RESILIENT NJ
NORTHEASTERN NEW JERSEY

SCENARIO DEVELOPMENT

JUNE 2022

This report includes options considered and does not represent the final recommendations.
For final recommendations, please see the Resilient NENJ Action Plan.

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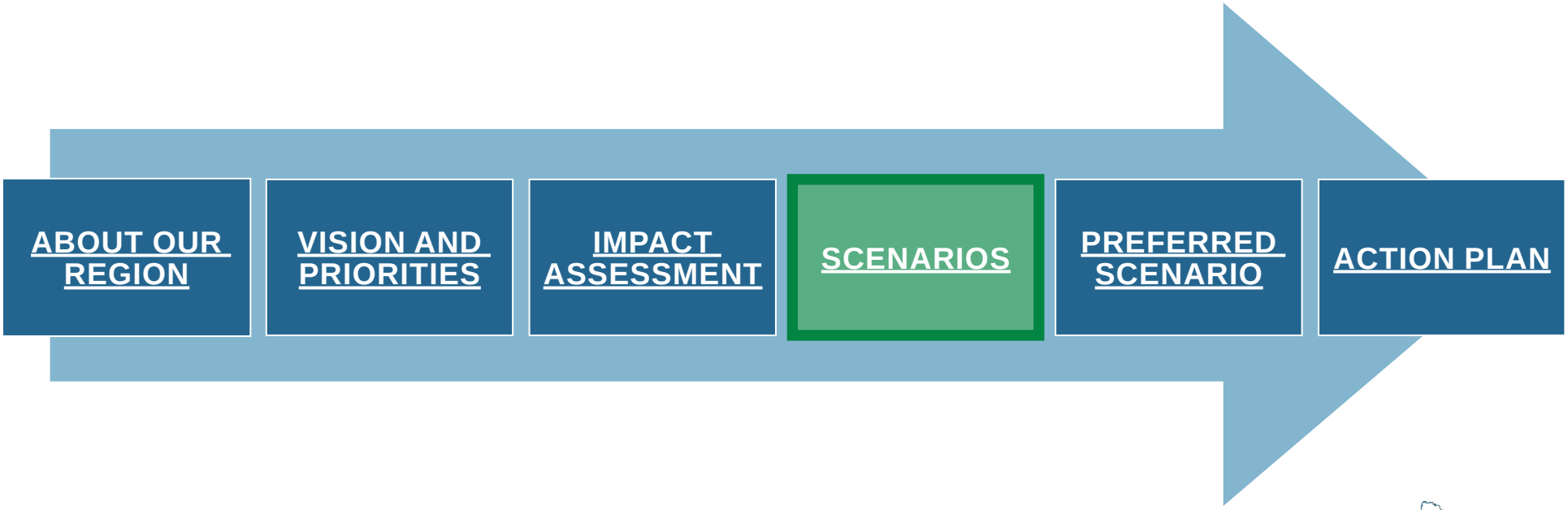
SHARE YOUR FEEDBACK

Resilient Northeastern NJ is always seeking your feedback to guide the program and ensure it is reflective of perspectives and priorities from across the region. Please continue to share your feedback on the program and get in touch with us through either of the options below:

- BY EMAIL: ResilientNENJ@gmail.com
- BY SOCIAL MEDIA: @ResilientNENJ on Twitter & Facebook, @resilient_nenj on Instagram

Please visit our website at www.resilient.nj.gov/nenj to learn more about the program and what we've done so far.



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RESILIENT NORTHEASTERN NEW JERSEY

RESILIENT NJ

NORTHEASTERN NEW JERSEY

SCENARIO DEVELOPMENT

JUNE 2022

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Thank you to the many community members, community-based organizations, agencies, and regional stakeholders that have contributed their time and expertise to the Resilient NJ process to date.

Resilient Northeastern New Jersey (Resilient NENJ) is developing a regional Action Plan to address current and future flood risks and improve quality of life in Jersey City, Newark, Hoboken, and Bayonne. The project is a partnership between the four cities, Hudson County, Ironbound Community Corporation, and HOPES CAP, Inc (the Region Team). Representatives from each organization participate on the Region team Steering Committee that leads the project. Resilient NENJ is part of the Resilient New Jersey program, administered by the New Jersey Department of Environmental Protection (NJDEP) and funded by the U.S. Department of Housing and Urban Development (HUD).

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ABOUT THIS REPORT

Resilient New Jersey (Resilient NJ) is a regional planning program that brings together resilience experts, local leaders, community organizations, residents, and regional infrastructure entities to discuss climate change and flood-related issues and develop effective solutions to reduce flood risk and build resilience. The program is administered by the New Jersey Department of Environmental Protection (NJDEP) and funded by the U.S. Department of Housing and Urban Development (HUD). The Resilient Northeastern New Jersey (Resilient NENJ) team addresses these goals in the region, which includes Jersey City, Newark, Hoboken, and Bayonne.

Resilient NENJ will develop actions to address current and future flooding that build toward long-term social, economic, and physical resilience. Resilient NENJ will also outline a pathway to implementation through an action plan. These actions will include a variety of different types of projects, scales of actions, partnerships, and coordination needs to ensure that the actions are carried out. Although Resilient NENJ began with a focus on flood hazard, the program has been expanded in response to community feedback to include other climate hazards.

This Scenario Development report, presents possible scenarios, or suites of actions, that are being evaluated for inclusion in the Action Plan to determine the future shape of Northeastern NJ communities. As described in this report, the scenarios were developed in collaboration with local leaders, community members, state agencies, and other infrastructure and regional entities. They are intended to represent all actions that are on the table to address flooding and other climate hazards. The scenarios are not necessarily alternatives and separate actions by scale and complexity of implementation into Individual Initiative, Shared Responsibility, and Regional Coordination scenarios. Developing these scenarios is one step in the process of creating an Action Plan, and community feedback and technical evaluations are continuously integrated. A preferred scenario, also referred to as the Draft Action Plan, will also incorporate the Flood Impact Assessment and Climate Hazards Assessment.

