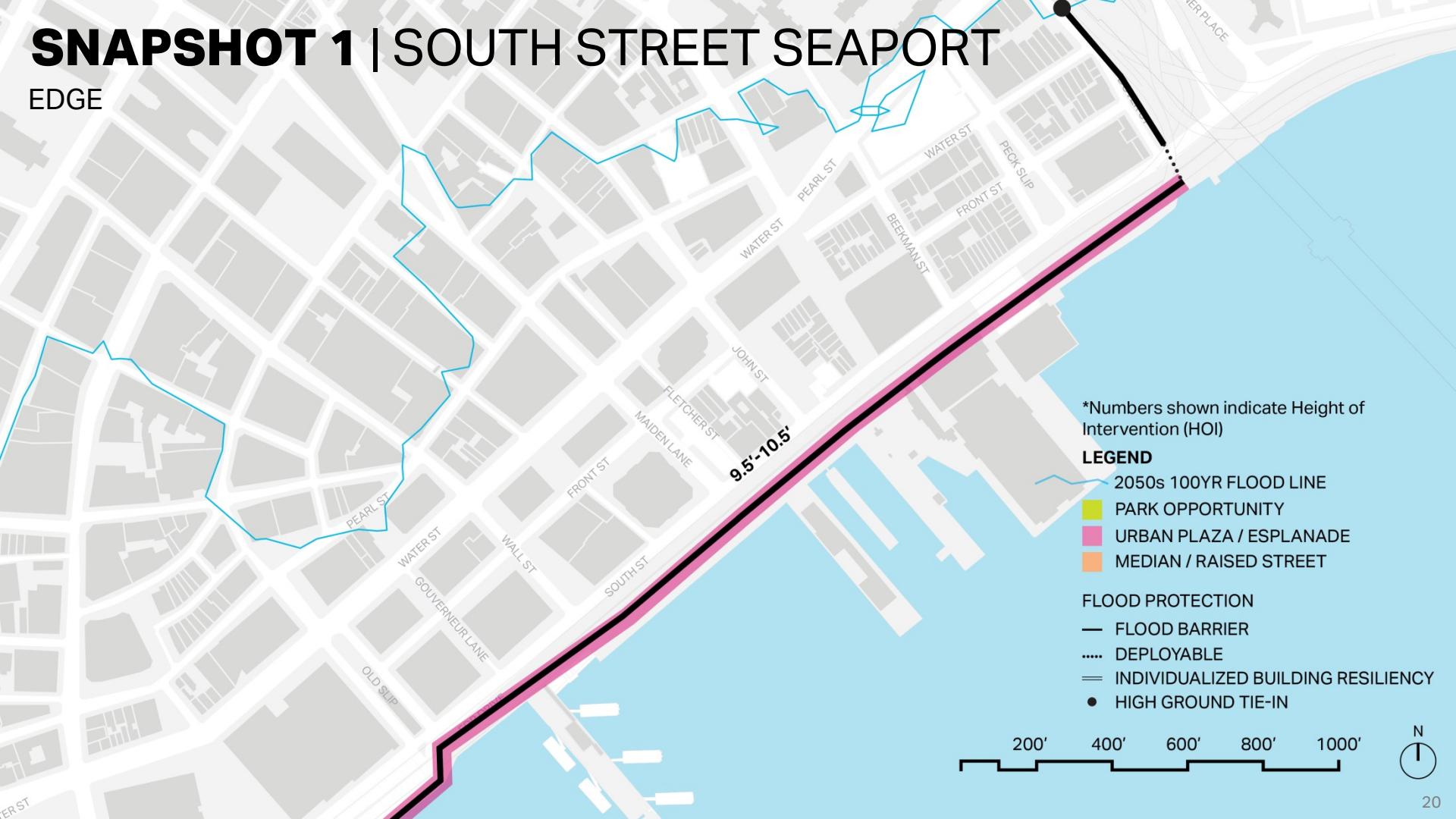
- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

200' 600' 1000'



SNAPSHOT 1 | SOUTH STREET SEAPORT

EDGE



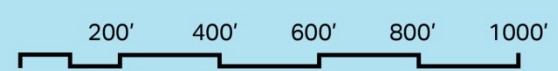
*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

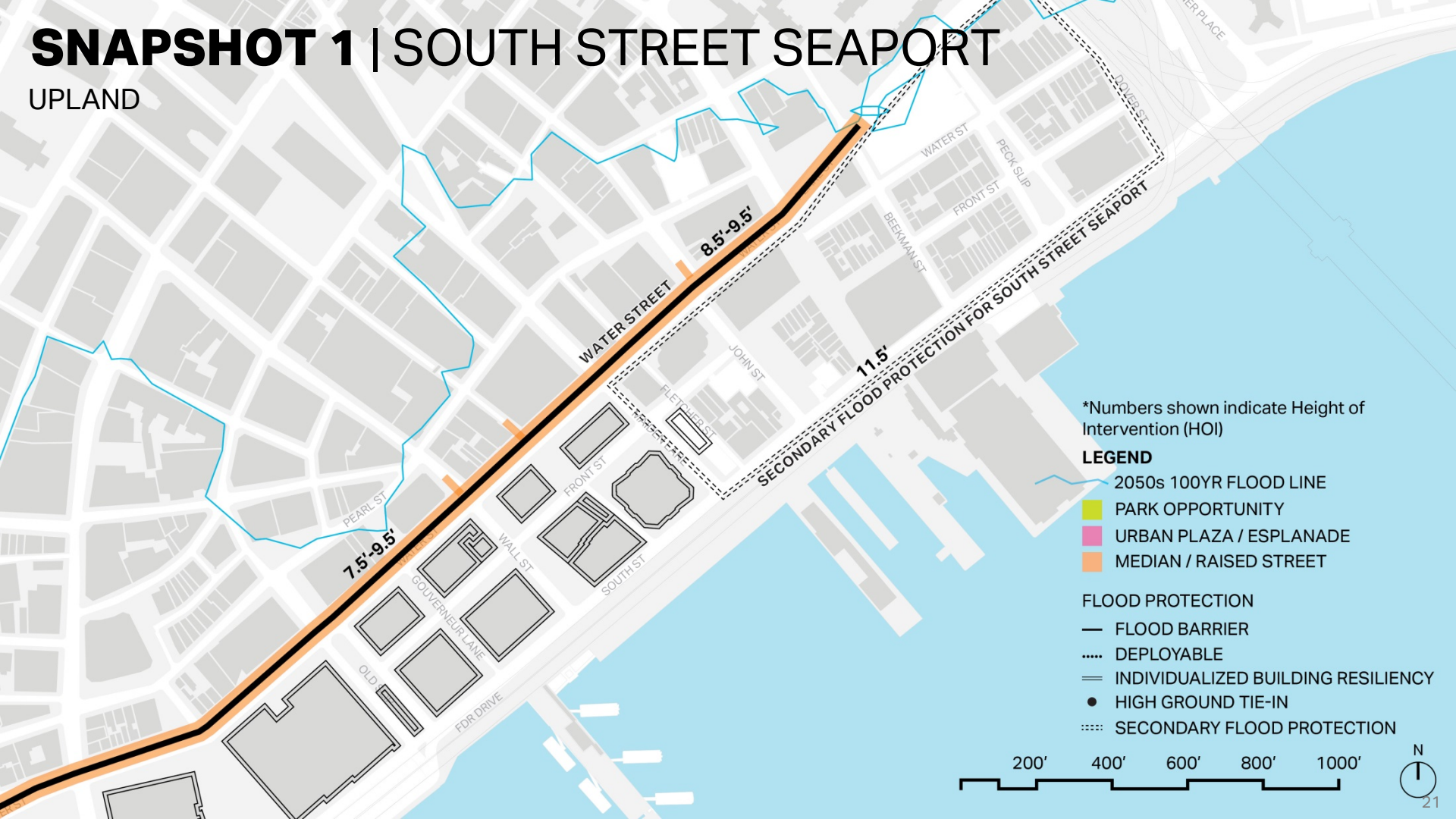
FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN



SNAPSHOT 1 | SOUTH STREET SEAPORT

UPLAND



*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

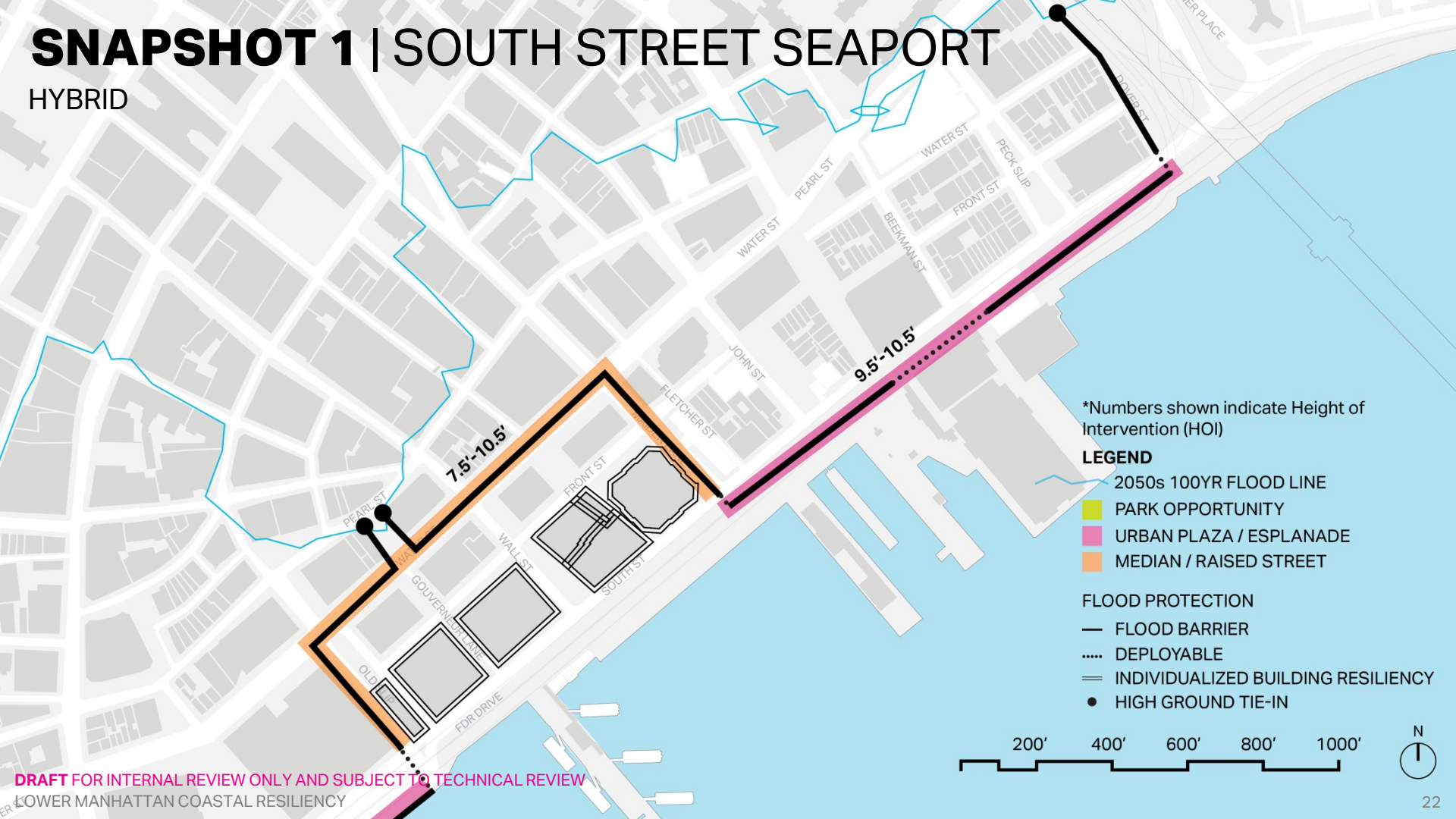
FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN
- SECONDARY FLOOD PROTECTION



SNAPSHOT 1 | SOUTH STREET SEAPORT

HYBRID



*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

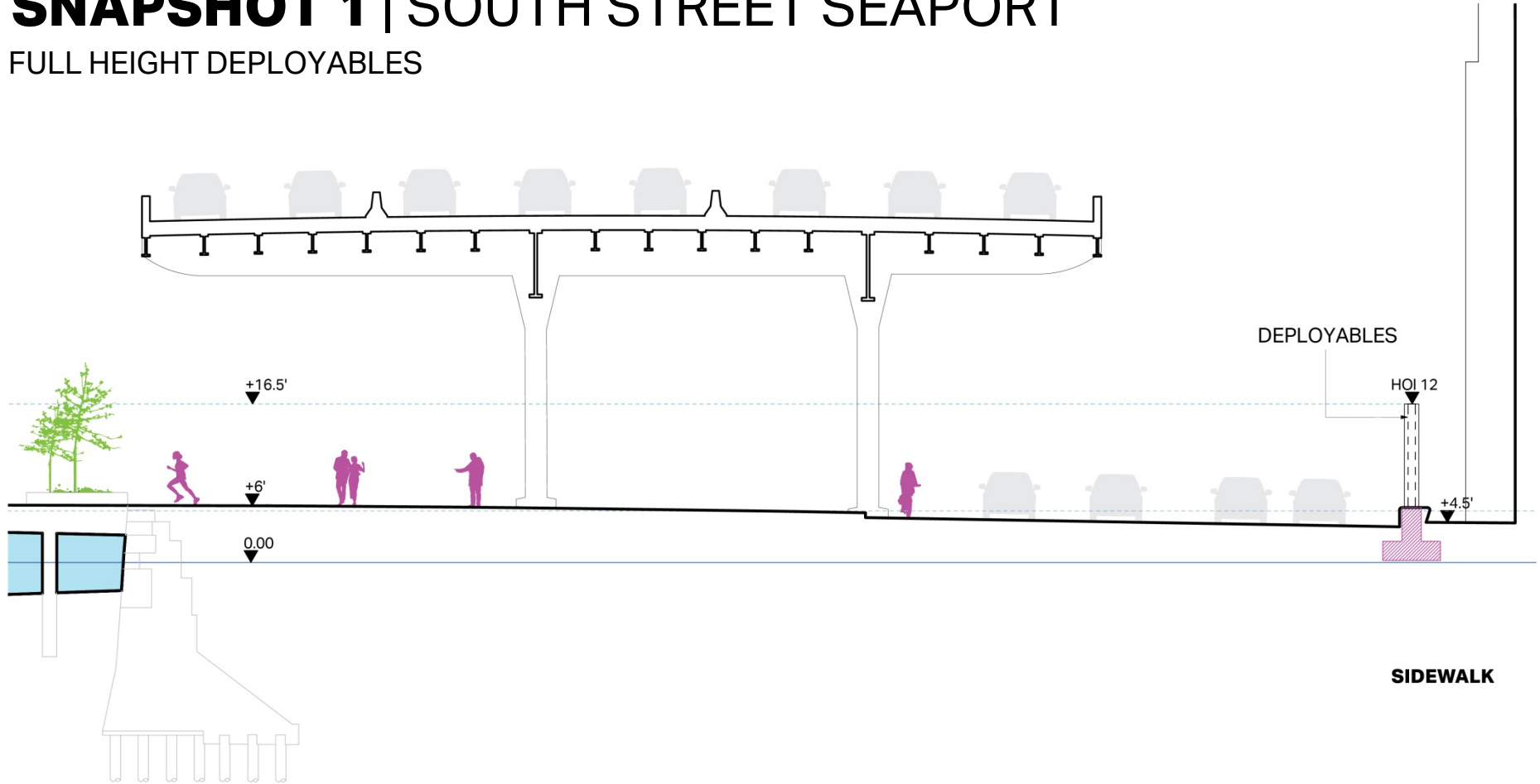
FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN



SNAPSHOT 1 | SOUTH STREET SEAPORT

FULL HEIGHT DEPLOYABLES

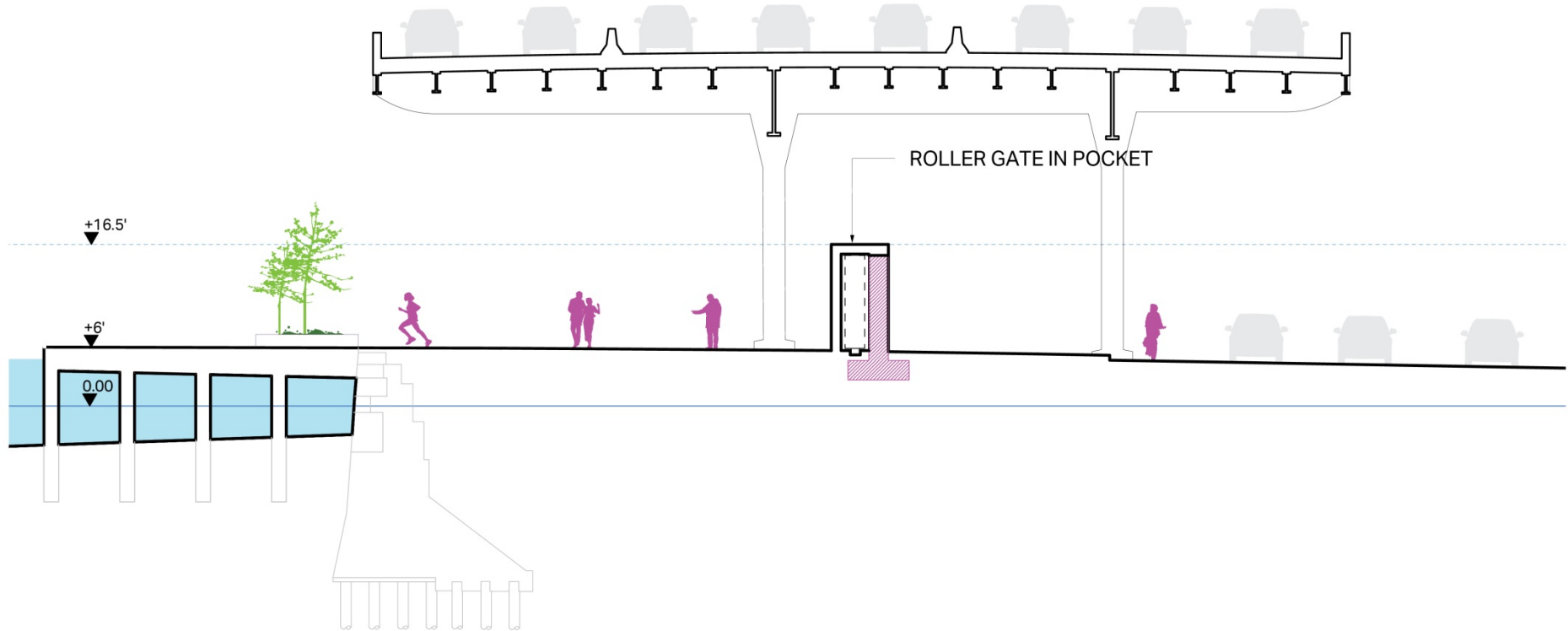


DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 1 | SOUTH STREET SEAPORT

WALL WITH ROLLER GATES



ROLLER GATE IN POCKET

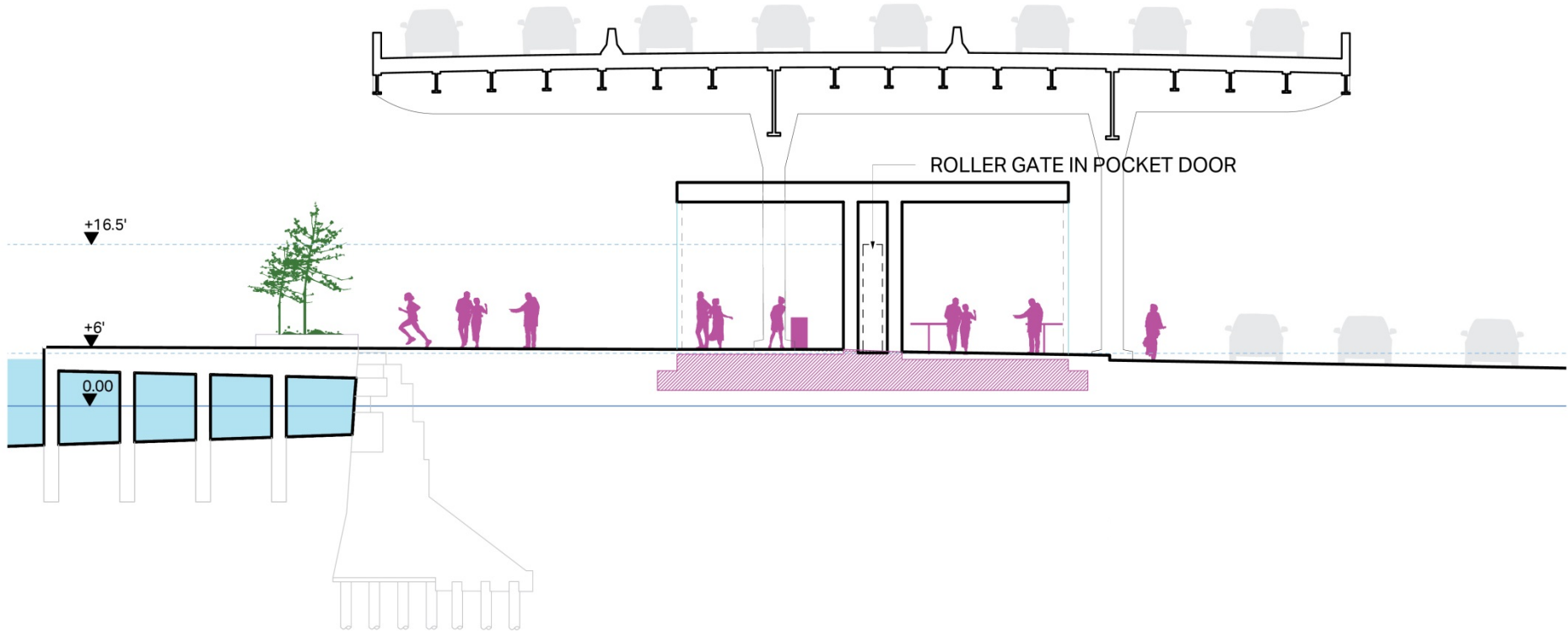
+16.5'

+6'

0.00

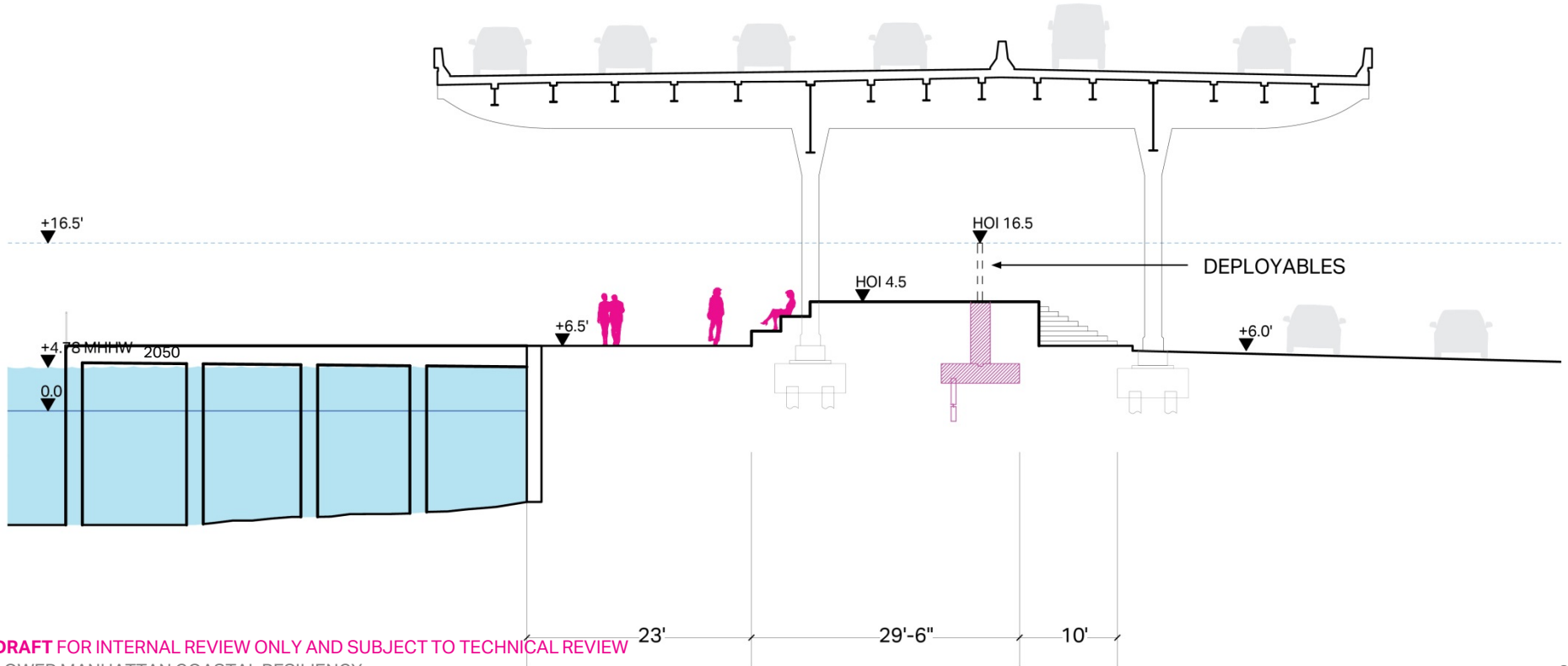
SNAPSHOT 1 | SOUTH STREET SEAPORT

KIOSKS WITH ROLLER GATES



SNAPSHOT 1 | SOUTH STREET SEAPORT

SEA LEVEL RISE PLATFORM WITH DEPLOYABLES



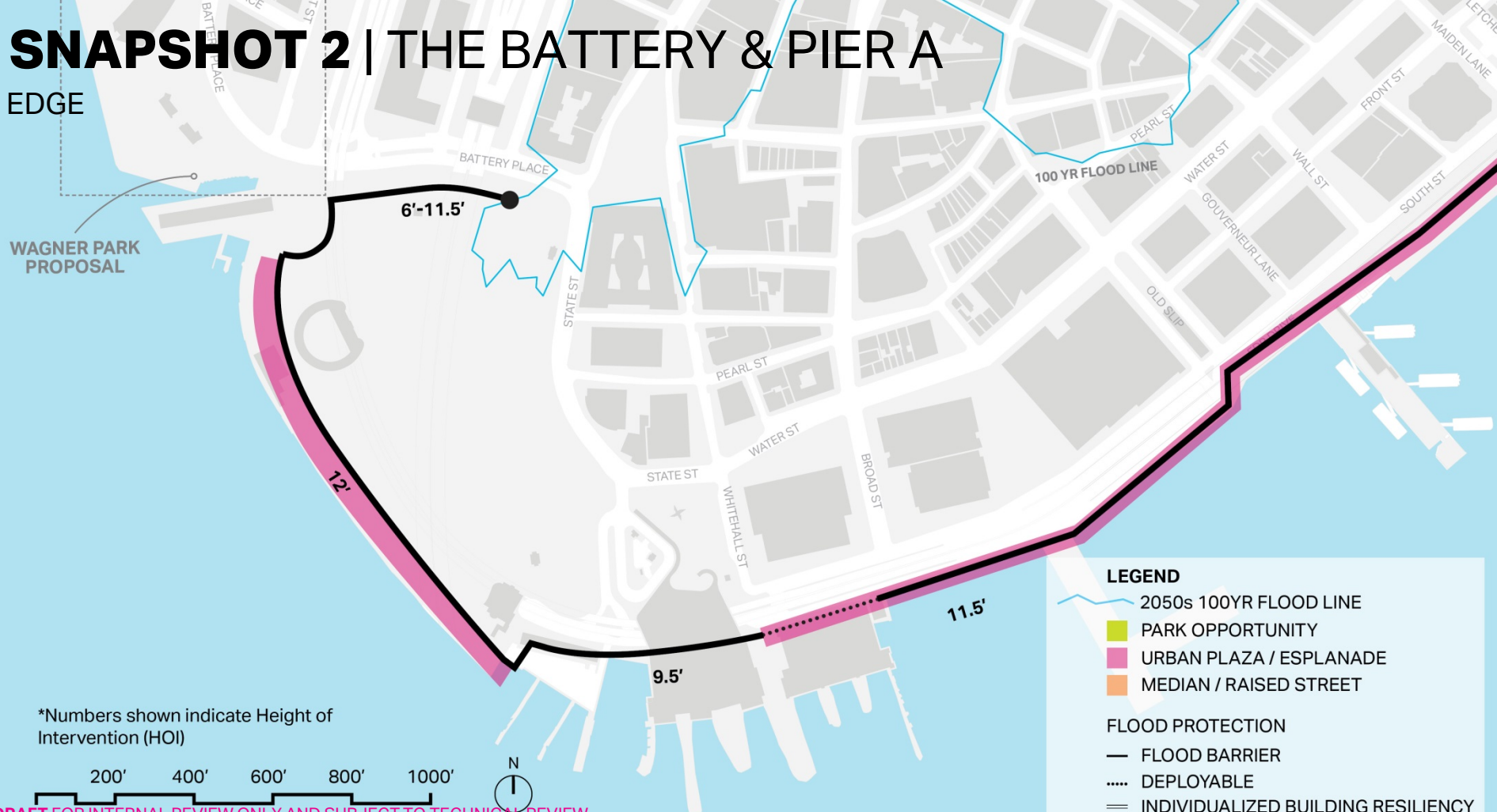
DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 2 | THE BATTERY & PIER A

