

REBUILDBYDESIGN
MEADOWLANDS

ODU ADAPTATION FORUM

DESIGN DEVELOPMENT // ENGAGEMENT // FINAL CONCEPT
JULY 20, 2018

HURRICANE SANDY

2



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

REBUILD BY DESIGN: COMPETITION & AWARD

U.S. DEPARTMENT OF HOUSING & URBAN DEVELOPMENT

3



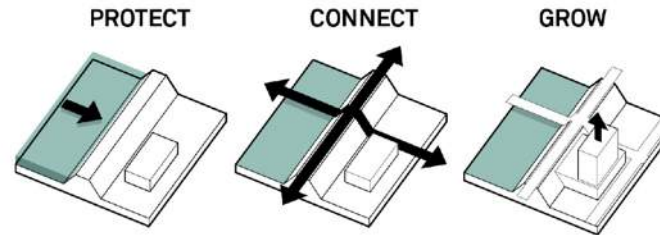
COMPETITION RENDERING

Competition Graphic: MITCAU, ZUS, ORG



COMPETITION SECTION PERSPECTIVE

- Original RBD Concept
- **Protect:** Flood Protection
- **Connect:** Transportation Improvements
- **Grow:** Re-Development
- Cost Estimate (Competition Cost) **Phase 1: \$850M+**



COMPETITION LENSES



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

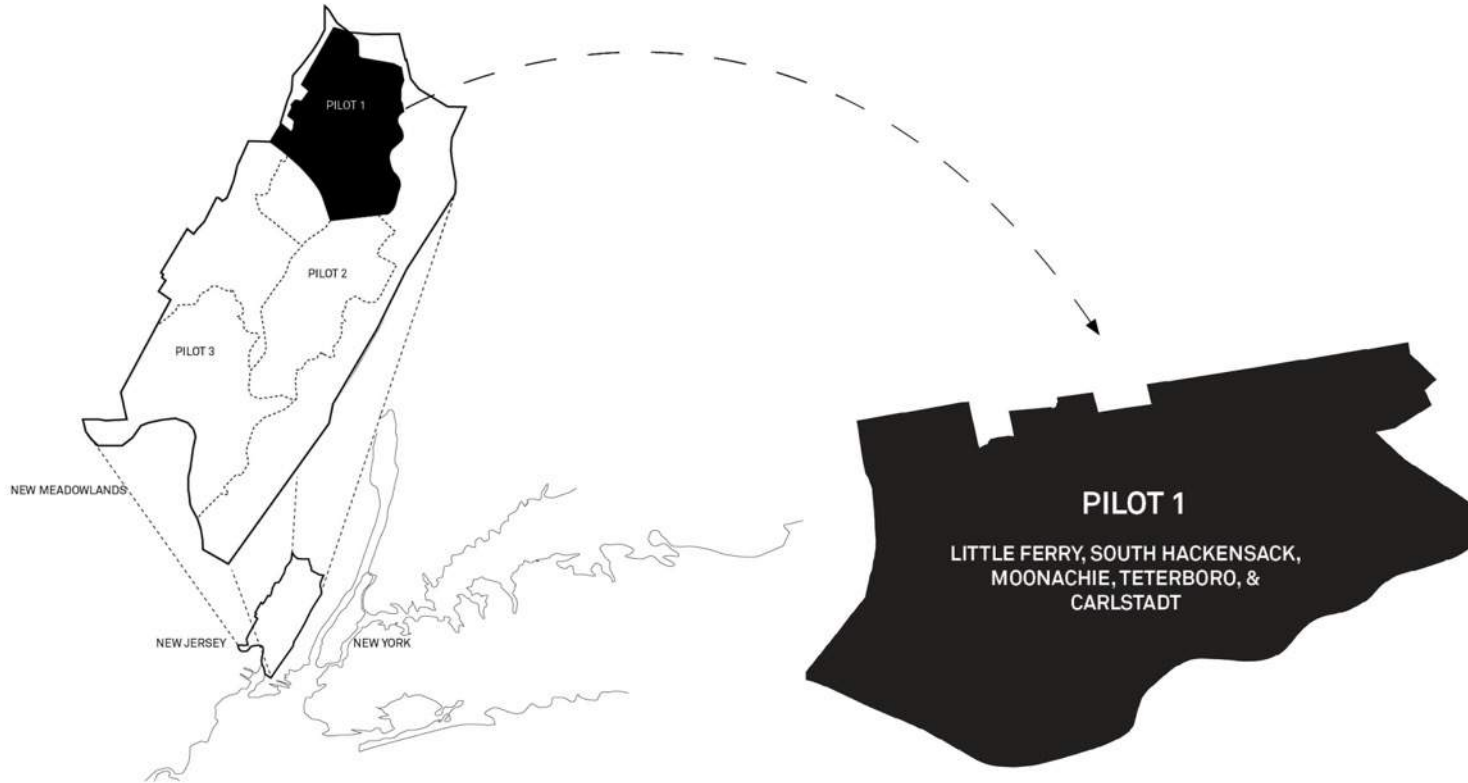
AECOM

REBUILD BY DESIGN COMPETITION & AWARD

PILOT AREA 1 AWARDED

4

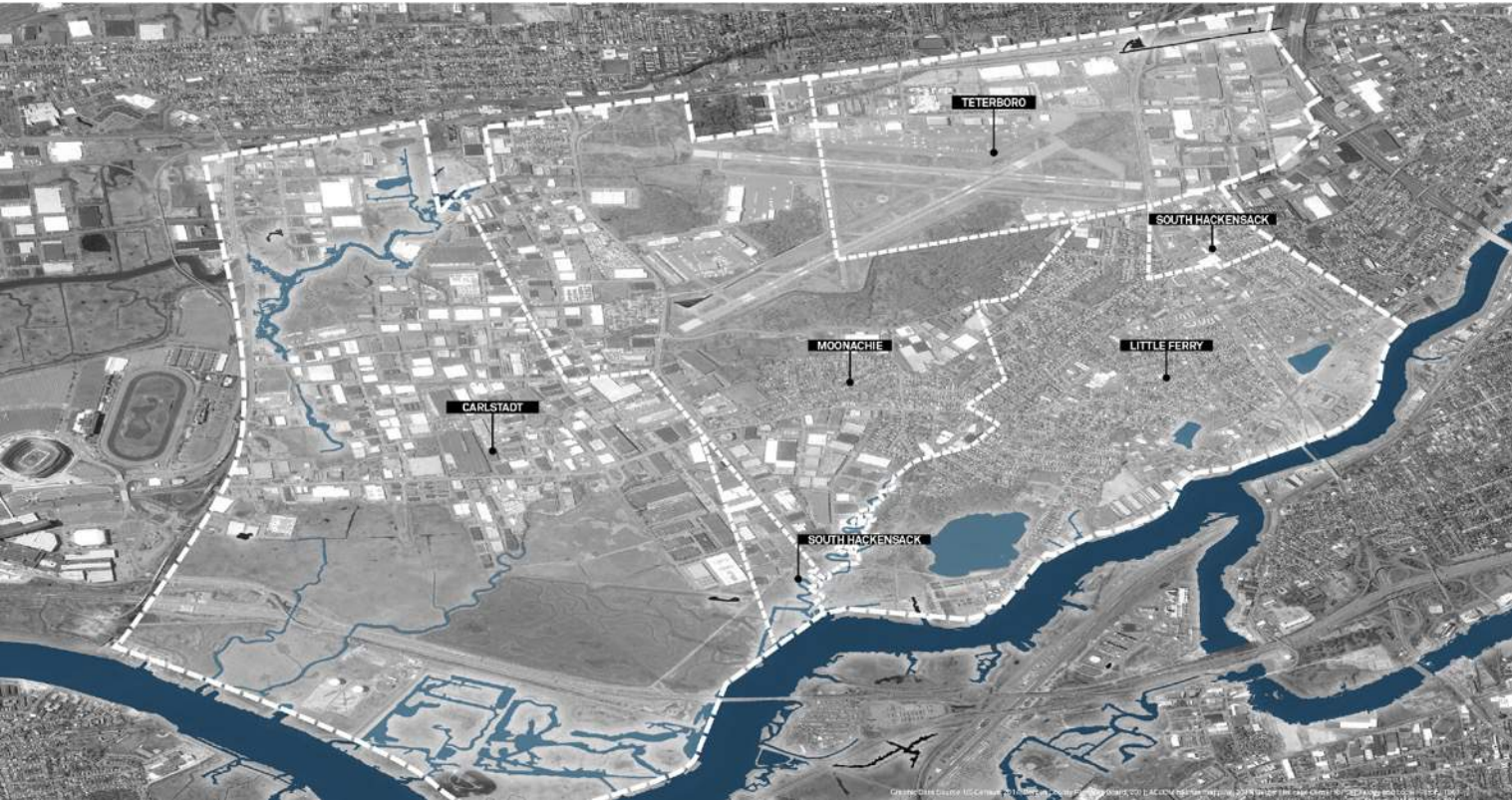
- HUD awarded State of New Jersey only **\$150M** for **Phase 1 Pilot Area**
- Project must be functional and **completed by September 2022**



REBUILD BY DESIGN COMPETITION & AWARD

5 MUNICIPALITIES

5



Pilot Area 1

- 5,500 Acres
- 16,000 Residents
- Teterboro Airport
- Regional Transportation Corridors
- Regional Warehouse and Distribution Centers



REBUILD BY DESIGN COMPETITION & AWARD

FUNDING CONSTRAINTS

6

1. Construct a complete project that functions with **INDEPENDENT UTILITY** to meet purpose & need without relying on future projects
2. Use only **AVAILABLE FUNDS** without relying on future funding
3. Construct a fully-functional project by **SEPTEMBER 2022**
4. Project must have a **POSITIVE BENEFIT COST RATIO**



THE TEAM



THE TEAM

RESILIENCE THROUGH PARTNERING

AECOM

HDR

 **Dewberry**



HR&A

New Meadowlands LLC

MATRIX**NEW**WORLD

Remora Consulting

ROBINSON



THE TEAM

RESILIENCE IN PRACTICE

9



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

SITE OVERVIEW



PROJECT AREA CHALLENGES

EXISTING FLOODPLAIN

- **98% OF THE PROJECT AREA IS WITHIN THE 100-YEAR FLOODPLAIN**

Legend

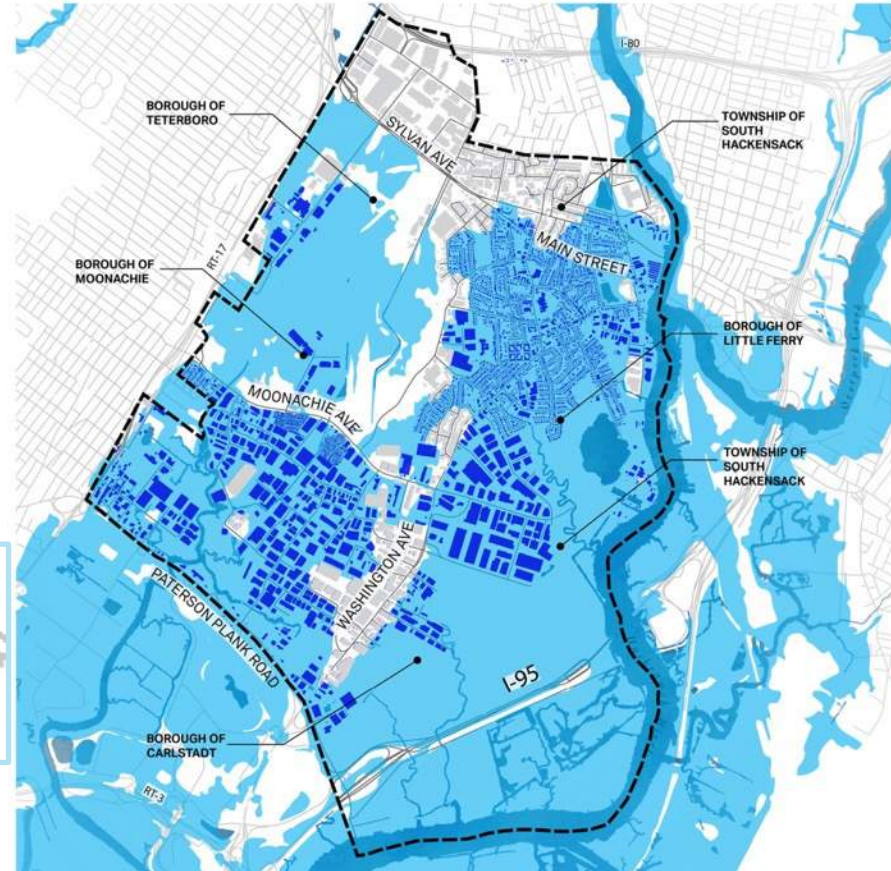
..... Municipality

100-Year Floodplain

Properties Within
100-Year Floodplain

Properties Not Within
100-Year Floodplain

Location Key



PROJECT AREA CHALLENGES

SEA LEVEL RISE BY 2075

12

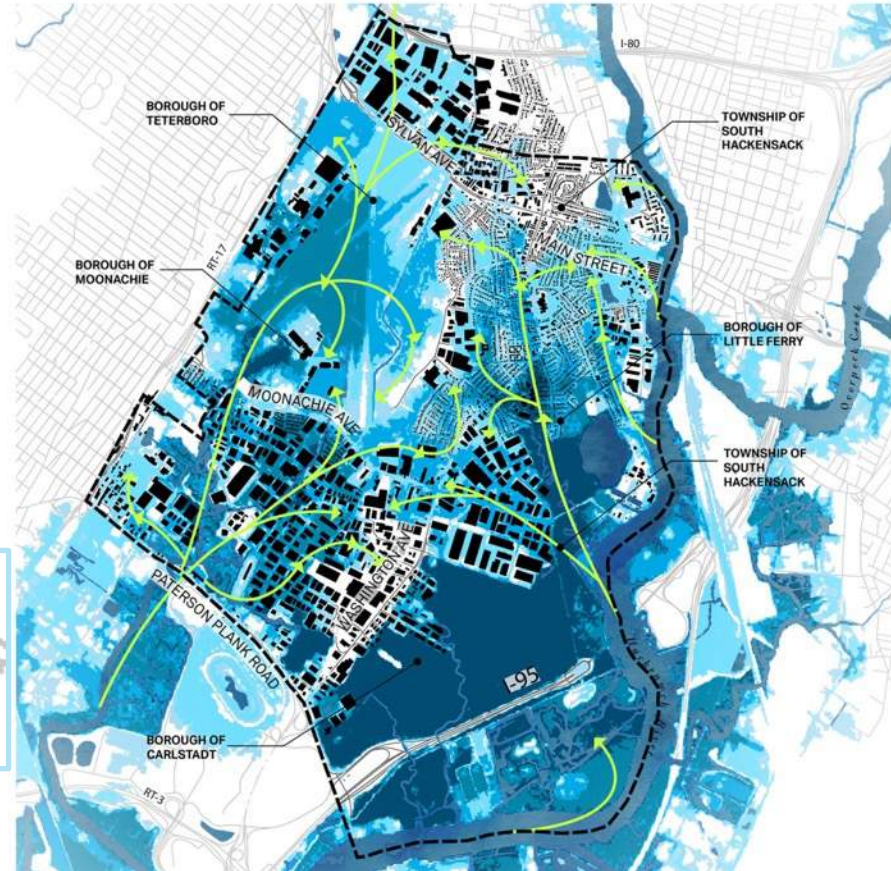
- **SEA LEVEL IS ESTIMATED TO RISE BETWEEN 1.2 – 2.4 FEET IN THE PROJECT AREA**
- **STORM SURGE IS ESTIMATED TO INCREASE 0.8-1.6 FEET**