The report summarizes the following:

- Goals that the actions are trying to achieve
- The process that was followed to identify possible actions to address flooding and other climate hazards, and the approach taken to divide actions into three scenarios, or suites of actions
- Actions included in the three scenarios:
  - Discussion of actions at the regional level, calling out key features of each scenario and how actions could change communities
  - Summaries of actions at the study area level to see what types of projects could take place in different neighborhoods

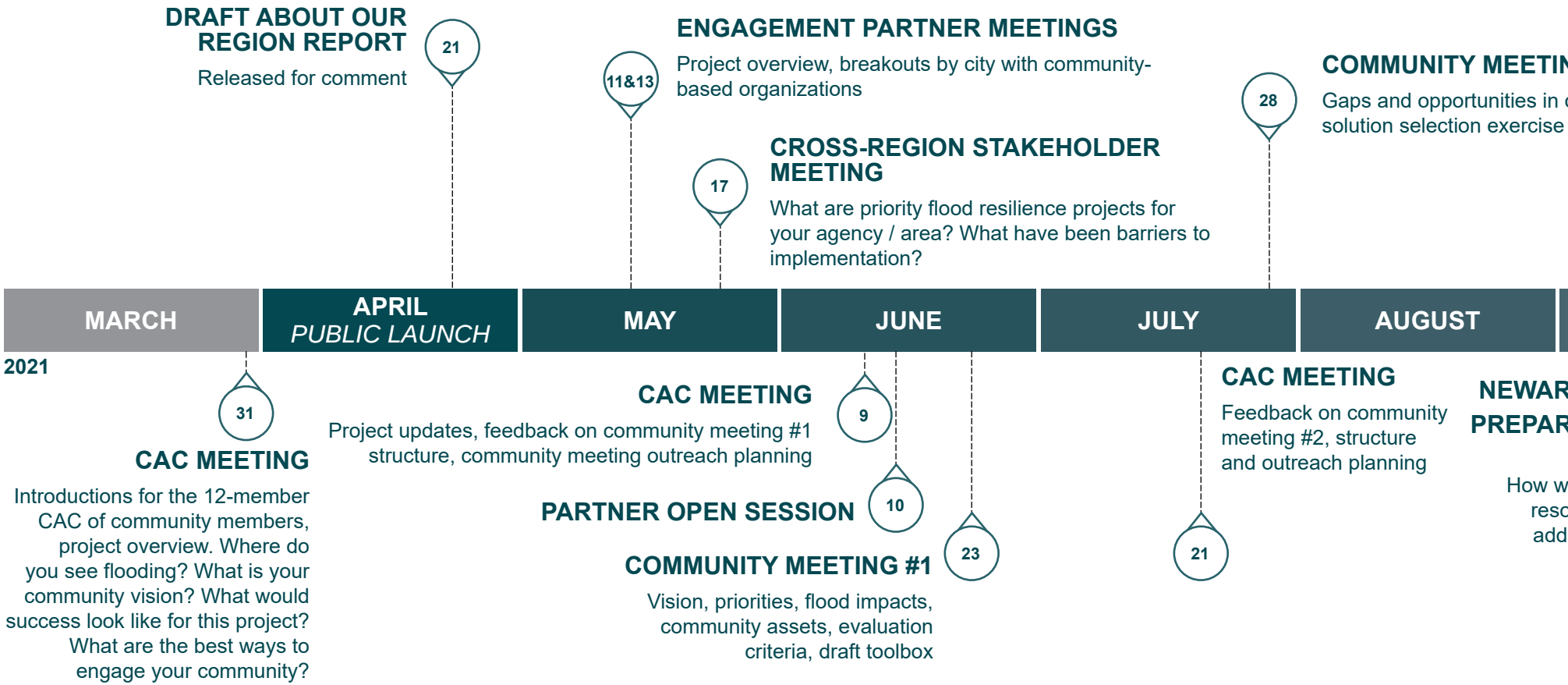
This report does not dive into the details of feasibility of solutions, estimates of risk reduction, or cost estimates. These considerations are evaluated only at a high level in this report, and detailed assessments will be included in the Action Plan.

ENGAGEMENT TO DATE

How are we listening and using what we hear?

Engagement is a critical part of the Action Plan development and has been stru
the scenario development process. The engagement process was organized ir
(CAC) and community meetings (approximately quarterly).

Resilient NENJ has been striving to engage diverse groups of people and to lis
to in the past. As a result, some project materials have been translated into 10



OTHER ENGAGEMENT NOT INCLUDED ABOVE

Vision and Priorities Survey, Irys App, Community Meetings

What do you love about your community, what do you want to see change, how has flooding impacted you, what are the most important factors to consider when choosing between alternatives?

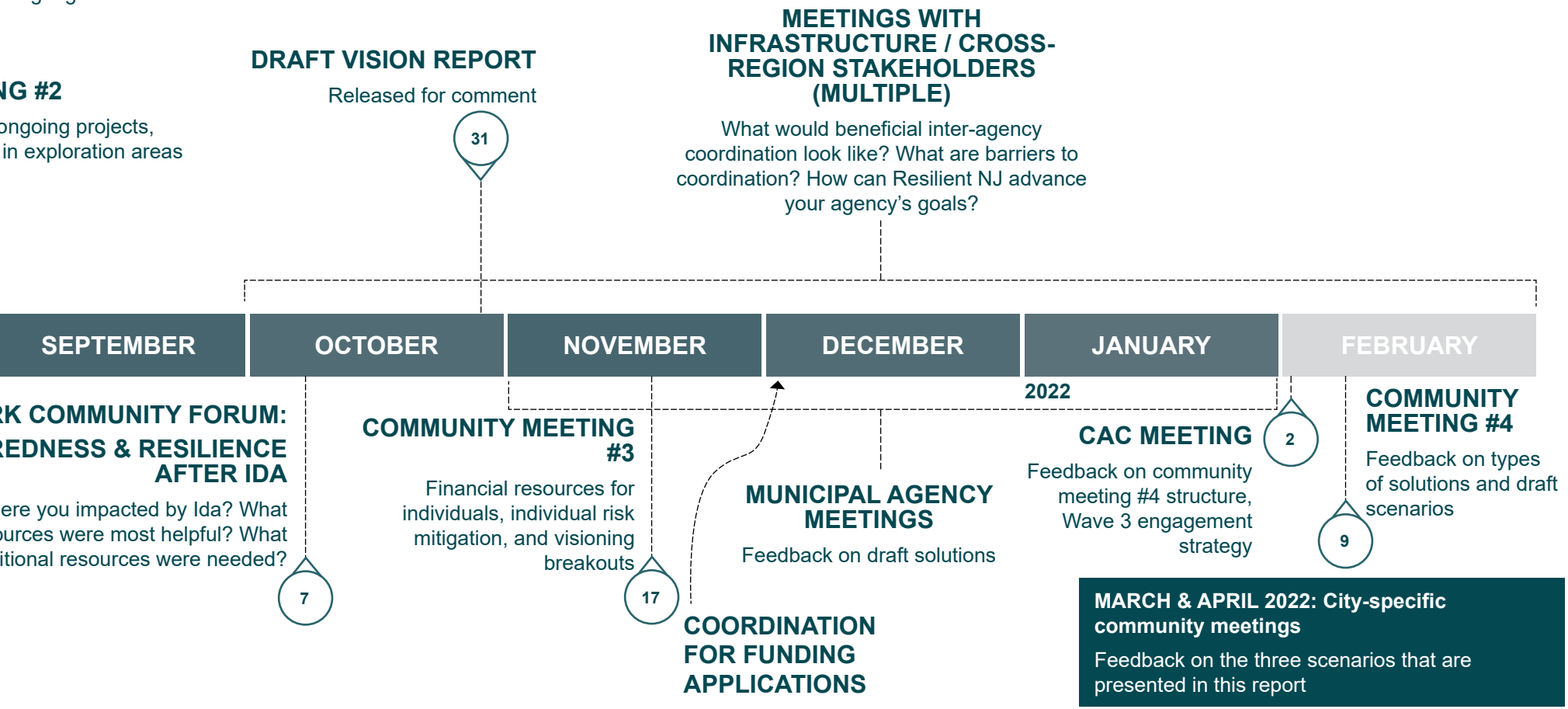
Partner Survey

Survey for community-based organizations. We asked: How can we magnify engagement by partnering with you? How can this project help further your mission?

uctured to gather input that directly feeds into
n waves with Community Advisory Council

sten to voices that may have not been listened
languages.

