REBUILDBYDESIGN

MEADOWLANDS

CITIZENS ADVISORY GROUP MEETING

ALTERNATIVES 1, 2, & 3

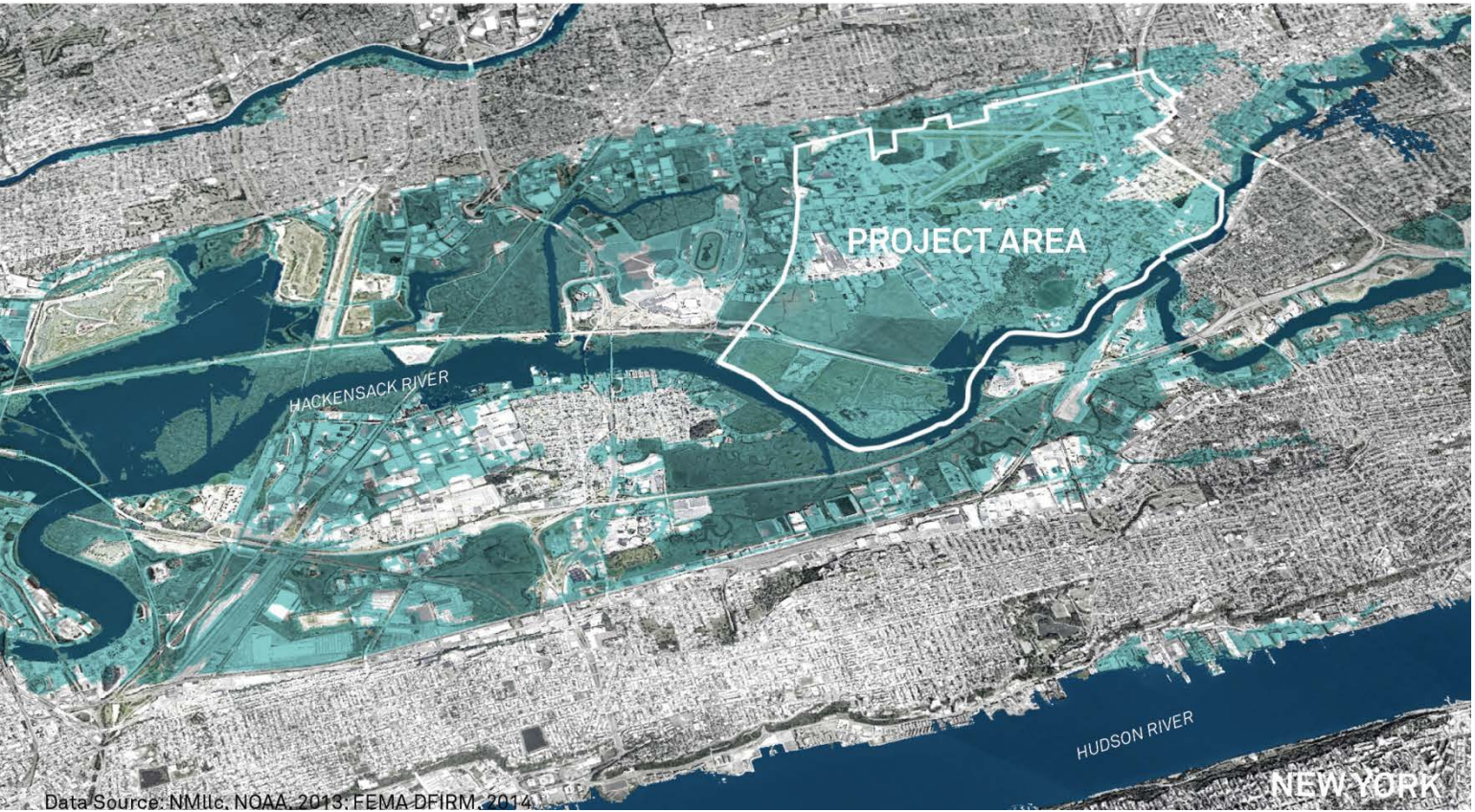
OCTOBER 17, 2017

AGENDA

Christopher Benosky, AECOM

- Welcome
- The Meadowlands Challenge
- Alternative 1
- Alternative 2
- Alternative 3
    - Build Plan
    - Future Plan
- Next Steps
- Question & Answer

THE MEADOWLANDS - A COMMUNITY AT RISK



- Nearly all the project area is within the 100-year floodplain

100-Year Floodplain

TWO MAIN CHALLENGES

1 Challenges from **MAJOR STORM SURGE** flooding

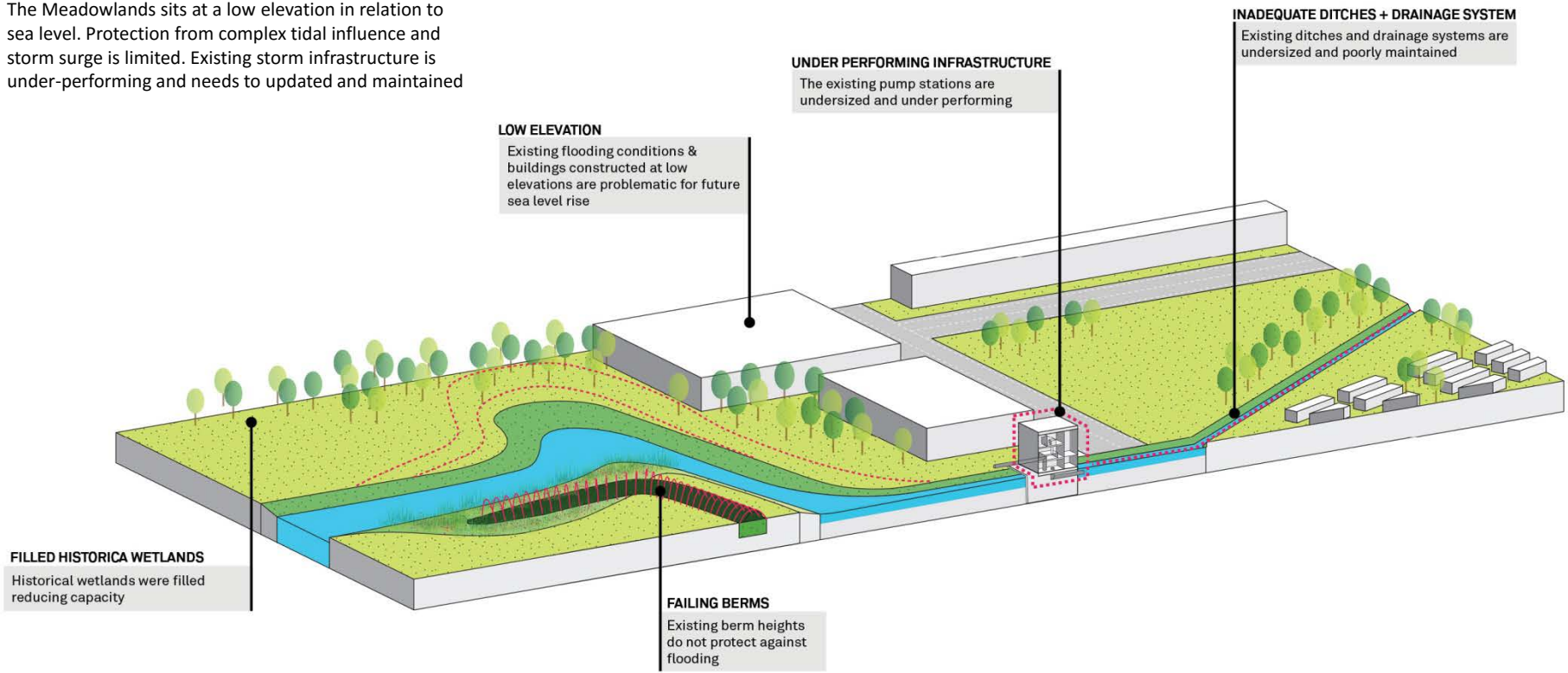
2 Challenges from **FREQUENT RAIN** flooding

CHALLENGE 1: STORM SURGE FLOODING

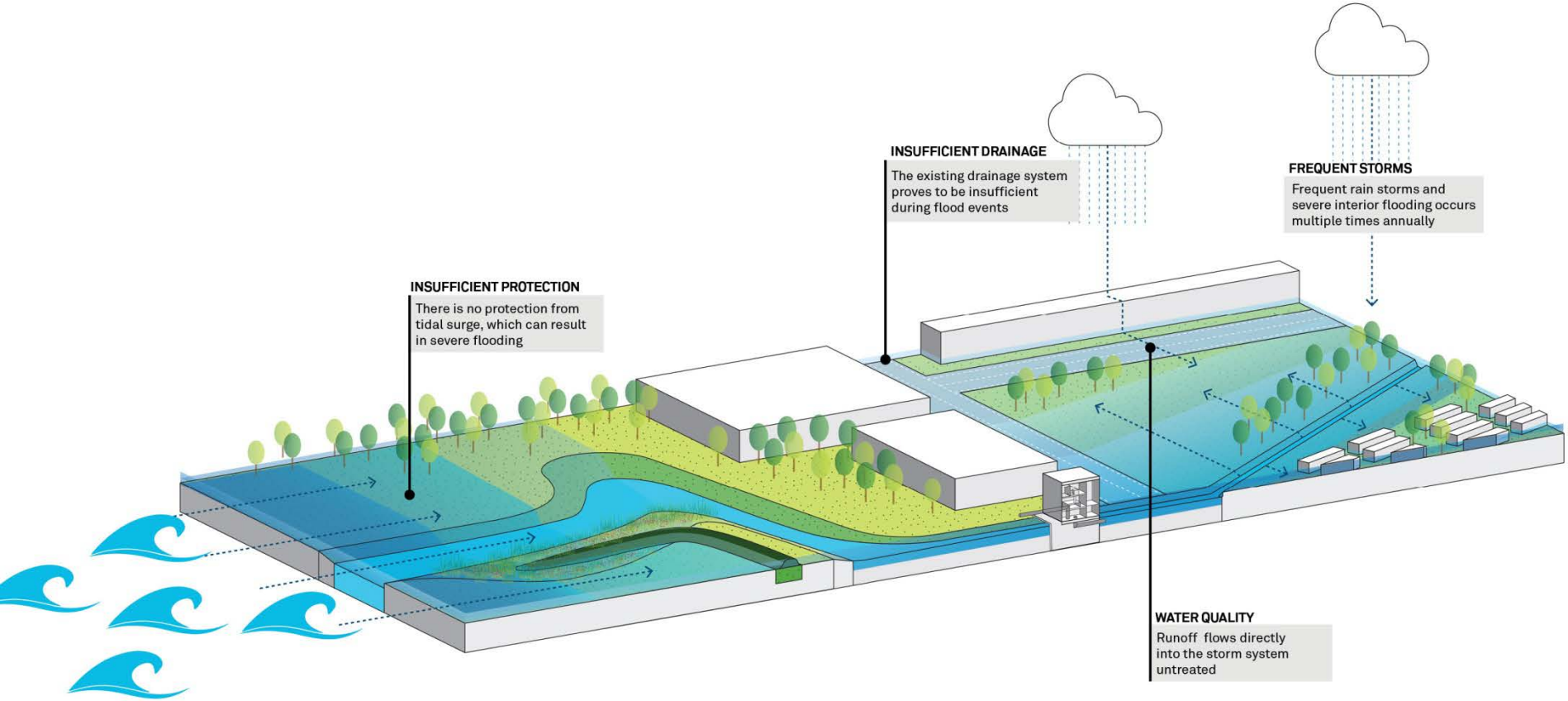
CHALLENGE 2: FREQUENT RAIN FLOODING

THE MEADOWLANDS CHALLENGE

The Meadowlands sits at a low elevation in relation to sea level. Protection from complex tidal influence and storm surge is limited. Existing storm infrastructure is under-performing and needs to updated and maintained



EXISTING CHALLENGES INCREASE FLOODING RISK



RESILIENT SOLUTIONS TO RECOVER MORE QUICKLY

- Provides protection against frequent storm events and improved infrastructure for quicker recovery
- Photo: existing condition of existing tide gate at East Riser Ditch

TWO MAIN CHALLENGES

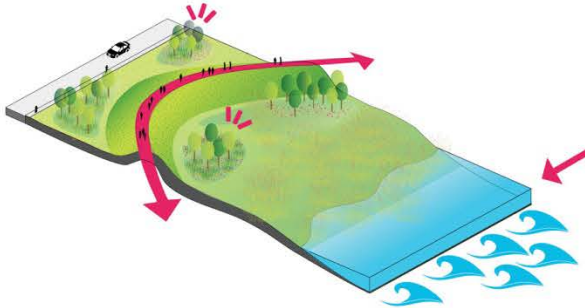
1

Challenges from **MAJOR STORM SURGE** flooding

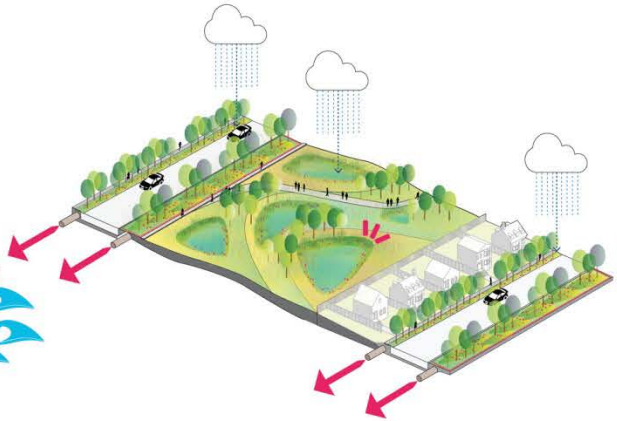
2

Challenges from **FREQUENT RAIN** flooding

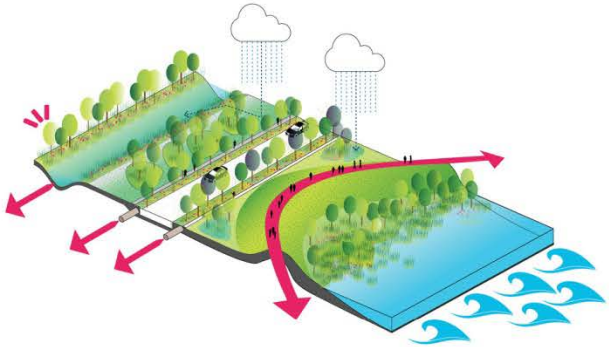
THE MEADOWLANDS - THREE ALTERNATIVES



Alternative 1:
Storm Surge Flooding



Alternative 2:
Frequent Rain Flooding



Alternative 3:
Storm Surge & Frequent Rain Flooding

THE PURPOSE

ADDRESS FLOOD RISK

INCREASE RESILIENCY of the communities and ecosystems

REDUCE IMPACTS to critical infrastructure, residences, businesses, and ecological resources

*Purpose & Need from NOI and Public Scoping Document

THE NEED

ADDRESS systemic **INLAND FLOODING AND COASTAL FLOODING** from storm surges

INCREASE COMMUNITY RESILIENCY

REDUCE FLOOD insurance **RATES** and claims from future event

ENHANCE WATER QUALITY and protect ecological resources

PROTECT life, public health, and property

Incorporate flood hazard risk reduction strategy with **CIVIC, CULTURAL, AND RECREATIONAL VALUES**

*Purpose & Need from NOI and Public Scoping Document

PROJECT GOALS

1. Create the **BEST POSSIBLE PROJECT** with the available funding

2. Meets the Project Mandate by providing **FLOOD REDUCTION & CO-BENEFITS** such as reducing sediment & improving water quality