EDGE

WAGNER PARK PROPOSAL



*Numbers shown indicate Height of Intervention (HOI)

200' 400' 600' 800' 1000'



LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 2 | THE BATTERY & PIER A

UPLAND

WAGNER PARK PROPOSAL

6'-11.5'
BATTERY PL

2.5'-7.5'

7.5'-9.5'

100 YR FLOOD LINE

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

*Numbers shown indicate Height of Intervention (HOI)

200' 400' 600' 800' 1000'



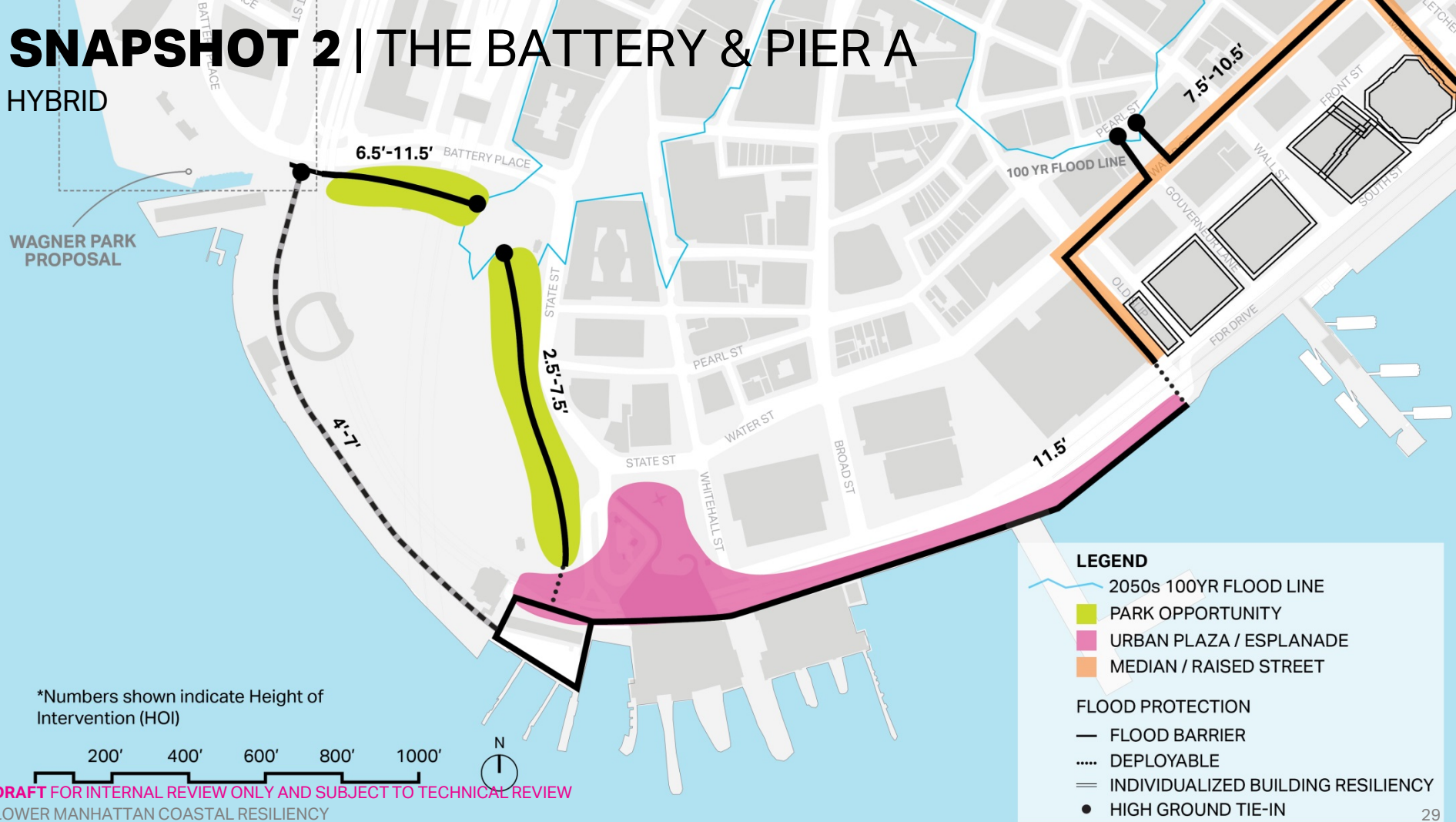
DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 2 | THE BATTERY & PIER A

HYBRID

WAGNER PARK PROPOSAL



*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 2 | PIER A & THE BATTERY

STREET MEDIAN

+16.5' 100-YEAR DFE

HOI 9.5

+8'

+7'

0.0

SIDEWALK

SIDEWALK

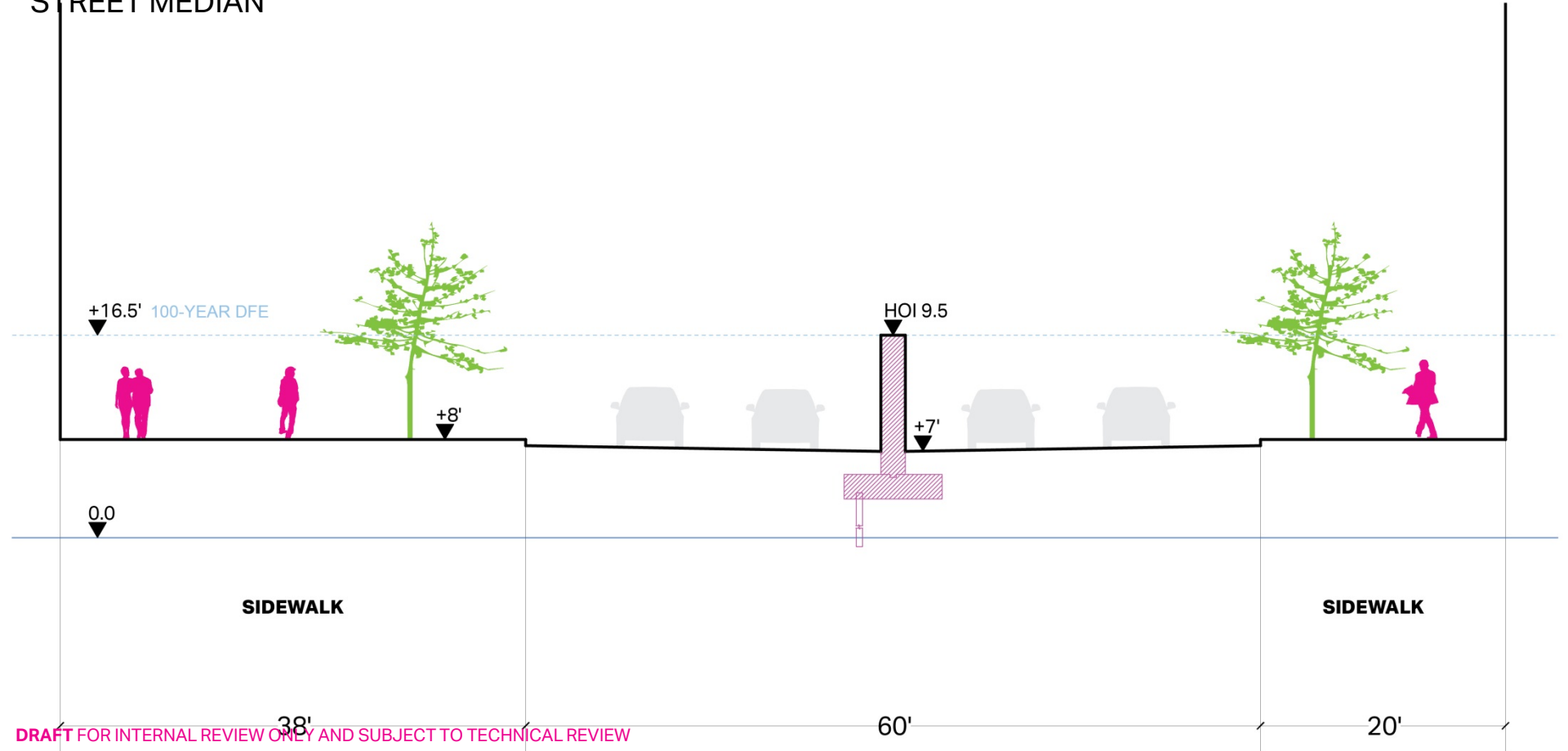
38'