Legend

- Municipality
- Direction of Water
- Water
- 0' Sea Level Rise
- 1' Sea Level Rise

- 2' Sea Level Rise
- 3' Sea Level Rise
- 4' Sea Level Rise
- 5' Sea Level Rise
- 6' Sea Level Rise

Location Key



1

Challenges from

MAJOR STORM SURGE Flooding

2

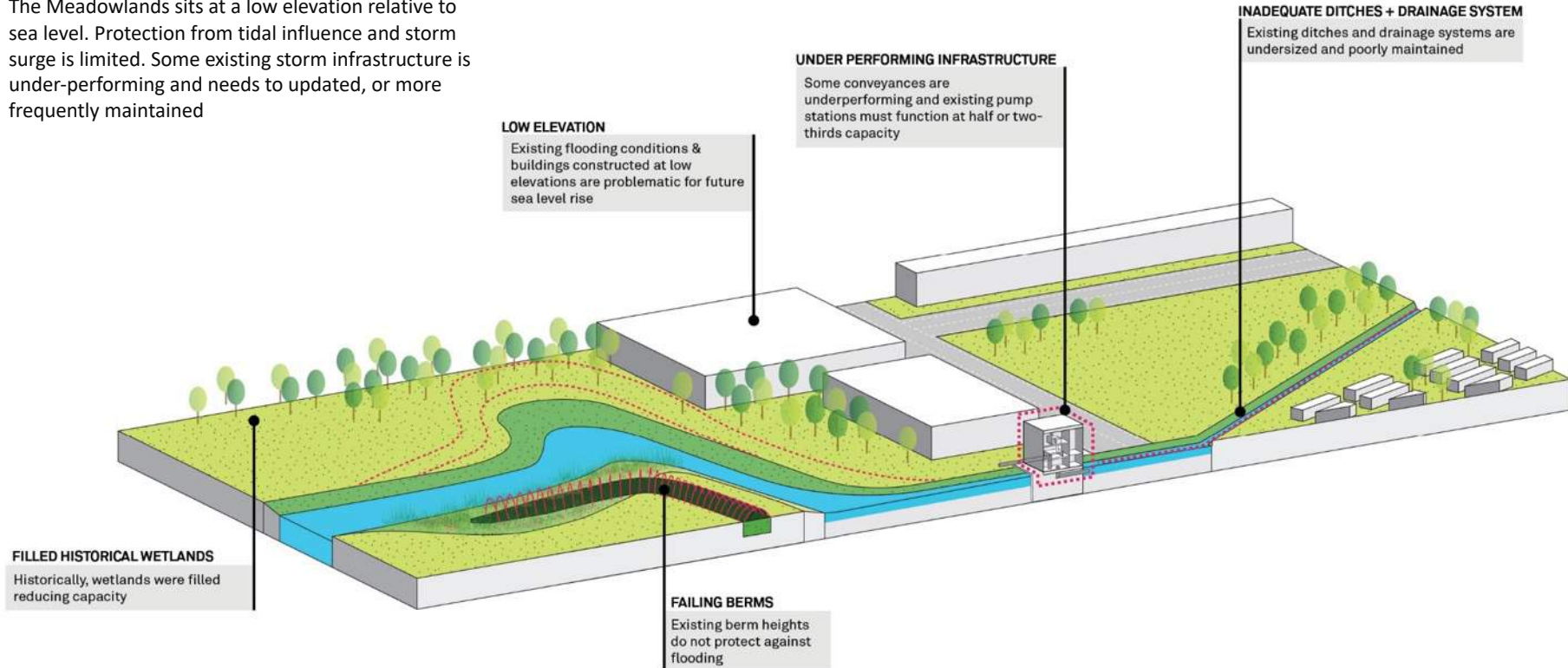
Challenges from

FREQUENT RAIN Flooding

PROJECT AREA CHALLENGES

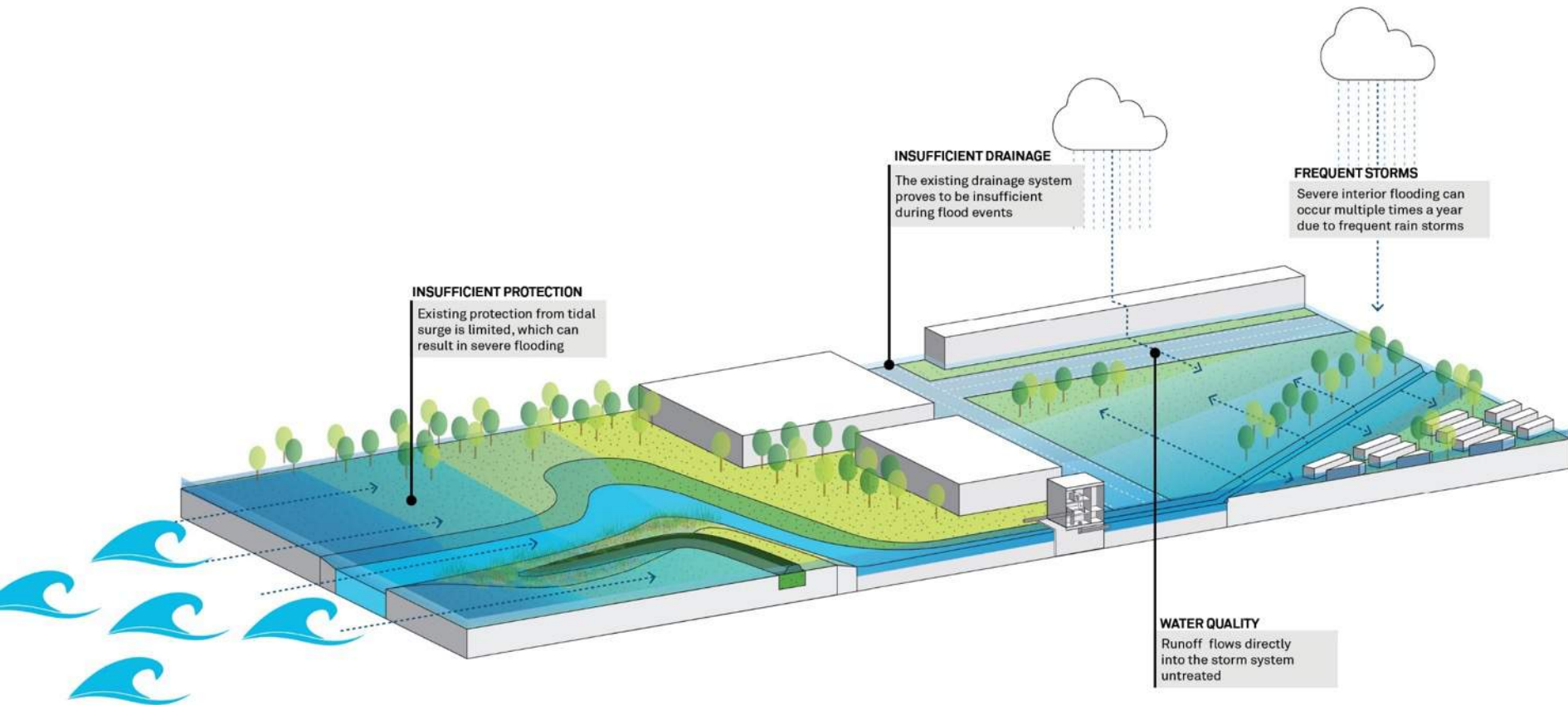
14

The Meadowlands sits at a low elevation relative to sea level. Protection from tidal influence and storm surge is limited. Some existing storm infrastructure is under-performing and needs to be updated, or more frequently maintained



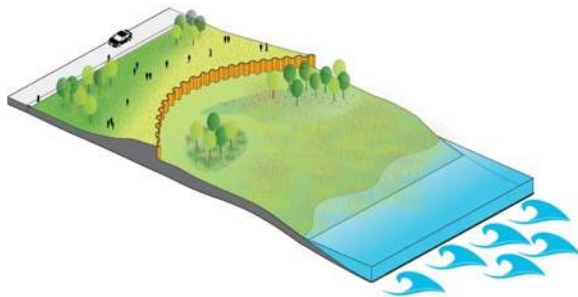
PROJECT AREA NEEDS

15



THE MEADOWLANDS - THREE ALTERNATIVES

16



Alternative 1:
Storm Surge Flooding



Alternative 2:
Frequent Rain Flooding

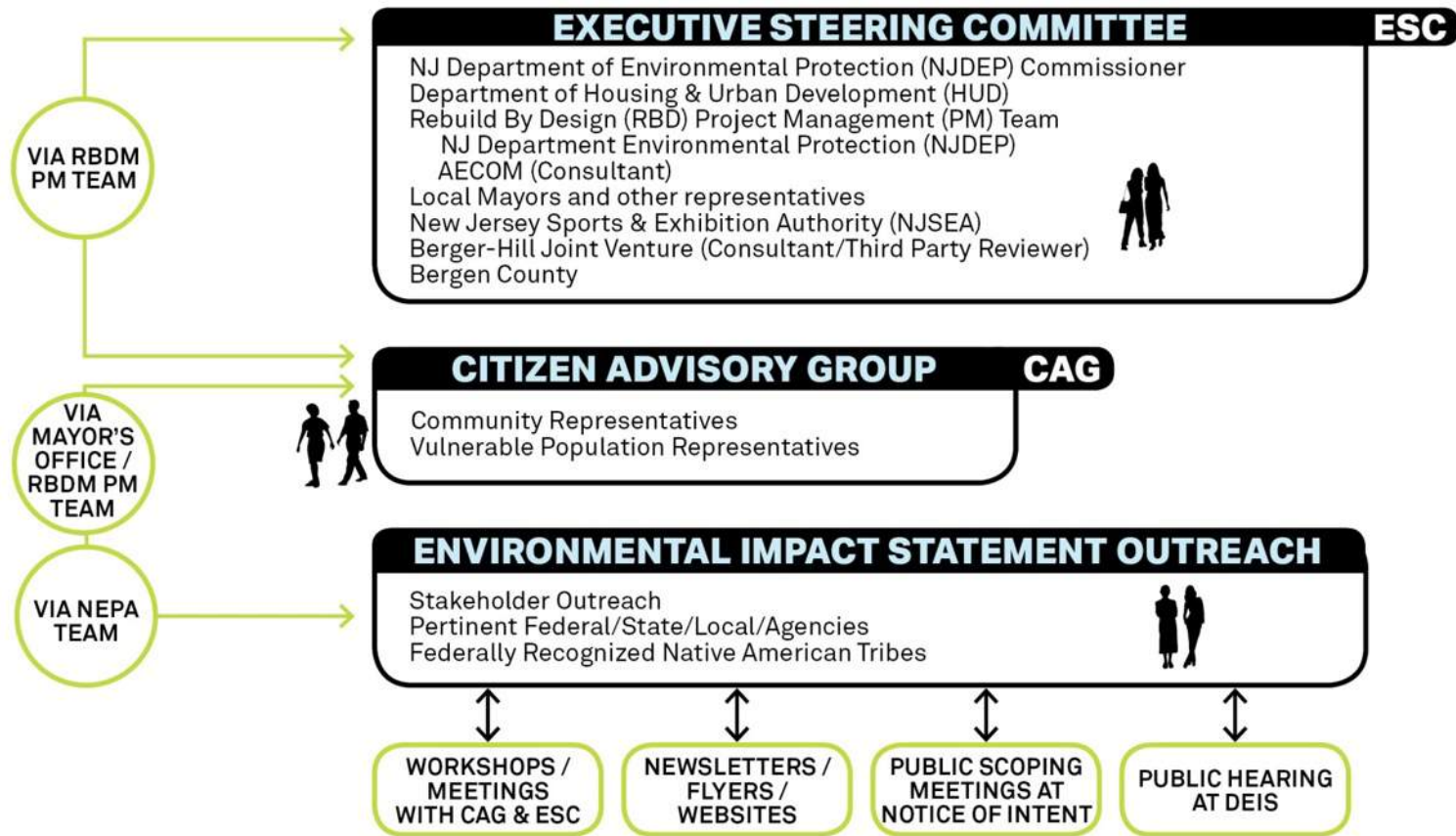


Alternative 3:
Storm Surge & Frequent
Rain Flooding

DEVELOPING A PREFERRED ALTERNATIVE

COMMUNITY ENGAGEMENT

EXECUTIVE STEERING COMMITTEE & CITIZENS ADVISORY GROUP



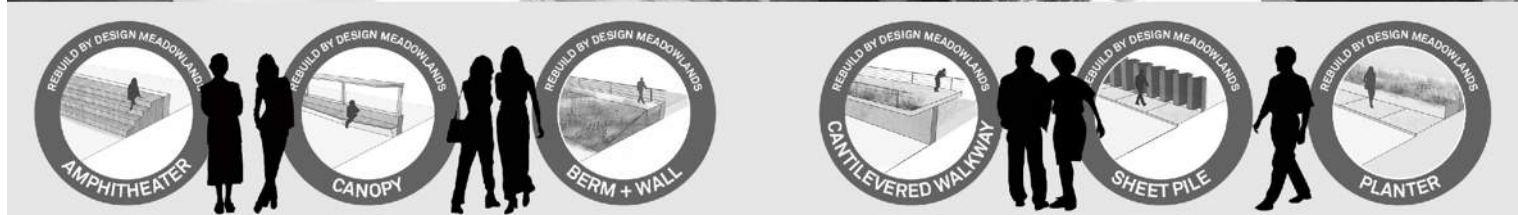
COMMUNITY ENGAGEMENT

EARLY CONSULTATION + CONTINUED INVOLVEMENT

19



- 15 Public Meetings in 20 months
- Real-time Concept Development
- Real-time Environmental Analysis
- Real-time Feasibility / Scenario Testing