3. Construct a project that provides **STORM PROTECTION** and allows for a **QUICKER RECOVERY**

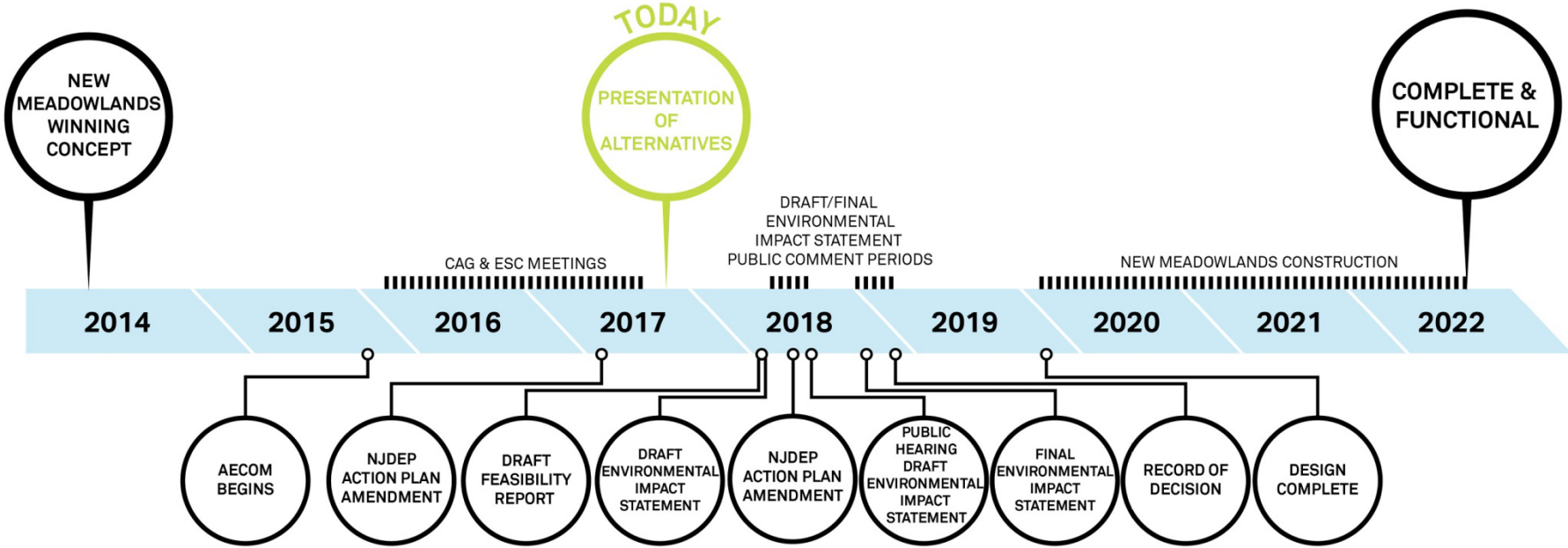
PROJECT CONSTRAINTS

1. Construct a complete project that functions as a **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**

PROJECT ROADMAP



OUR PROCESS

THE SCREENING TOOL

Concepts are screened against each other to determine how they will meet the below metrics

FLOOD REDUCTION BENEFITS

Categories Evaluated:

- Reduces Flood Risk from Coastal Storm Surge (Alternatives 1 and 3)
- Reduces Flood Risk from Rainfall /Interior Drainage Challenges (Alternatives 2 and 3)
- Provides Protection to Vulnerable and Underserved Populations
- Provides Protection to Critical Infrastructure (emergency services, hospitals, transit facilities)

BUILT HUMAN ENVIRONMENT

Categories Evaluated:

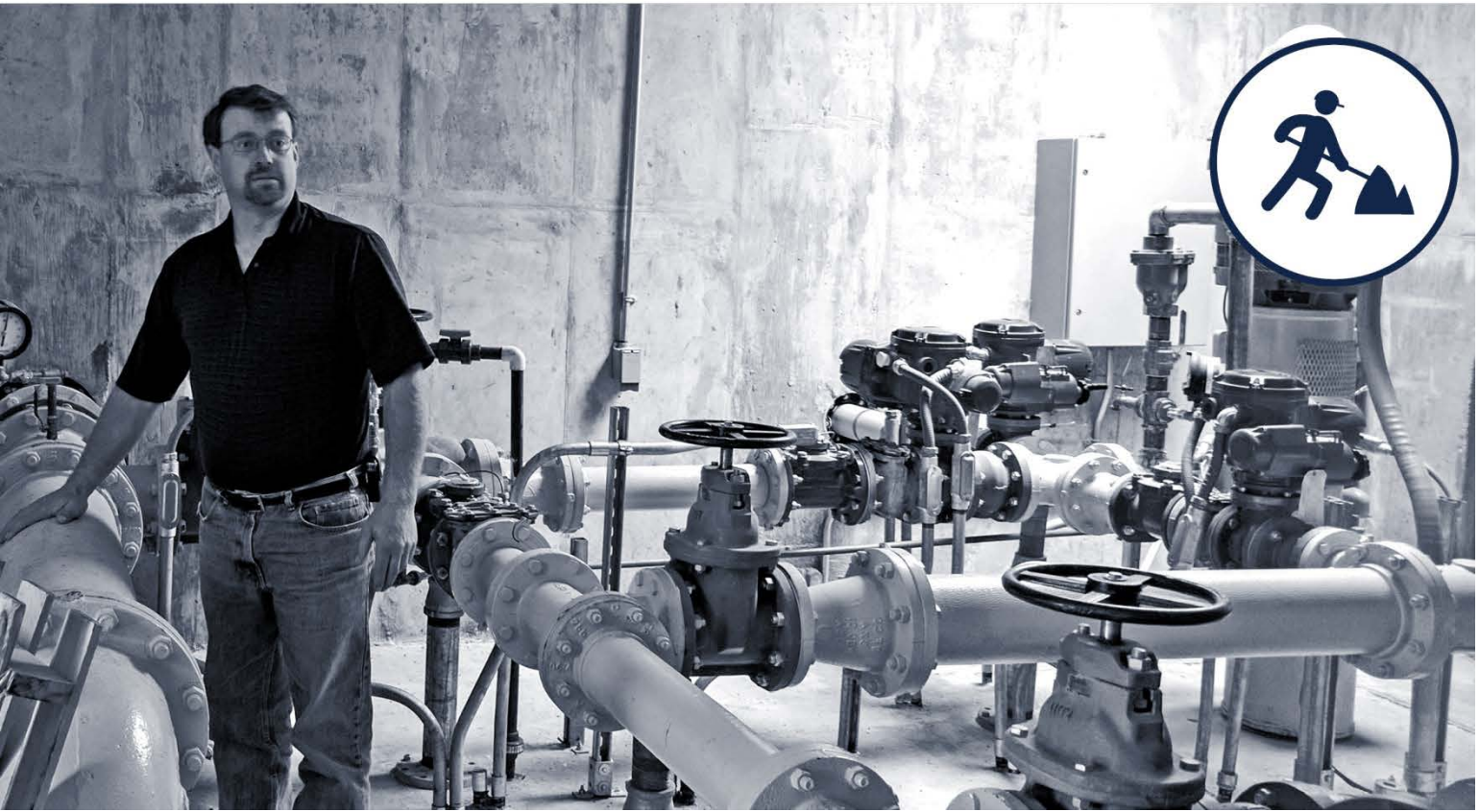
- Effects to Existing Utilities & Utility Infrastructure
- Effects to Existing Transportation Network, Local Traffic, and Connectivity
- Effects on Land Acquisition / Housing Displacements
- Potential to Provide Increased Waterfront Access
- Effects to Recreational, Civic, and Cultural Amenities and Uses
- Effects to Viewshed and Local Visual Quality
- Effects to Air Traffic Safety at Teterboro Airport

NATURAL ENVIRONMENT

Categories Evaluated:

- Effects to Existing Hazardous Waste Sites
- Effects to Berry's Creek Remediation
- Effects on the Transport of Environmental Contaminants/ Sediments during Flood Events
- Effects to Water Resources, including Water Quality, "Waters of the US," Wetlands, and Mitigation Banks
- Effects to Fisheries and Essential Fish Habitat (EFH)
- Effects on Protected Species and their Habitats
- Effects on Other Sensitive Ecological Resources, including Biodiversity, Habitat, and Migration/Movement Corridors
- Effects to Historic and Prehistoric Cultural Resources

CONSTRUCTION & MAINTENANCE



Categories Evaluated:

- Constructability
- Minimizes Long-Term Maintenance & Operation Requirements for Overall System
- Potential to Complete by September 2022

BENEFIT & COST

Categories Evaluated:

- Provides Benefits to the Project Area and Community
- Can be Implemented within Available Funding Limits
- Has a Positive Benefit/Cost Ratio

STORM SURGE FLOODING

ALTERNATIVE 1

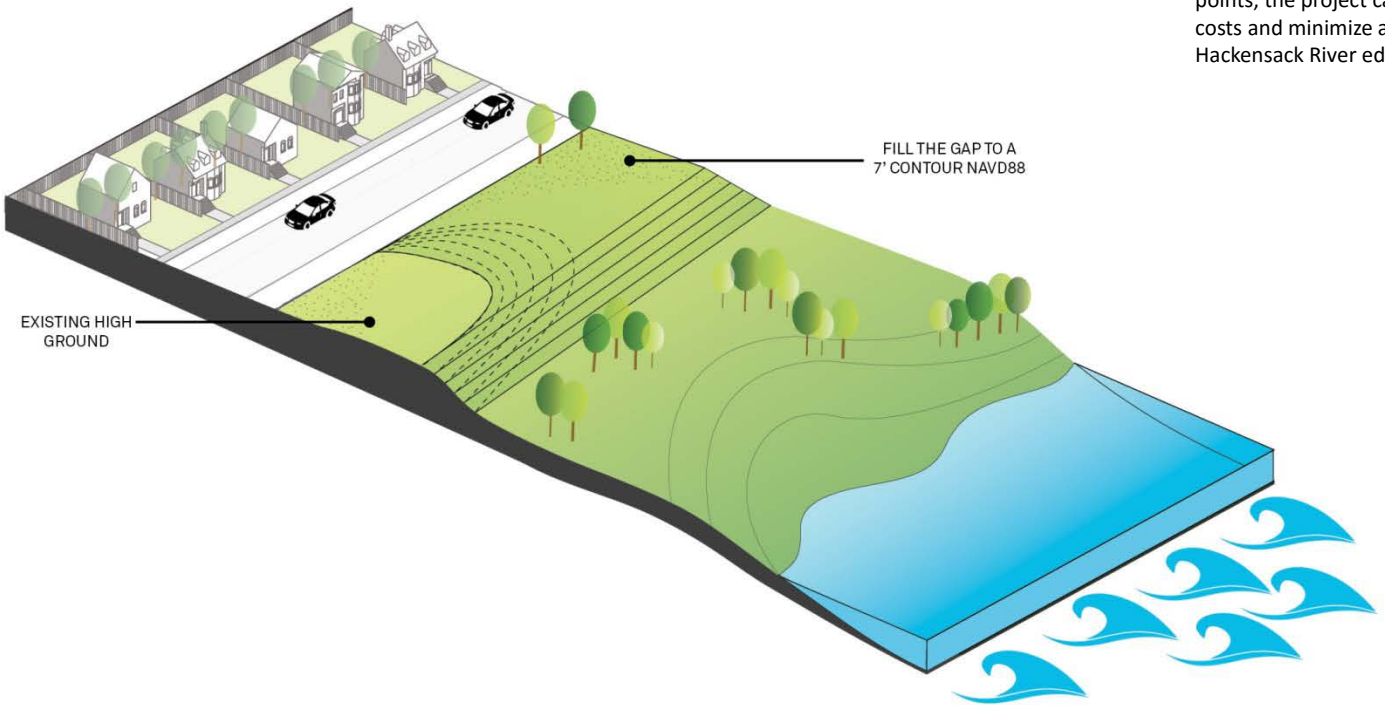
LULU LOQUIDIS, AECOM

ALTERNATIVE 1 STORM SURGE - PROTECT

APPROACH & GOALS

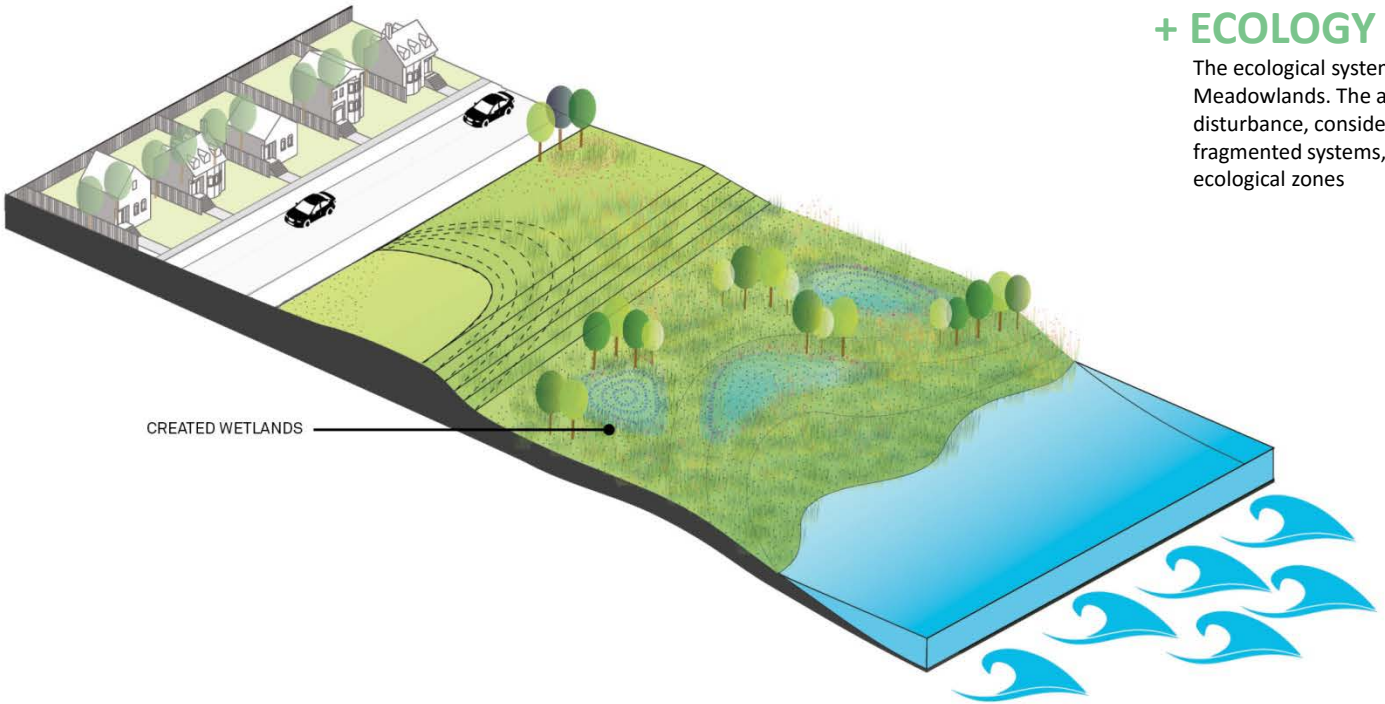
+ INFRASTRUCTURE

By connecting the existing topographical high points, the project can reduce construction costs and minimize additional regrading of the Hackensack River edge



ALTERNATIVE 1 STORM SURGE - CULTIVATE

APPROACH & GOALS



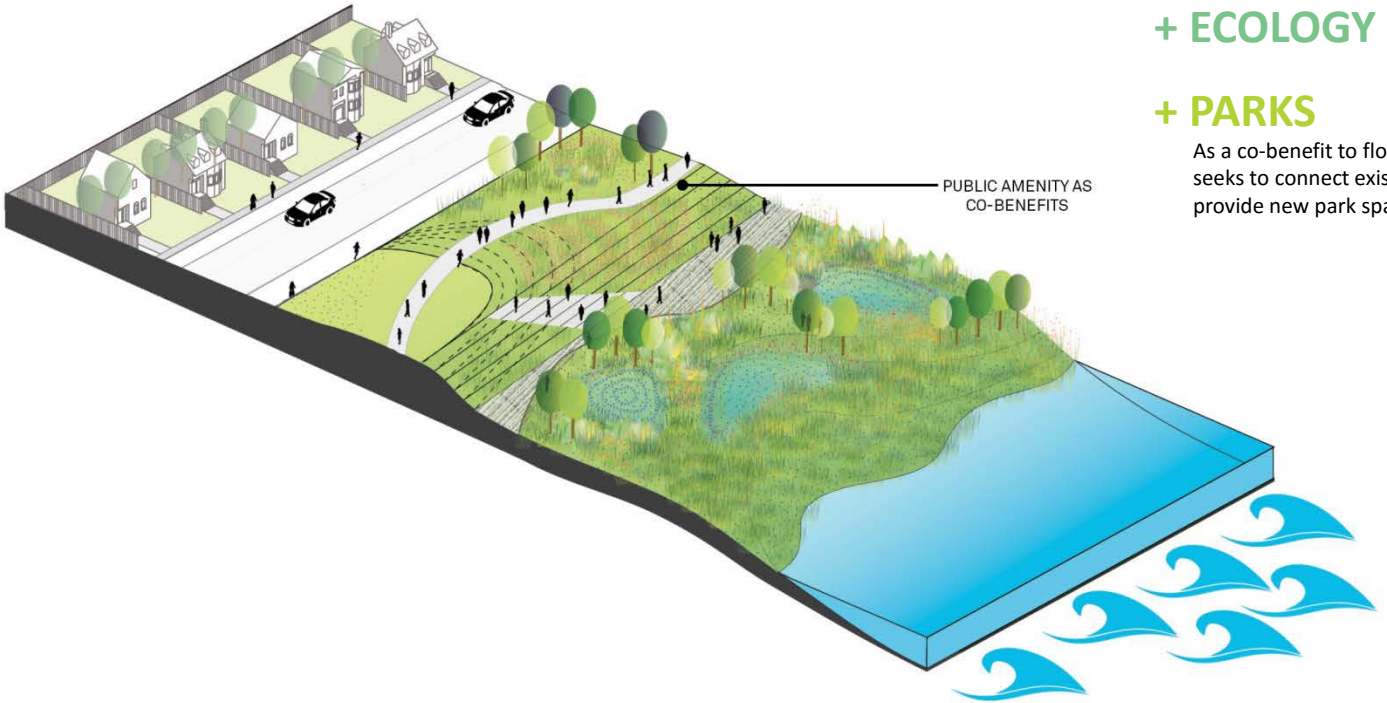
+ INFRASTRUCTURE

+ ECOLOGY

The ecological systems are essential to the Meadowlands. The approach will minimize disturbance, consider habitat improvements to fragmented systems, and creation of new ecological zones