The three scenarios described in this report were presented at Community Meeting #4 in February and at city-specific meetings in March and April of 2022. Feedback from these meetings and technical evaluations are being used to craft the Draft Action Plan. Community Meeting #5 in June and other outreach (youth engagement, partner engagement) will gather additional input to guide the Draft Action Plan.



Interviews and meetings with members of the Region Team / Steering Committee and other stakeholders

What should this project accomplish? What are priorities related to flooding for your area?

Feedback on related initiatives

We reviewed other reports (that are referenced in the About Our Region report) to incorporate relevant feedback

In-person engagement at local events like festivals and street fairs

Other input received through email, voicemail, social media, and other channels

We have received additional inquiries and feedback through these channels

VISION AND GOALS

All scenarios must meet these

COMMUNITY VISION

The first wave of the Resilient NENJ program was focused on creating a shared visio
resilience. Engagement questions centered around what community members love a
see change in the future, with respect to flooding and in general. The Vision and Prior
what was heard. This page provides an overview of the vision, broken down by pillars
advanced through different types of solutions.

VISION *BY PILLAR OF RESILIENCE*

SOCIAL

1. Keep communities intact and prevent gentrification
2. Protect human life and reduce impacts of flooding on daily life
3. Preserve and enhance the waterfront, open space, recreation, and access

INSTITUTIONAL / GOVERNANCE

1. Improve transparency and communication between community members and government related to flooding and flood resilience

ENV

1. Address iss urban heat
2. Protect and and green /

*Goals that cut across solution types are marked with asterisks

GOALS *BY SOLUTION TYPE*

OUTREACH, EDUCATION, AND CAPACITY BUILDING

1. Expand leadership capacity and coordination
2. Increase community preparedness and awareness
3. Improve outreach to all populations
4. Leverage resident expertise

POLICY AND GOVERNANCE

1. Incorporate resilience in new development
2. Increase small scale GI*
3. Integrate stormwater management in open space*
4. Incorporate resilience into contaminated sites
5. Reduce risk from contaminated sites
6. Increase coordination on infrastructure investments

SER PR DEVE

1. Increase s
2. Create res
3. Waste red

n for the future and establishing priorities for
bout their community now and what they want to
rities report, released in October 2021, describes
, and shows how elements of the vision can be

Flood risk reduction goals that cut across pillars:

1. Act quickly to address current flood conditions due to the urgency of the problem
2. Address risk from all flood-related hazards (e.g., rainfall and coastal flooding)
3. Ensure solutions consider climate change impacts
4. Ensure solutions protect the most vulnerable populations
5. Ensure solutions are effective in the long run

VIRONMENT

sues of air quality and
island effect

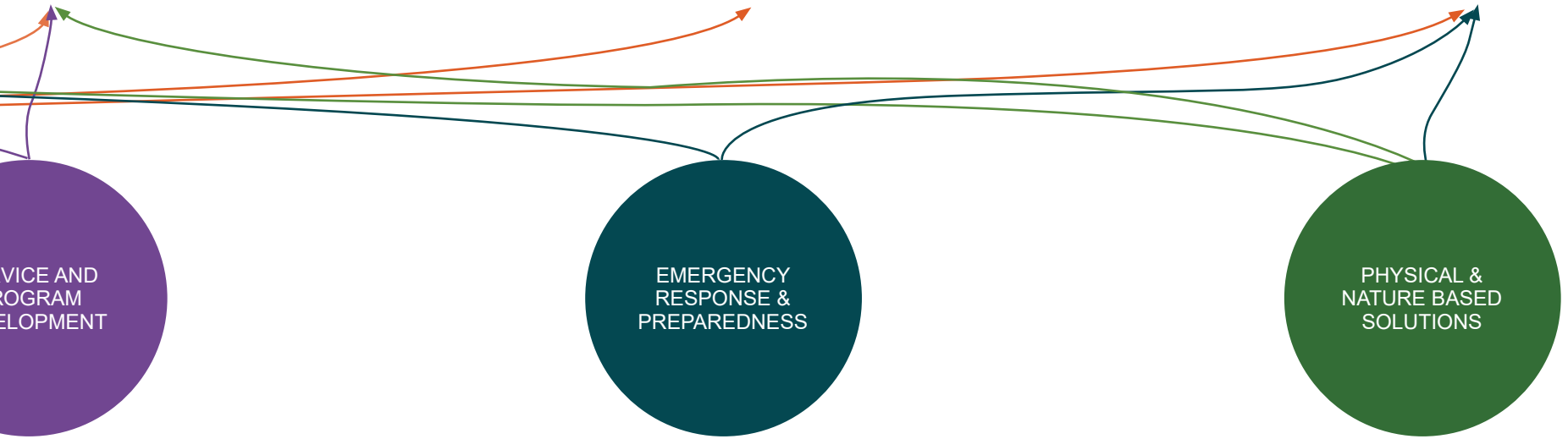
l increase tree canopy
/ open space

ECONOMIC

1. Reduce economic burdens to residents
2. Create new jobs, including higher quality and green jobs, and provide training to prepare residents for those jobs

PHYSICAL

1. Reduce flood impacts to power and transportation systems
2. Creatively use vacant lots or buildings
3. Limit disruption through a dig-once approach



small scale GI*
silience hubs
uction

1. Improve preparedness through warning systems
2. Improve sheltering and evacuation
3. Improve response during flood events
4. Advance real-time understanding of flood conditions
5. Improve emergency response of the private sector
6. Improve financial assistance systems for recovery

1. Address risks from coastal storms and tidal flooding
2. Address risks of flooding from frequent rainfall
3. Address risks associated with major rainfall events and combined sewer overflows (CSOs)
4. Leverage improvements to meet other needs and address additional climate related hazards

SCENARIO DEVELOPMENT PROCESS

Resilient NENJ used community and stakeholder feedback, evaluations of risk context and research on ongoing projects and infrastructure to develop three scenarios consisting of a range of types of actions.