REBUILD BY DESIGN MEADOWLANDS

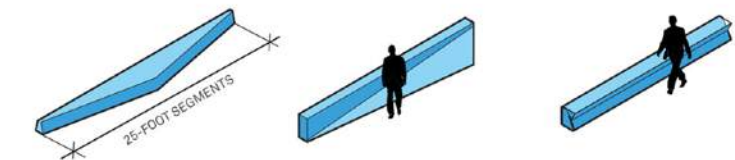
ODU Adaptation Forum // July 20, 2018

AECOM

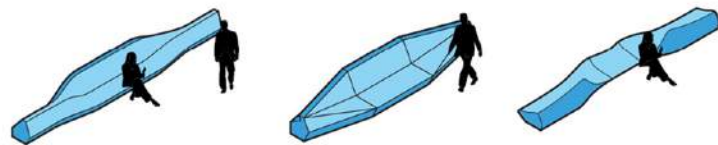
COMMUNITY ENGAGEMENT

GRAPHIC COMMUNICATION TOOLS

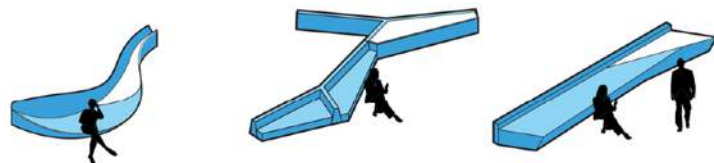
20



BASIC WALL STUDIES



BENCH STUDIES



BENCH + PLANTER STUDIES



STRUCTURAL WALL UNIT



BENCH UNIT



PLANTER UNIT



AMPHITHEATER UNIT



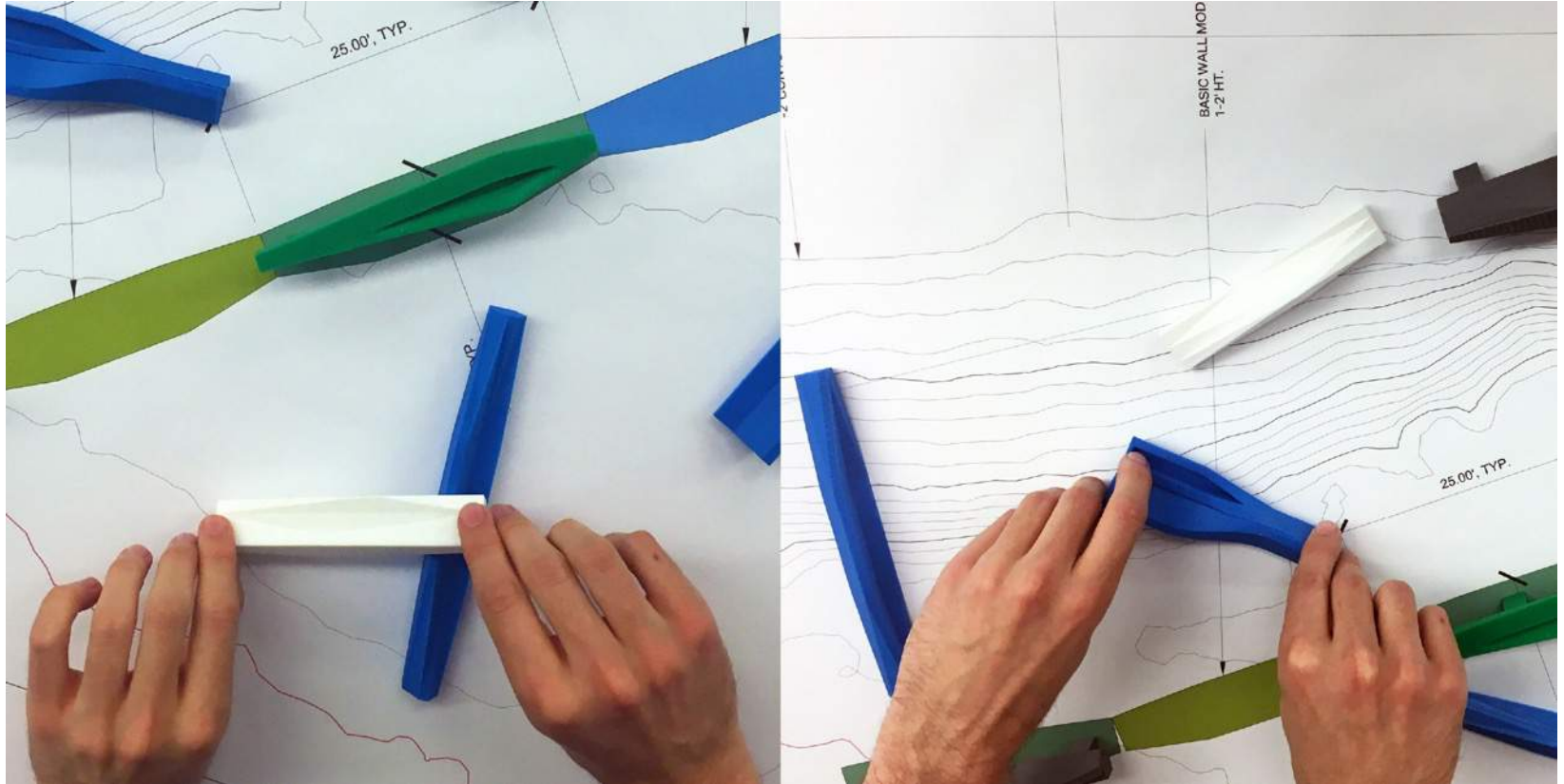
CANOPY UNIT



COMMUNITY ENGAGEMENT

PHYSICAL COMMUNICATION TOOLS

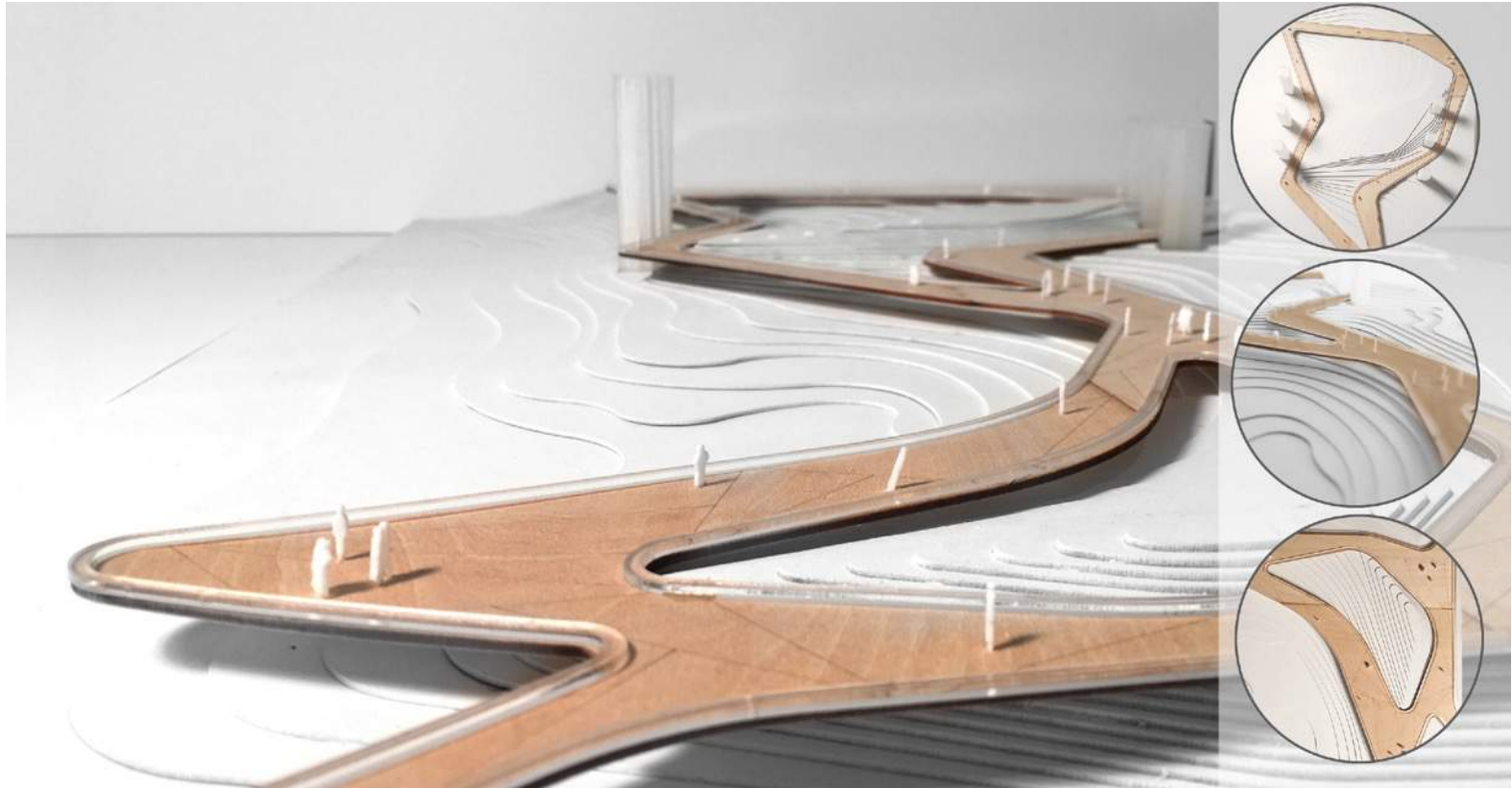
21



COMMUNITY ENGAGEMENT

PHYSICAL COMMUNICATION TOOLS

22



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

STORM SURGE FLOODING

ALTERNATIVE 1

ALTERNATIVE 1 STORM SURGE

APPROACH & GOALS

24

+ INFRASTRUCTURE

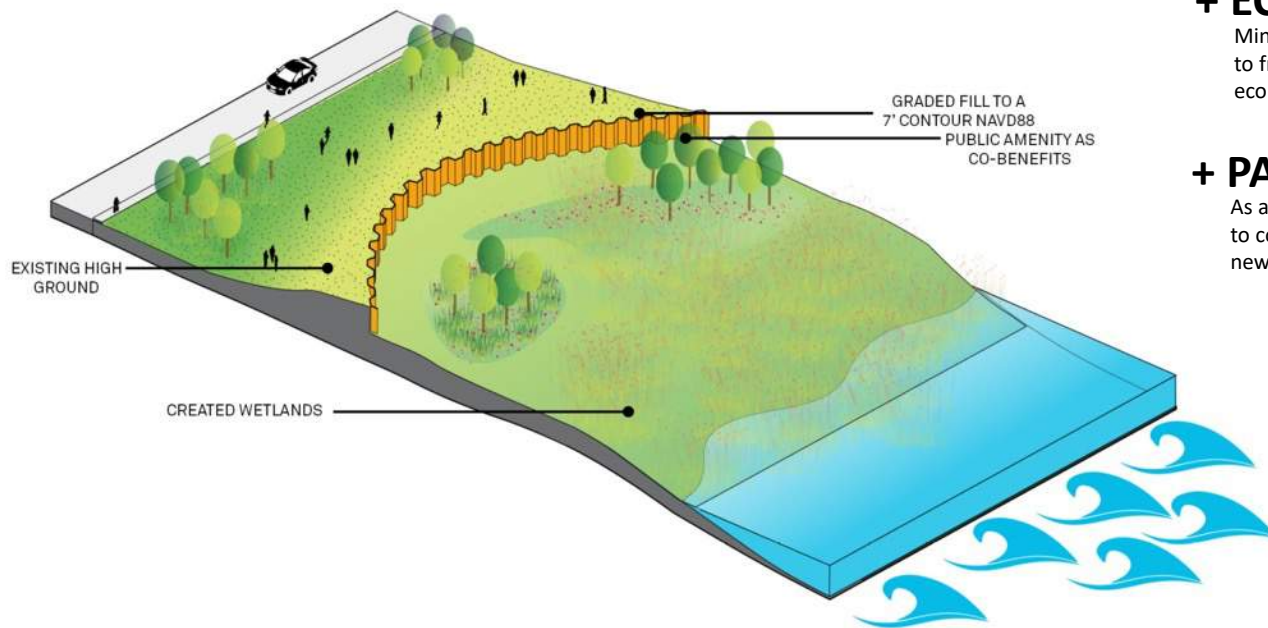
Connecting to high points to reduce construction costs and minimize grading