ALTERNATIVE 1 STORM SURGE - ENERGIZE

APPROACH & GOALS



+ INFRASTRUCTURE

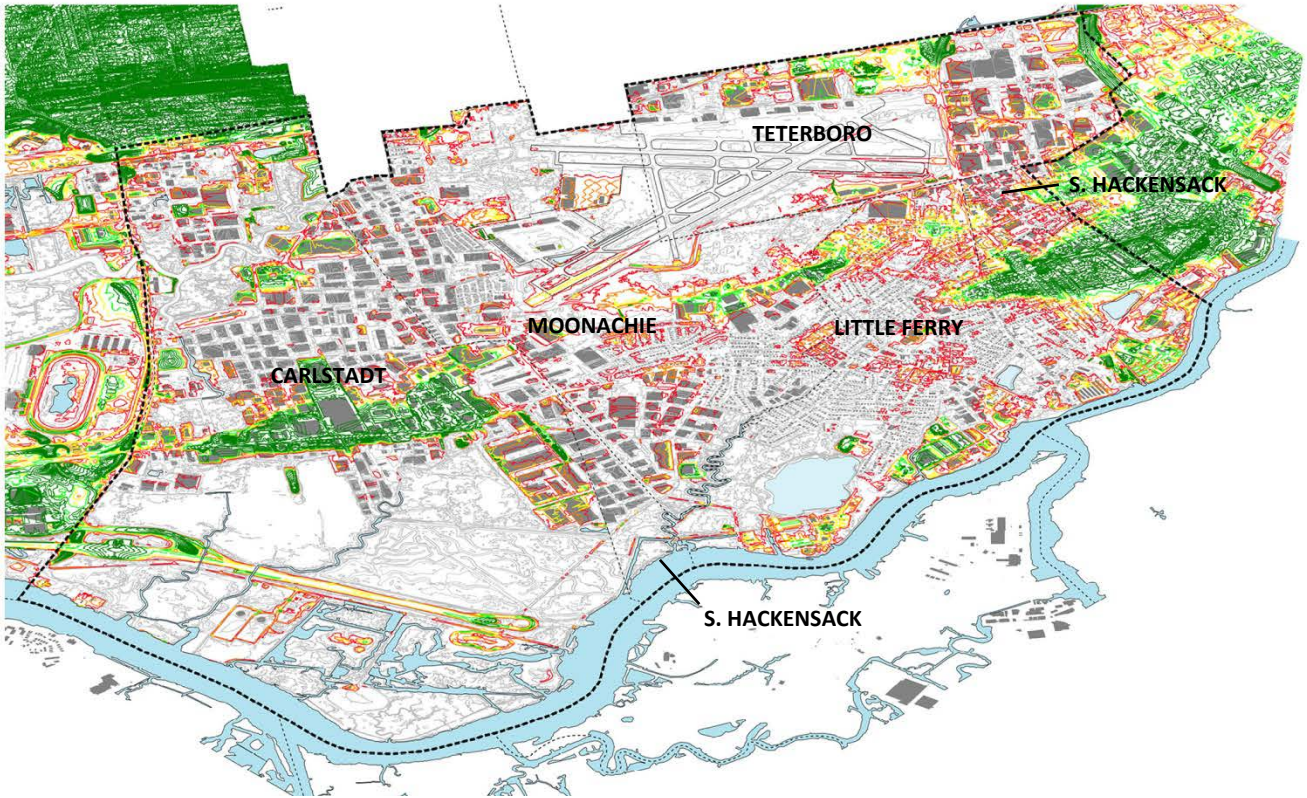
+ ECOLOGY

+ PARKS

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

ALTERNATIVE 1 STORM SURGE - ANALYSIS

HIGH POINTS



- Existing topography was analyzed to determine water flow and identify areas of high ground

Above 10' NAVD88

9' NAVD88

8' NAVD88

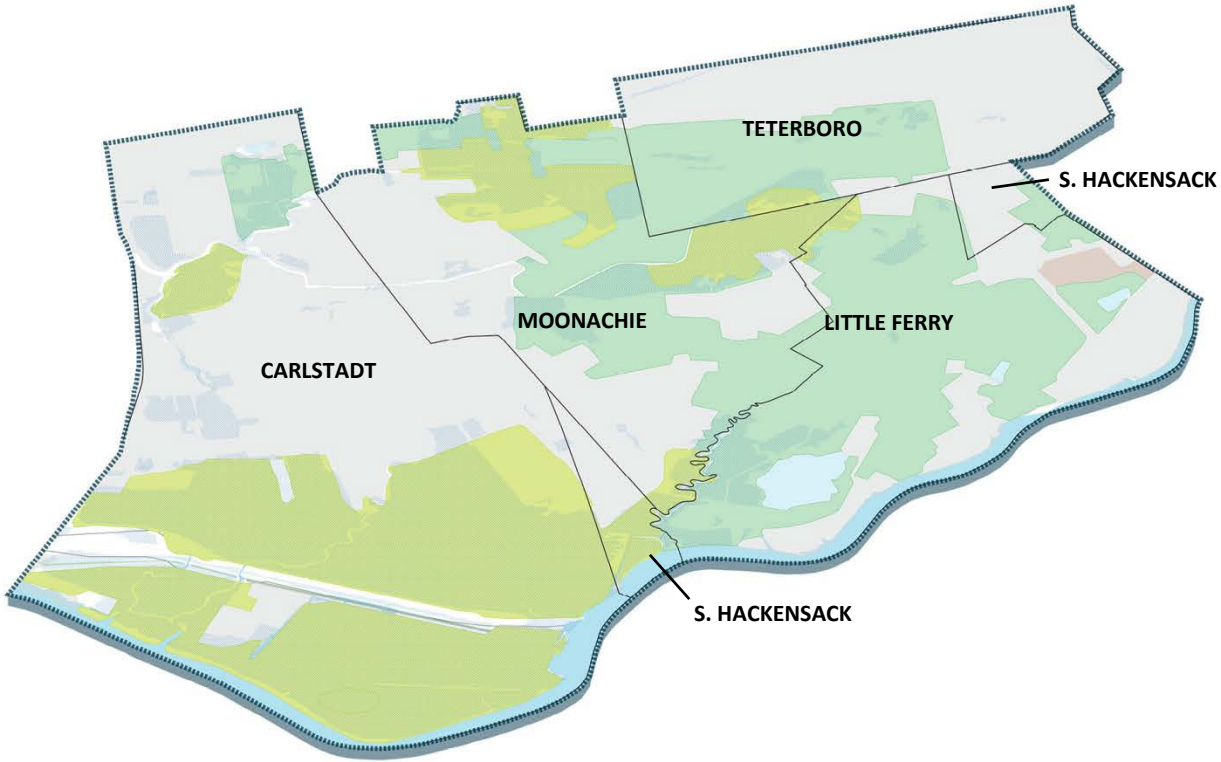
7' NAVD88

6' NAVD88

Below 6' NAVD88

ALTERNATIVE 1 STORM SURGE - ANALYSIS

SOILS & SUB-STRUCTURE



- All proposed flood protection strategies were informed by geo-technical analysis
- The soil type helped the team determine how deep the piles and sub-structure needed to extend

Frequently flooded-soils

Urban soils-wet sub stratum

Urban soils

Loam-urban context

Data Source:
USDA WSS AOI Web Soil Survey
http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

ALTERNATIVE 1 STORM SURGE – SCREENING OF CONCEPTS

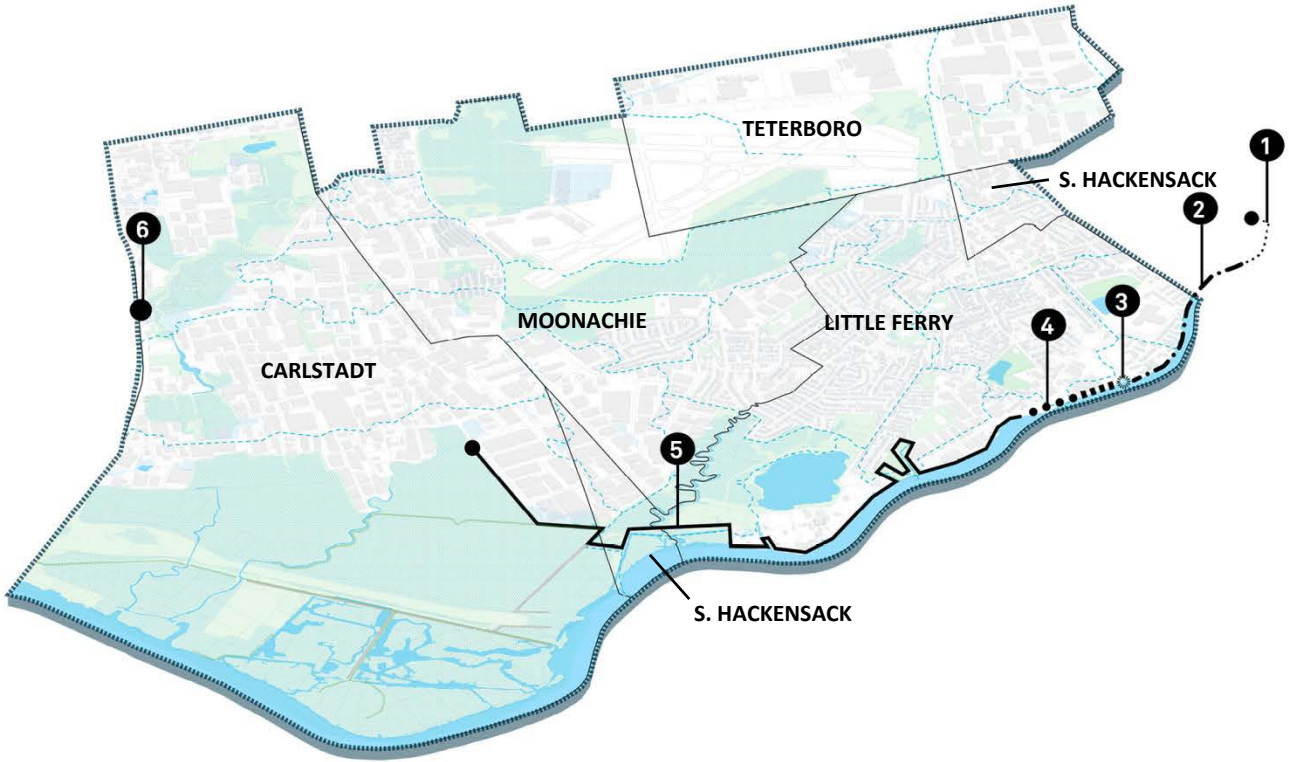
PROVIDING PROTECTION TO A 7’ ELEVATION

Initial Concepts	Description	Within Budget	No Increased Flood Risk	Benefit Cost Ratio >1
Option 1	100-year Storm Protection/ Expanded Project Area	X	●	●
Option 2	100-year Storm Protection/ Project Area	X	●	●
Option 3	50-year Level of Protection/ Project Area	●	●	●
Option 4	Ring Levees/ Reduced Project Area	●	●	X
Option 5	Storm Surge Barrier on Hackensack River	X	X	●

50-YEAR LEVEL OF PROTECTION ADVANCES

- Explored many options to a 100-year flood, but all resulted in a fatal flaw
- The 7’ NAVD88 design elevation was further analyzed

ALTERNATIVE 1 STORM SURGE - PLAN



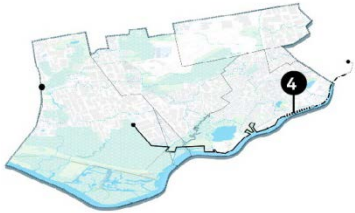
- Provides protection from a storm surge to elevation 7' NAVD88 (approximately a 50-yr storm)
- Provides community co-benefits through water access & multifunctional wall elements
- Positive Benefit Cost Ratio greater >1
- Revised Feasibility-level concept cost exceeds $150M

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

CANTILEVER WALKWAY

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- The Cantilever Walkway combines flood protection and public access