Through the spring, fall, and summer of 2021, Resilient NENJ worked with stakeholders to understand the region's vision and priorities, develop Scenario 0 (described below), develop a solutions toolbox (see draft in Vision Report), and better understand risk and how flooding affects the people who live, work, and play in the region. In December 2021, new flood models enabled a deeper understanding of potential risk and how different solutions would help address this risk.

To develop scenarios, Resilient NENJ investigated a wide range of possible solutions from the toolbox (see Vision Report) and then refined or eliminated solutions through deeper evaluations and engagement. Due to the large geographic scale, the team divided the region into 13 study areas, described on the next page.

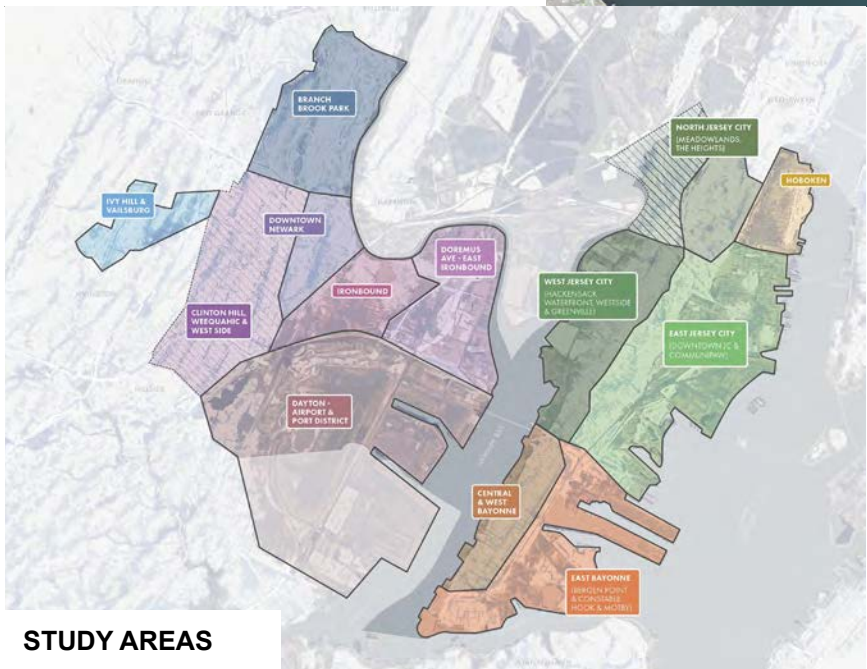
Initial feedback on these scenarios was gathered from community members in city-focused community meetings in March and April. The Resilient NENJ team will continue to collect feedback on the scenarios and conduct further engagement to guide development of the Action Plan, expected to be released in 2022. Evaluation criteria and findings of the Flood Impact Assessment (No Action Scenario) will also help chart a path toward the Action Plan.

SCENARIO 0

Resilient NENJ is not operating in a vacuum. An understanding of where projects are already being completed is important to understand where risk is already being reduced, where gaps remain, and to highlight exemplary projects that can be replicated in other parts of the region. Scenario 0 is an inventory of recently completed, ongoing, and planned resilience-related projects in the region. The Planning Context Task (Task 1) and conversations with Steering Committee members and stakeholders helped develop the initial draft Scenario 0. It has been updated continuously throughout the project to reflect changes in status. Some of the projects that are in earlier stages of project completion (e.g., conceptual projects or projects that have not been advanced due to barriers) are included in the three scenarios as recommended actions.

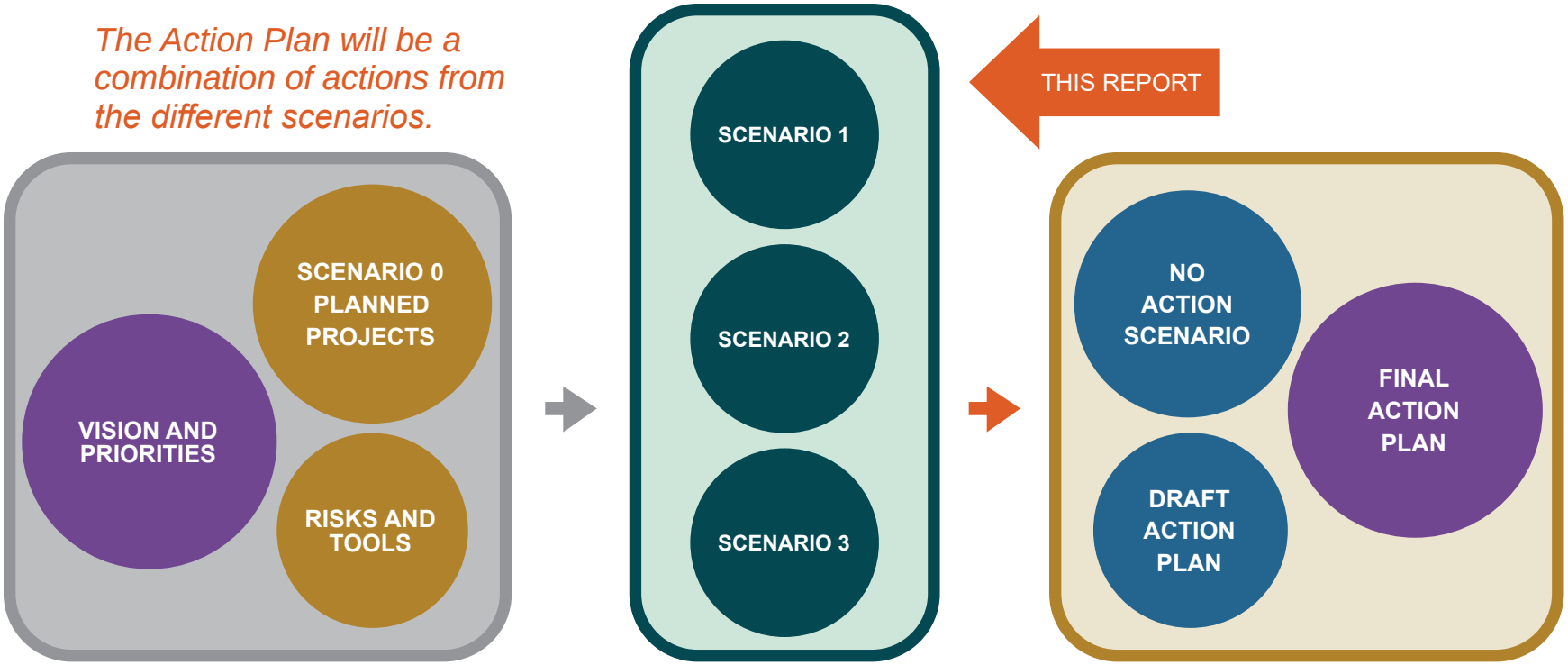
SCENARIO 0 PROJECTS

SCENARIO 0 REDEVELOPMENT AREAS



STUDY AREAS

The Action Plan will be a combination of actions from the different scenarios.