+ ECOLOGY

Minimize disturbance, consider habitat improvements to fragmented systems, and creation of new ecological zones

+ PARKS

As a co-benefit to flood reduction, the project seeks to connect existing public parks as well as provide new park space

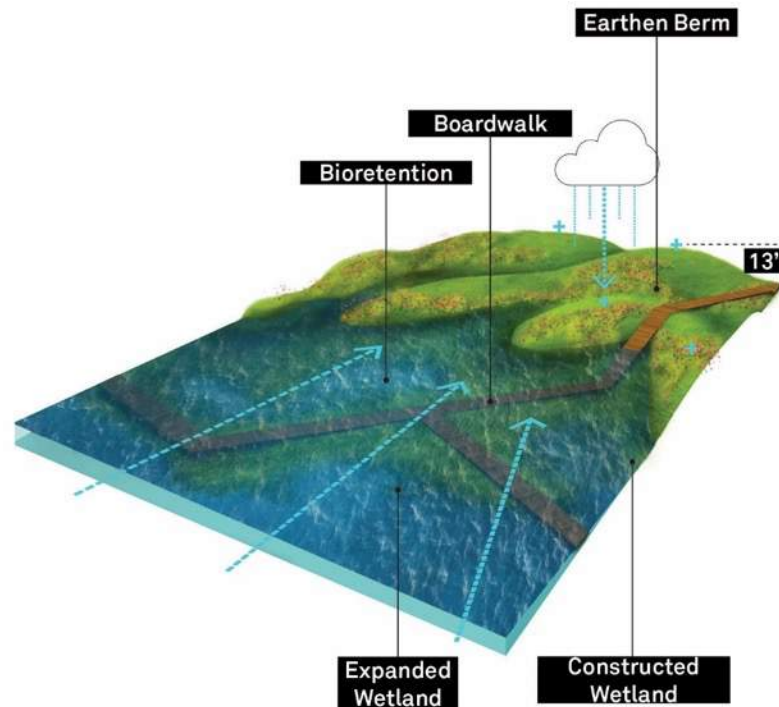


CANTILEVER WALKWAY

CONCEPT DIAGRAMS



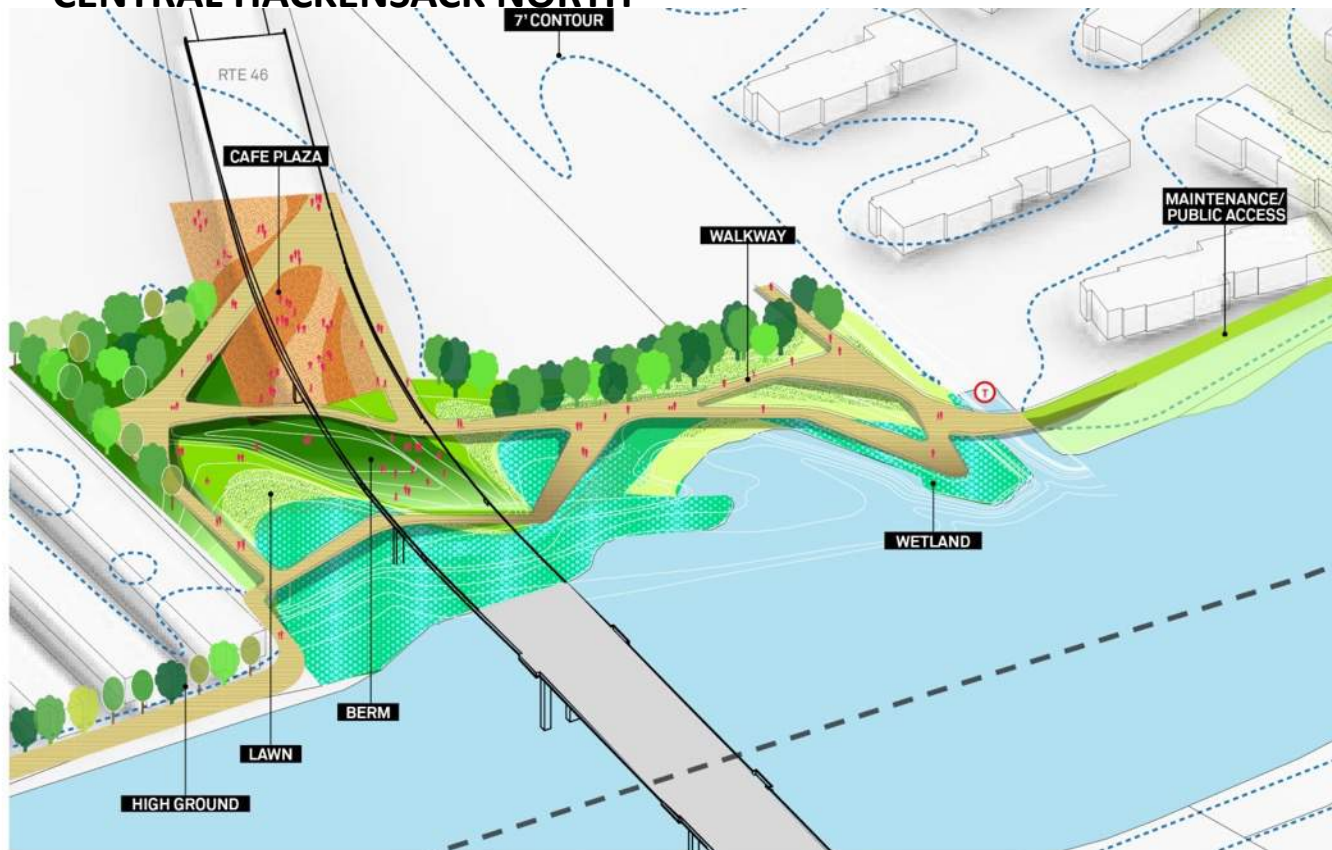
RESIDENTIAL PASSAGE
Cantilevered Walkway



FLUVIAL WETLAND PARK
A Flooded View of the Park

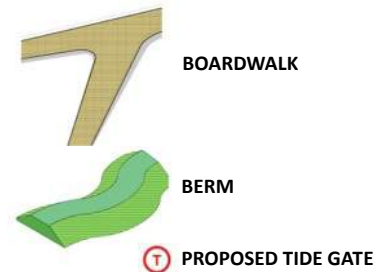
ALIGNMENT DEVELOPMENT – FLUVIAL PARK

CENTRAL HACKENSACK NORTH



APPLYING THE “KIT OF PARTS”

- A berm system turns into a public space under Route 46
- The berm system allows for inundation on the river's side during a flood event



ALIGNMENT DEVELOPMENT – FLUVIAL PARK CONNECTION

CENTRAL HACKENSACK NORTH

27



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

ALIGNMENT DEVELOPMENT – FLUVIAL PARK CONNECTION

CENTRAL HACKENSACK NORTH

28



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

CANTILEVER WALKWAY

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

29



- The Cantilever Walkway combines flood protection and public access



- 1 Public walk
- 2 Modular planter
- 3 Cantilever access
- 4 Recreational space



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

CANTILEVER WALKWAY

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

30



- The Cantilever Walkway combines flood protection and public access



- 1 Public walk
- 2 Modular planter
- 3 Cantilever access
- 4 Recreational space



FLOOD PROTECTION

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

31



- The entire structure is built up to a 7' NAVD88 elevation



- 1 Flood protection system
- 2 Newly-created tidal wetland



VIEWING PLATFORM & SHEET PILE

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

32



- Sheet pile is a cost effective material used in the southeast
- Public viewing platforms were integrated into the system



1 Viewing deck

2 Wetland



FLOOD PROTECTION

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

33



- Sheet pile wraps around viewing platform to form the flood protection system

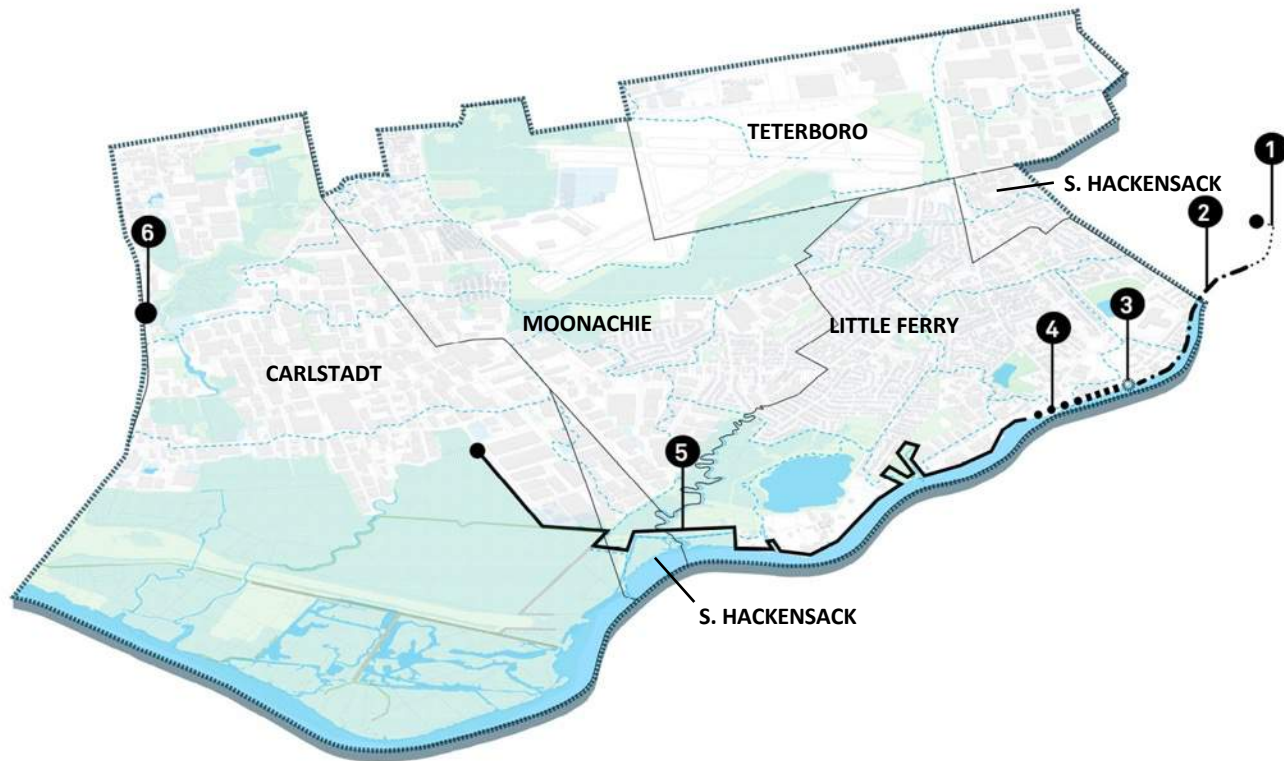


1 Sheet pile



ALTERNATIVE 1 STORM SURGE - PLAN

34



- Provides protection from a storm surge to elevation 7' NAVD88 (approximately a 50-yr storm)
- Provides community co-benefits through water access & multifunctional wall elements
- Positive Benefit Cost Ratio greater >1
- Revised Feasibility-level concept cost exceeds \$150M

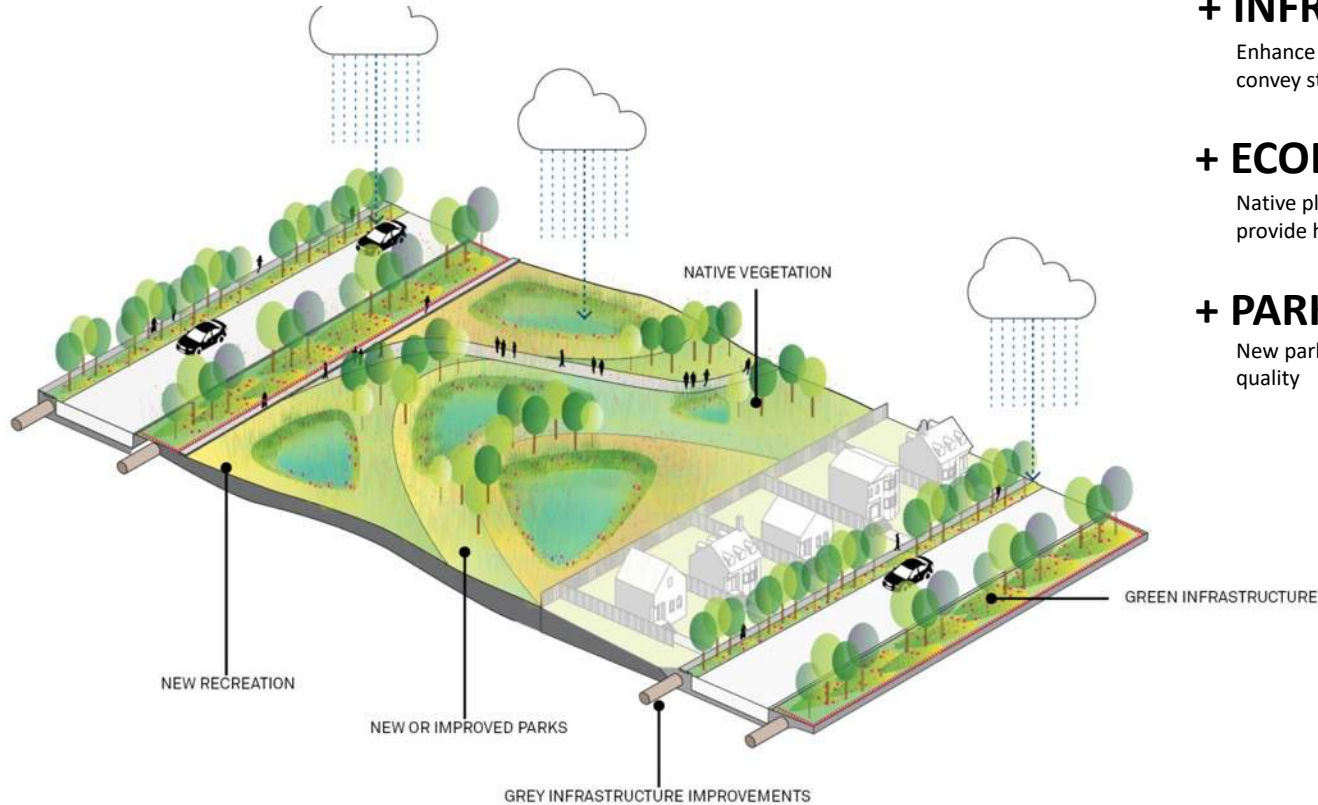
FREQUENT RAIN FLOODING

ALTERNATIVE 2

ALTERNATIVE 2 FREQUENT RAIN FLOODING

APPROACH & GOALS

36



+ INFRASTRUCTURE

Enhance & restore channels to improve capacity to convey stormwater

+ ECOLOGY

Native plantings and naturalized channel edges provide habitat and improve water quality