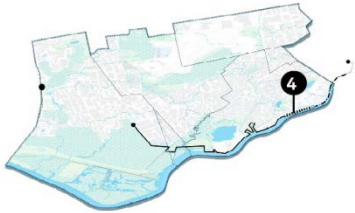


1. Public walk
2. Modular planter
3. Cantilever access
4. Recreational space

FLOOD PROTECTION

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

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

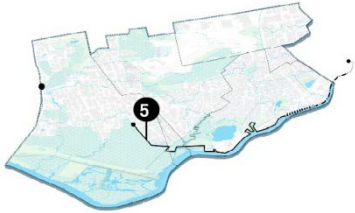


1. Flood protection system
2. Newly-created tidal wetland

VIEWING PLATFORM & SHEET PILE

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

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



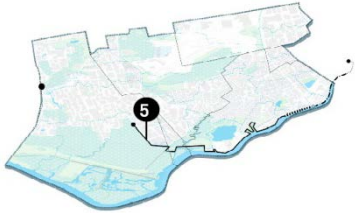
1 Viewing deck

2 Wetland

FLOOD PROTECTION

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

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



1 Sheet pile

FREQUENT RAIN FLOODING

ALTERNATIVE 2

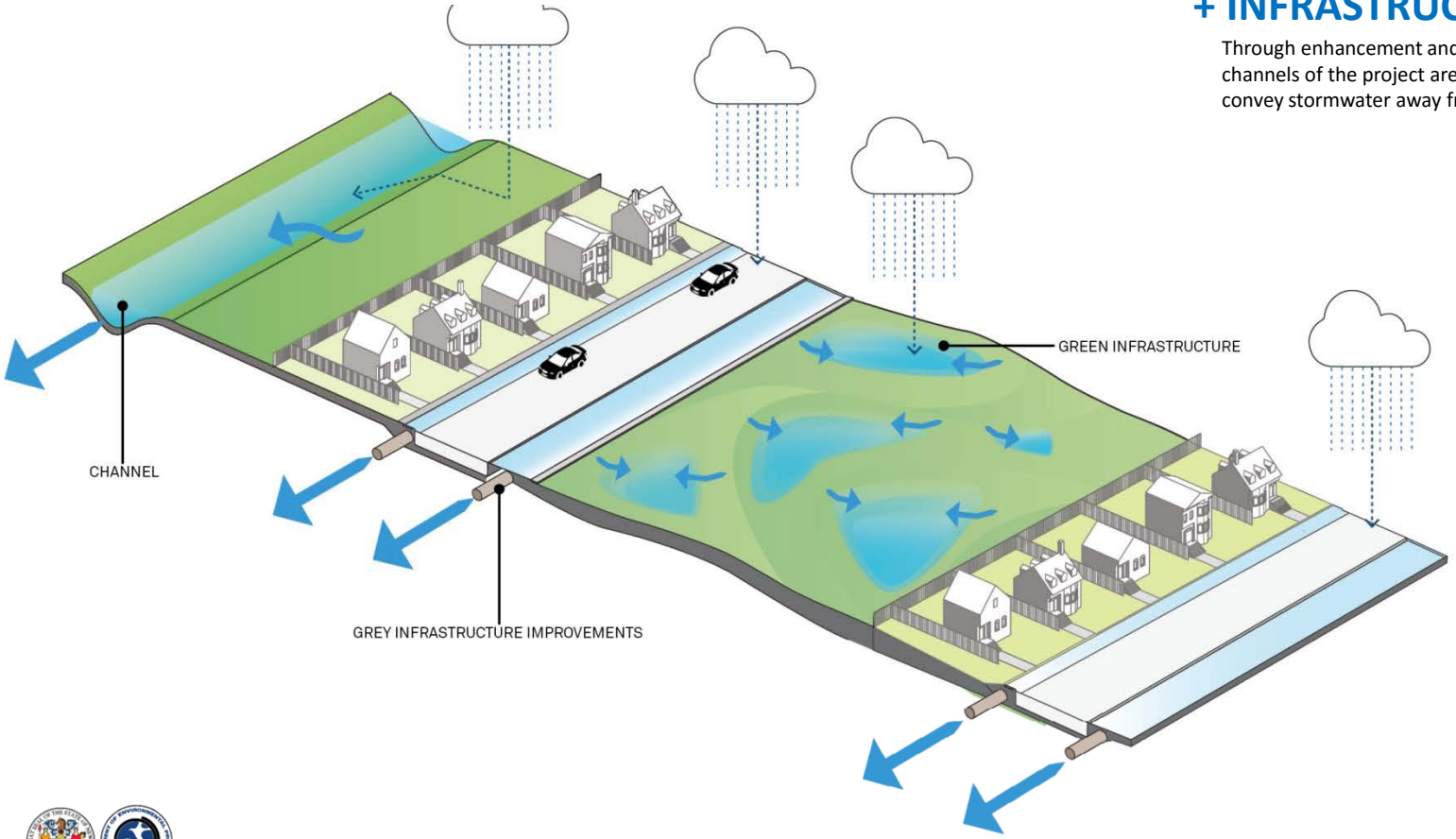
GARRETT AVERY, AECOM

ALTERNATIVE 2 FREQUENT RAIN FLOODING - PROTECT

APPROACH & GOALS

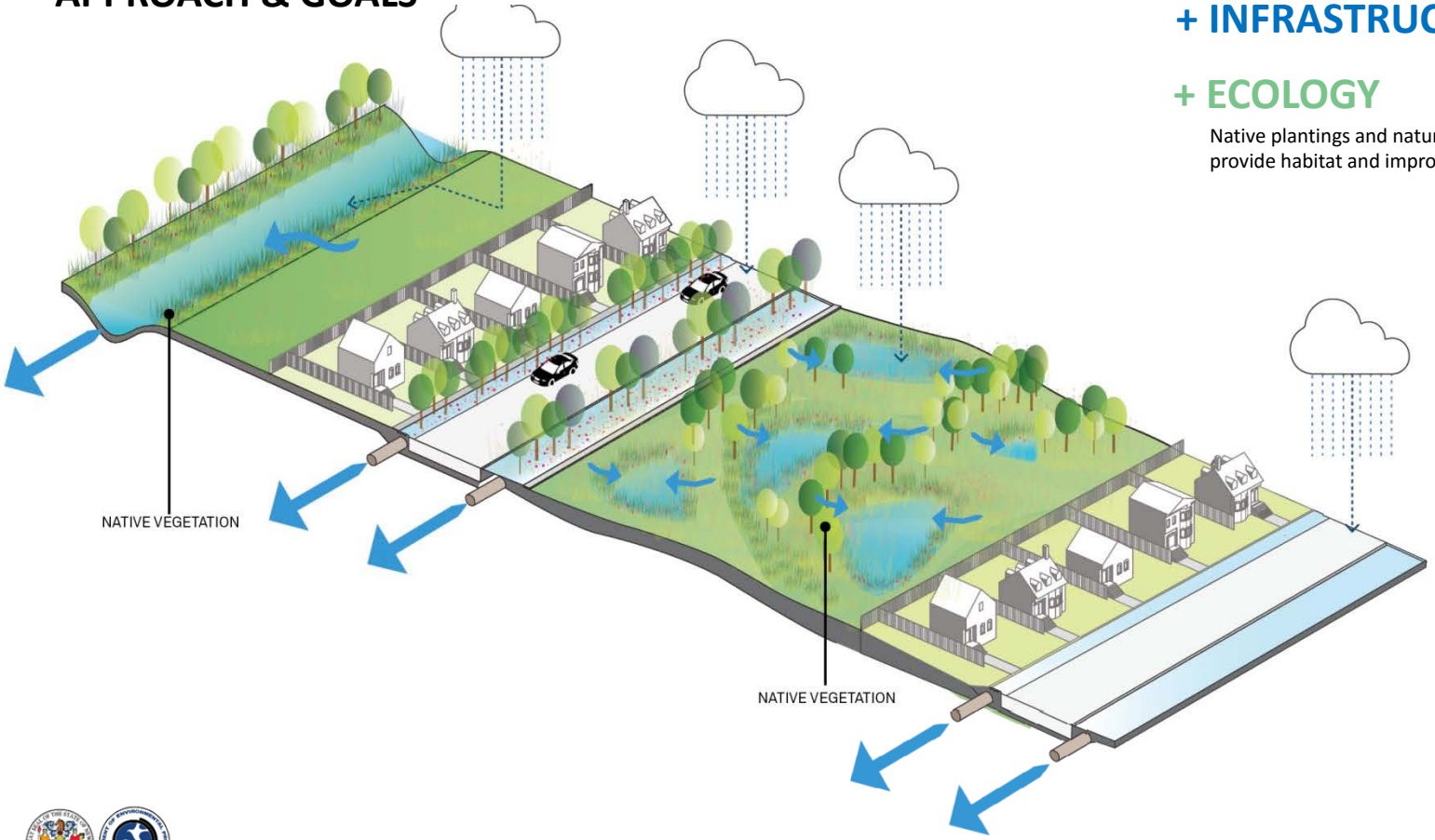
+ INFRASTRUCTURE

Through enhancement and restoration, the existing channels of the project area will have capacity to convey stormwater away from flood-prone areas



ALTERNATIVE 2 FREQUENT RAIN FLOODING - CULTIVATE

APPROACH & GOALS



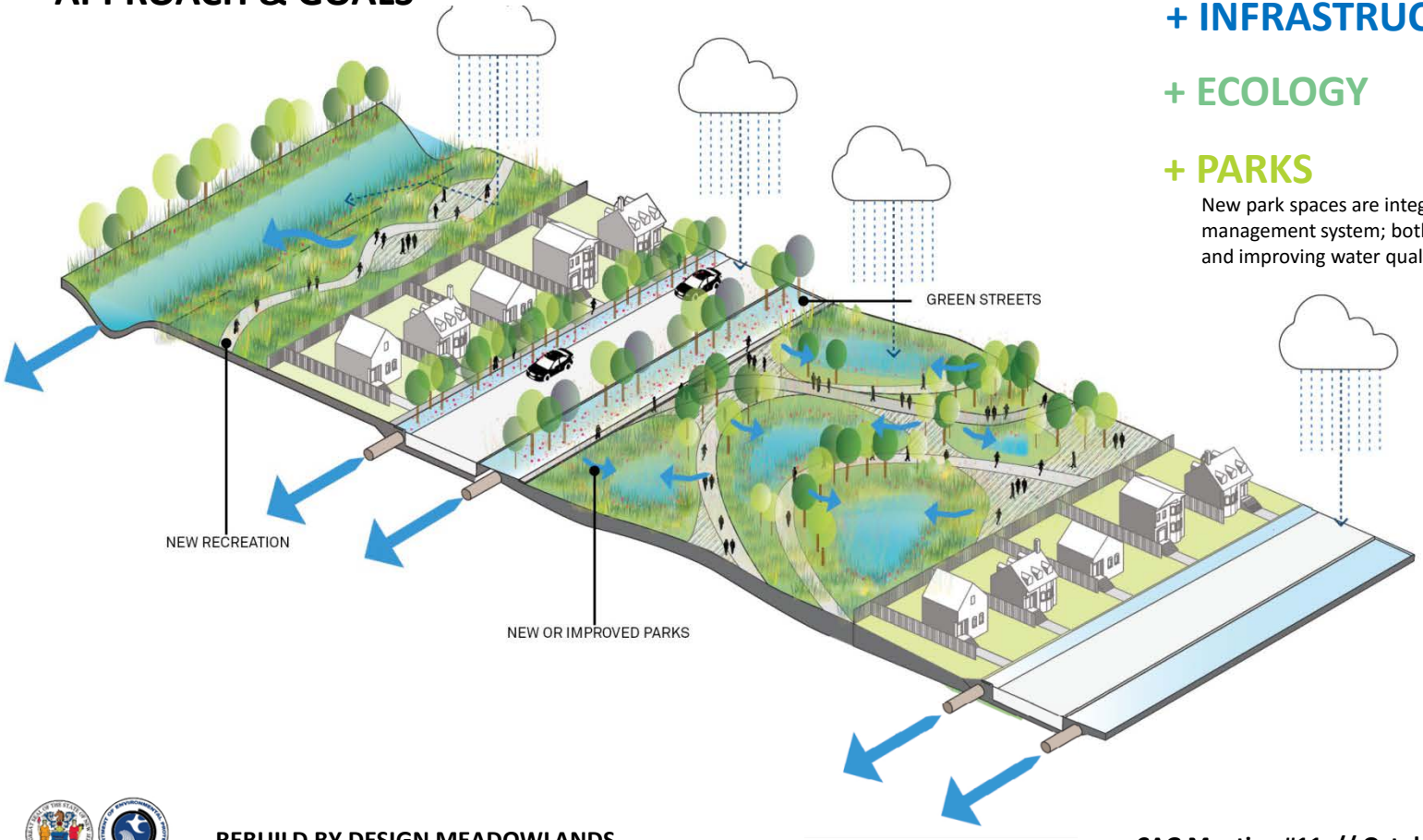
+ INFRASTRUCTURE

+ ECOLOGY

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

ALTERNATIVE 2 FREQUENT RAIN FLOODING - ENERGIZE

APPROACH & GOALS



+ INFRASTRUCTURE

+ ECOLOGY

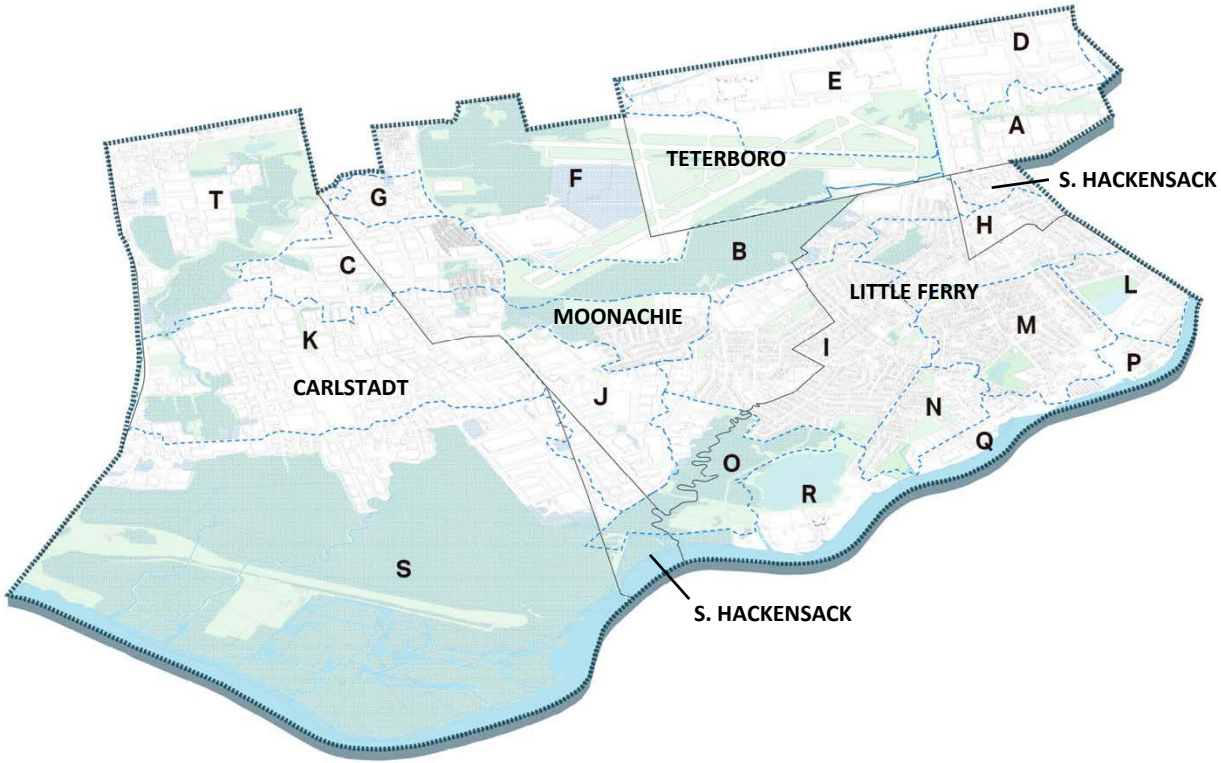
+ PARKS

New park spaces are integral to the water management system; both by slowing runoff and improving water quality

ALTERNATIVE 2 FREQUENT RAIN FLOODING -ANALYSIS

20 SUB-BASINS

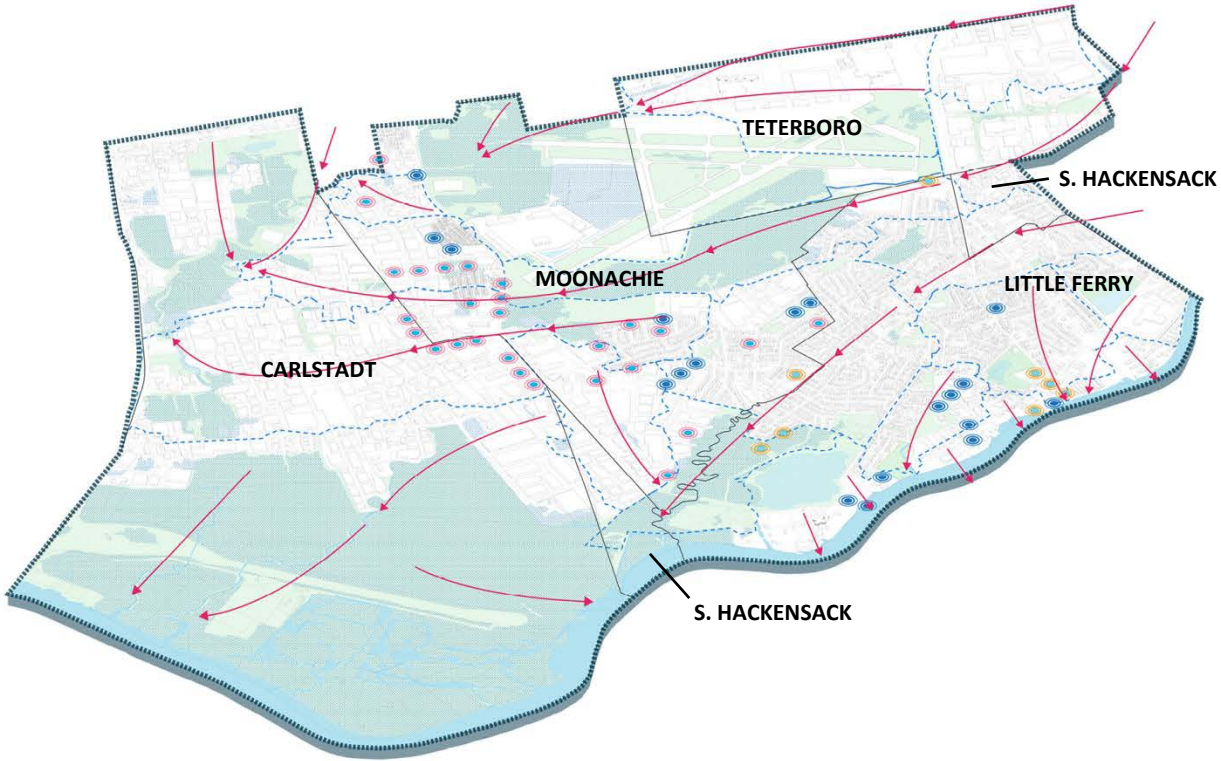
- Analyzed 20 sub-basin areas in the hydrologic model