STUDY AREAS

Using study areas helped the team compile preliminary information of flood risk, identify key assets, and evaluate Scenario 0 projects in different areas to understand potential gaps and opportunities. The region team met with municipal stakeholders to discuss the possible solutions, identify potential barriers to implementation, and identify other stakeholders for engagement. After initial solution refinement at the study area level, the team mapped solutions at the regional scale to look for gaps and connections and organized them into three scenarios.

SOLUTION TYPES

Physical solutions include green infrastructure (GI), drainage solutions, and coastal solutions. Non-physical solutions include outreach, education, and capacity building, service and program development, policy and governance, and emergency response and preparedness.

ADDITIONAL CLIMATE HAZARDS

In response to feedback, Resilient NENJ has expanded to include other climate hazards beyond flooding, such as heat, air quality, and groundwater rise. A separate Climate Hazards Assessment will be released to provide information on how hazards would affect this region. This report incorporates solutions for other climate hazards at the regional level.

SCENARIO FRAMEWORK

To advance the final goal of developing an implementable regional Action Plan, Resilient NENJ has grouped the three scenarios by implementation pathway and level of complexity of coordination: Individual Initiative, Shared Responsibility, and Regional Coordination. Organizing the scenarios based on these factors helps to root the scenario development process in implementation and to consider different pathways for implementing the same action. This framework also responds to uncertainties expressed by stakeholders about how plans and designs will come to life, how long they will take, the right scale for advancing changes, and who will need to be involved, as well as who has existing authority to execute decisions.

PDF visuals of physical scenarios are available at this link, or by QR code, under Documents > Meeting-in-a-box Wave 3

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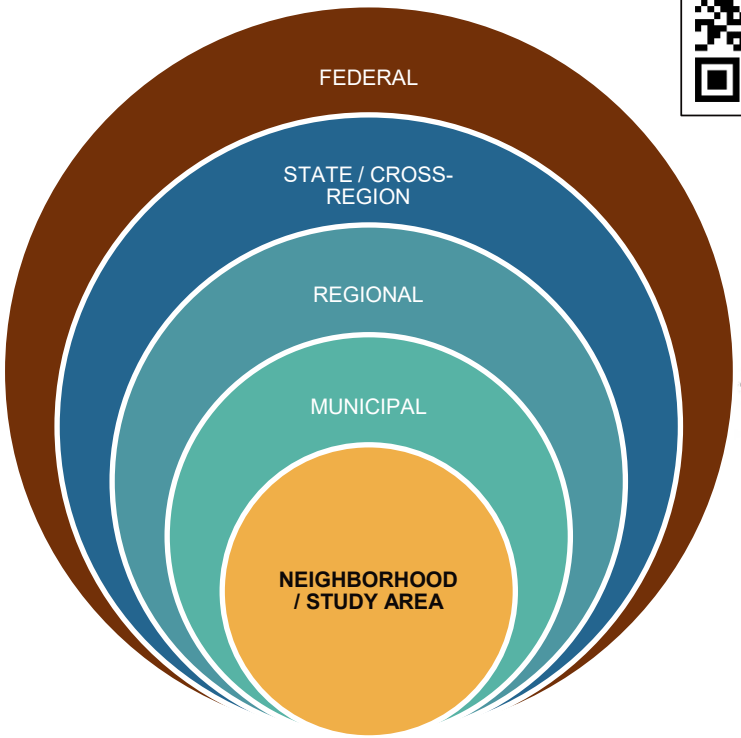
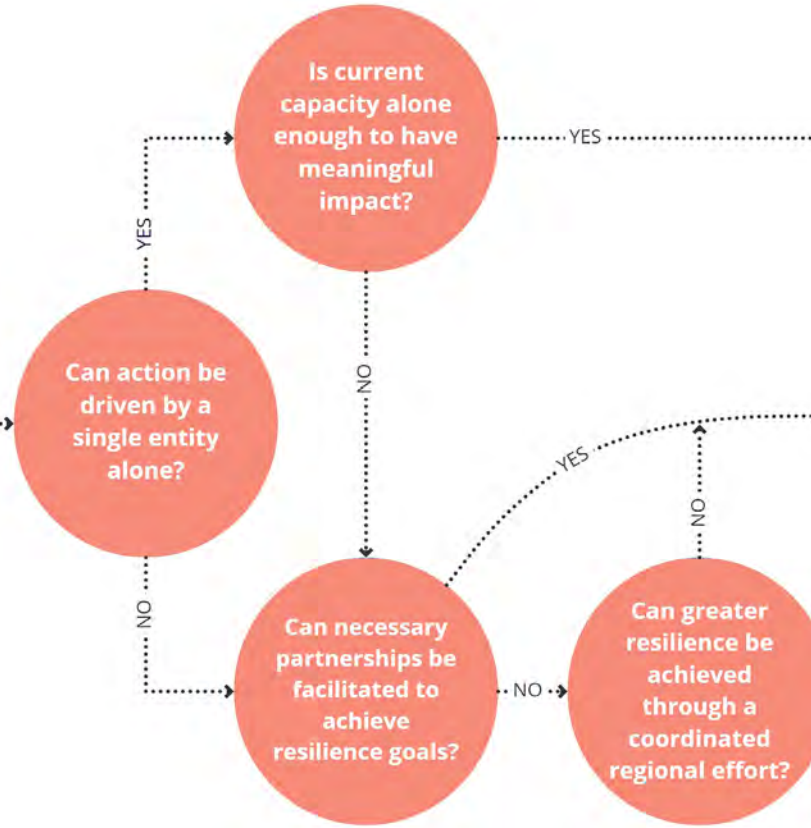