60'

20'

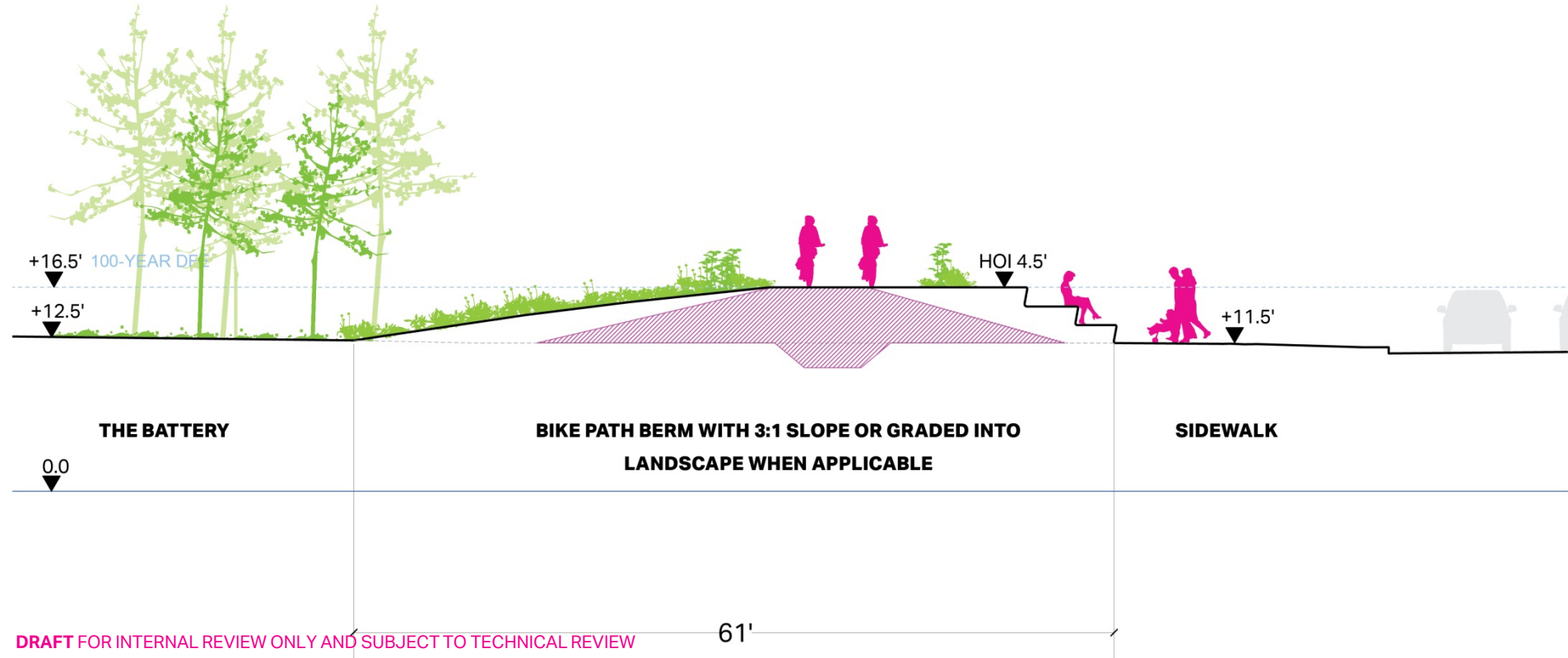
DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY



SNAPSHOT 2 | PIER A & THE BATTERY

BATTERY BERM SOUTH

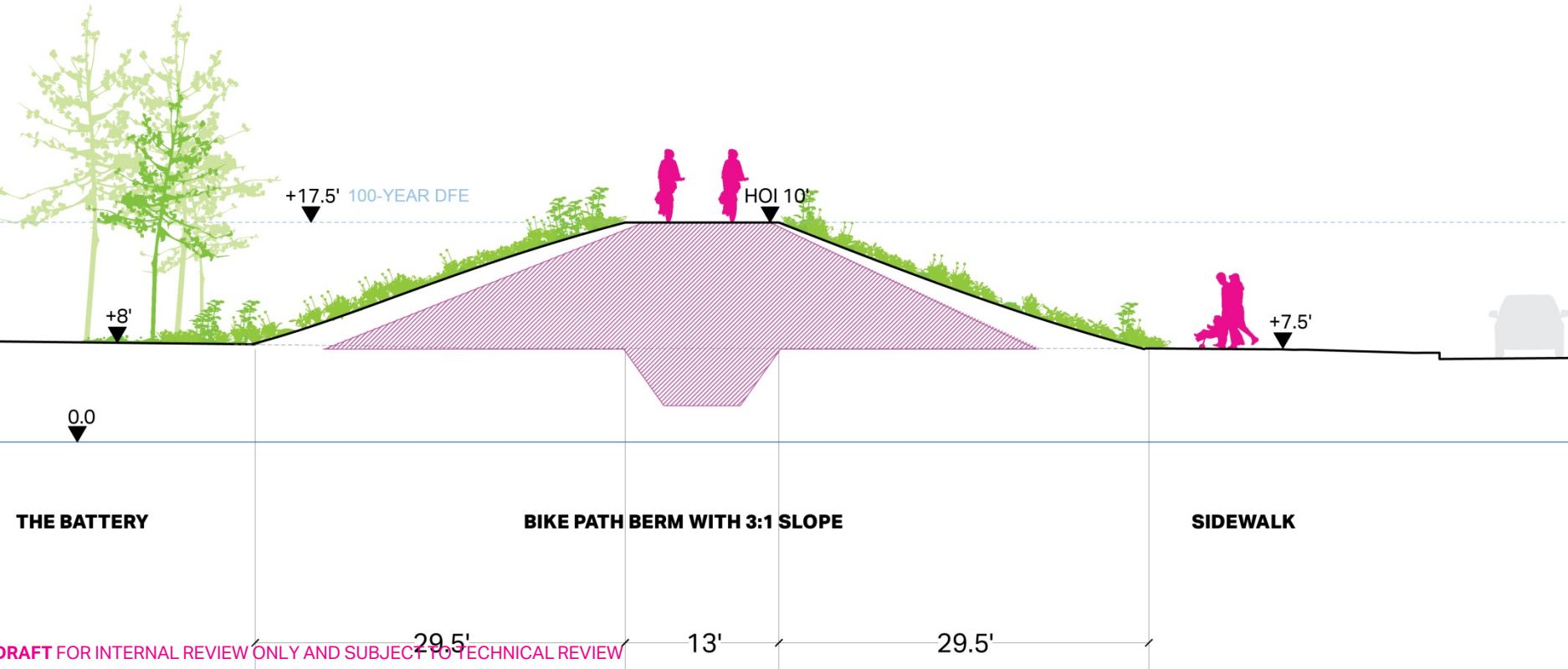


DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 2 | PIER A & THE BATTERY

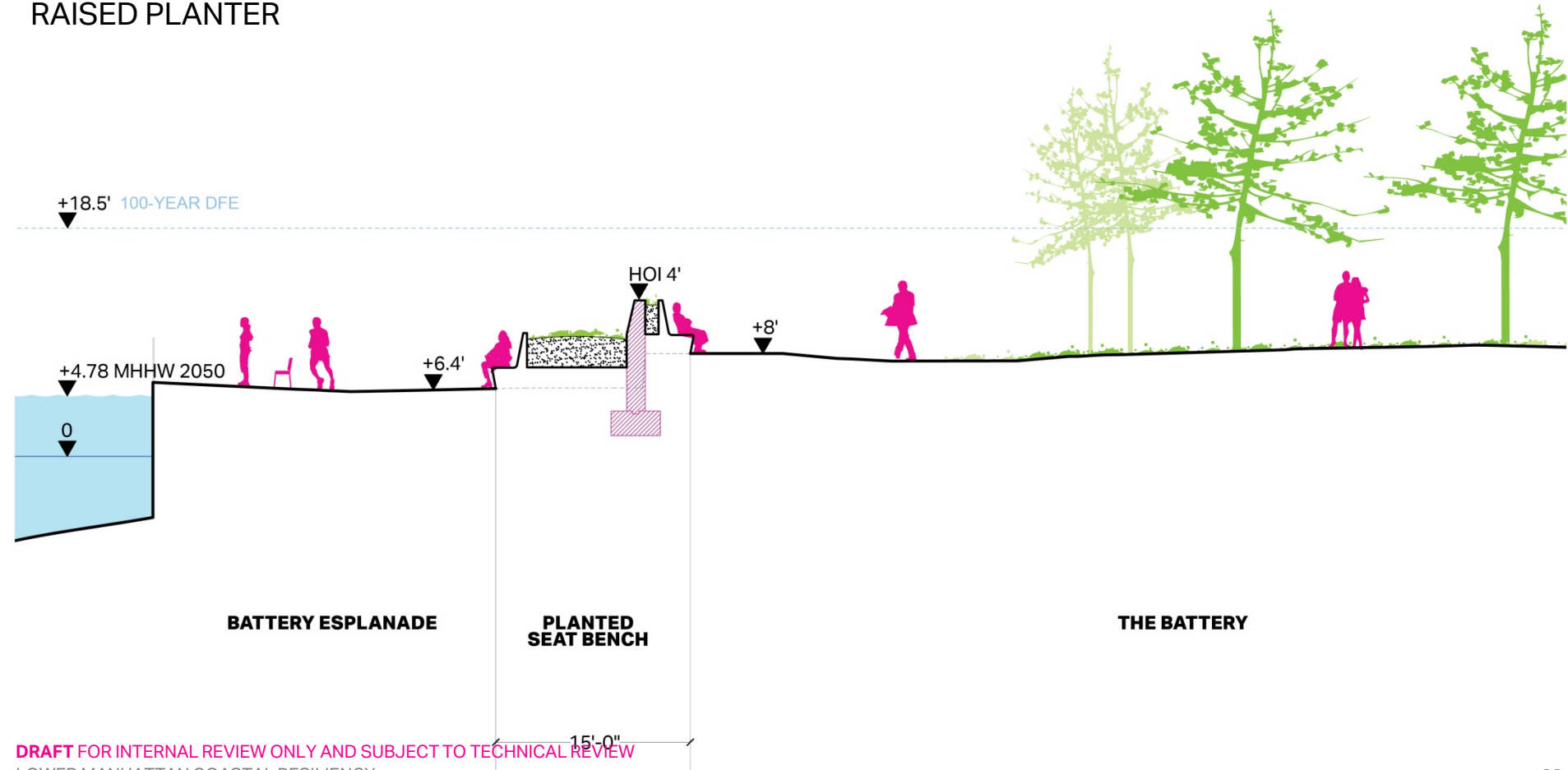
BATTERY BERM NORTH



DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

SNAPSHOT 2 | PIER A & THE BATTERY

RAISED PLANTER







SNAPSHOT 3 | BATTERY PARK CITY





EDGE

*Numbers shown indicate Height of Intervention (HOI)

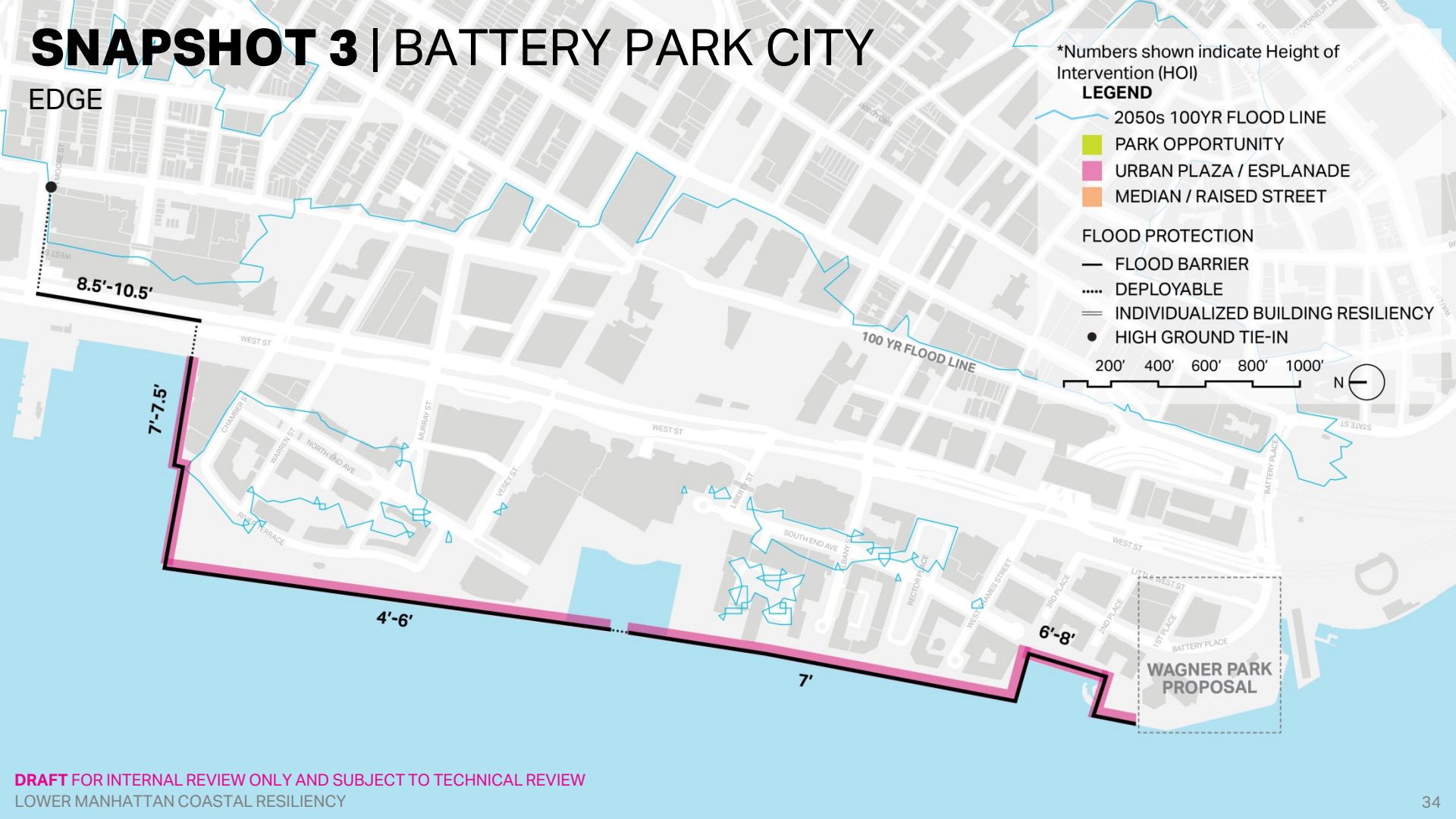
LEGEND

-  2050s 100YR FLOOD LINE
-  PARK OPPORTUNITY
-  URBAN PLAZA / ESPLANADE
-  MEDIAN / RAISED STREET

FLOOD PROTECTION

-  FLOOD BARRIER
-  DEPLOYABLE
-  INDIVIDUALIZED BUILDING RESILIENCY
-  HIGH GROUND TIE-IN

200' 400' 600' 800' 1000'



WAGNER PARK PROPOSAL

SNAPSHOT 3 | BATTERY PARK CITY

UPLAND

*Numbers shown indicate Height of Intervention (HOI)

LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

200' 400' 600' 800' 1000'



SNAPSHOT 3 | BATTERY PARK CITY

HYBRID

*Numbers shown indicate Height of Intervention (HOI)