Sub-basin

ALTERNATIVE 2 FREQUENT RAIN FLOODING -ANALYSIS

FREQUENCY & FLOW



- 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

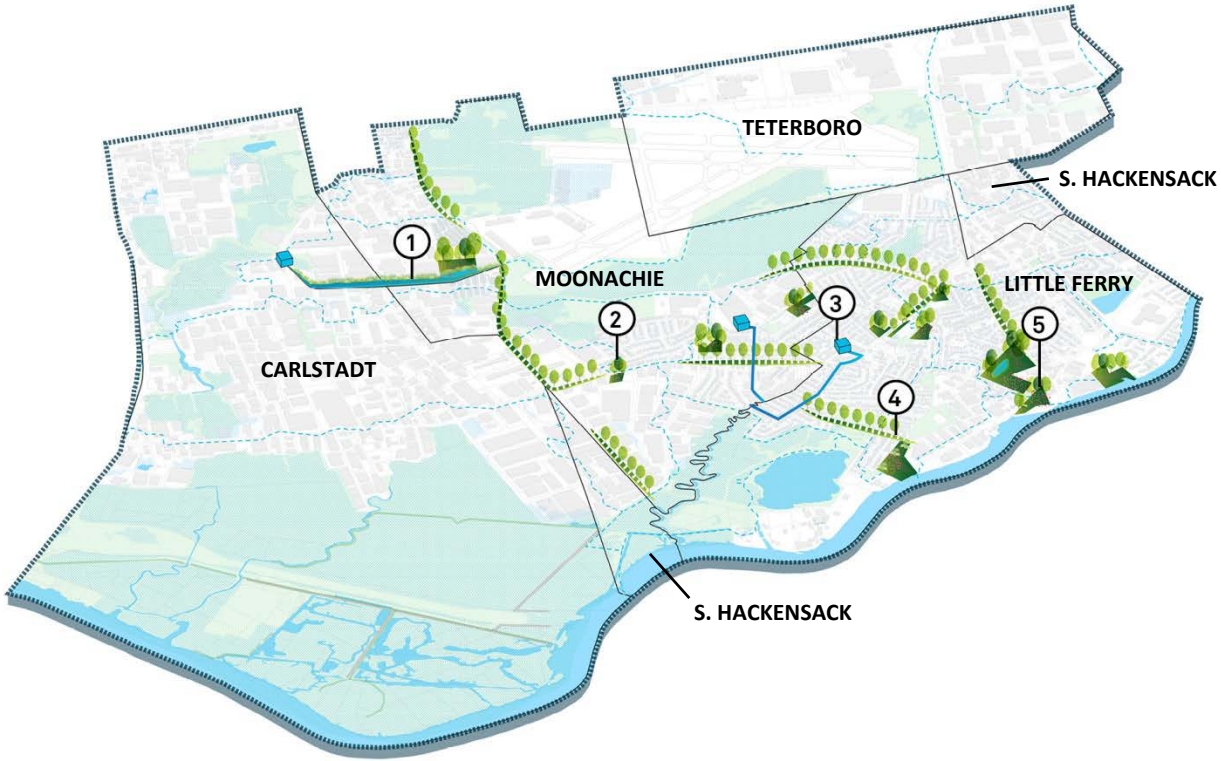
SCREENING

Initial Concepts	Description	Within Budget	Distribution of Benefits	Benefit Cost Ratio >1
Main Street	Increase storage capacity at Indian Lake, improves storm drainage pipes, includes upgrades to existing Willow Lake pump station discharge line, and new street and park green infrastructure	●	X	X
DePeyster Creek	Upgrade of existing pump station, upgrades of existing upstream culvert, channel dredging with habitat restoration, and new street and park green infrastructure	●	●	X
Losen Slote & Carol Place	Two new pump stations and force mains to divert stormwater from residential area to downstream of Losen Slote, upgrades to existing storm drainage ditches and culverts, and new street and park green infrastructure	●	●	X
West Riser	New pump station, channel conveyance improvements with habitat restoration, culvert upgrades, and new street green infrastructure.	●	X	●
East Riser	Pump station improvements, channel conveyance improvements with habitat restoration, culvert and bridge upgrades, and new street and park green infrastructure.	X	●	●
Revised Concept	New pump station and force mains to divert stormwater from residential area to downstream of Losen Slote, upgrades to culverts and bridge crossings, East Riser Ditch conveyance improvement and new pump station, and new street and park green infrastructure	●	●	●

REVISED CONCEPT ADVANCES

- Top concepts were reviewed and evaluated using the screening criteria
- The Revised Concept was a result of reviewing and rearranging to create a concept carrying increased benefits

ALTERNATIVE 2 – FREQUENT RAIN FLOODING PLAN

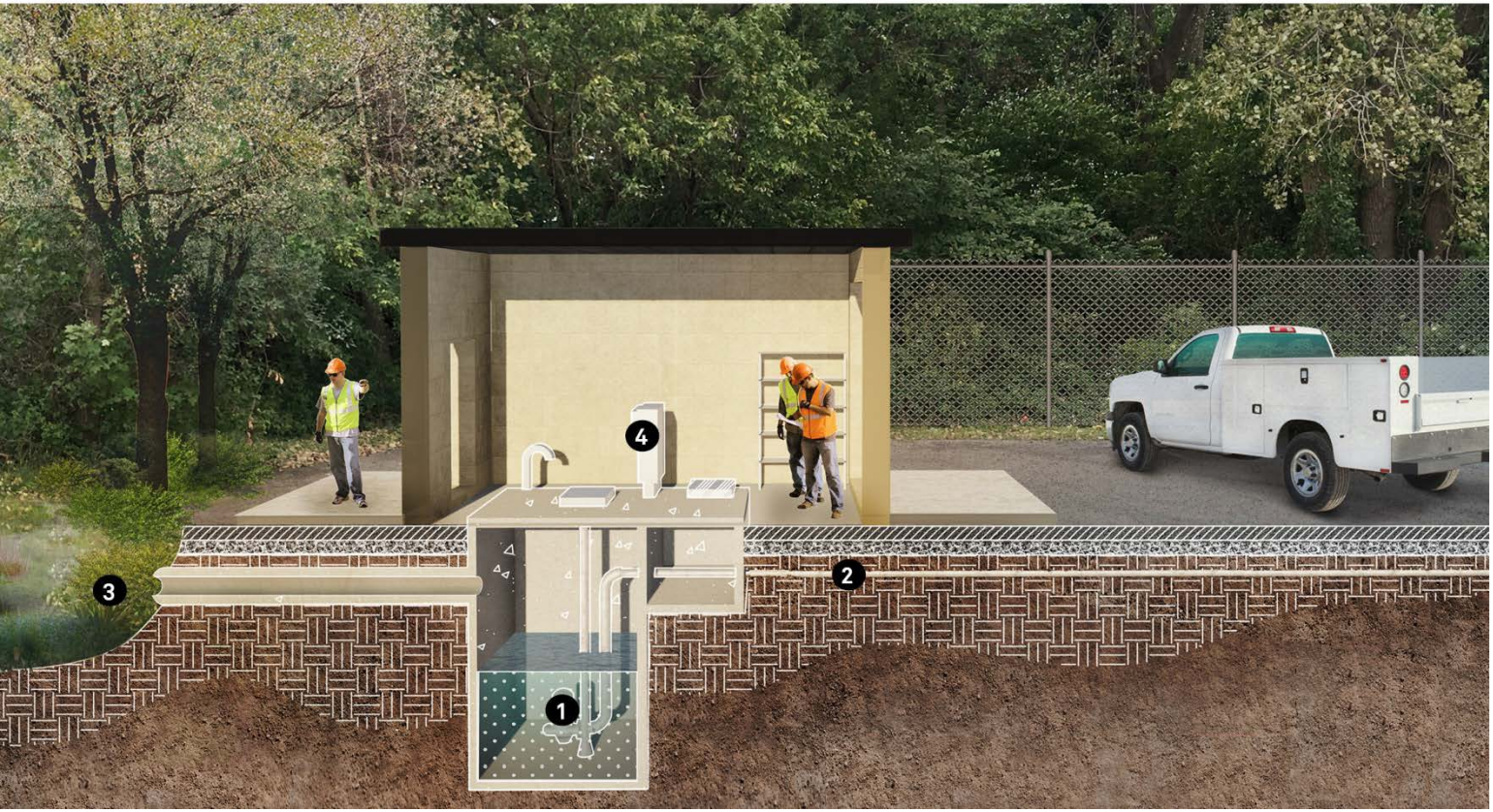


- Reduction in areal extent of flooding and depth of flooding for fluvial storms of a recurrence interval of 100-yr or less
- Provides community co-benefits through green infrastructure
- Positive Benefit Cost Ratio greater >1
- Revised Feasibility-level concept cost exceeds $150M

1. East Riser Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Force Main + Public Facility Improvements
4. Green Infrastructure + New Park
5. Park Improvements + 3 New Parks + Green Infrastructure

LOSEN SLOTE DRAINAGE IMPROVEMENTS

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES



- New pump stations improve conveyance capacity by moving water from one location to another

1. Submersible pump
2. 36” force main
3. Losen Slote
4. Control panel

GREEN INFRASTRUCTURE & PARK IMPROVEMENTS

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

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

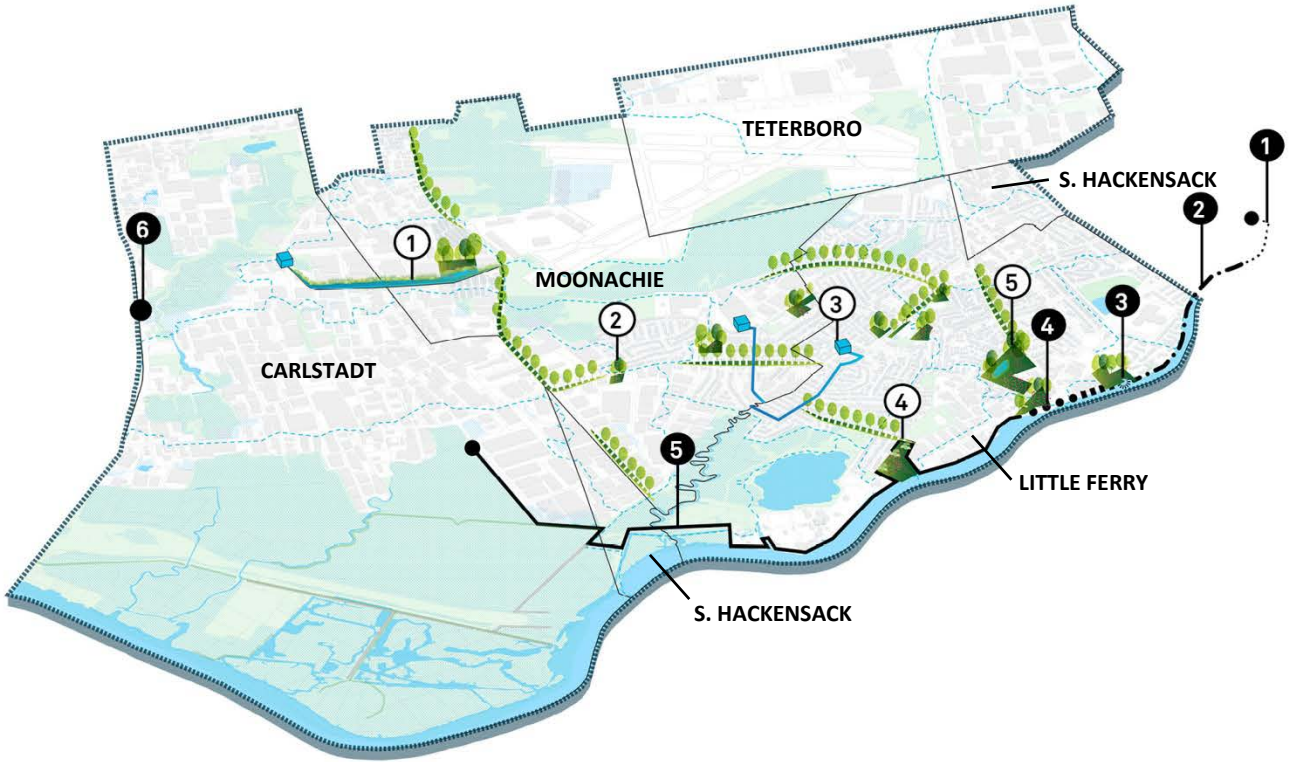
1. Elevated boardwalk
2. Channel improvements
3. Shallow emergent marsh
4. Atlantic White Cedar

STORM SURGE & FREQUENT RAIN FLOODING

ALTERNATIVE 3 - HYBRID

GARRETT AVERY & LULU LOQUIDIS, AECOM

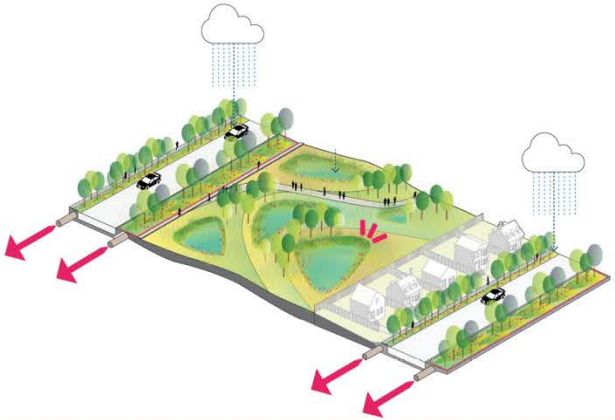
ALTERNATIVE 3 – A PLAN FOR BOTH CHALLENGES



1. East Riser Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Force Main + Public Facility Improvements
4. Green Infrastructure + New Park
5. Park Improvements + 3 New Parks + Green Infrastructure

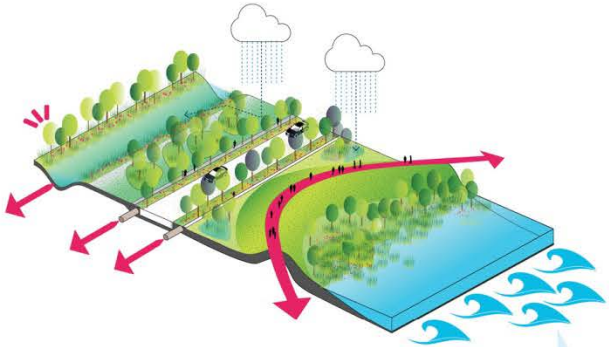
1. Existing Riverwalk
2. Sheet Pile Cantilever
3. Berms at Fluvial Park
4. Cantilever Walkway
5. Sheet pile or Floodwall
6. Surge Barrier