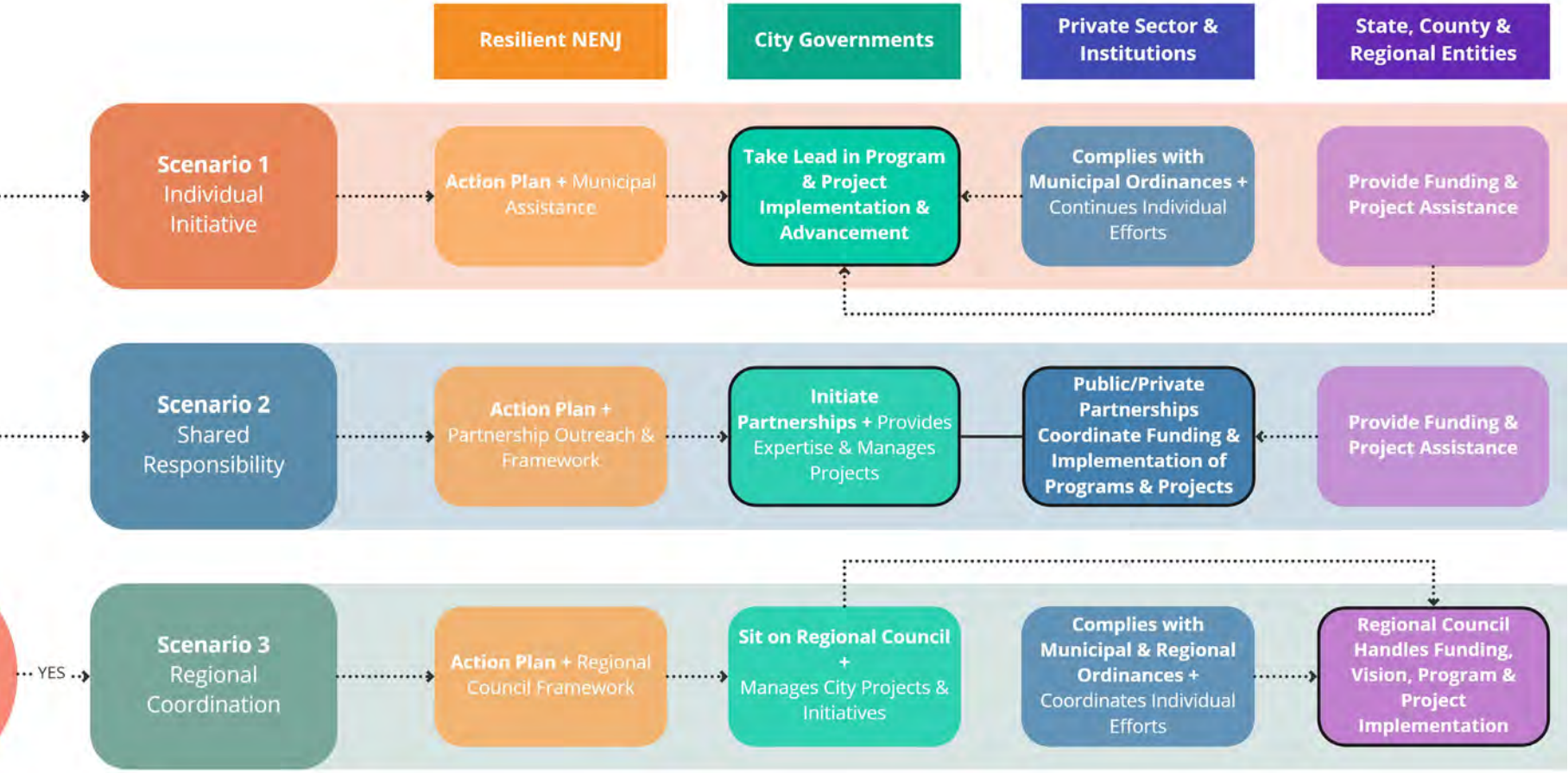
Solution scales

KEY QUESTIONS



Every scenario must meet the goals of the Resilient NJ program, the vision and goals of the region, and the threshold evaluation criteria articulated in the Vision Report (see definition of threshold criteria on page 13). While each scenario will meet these requirements, the scenarios are not alternatives. The region is not likely to pick one scenario to advance; the final preferred scenario will be an amalgam of actions from within each scenario. Actions are also not mutually exclusive, The final approach might have solutions that evolve and progress through all three scenarios or co-exist.

Pages 13 to 14 provide additional information about the three scenarios and how they compare. The Three Regional Scenarios section provides overviews of the three scenarios. Each scenario groups actions into the different solution types: physical solutions (and the subcategories of drainage, GI, and coastal) and non-physical solutions (and the subcategories of Outreach, Education, & Capacity Building, Policy & Governance, Service & Program Development, and Emergency Response & Preparedness). Non-physical solutions include those that are specifically designed to address flooding as well as those that address other climate-related hazards.



Examples of how responsibilities might play out with the city governments as lead agency on an initiative.

DIFFERENT APPROACHES TO RESILIENCE

These pages provide summaries of the three scenarios and how they compare using evaluation criteria. The Resilient NENJ team drafted evaluation criteria using guidance from NJDEP and initial input from the Steering Committee and early interviews. Community feedback about priorities gathered through community meetings, surveys, and other outreach provided further refinement.

The categories for evaluation criteria include the following:

- Design Life / Adaptability
- Cost / Feasibility
- Risk Reduction
- Environment
- Community / Health
- Partnership / Education

In each of these categories, **threshold criteria** are standards a scenario must accomplish or meet. Every solution or scenario we propose will meet these criteria.

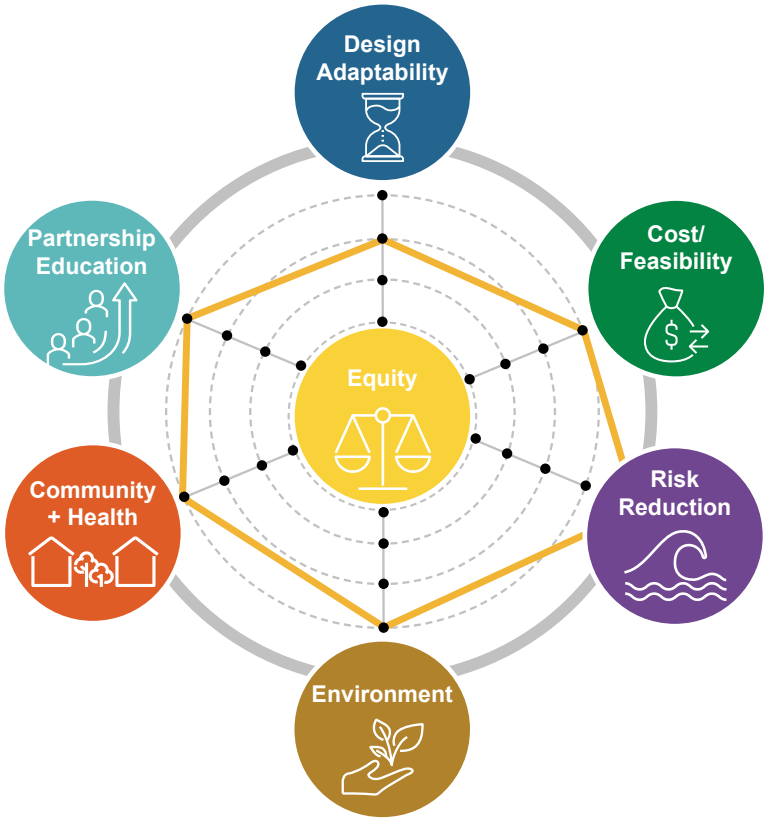
Alternatives evaluation criteria are the factors we will use to compare or weigh alternative actions against each other. A threshold criterion may also have an alternatives evaluation criterion dimension.