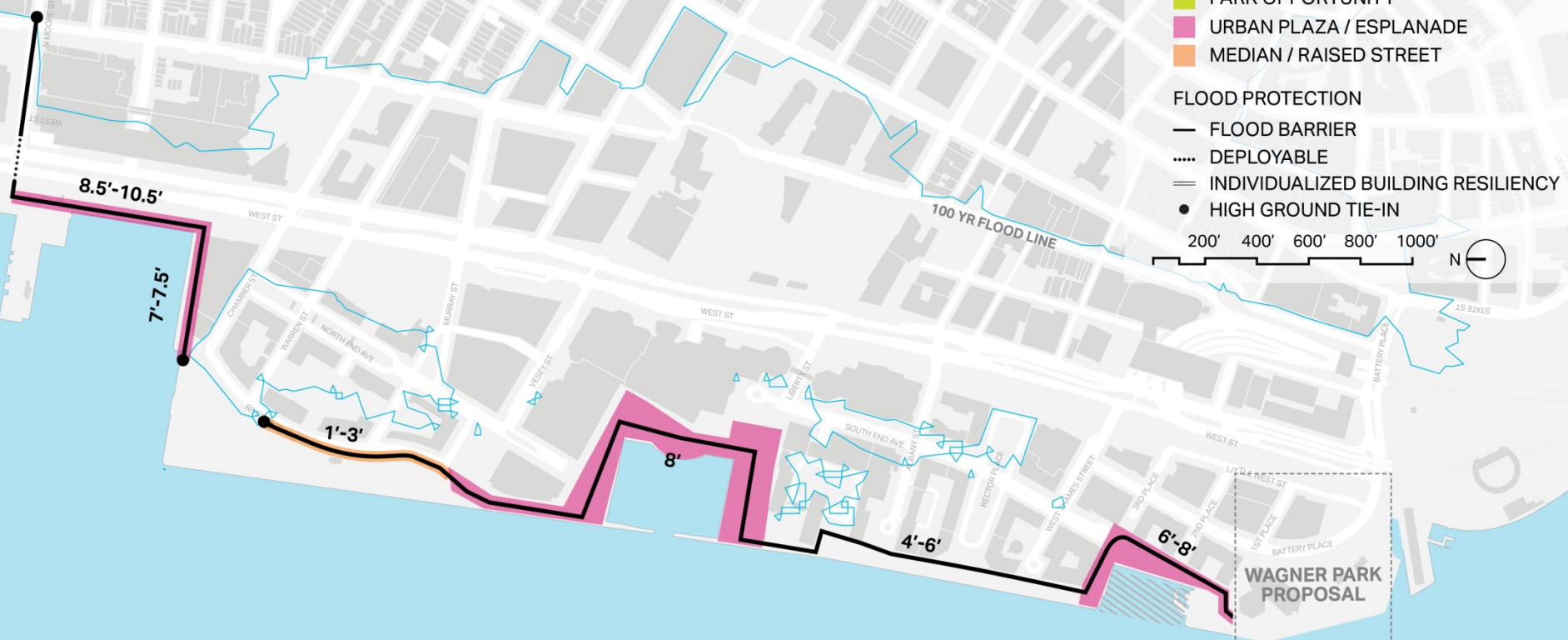
LEGEND

- 2050s 100YR FLOOD LINE
- PARK OPPORTUNITY
- URBAN PLAZA / ESPLANADE
- MEDIAN / RAISED STREET

FLOOD PROTECTION

- FLOOD BARRIER
- DEPLOYABLE
- INDIVIDUALIZED BUILDING RESILIENCY
- HIGH GROUND TIE-IN

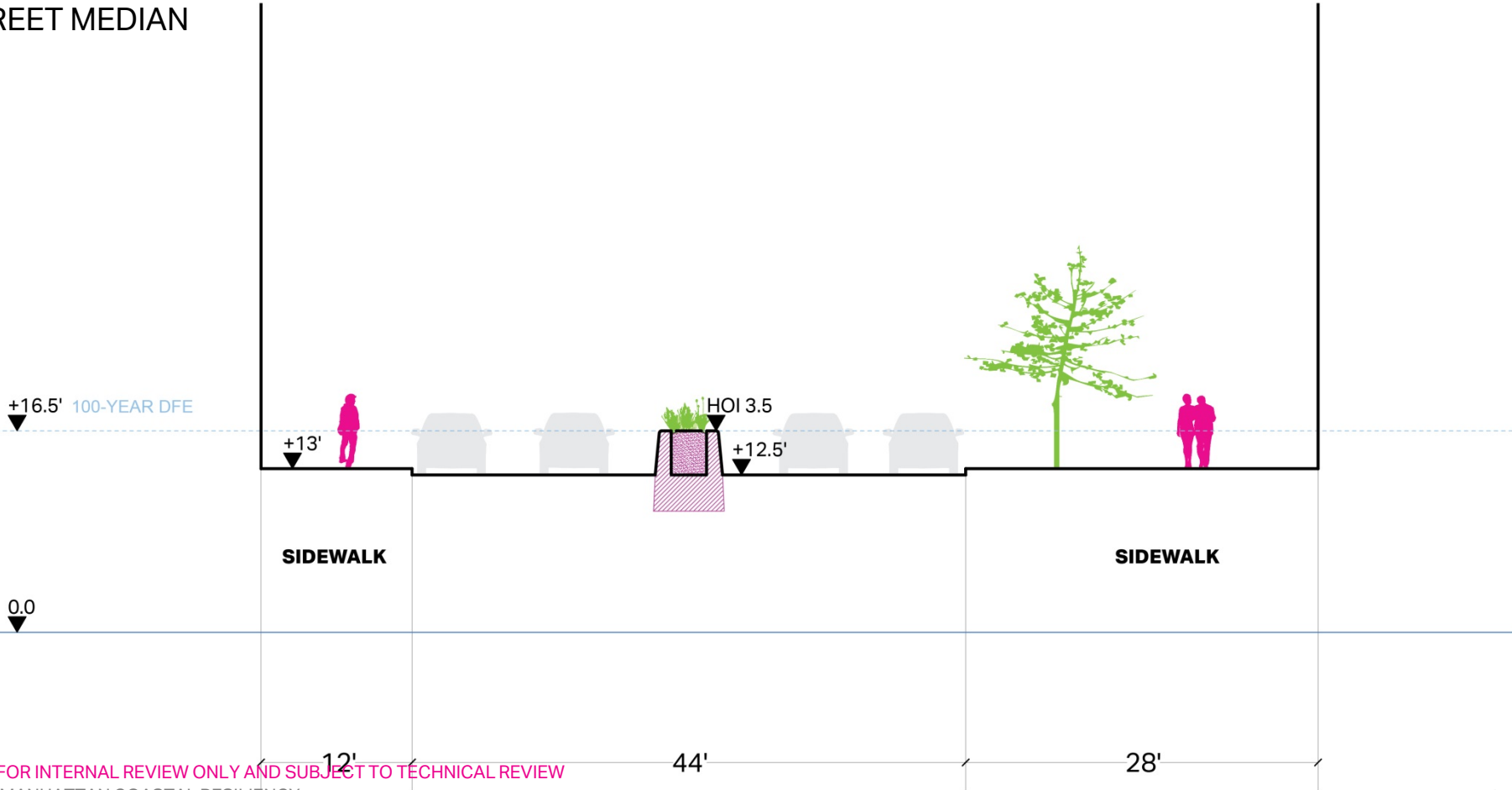
200' 400' 600' 800' 1000'