+ PARKS

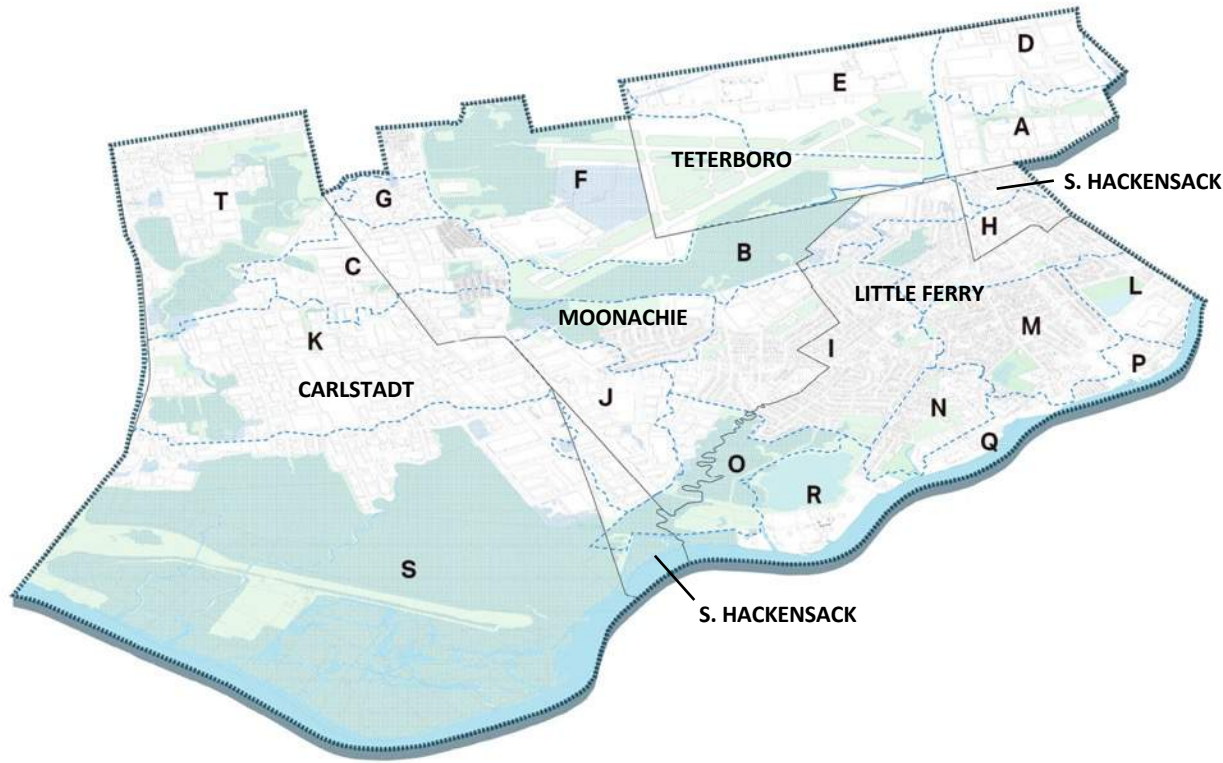
New park spaces slowing runoff & improve water quality

ALTERNATIVE 2 FREQUENT RAIN FLOODING -ANALYSIS

20 SUB-BASINS

37

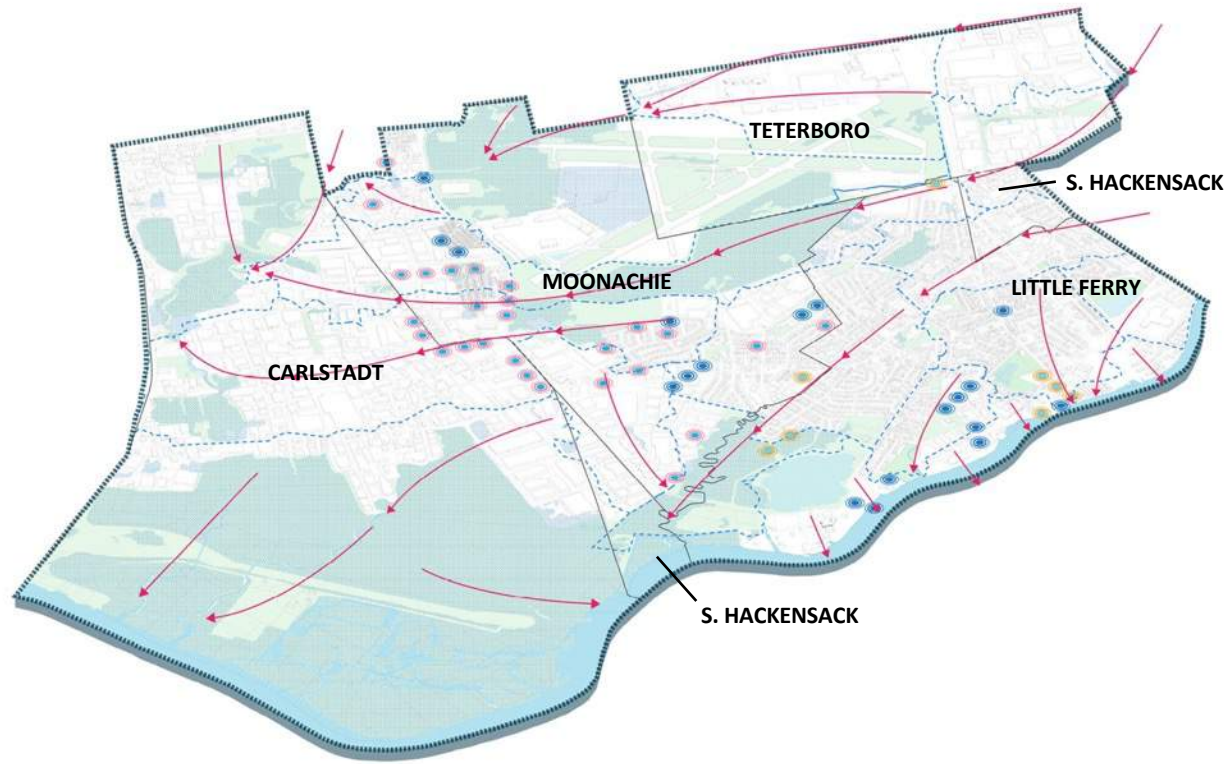
- Analyzed 20 sub-basin areas in the hydrologic model



ALTERNATIVE 2 FREQUENT RAIN FLOODING -ANALYSIS

FREQUENCY & FLOW

38



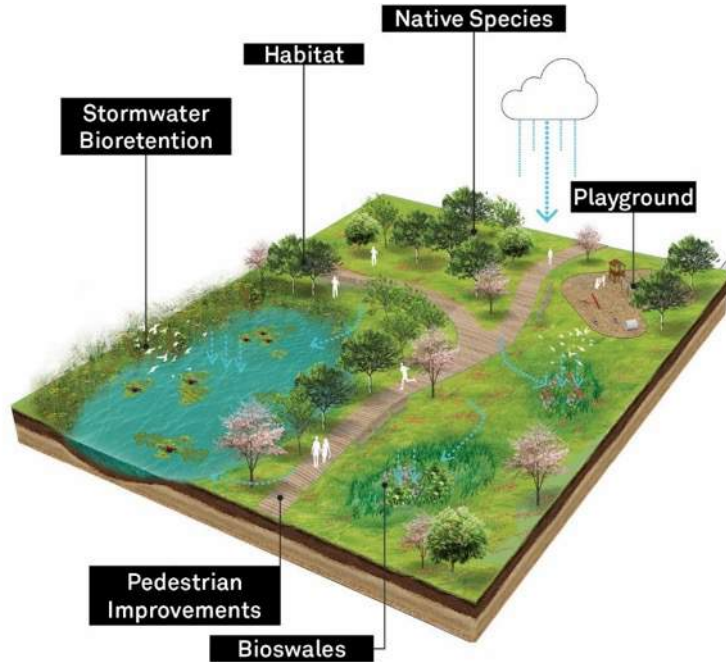
- Runoff flows to lower elevations, into creeks or ditches and is conveyed eventually into the Hackensack River or Berry's Creek
- We listened to the community members and used their input to map areas of frequent flooding

- Floods in regular event
- Floods in heavy event
- Floods in major event
- Primary conveyance direction
- Sub-basin

ALTERNATIVE 2 FREQUENT RAIN FLOODING

CONCEPT DIAGRAMS

39



OPEN SPACE

Managing Water + Providing Open Space



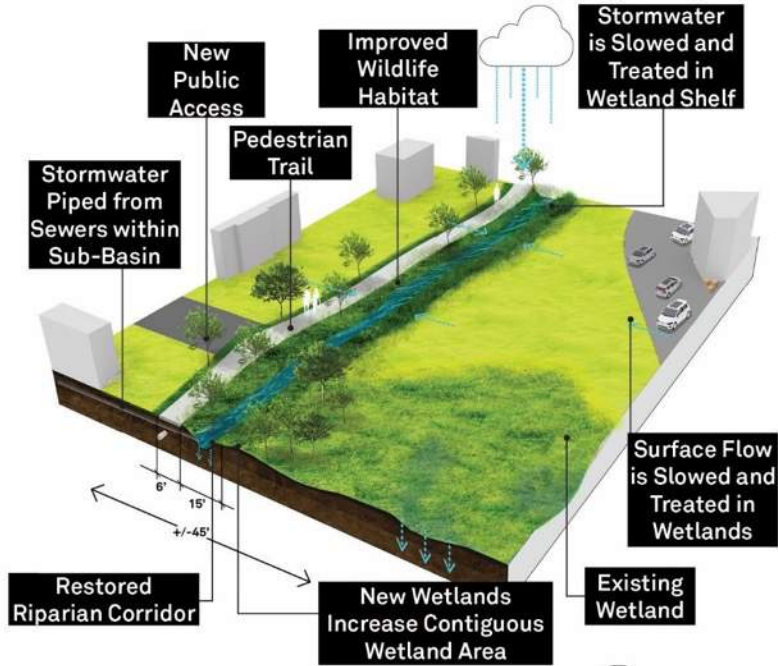
STREET IMPROVEMENTS

Walkable Streets + Bike Lanes

ALTERNATIVE 2 FREQUENT RAIN FLOODING

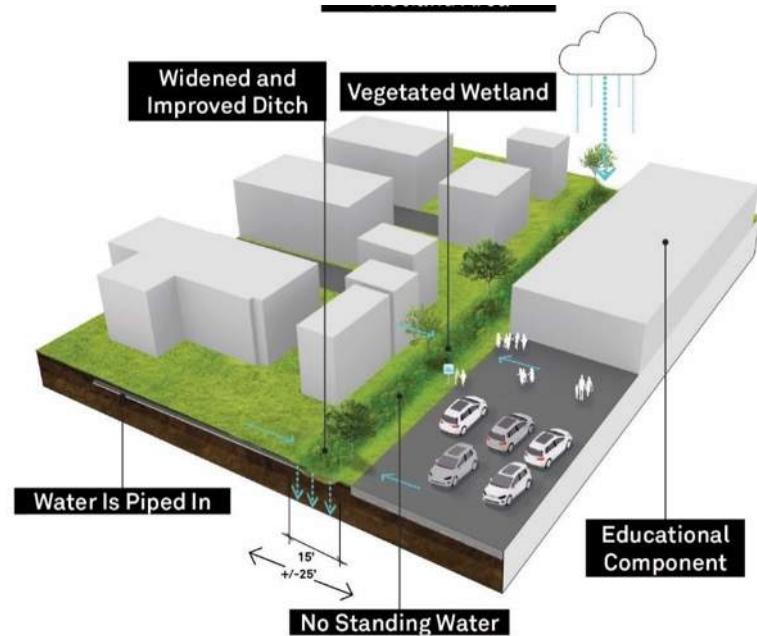
CONCEPT DIAGRAMS

40



REVIVING THE DITCH

Option 1: Extend the Riparian Corridor



REVIVING THE DITCH

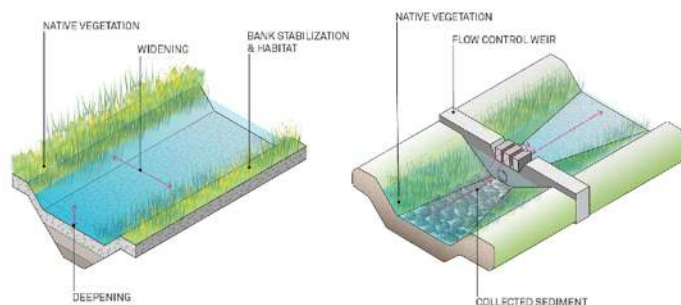
Option 2: Daylight and Enhance the Ditch



ALTERNATIVE 2 FREQUENT RAIN FLOODING

CONCEPTUAL KIT OF PARTS

41

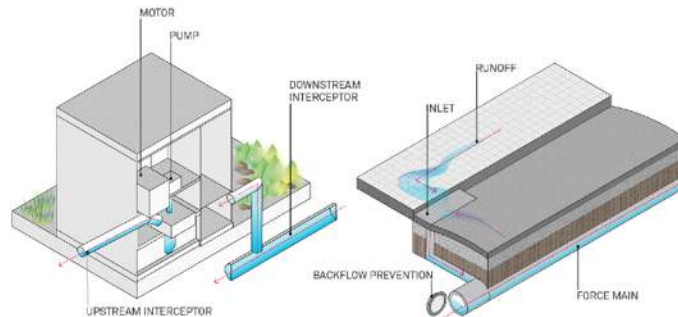


CHANNEL IMPROVEMENTS

Channels can be enhanced and restored to increase stormwater capacity. They can also be relocated or reshaped (e.g., straightened) as necessary to improve conveyance. Improvements can further be made to prevent erosion and/or enhance ecological conditions and values, which benefit both water quality and biological resources.