The final list of evaluation criteria is provided in the Vision and Priorities report.

SCENARIO 1:

INDIVIDUAL INITIATIVE

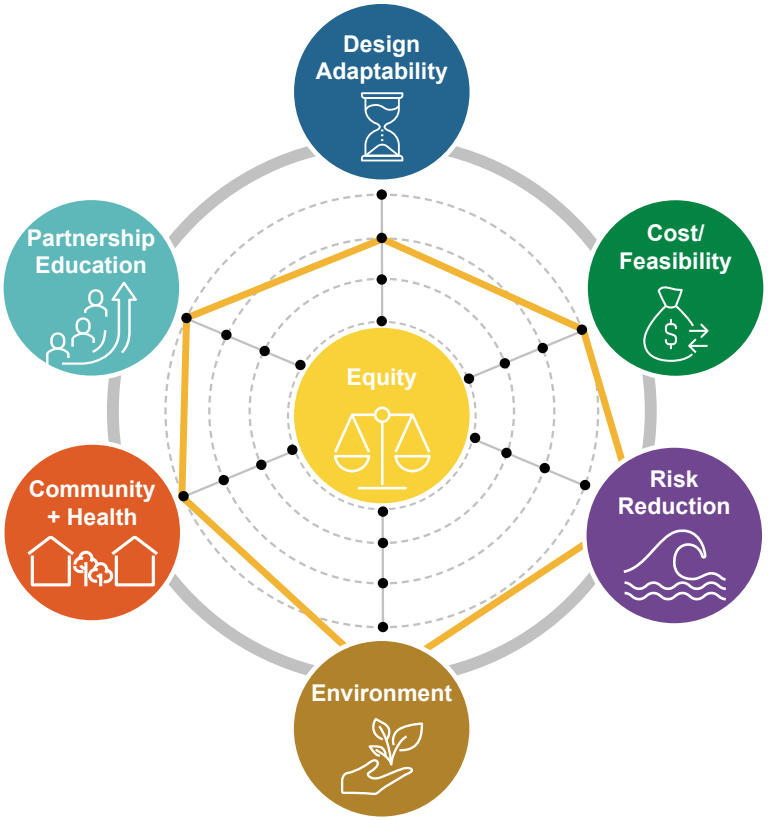
Scenario 1 increases resilience through actions that can be driven at the municipal level or by agencies or stakeholders through existing implementation pathways. Funding would still come through typical funding pathways, such as federal or state grant or loan programs, and state and regional agencies would continue to provide technical assistance and support. Actions that are already being taken with an ad hoc approach, such as elevation or hardening of individual properties by owners, would also continue as the status quo.



SCENARIO 2:

SHARED RESPONSIBILITY

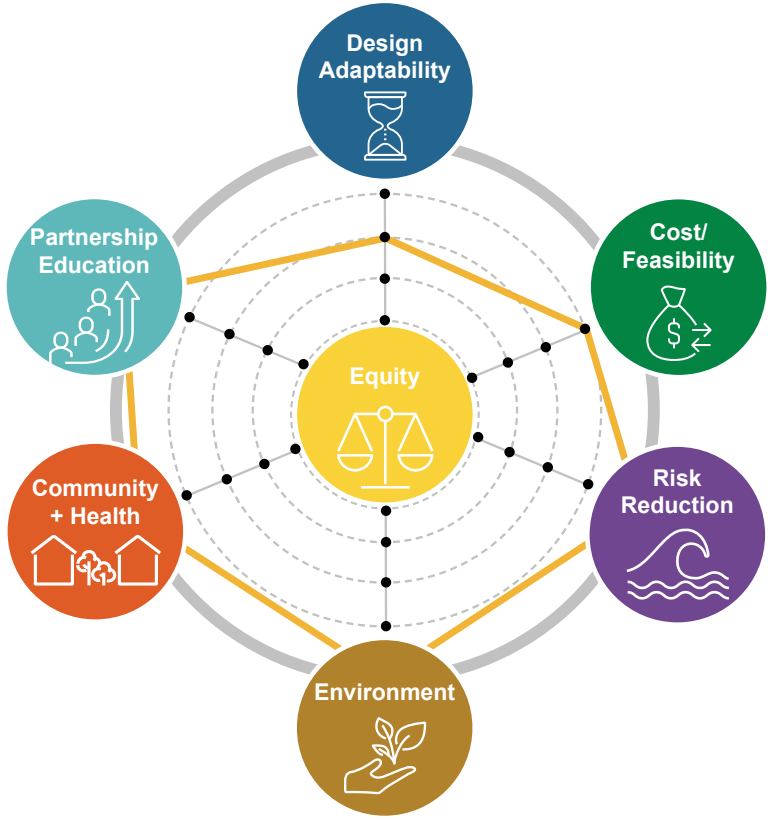
Scenario 2 includes solutions that must be implemented through partnerships, such as those between municipalities, community-based organizations, private institutions, developers, and others. Increased partnerships and coordination would allow for implementation of physical solutions beyond publicly owned parcels, which would improve effectiveness and associated benefits. Solutions in Scenario 2 also include policy measures that incentivize or require increased responsibility from individual property owners.



SCENARIO 3:

REGIONAL COORDINATION

Scenario 3 includes actions that can increase capacity for regional coordination and actions that would be implemented at a regional scale through this enhanced coordination structure. By implementing solutions at a regional scale versus locally, resources can be pooled and leveraged to target priority areas and achieve even larger benefits. Scenario 3 promotes regional interconnectivity of people, ecologies, and economies.



THREE REGIONAL SCENARIOS

This section presents overviews of the three scenarios at a regional scale, including highlights of physical solutions (divided into coastal, drainage, and green infrastructure solutions) and non-physical solutions (divided into outreach / education / capacity building, policy & governance, new programs and services, and emergency response and preparedness).