ALTERNATIVE 3 HYBRID - THE BUILD & FUTURE PLAN



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

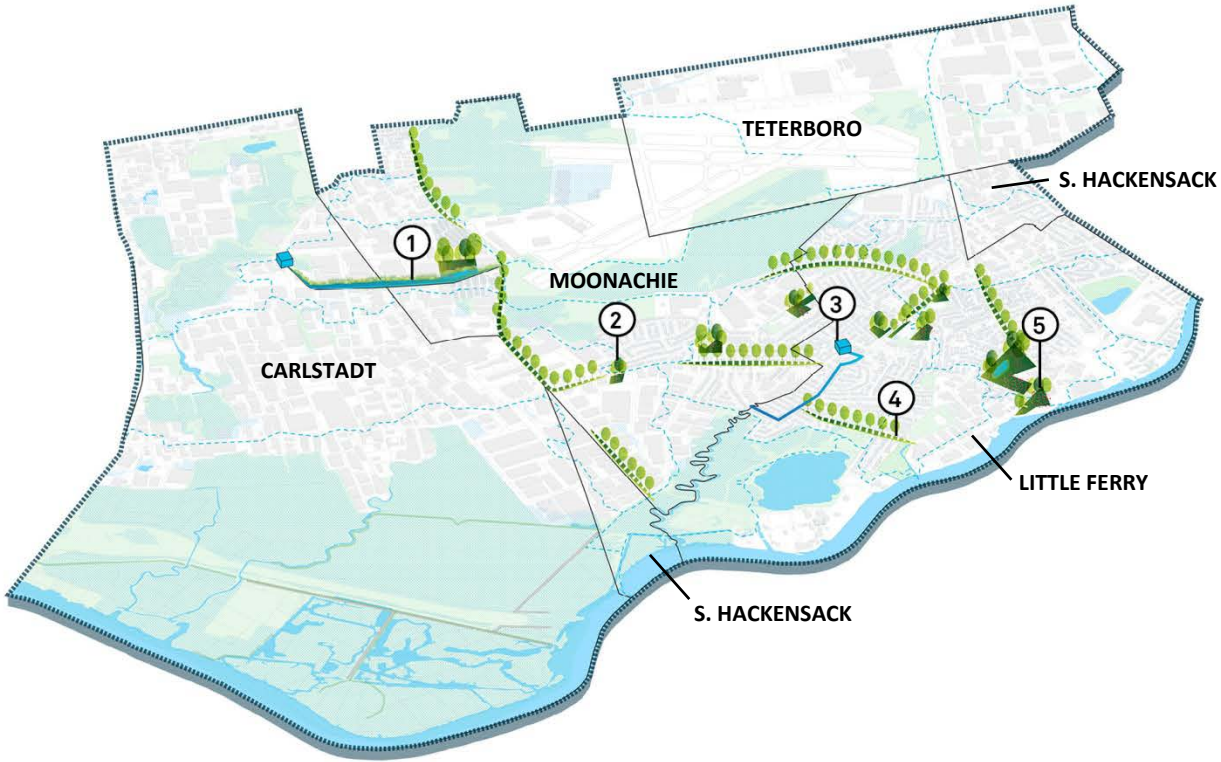


Future Plan

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

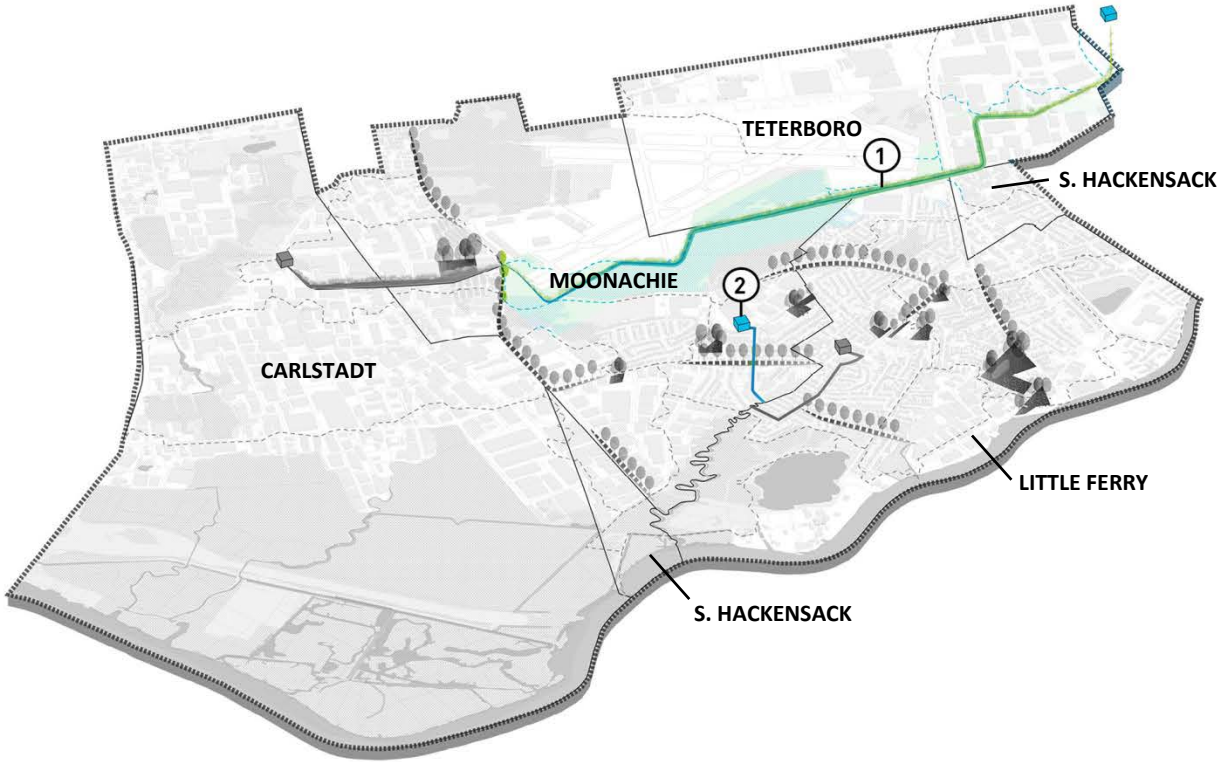


1. Pump station +Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Pump Station + Force Main + Public Facility Improvements
4. Green Infrastructure
5. Park Improvements + 1 New Park + Green Infrastructure

- Channel Improvements
- Force Main Improvements
- New Pump Stations
- Street Green Infrastructure
- Created Wetlands
- GI & Open Space Improvements

FOR FUTURE IMPLEMENTATION

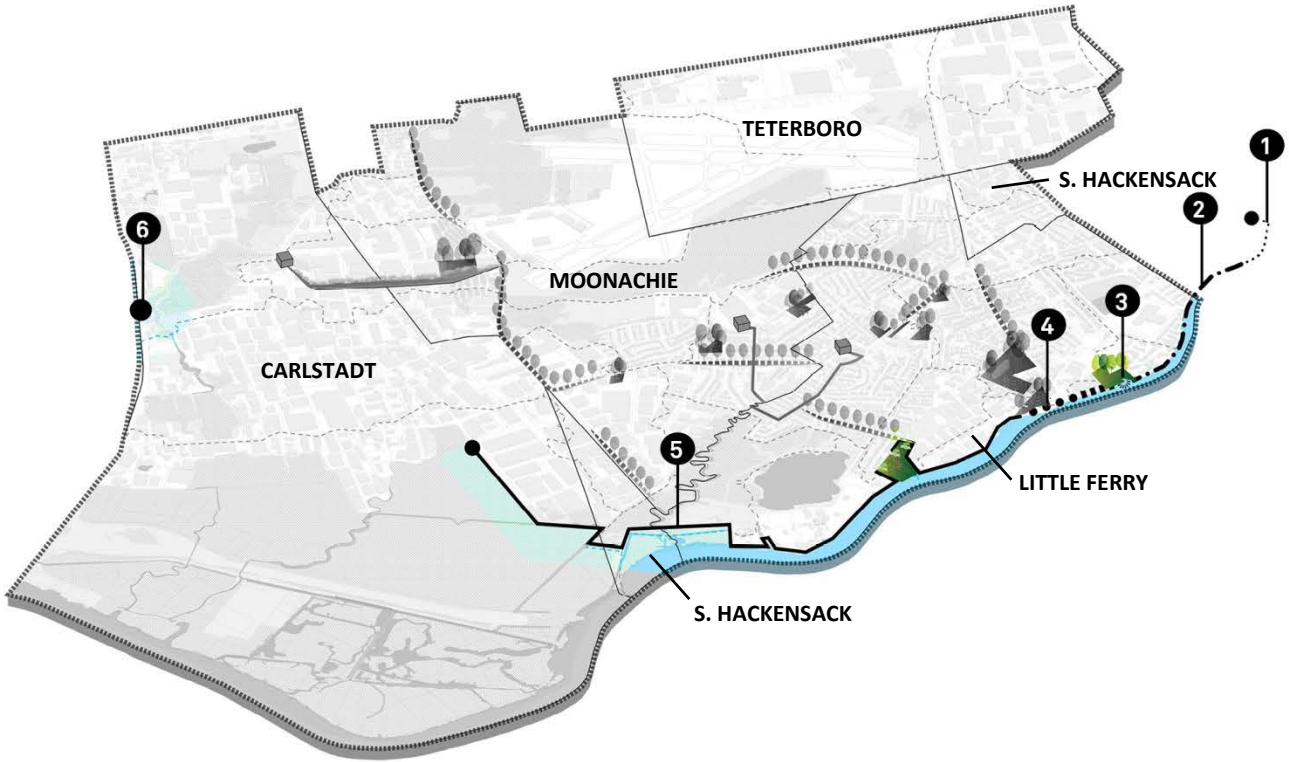
ADDITIONAL RAIN FLOODING REDUCTION FROM ALTERNATIVE 2



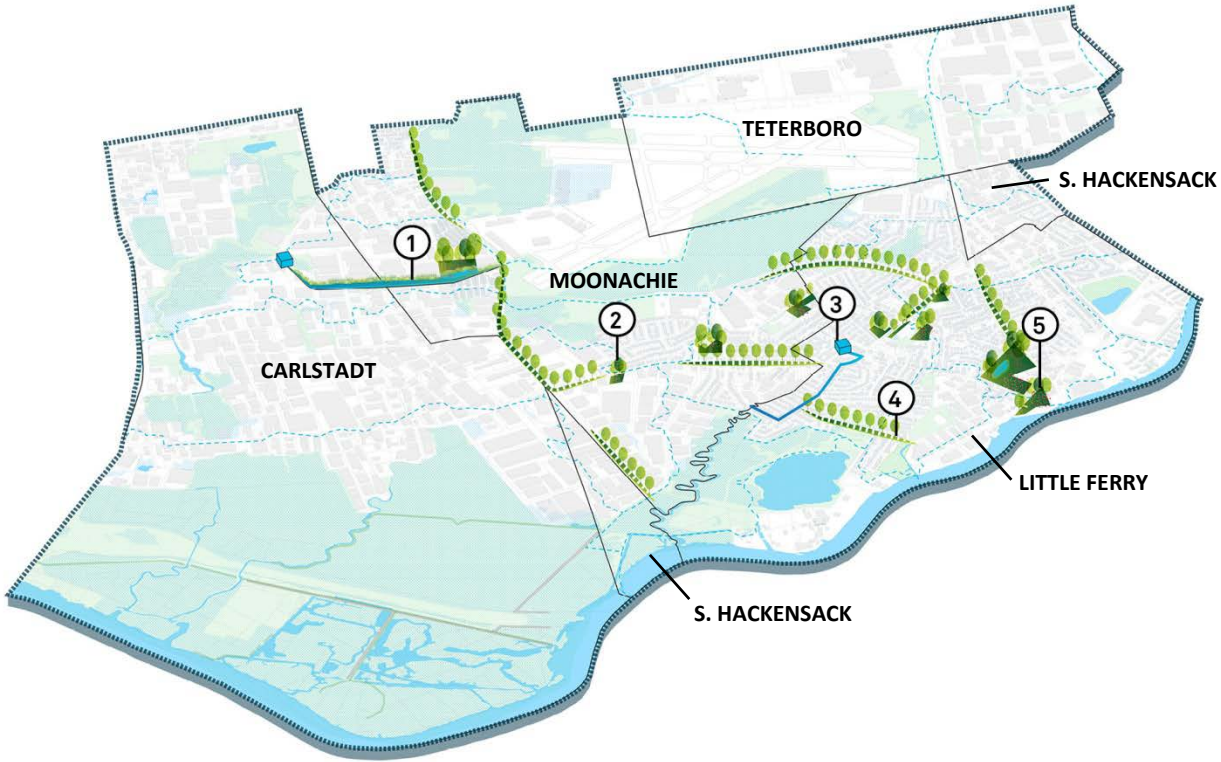
1. East Riser Channel Improvements Extension toward South Hackensack
2. A second Losen Slote Pump Station & Force Main

FOR FUTURE IMPLEMENTATION

50-YEAR STORM SURGE PROTECTION FROM ALTERNATIVE 1



ALTERNATIVE 3 - BUILD PLAN

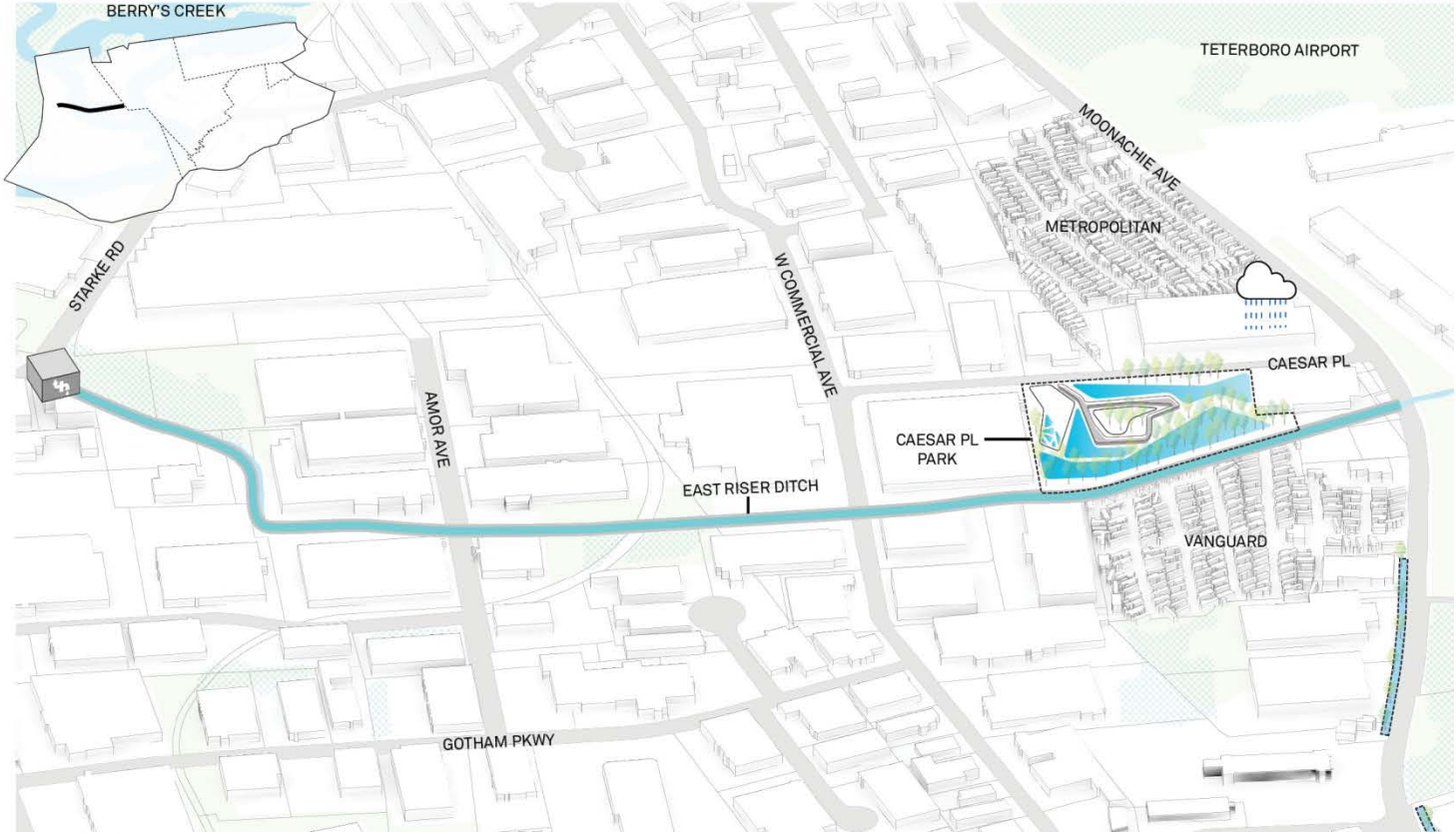


- The Build Plan can be constructed and functional by 2022
- The plan put forth will require less maintenance then that of an Alternative 1 system
- Positive Benefit Cost Ratio greater >1
- Plan can be constructed within Available Funds

1. East Riser Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Force Main + Public Facility Improvements
4. Green Infrastructure
5. Park Improvements + 1 New Park + Green Infrastructure