SETTLING BASIN & FOREBAY

Settling basins are generally earthen depressions that collect and retain stormwater long enough to allow suspended solids (i.e., sediment) to settle out of the water. Forebays serve a similar function, except are located immediately upstream of another water body. By removing pollutants, sediment, and excess nutrients, settling basins and forebays help to prevent water pollution and to improve water quality.

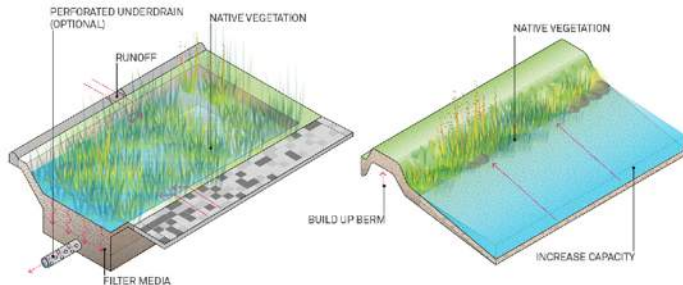


PUMP STATIONS

Pump stations are constructed to move water from one location to another, and vary significantly in terms of the volume of water they can move. Pump stations may be installed either in locations that regularly require water to be pumped, such as flat areas where drainage is naturally difficult, or in locations that accumulate large amounts of water during floods and need to be pumped on occasion.

FORCE MAIN & BACKFLOW PREVENTION

A force main is a pressurized sewer pipe. Sewers most often operate using the force of gravity to keep the stormwater flowing. However, in some cases, sewers must be installed at a nearly flat angle or go uphill. In these situations, pumps or compressors can be used to pressurize the sewers to keep the stormwater flowing. Backflow preventers are flap gates, valves, or other devices used to prevent water from flowing backwards through the stormwater drainage infrastructure, such as when stormwater outfalls are submerged during floods.

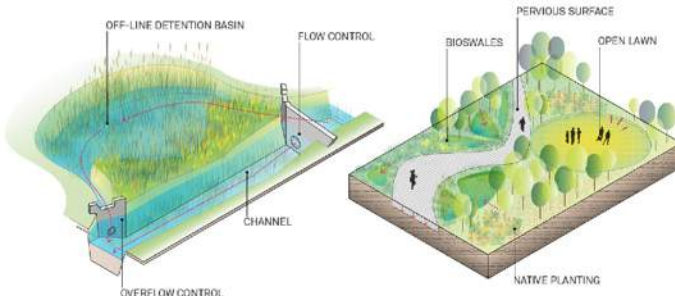


STREET BIOSWALE

A series of bioswales may be placed along a street with breaks between them to allow for pedestrian access to the street. Where sidewalks are narrow or no sidewalk exists, bioswales can be placed within existing grass areas adjacent to the street and are functionally permeated sections between A and B feet wide that meet

POND BERMING

Berms may be installed along ditches or ponds in order to improve their stormwater storage capacities.



OFF-CHANNEL STORAGE

Off-channel storage refers to areas to which stormwater can be diverted when the capacity of the drainage infrastructure is exceeded. This type of storage can take various forms, including retention/detention basins, underground vaults, parks, and meadows (Ohio DNR 2011).

NEW & IMPROVED OPEN SPACE

New or improved open spaces provide additional area for stormwater to be collected and absorbed by the land, such as by reducing impervious surfaces and incorporating native plantings. These areas could further provide additional recreational opportunities, such as playing fields, and could incorporate



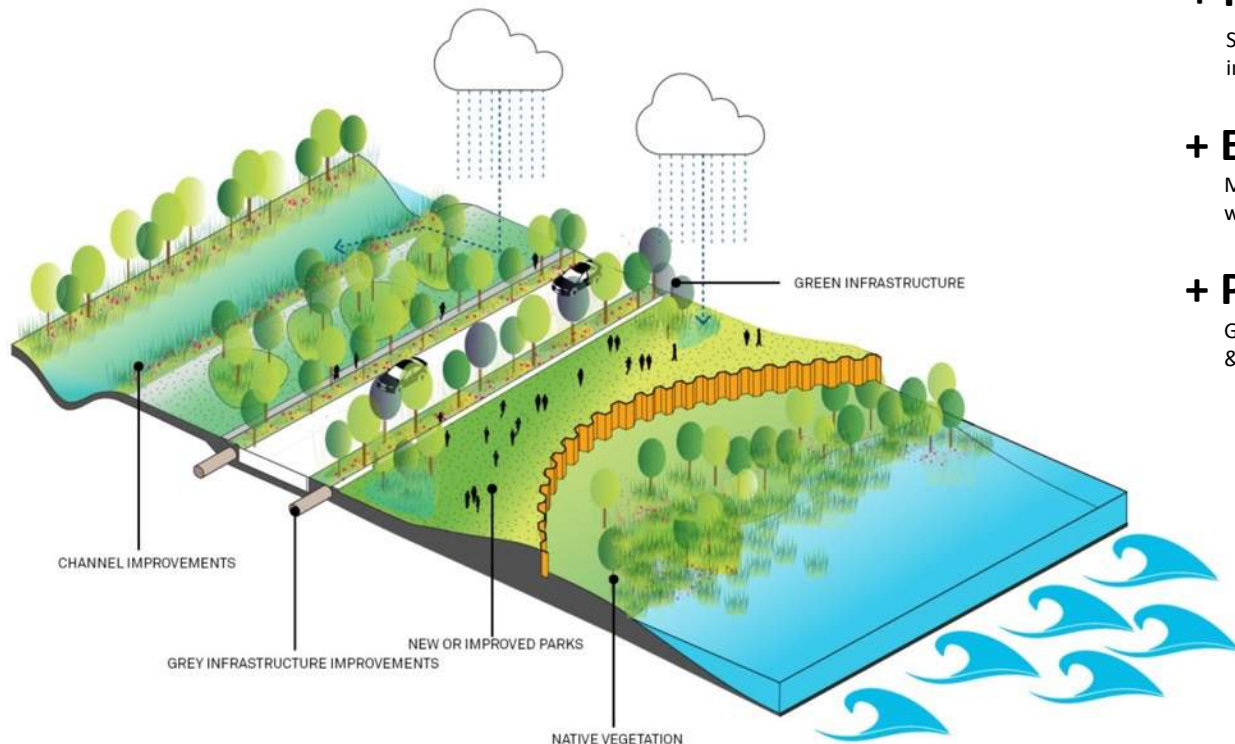
THE PREFERRED ALTERNATIVE

ALTERNATIVE 3 – STORM SURGE & FREQUENT RAIN FLOODING

ALTERNATIVE 3 – HYBRID

APPROACH & GOALS

43



+ INFRASTRUCTURE

Structural Flood Reduction and local drainage infrastructure improvements

+ ECOLOGY

Minimize ecological disturbance and improve habitat within channels, streets, and parks

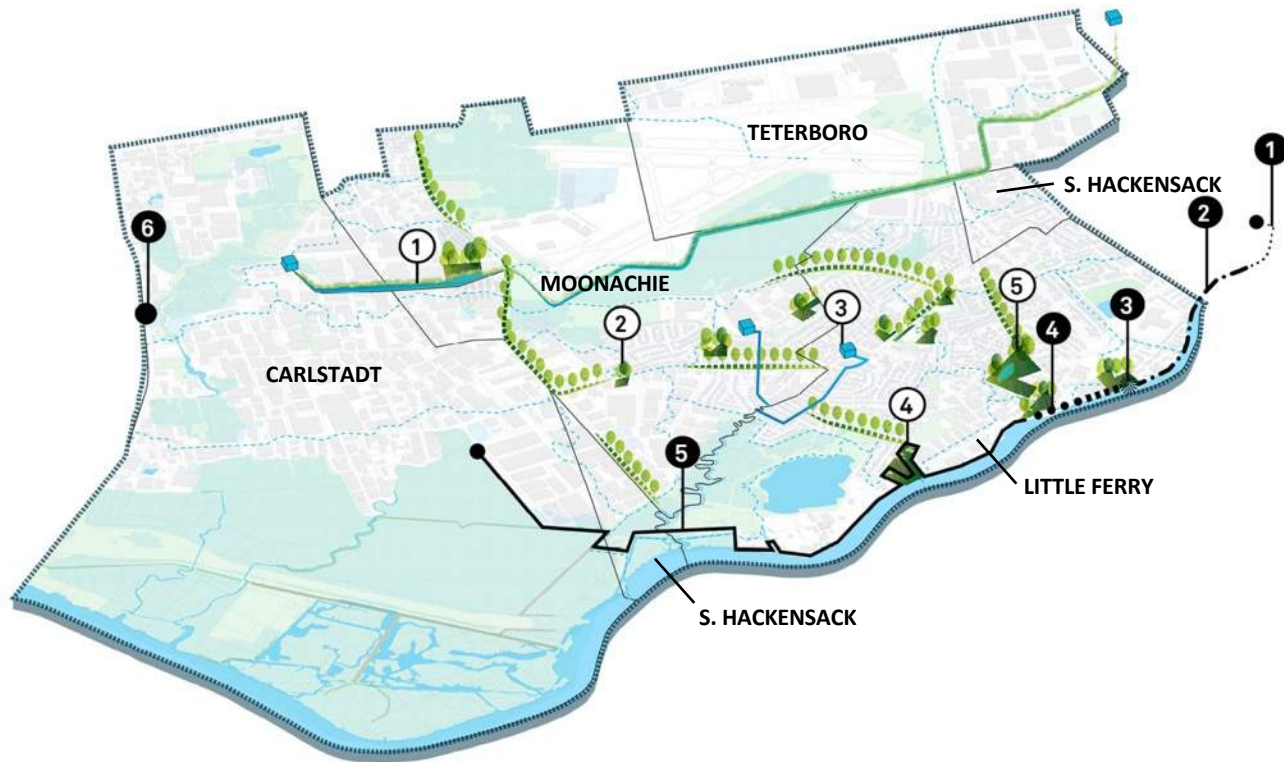
+ PARKS

Green infrastructure provides additional flood reduction & improves existing public parks

ALTERNATIVE 3 – THE PREFERRED

A PLAN FOR BOTH CHALLENGES

44



Stormwater Management

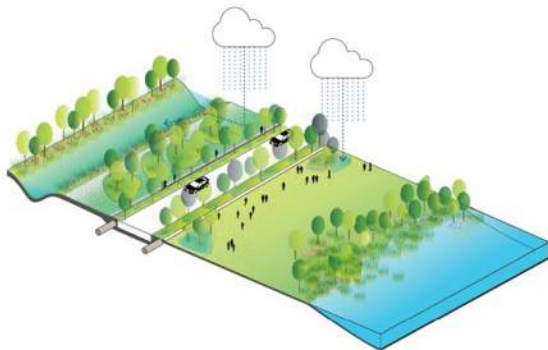
- ① East Riser Channel Improvements + Enhanced Wetland Open Space
- ② Green Infrastructure + Enhanced Existing Open Space
- ③ Force Main + Public Facility Improvements
- ④ Green Infrastructure + Enhanced Open Space
- ⑤ GI Improvements to Existing Park + 3 New Wetland / Open Spaces

Storm Surge Protection

- ① Existing Riverwalk
- ② Sheet Pile Cantilever
- ③ Berms at Fluvial Park
- ④ Cantilever Walkway
- ⑤ Sheet pile or Floodwall
- ⑥ Surge Barrier

ALTERNATIVE 3 HYBRID - THE BUILD & FUTURE PLAN

45



Build Plan

The *Build Plan* represents a feasible project that can be **constructed by 2022**. Components include flood reduction strategies to address frequent rain flooding