WAGNER PARK PROPOSAL

SNAPSHOT 3 | BATTERY PARK CITY

STREET MEDIAN

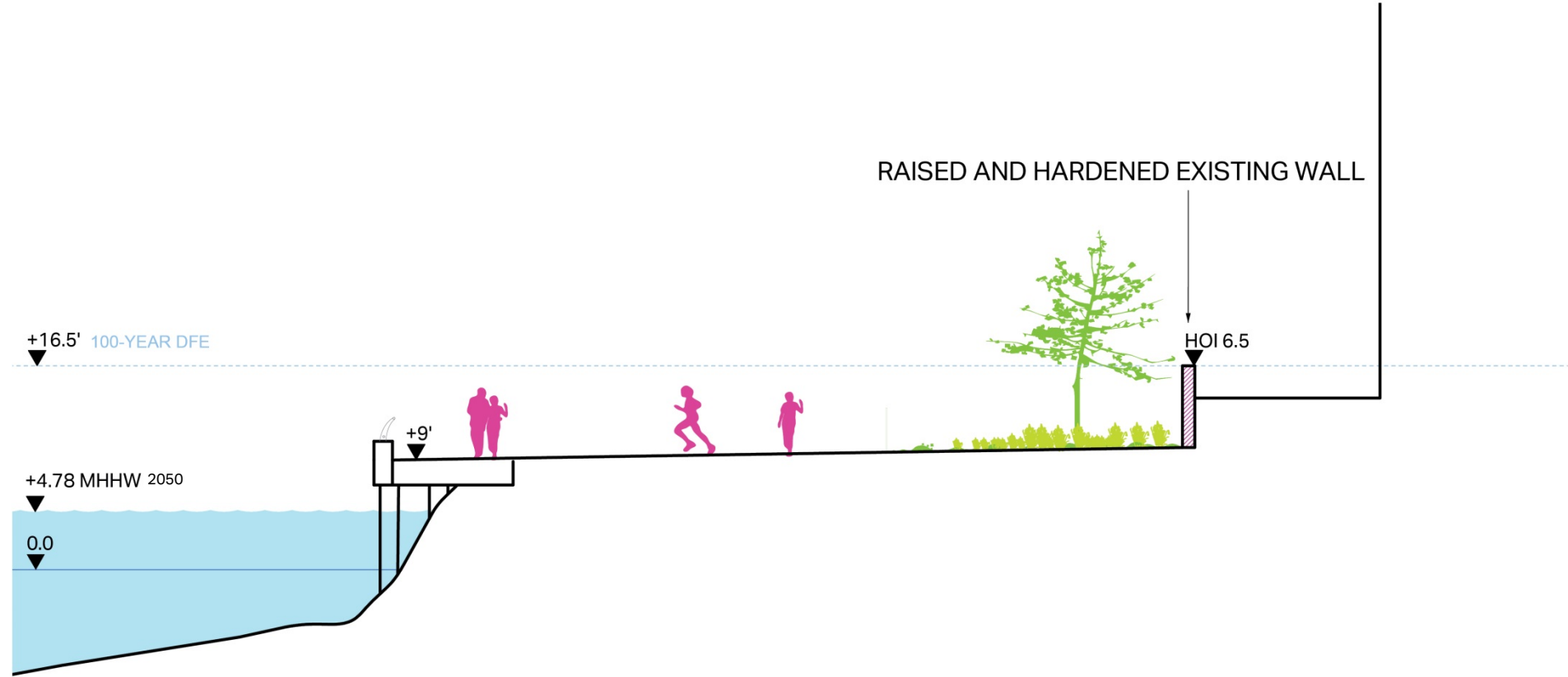


DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

SNAPSHOT 3 | BATTERY PARK CITY

HARDENED EXISTING WALL

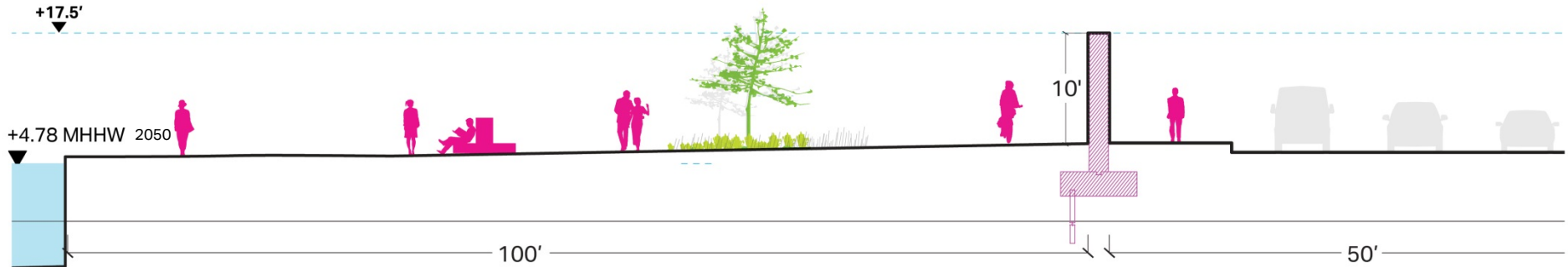


DRAFT FOR INTERNAL REVIEW ONLY AND SUBJECT TO TECHNICAL REVIEW

LOWER MANHATTAN COASTAL RESILIENCY

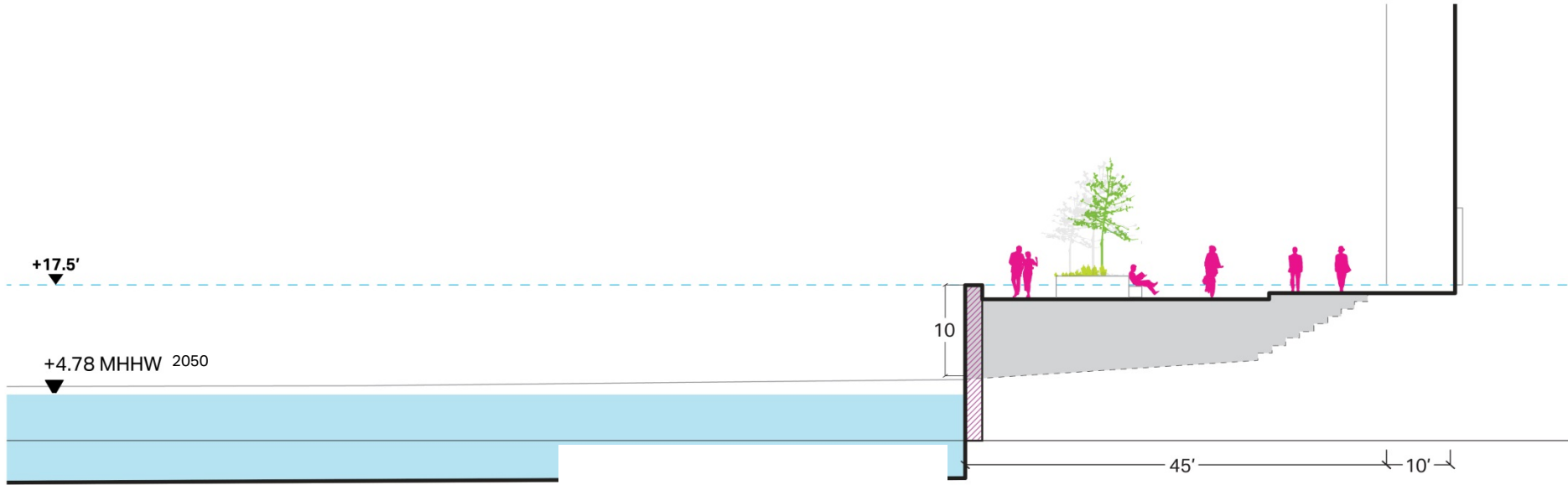
SNAPSHOT 3 | BATTERY PARK CITY

WALL



SNAPSHOT 3 | BATTERY PARK CITY

FILLED ESPLANADE



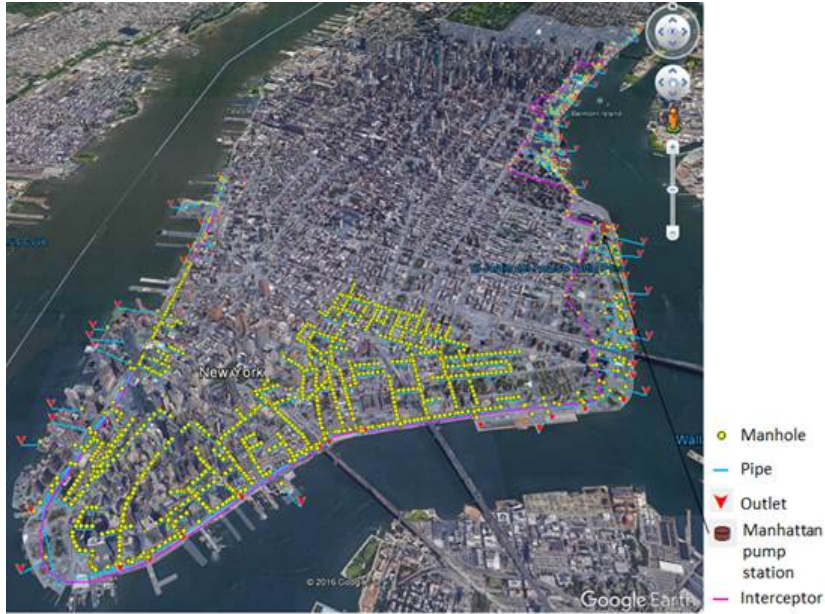
PRIVATE PROPERTY OWNER INTERVIEWS

- **LMCR Project team gathered data on 27 privately-owned properties across the Financial District and Two Bridges neighborhoods**
- **The average recovery period for buildings to be fully operational for tenants was 3-5 months.**
- **The average water-level of flooding at the lobby level of the building was 4-5ft.**
- **The total amount of capital put into protection across the properties was \$114,000,000**

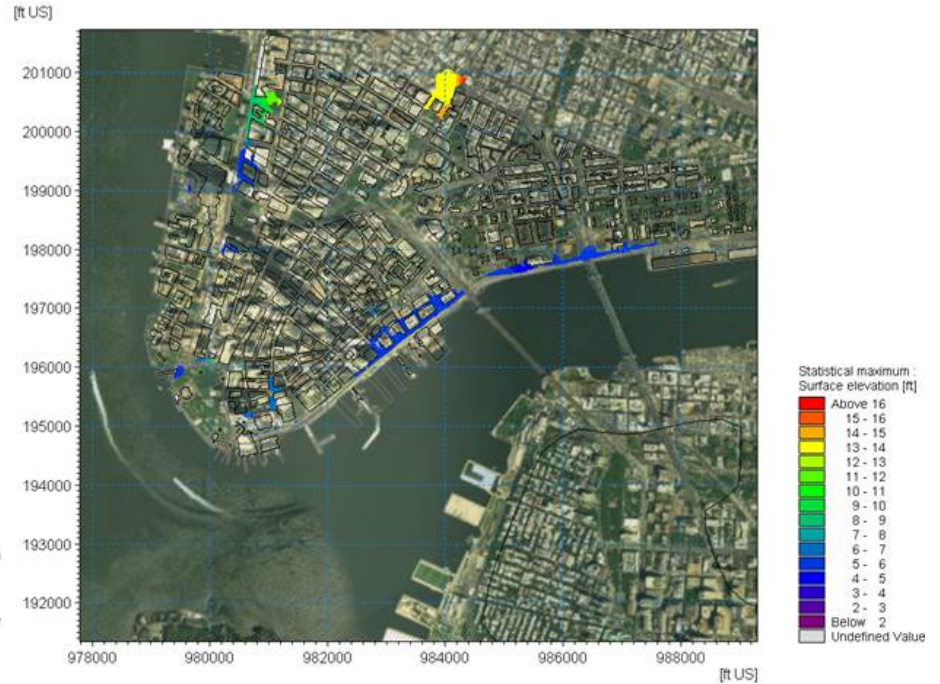
PRIVATE PROPERTY OWNER INTERVIEWS

- **67% of properties have relocated mechanical equipment such as electrical and cooling systems to a higher floor**
- **69% of properties interviewed had implemented or planned flood protection.**
- **Average Height of Protection = 6ft 10in**
- **Average time to deploy protection is between 9-17 hours**

MIKE URBAN WATER MODEL



MIKE URBAN Model Domain in Google Earth Format



10-year Rainstorm for 2050s with SLR

PROJECT NEXT STEPS

- **Discuss trade offs of each alignment with the community**
- **Incorporate coastal model to inform alignment and drainage**
- **Further evaluate land use and environmental review timelines**
- **Develop preliminary cost estimates**
- **Narrow in on potential alignments**

UPCOMING PUBLIC MEETING

1. Progress Update

- Lessons Learned
- Reporting on private property assessment
- Update on data collection

2. Alignments

- Overall Concepts
- Preliminary geographically specific alignments

3. Community Feedback on Concepts

- Workshops

FUTURE MILESTONES

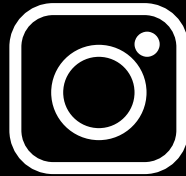
- **May 18th Workshop (concepts)**
St Paul's Chapel
209 Broadway (at Fulton Street)
6-8 pm

- **Fall '17 TF/ Public Workshop (select alternative)**
- **Winter '17/ '18 (refine alternative)**
- **Summer/Fall '18 – Prepare environmental review**
- **2019 + - Final Design and project implementation**

STAY IN TOUCH



www.nyc.gov/lmcr



@NYClimate



@NYClimate



By Mail
253 Broadway – 14th Floor



In person



nycresiliency@cityhall.nyc.gov