EAST RISER CHANNEL IMPROVEMENTS

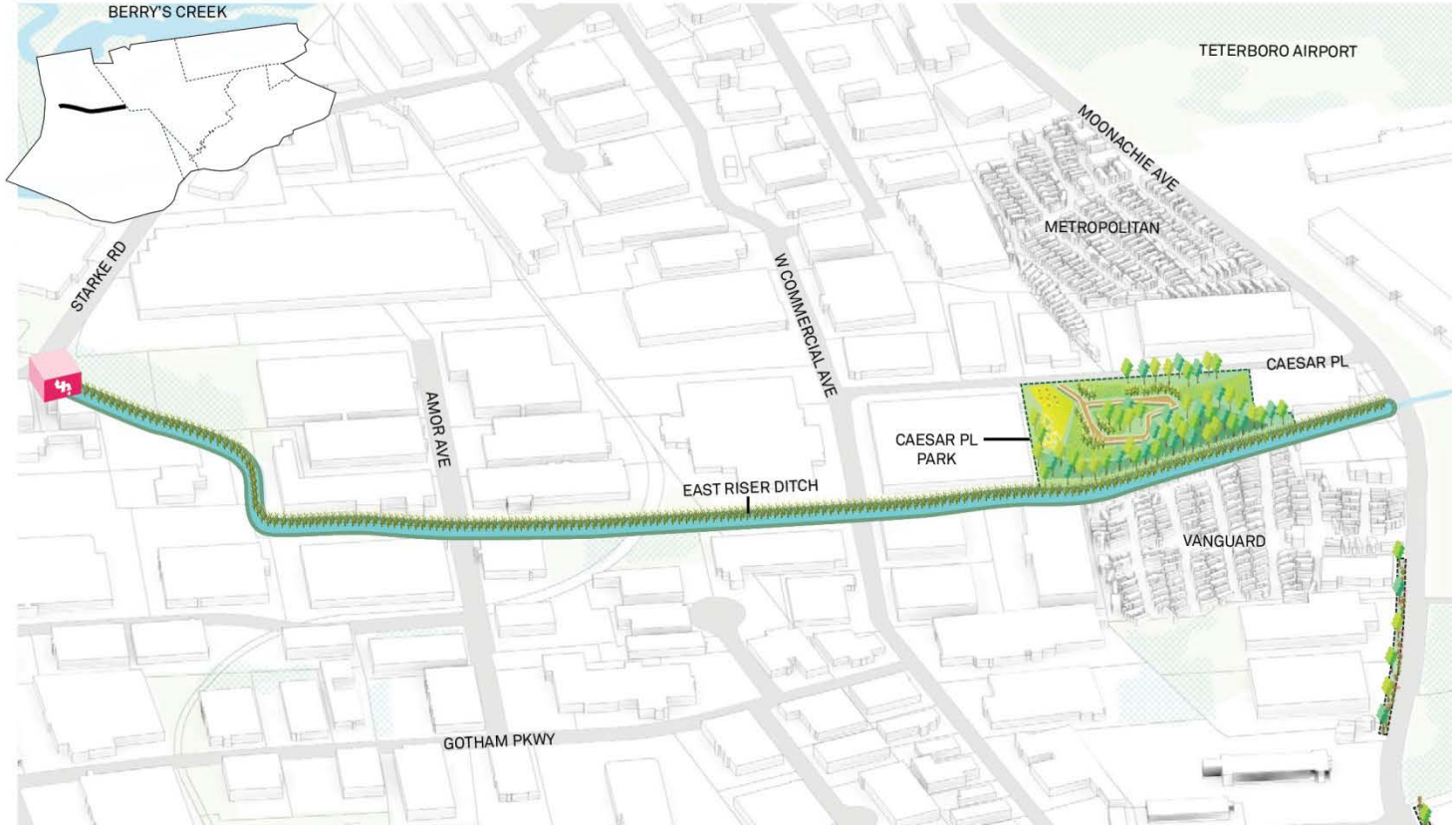
PROTECT



- **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

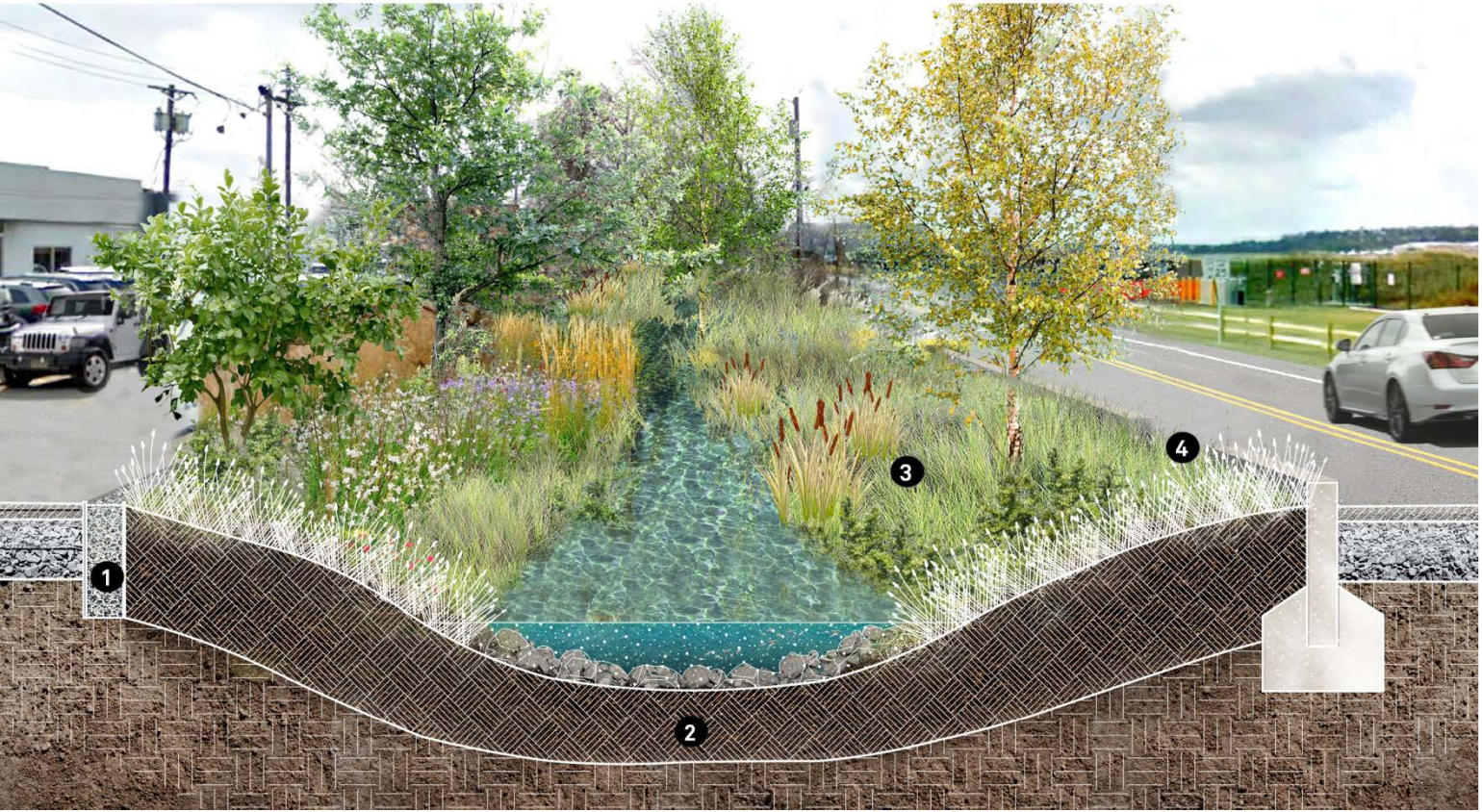
CULTIVATE & ENERGIZE



- 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**

EAST RISER CHANNEL IMPROVEMENTS

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

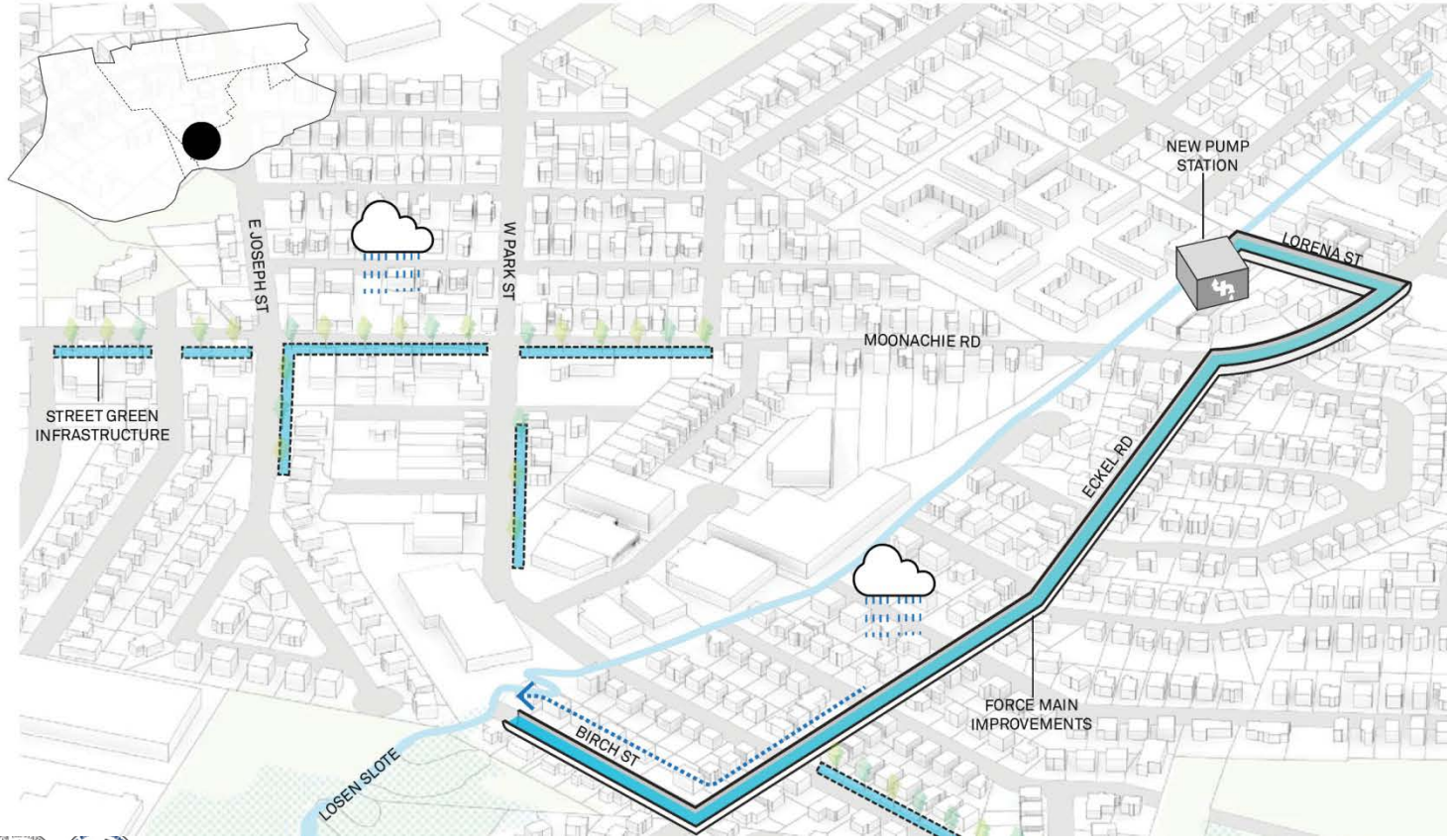


- Improves conveyance capacity
- Captures road runoff and filters suspended solids
- Native vegetation provides habitat and improves visual quality along the channel

1. Gravel trench
2. Channel improvement
3. Native vegetation
4. Curb cut

LOSEN SLOTE DRAINAGE IMPROVEMENTS

PROTECT



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

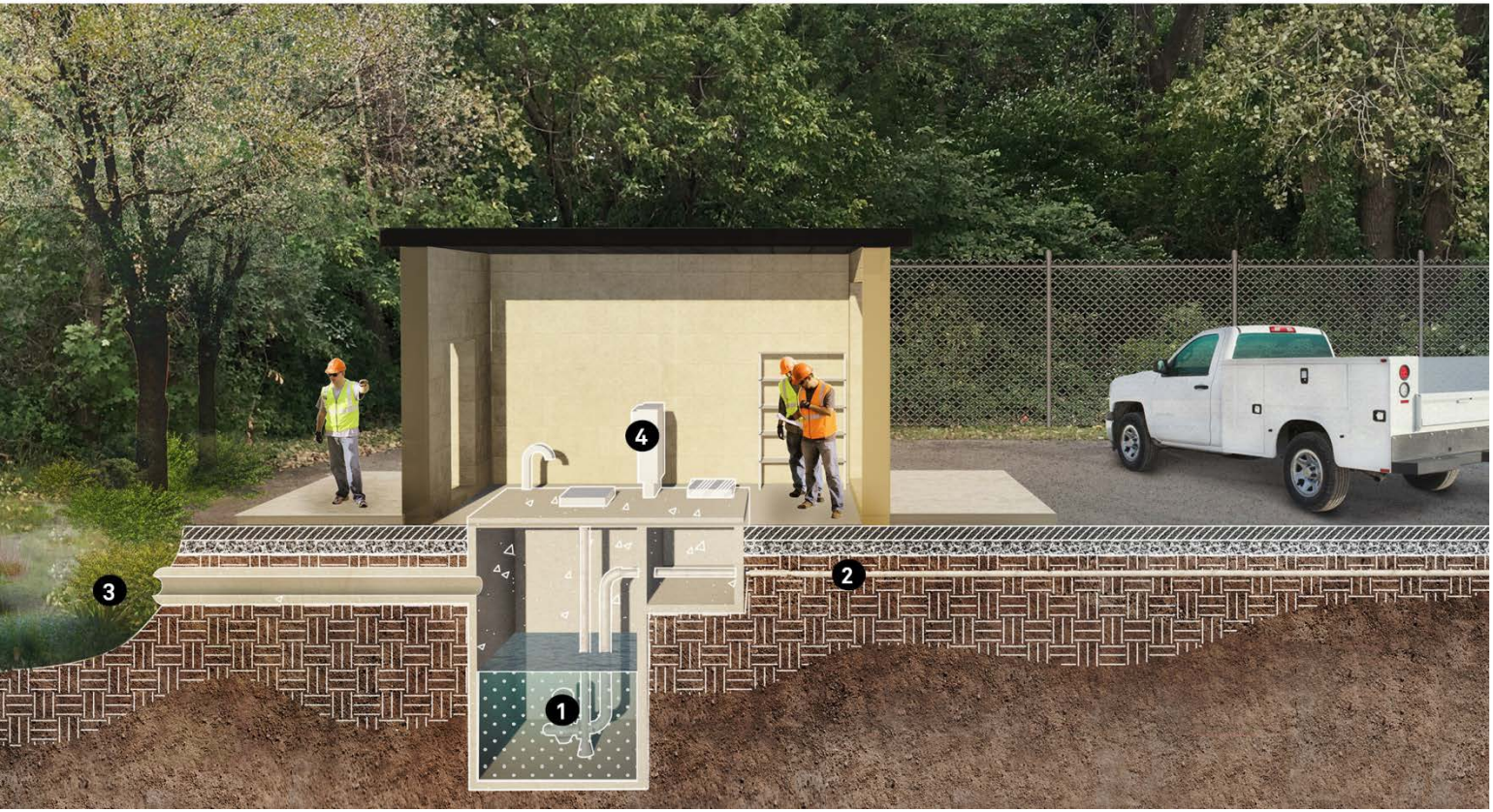
LOSEN SLOTE DRAINAGE IMPROVEMENTS

CULTIVATE & ENERGIZE

- 36” force main is located in the subsurface of the **public right-of-way**
- Green infrastructure benefits include **improved water quality**, new habitat, and **visual improvements**

LOSEN SLOTE DRAINAGE IMPROVEMENTS

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

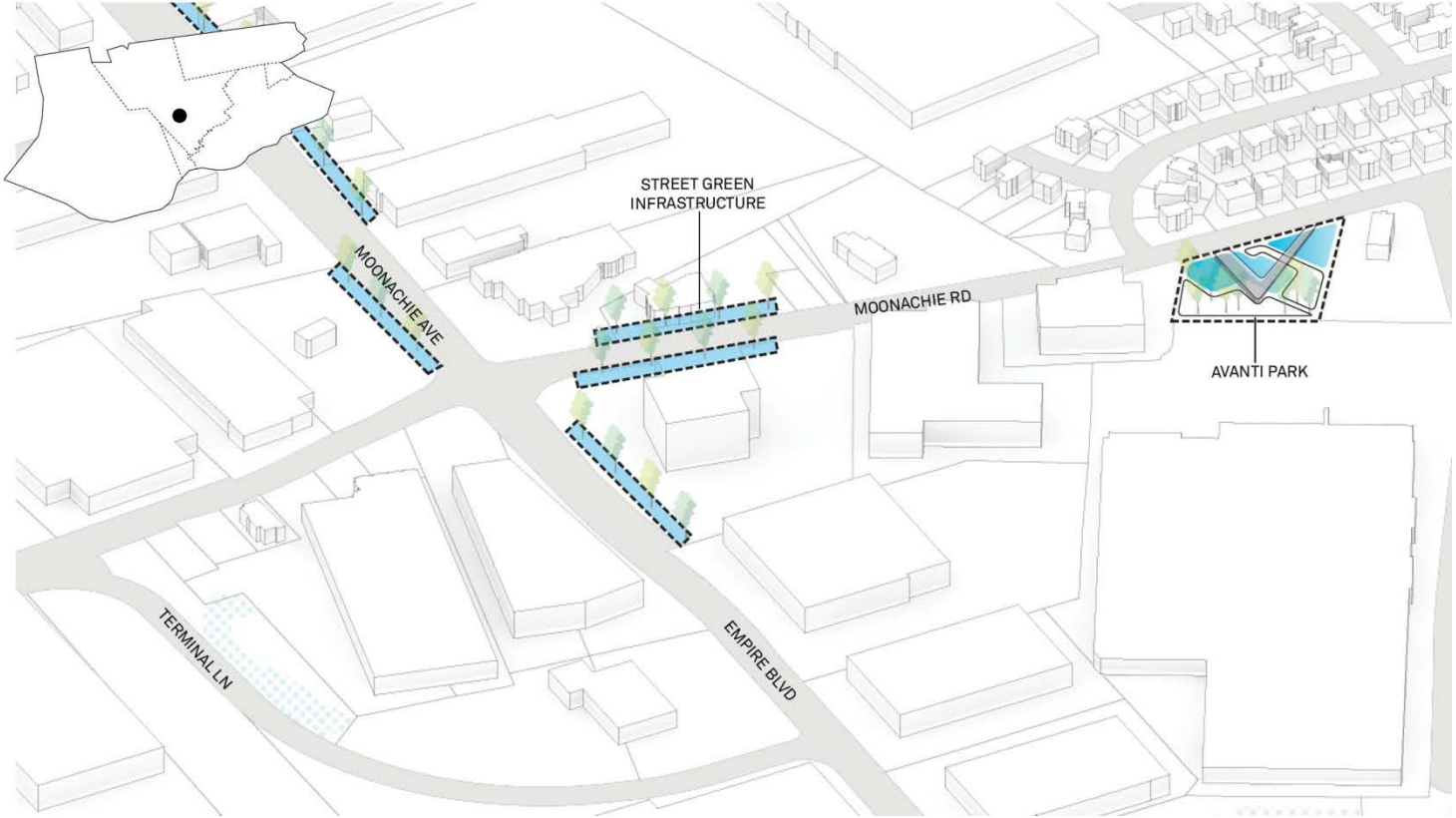


- A new pump station improves conveyance capacity by moving water from one location to another