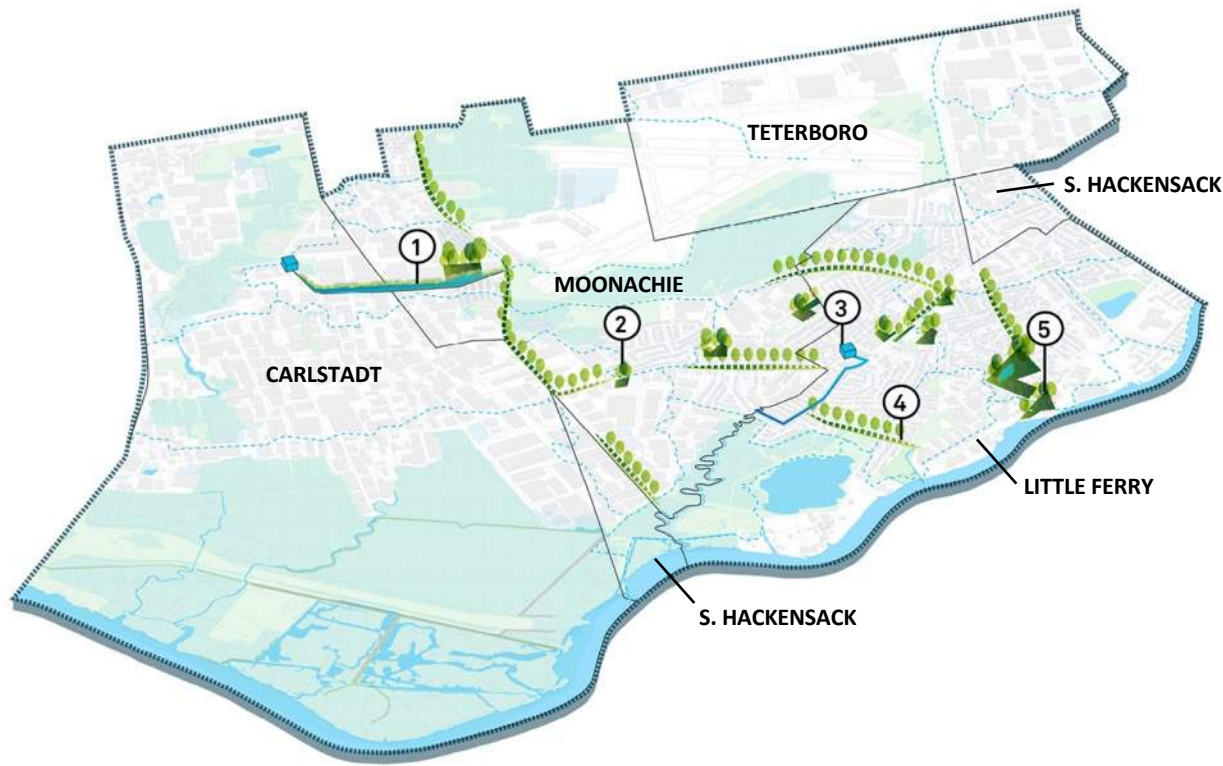
Future Plan

Components that were not selected for the *Build Plan* became elements of a *Future Plan*. These elements could **be implemented** by others **over time** as new funding sources become available

ALTERNATIVE 3 - BUILD PLAN

FREQUENT FLOOD REDUCTION

46



- ① Pump station + Channel Improvements + New Park
- ② Green Infrastructure + New Park
- ③ Pump Station + Force Main + Public Facility Improvements
- ④ Green Infrastructure
- ⑤ Park Improvements + 1 New Park + Green Infrastructure

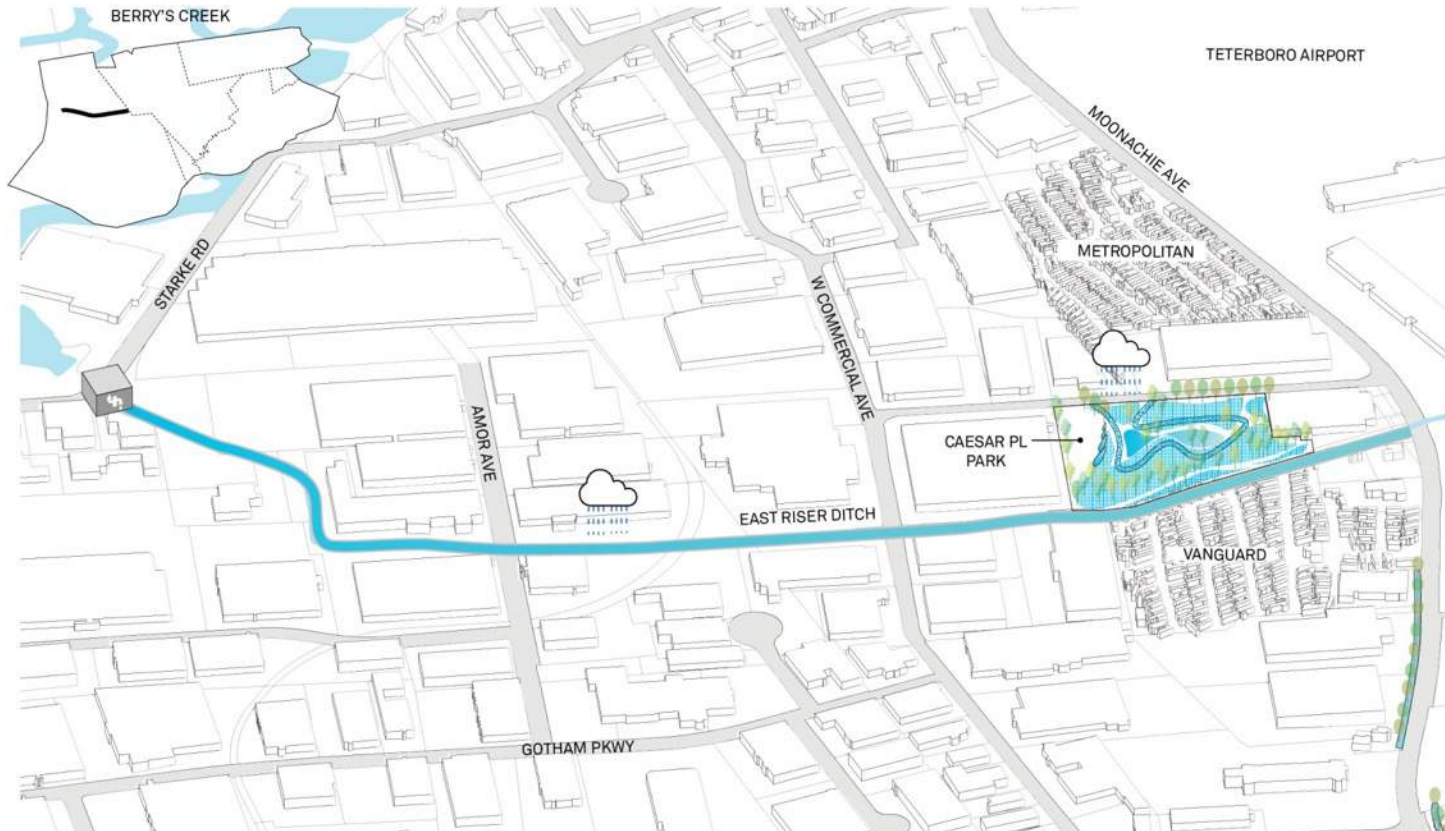
Stormwater Management Features

- ① East Riser: Channel Improvements + Enhanced Wetland Open Space
- ② Avanti Park: Street Green Infrastructure + Enhanced Open Space
- ③ Losen Slote: Force Main + Public Facility Improvements
- ④ Green Infrastructure + Enhanced Wetland Open Space
- ⑤ GI Improvements to Willow Lake Park + 1 New Wetland / Open Space along Hackensack River

EAST RISER CHANNEL IMPROVEMENTS

FLOOD REDUCTION BENEFITS

47



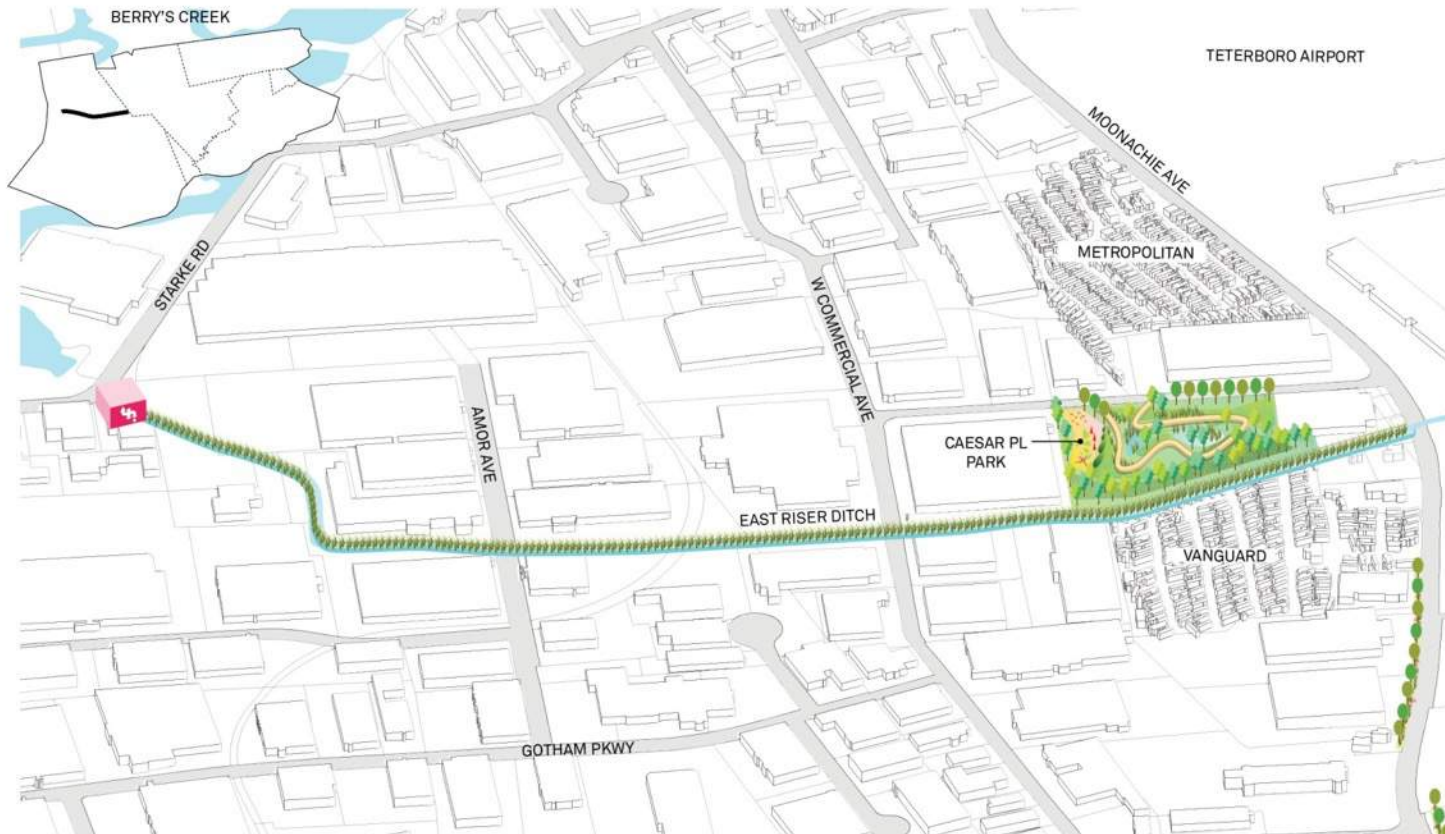
- **Channel conveyance improvements** below Moonachie Ave with a **new pump station**
- New wetland eco-park with ~12,000 SF of **integrated green infrastructure** and ~129,000 SF of wooded and emergent wetland to **improve storage and water quality**



EAST RISER CHANNEL IMPROVEMENTS

FLOOD REDUCTION CO-BENEFITS

48



- Channel conveyance improvements include **habitat restoration with native vegetation**
- New wetland eco-park is part of the flood reduction system, but also offers benefits in the form of **habitat, environmental education, and recreation space**



GREEN INFRASTRUCTURE & PARK IMPROVEMENTS

CONCEPTUAL RENDERING

49

- Wetland enhancement, improves storage and treatment capacities, and improves public recreation opportunity



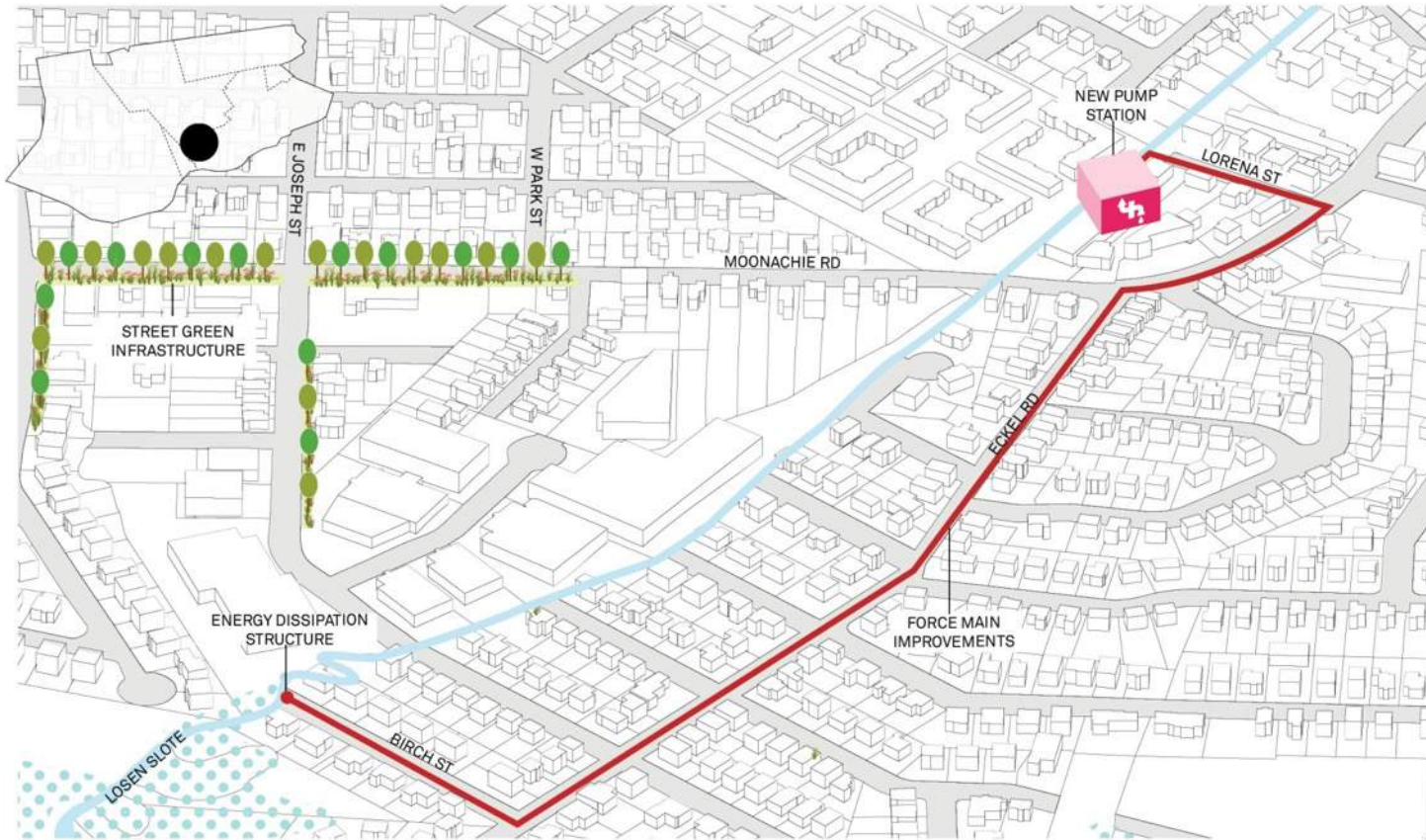
- 1 Elevated boardwalk
- 2 Channel improvements
- 3 Shallow emergent marsh
- 4 Native vegetation



LOSEN SLOTE DRAINAGE IMPROVEMENTS

FLOOD REDUCTION & CO-BENEFITS

50



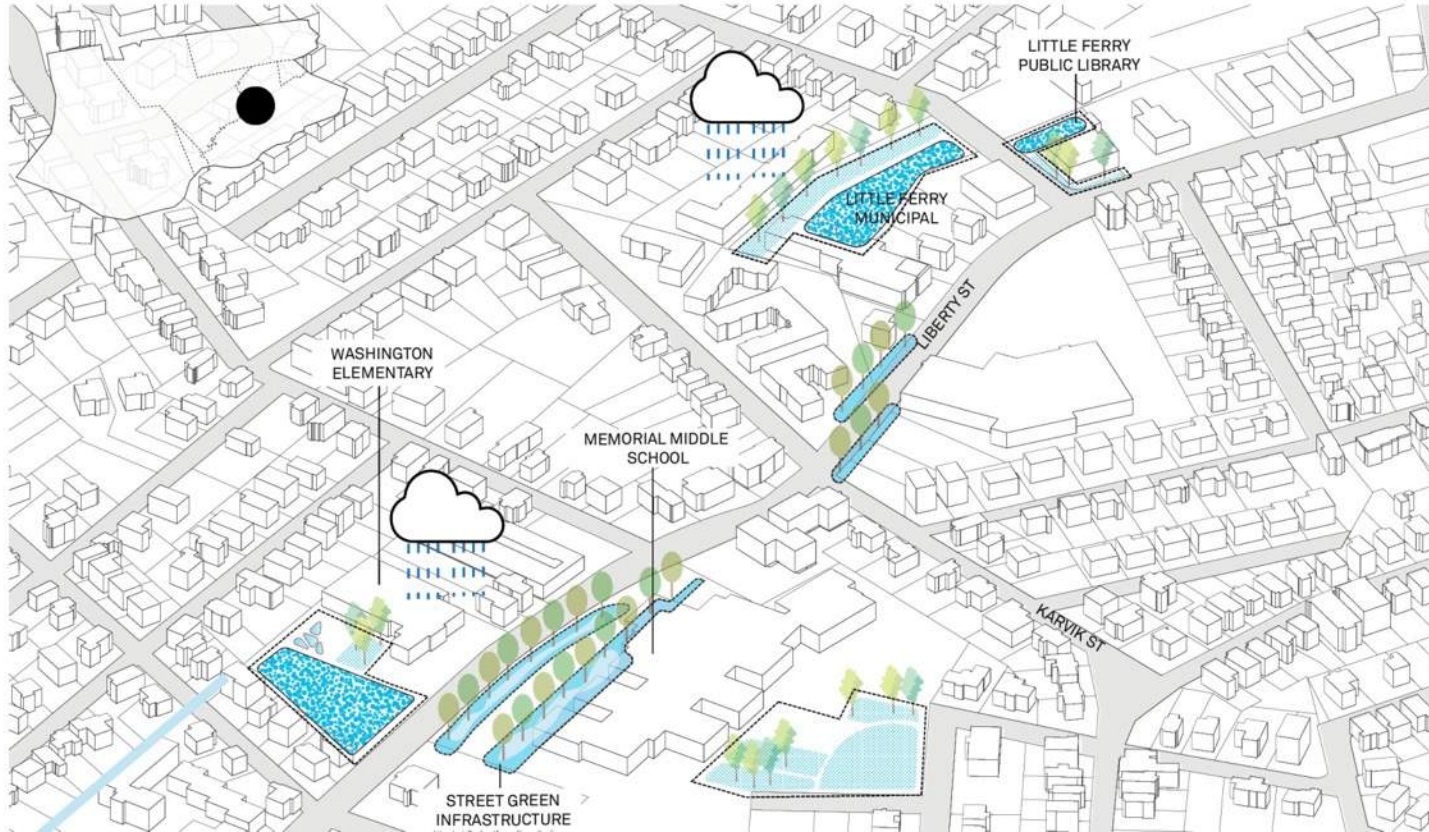
- **New pump station** within the residential area of the stream
- Stormwater discharges via a **36" force main** to the downstream Losen Sote marsh
- **Energy dissipation structure** limits erosion at discharge points
- Street green infrastructure **collects water** and **filters** total suspended solids



CIVIC LOCATIONS

FLOOD REDUCTION BENEFITS

51



- Multiple improvements are proposed at public facilities in Little Ferry such as bioswales and underground storage trenches
- Improvements are planned for the following facilities: Little Ferry Library, Little Ferry Municipal Building, Memorial Middle School, Washington Elementary, and Robert Craig Elementary



AVANTI PARK

CONCEPTUAL RENDERING

52



- Bioretention systems capture and filters 1.25 inches of rainfall in two hours through planting media
- New retention areas create room for additional water storage
- Undeveloped land becomes public park and productive ecosystem

- 1 Boardwalk foundation
- 2 Headwall & inlet pipe
- 3 Energy dissipator
- 4 Native planting
- 5 Integrated seating



REBUILD BY DESIGN MEADOWLANDS

ODU Adaptation Forum // July 20, 2018

AECOM

CIVIC LOCATIONS

FLOOD REDUCTION CO-BENEFITS

53



- Co-benefits to the municipal buildings include improvements near community buildings, such as opportunities for education, community outreach and involvement, and new habitat



MUNICIPAL BUILDINGS & SCHOOLS

CONCEPTUAL RENDERING

54



- Permeable paving and rain gardens collect and filters 1.25 inches of rainfall in two hours through planting media
- Green infrastructure can be an educational opportunity for schools and public buildings
- Greener streets improve habitat, create safer streets, and improve visual quality of the street

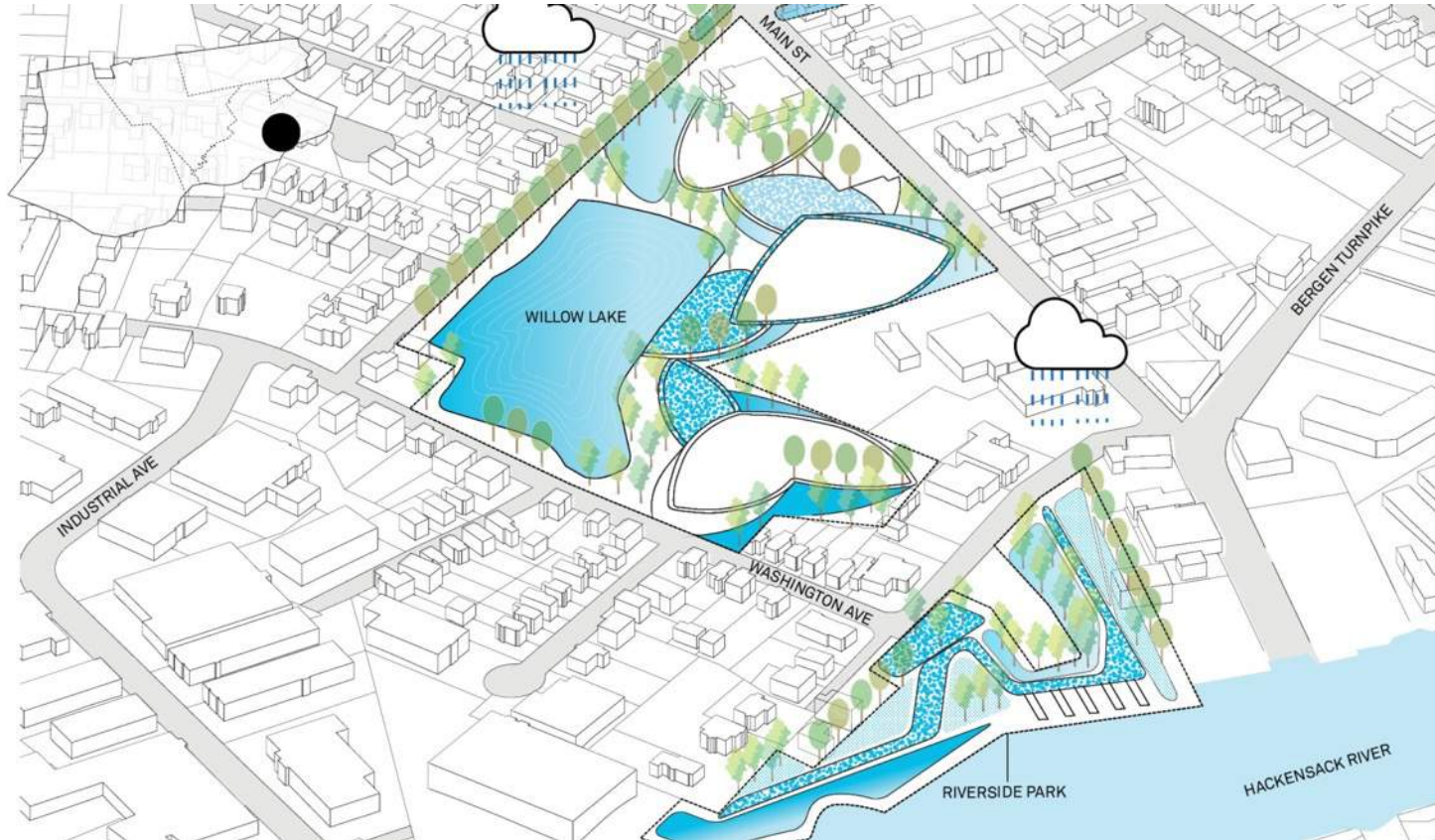
- 1 Permeable paver
- 2 Bioretention
- 3 Grass and concrete permeable paver



WILLOW LAKE & RIVERSIDE PARKS

FLOOD REDUCTION BENEFITS

55



- Reduce sedimentation into the drainage system & slows water movement
- Improvements to Willow Lake include approximately 65,000 SF of new native planting and low meadow and approximately 1,200 SF of rain gardens
- A new public open space on the Hackensack River includes approximately 5,700 SF of restored riparian wetland and approximately 30,000 SF of native planting and bioswales



WILLOW LAKE & RIVERSIDE PARKS

FLOOD REDUCTION CO-BENEFITS

56



- Co-benefits to the new and improved Little Ferry open spaces include new walking trails, space for recreation, water access, new habitat, and visual improvements



WILLOW LAKE PARK IMPROVEMENTS

CONCEPTUAL RENDERING

57



- Green infrastructure system would be sized to capture and treat 1.25 inches of rainfall in two hours
- Stone chimneys provided outlet for ponding water to reach stone storage
- Improvements to Willow Lake Park enhance water quality and user experience

- 1 Permeable paving
- 2 Stone chimney
- 3 Native planting
- 4 Recreation space
- 5 Existing playground



BUILD PLAN CONSTRUCTION COST

FEASIBILITY-LEVEL COST BREAKDOWN

58

100%

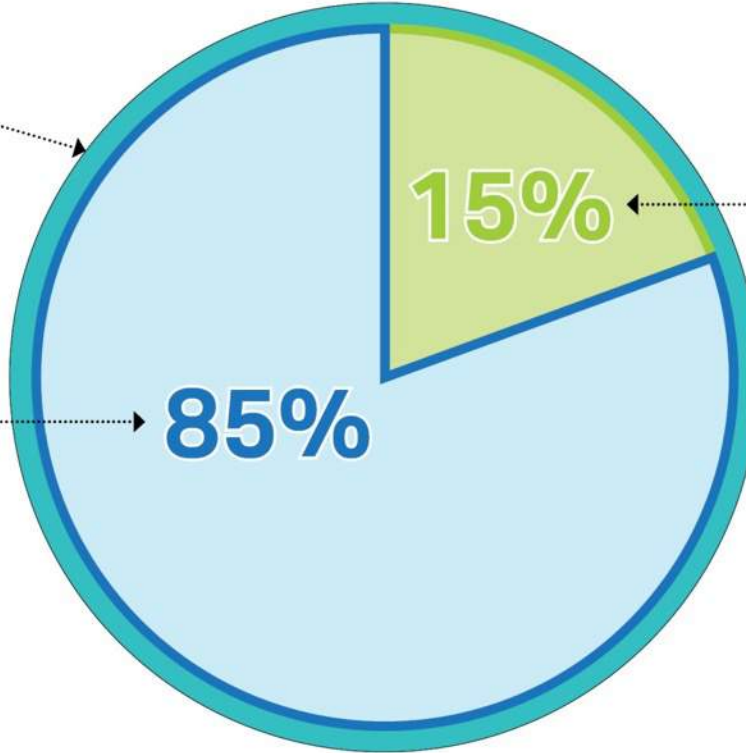
MEETS PROJECT PURPOSE & NEED

GREY INFRASTRUCTURE AND
CHANNEL IMPROVEMENTS

85%

15%

GREEN INFRASTRUCTURE AND
PARK IMPROVEMENTS



QUESTIONS?



THANK YOU