1. Submersible pump
2. 36” force main
3. Losen Slote
4. Control panel

AVANTI PARK

PROTECT



- **Water is stored** in new open space and green infrastructure
- ~19,000 SF of **improved wetland** and ~11,000 SF of native planting and raingardens **capture total suspended solids**

AVANTI PARK

CULTIVATE & ENERGIZE

- Street green infrastructure **improves water quality**, creates new habitat, and **provides visual improvements**
- New park space also creates places for people to gather, **new habitat**, and space for **recreation**

AVANTI PARK

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

- 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

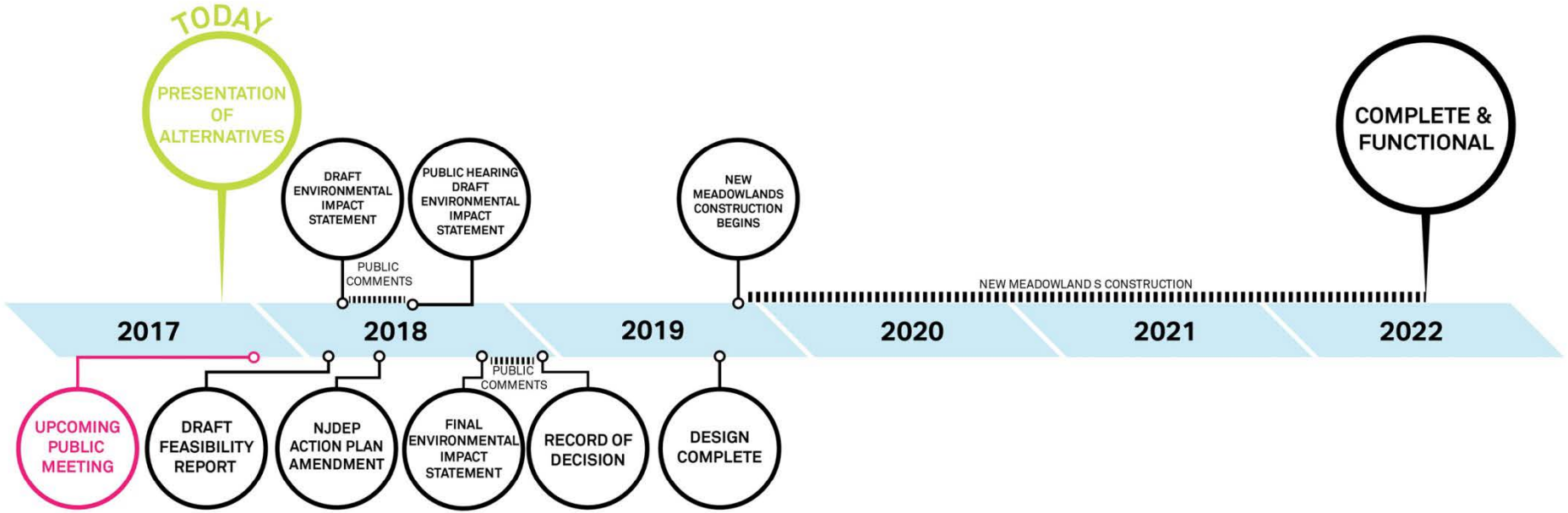
- Green infrastructure provides a holding space for street runoff that is slowly released back into the stormwater system
- Subsurface green infrastructure features provide storage and ability to infiltrate runoff to reduce peak flow reaching the existing strormwater system

1. Connection to storm system
2. Filter media
3. Native vegetation
4. Street Trees

NEXT STEPS

CHRISTOPHER BENOSKY, AECOM

UPCOMING SCHEDULE



NEXT STEPS

NJDEP / AECOM: UPCOMING ACTIVITIES

- Recommended Alternative **Public Meeting December 2017**
  - Alternative 1 – Storm Surge Flooding
  - Alternative 2 – Frequent Flood Reduction
  - Alternative 3 – Hybrid Alternative

- Draft Environmental Public Hearing in **Winter/Spring 2018**

NEXT STEPS

CAG: CALL TO ACTION

- Submit comments from CAG #11 meeting by **October 24, 2017**
- Share information from this meeting with friends and neighbors
- Continue to build interest in the Project
- Ensure the public knows about upcoming information (to be posted on Project website)

Critical Information

Project Website

www.rbd-meadowlands.nj.gov

Project Email

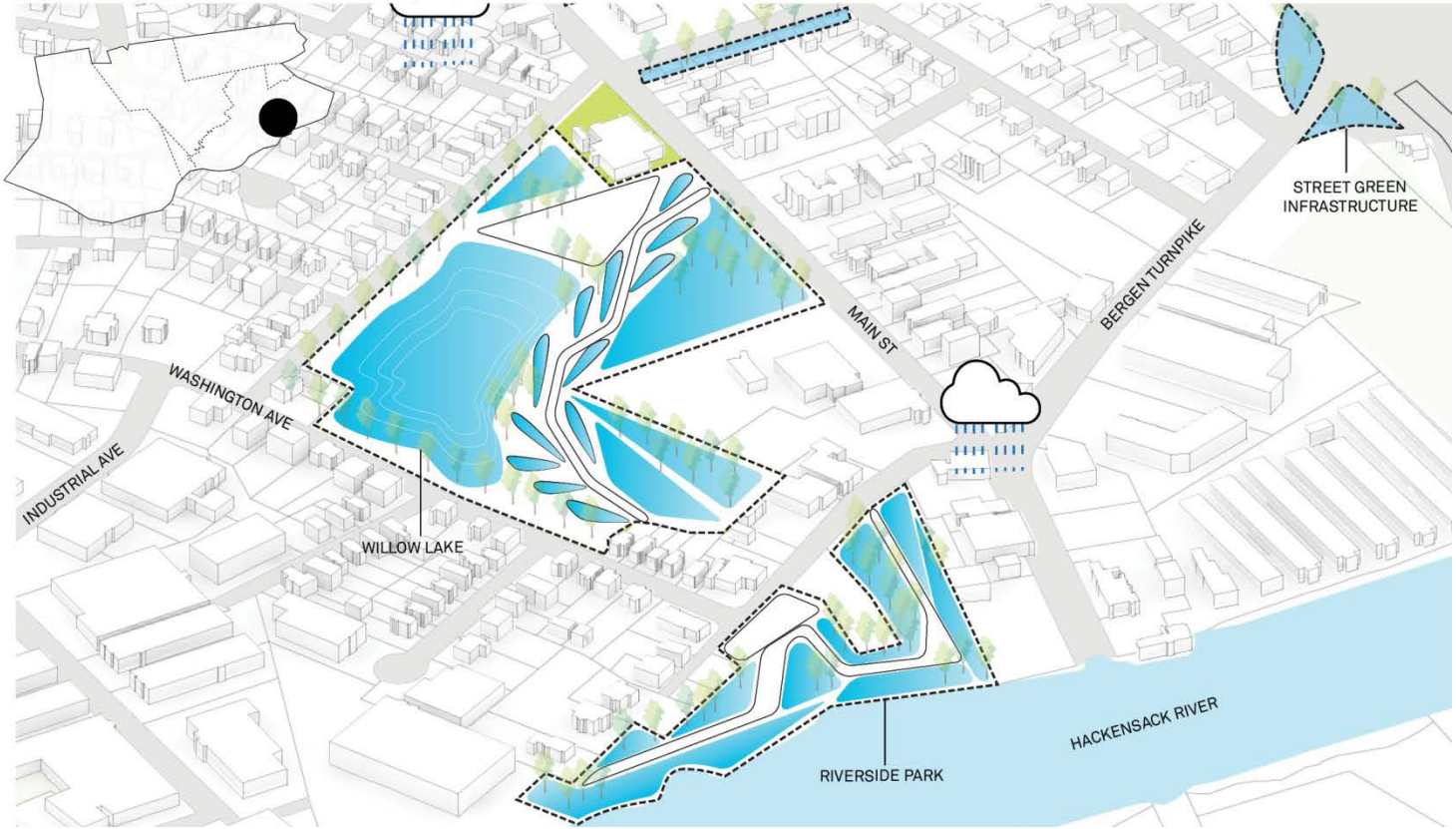
rbd-meadowlands@dep.nj.gov

Question & Answer

THANK YOU

WILLOW LAKE PARK

PROTECT



- 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

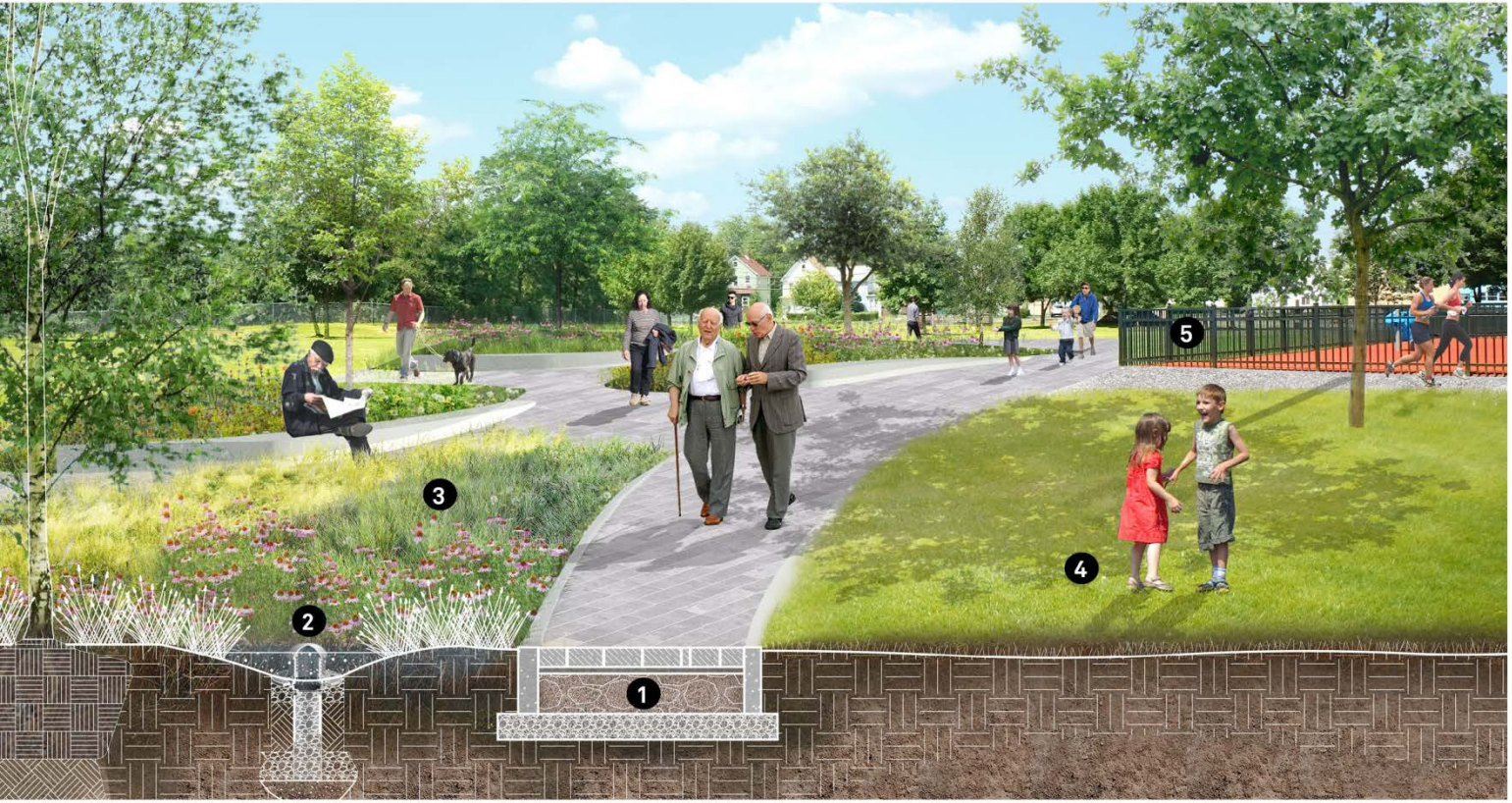
WILLOW LAKE & RIVERSIDE PARKS

CULTIVATE & ENERGIZE

- 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

CONCEPTUAL RENDERING FOR ILLUSTRATIVE PURPOSES

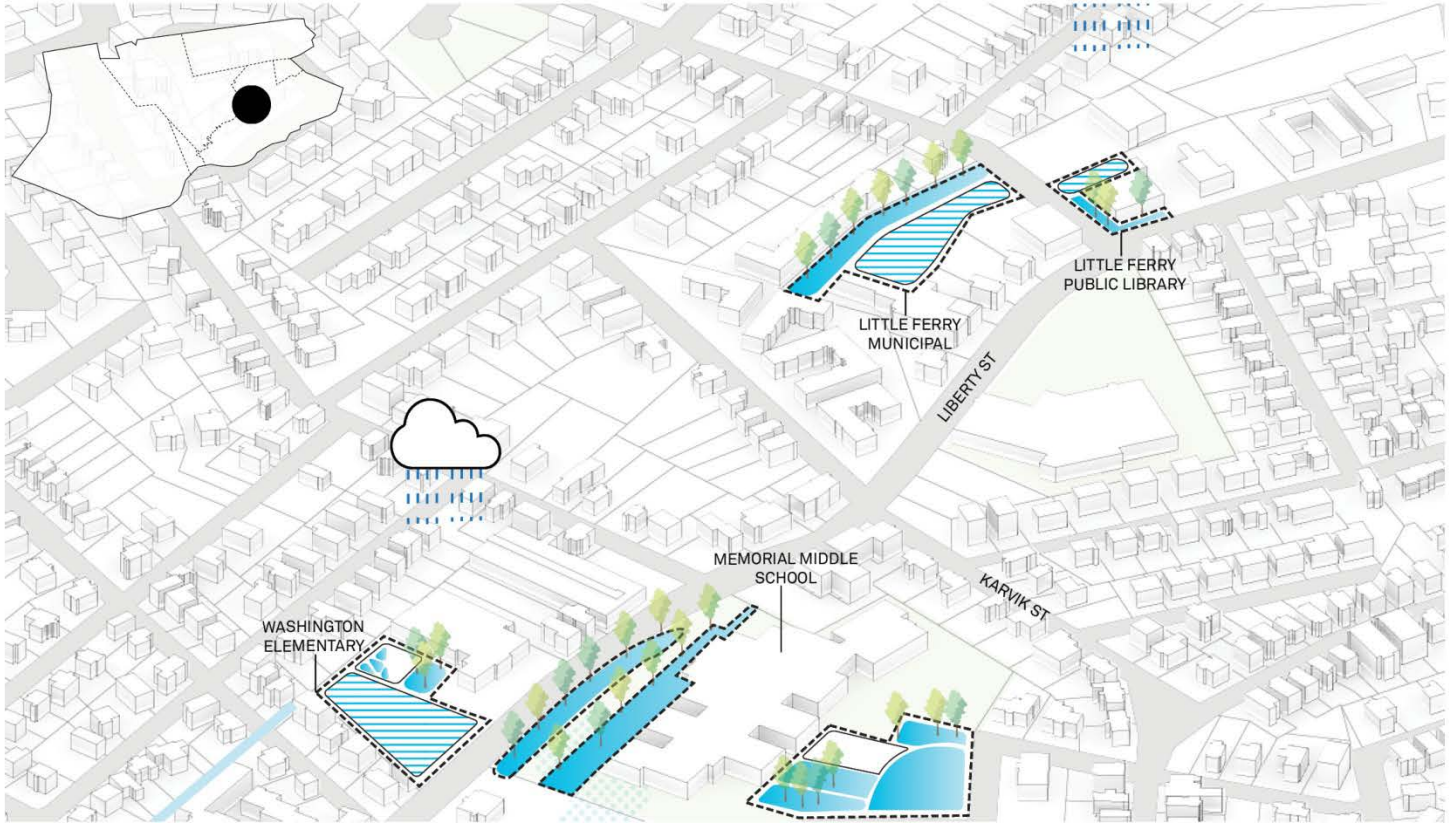


- Green infrastructure system would be sized to capture and treat 1.25 inches of rainfall in two hours
- Stone chimneys provided outlet for ponding water to reach stone storage
- Improvements to Willow Lake Park enhance water quality and user experience

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

MUNICIPAL BUILDINGS & SCHOOL LOCATIONS

PROTECT



- Multiple improvements are made to the 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

MUNICIPAL BUILDINGS & SCHOOL LOCATIONS

CULTIVATE & ENERGIZE

- 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 FOR ILLUSTRATIVE PURPOSES

- 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