Scenario 1: Individual Initiative

Scenario 2: Shared Responsibility

Scenario 3: Regional Coordination

SCENARIO 1: Individual Initiative

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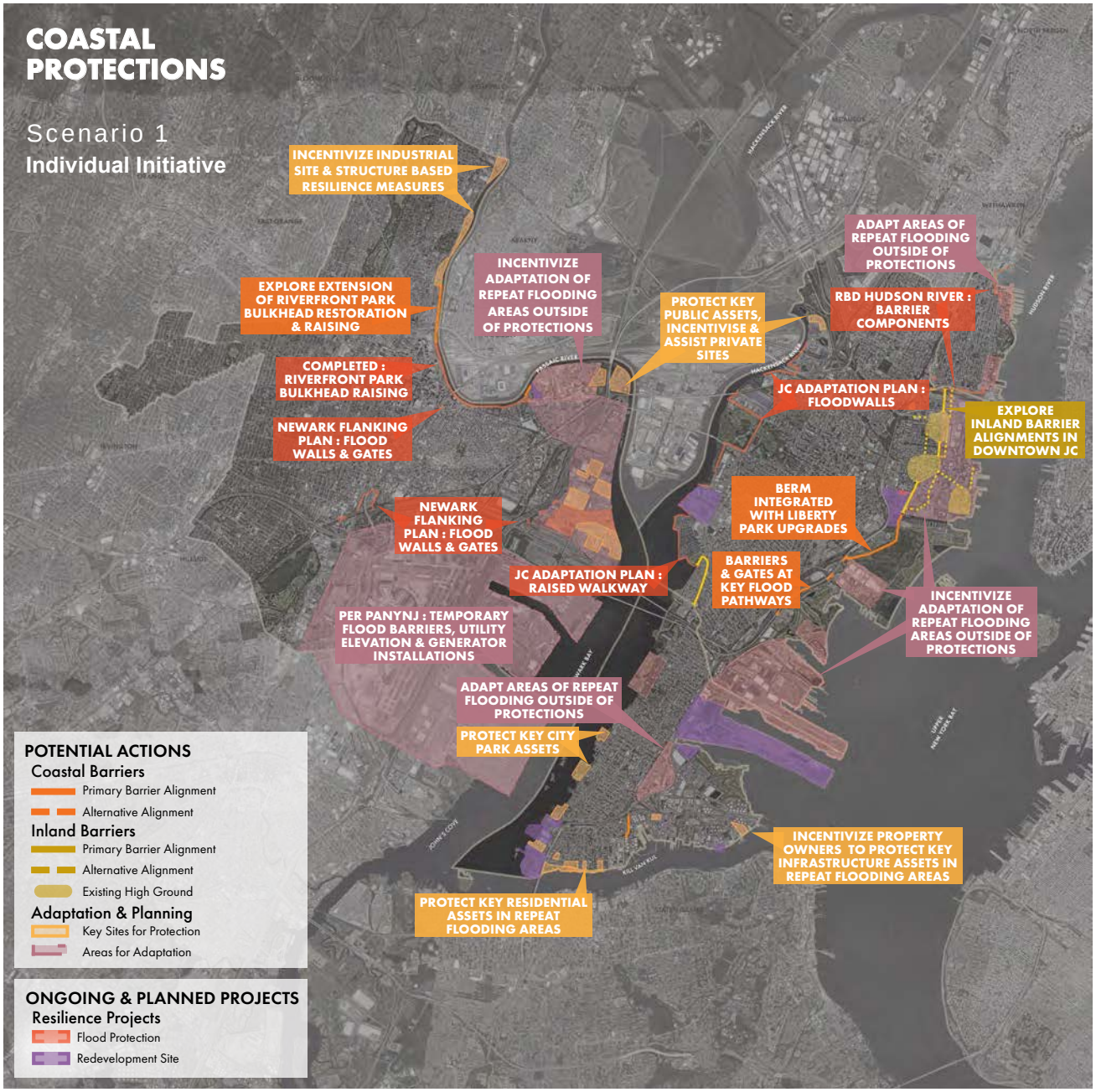
PHYSICAL SOLUTIONS: COASTAL | Scenario 1

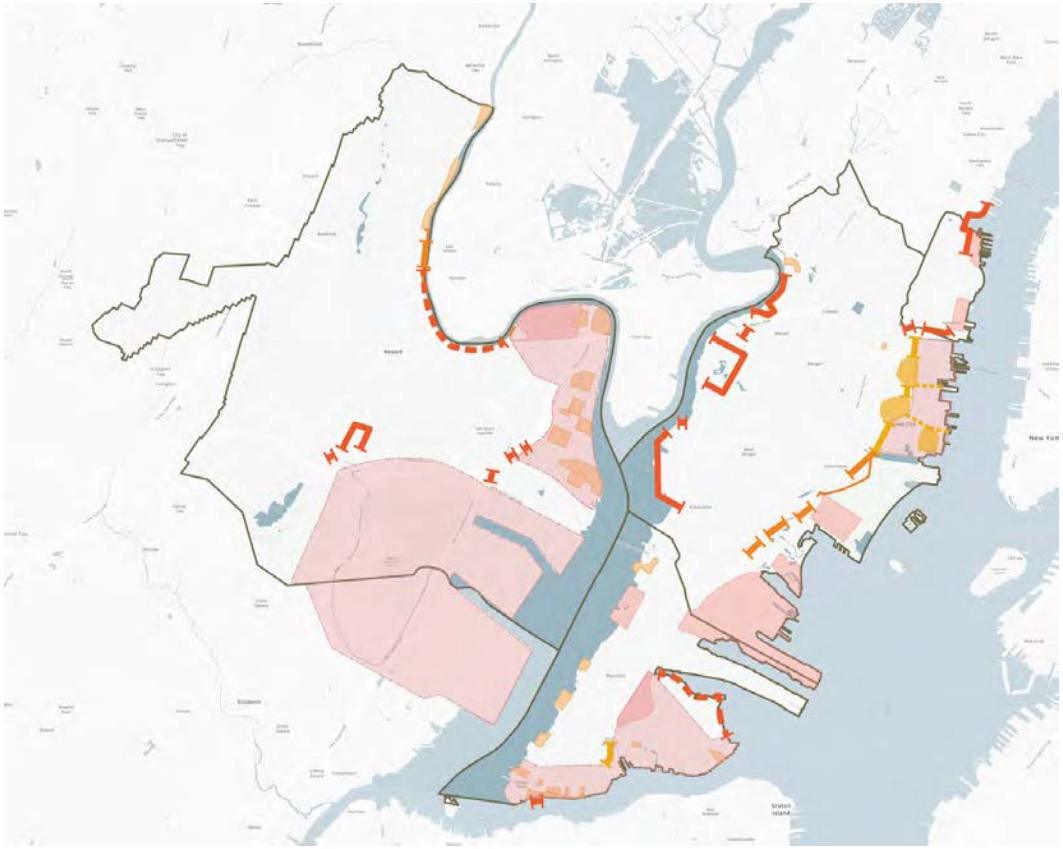


KEY FEATURES OF SCENARIO 1: COASTAL SOLUTIONS

- Existing planned coastal defenses are implemented
- Gaps in coastal protections are addressed with targeted actions
- Key city-owned sites and assets are adapted
- Cities explore street raising and inland barrier options
- Areas outside of protections are incentivized to adapt

COASTAL OBJECTIVES

Close gaps in infrastructure and topography using strategies, such as inland barrier alignments with adaptation measures applied to areas left outside protections.



EXAMPLE CHANGES

INDIVIDUAL SITE PROTECTIONS
Reading, United Kingdom

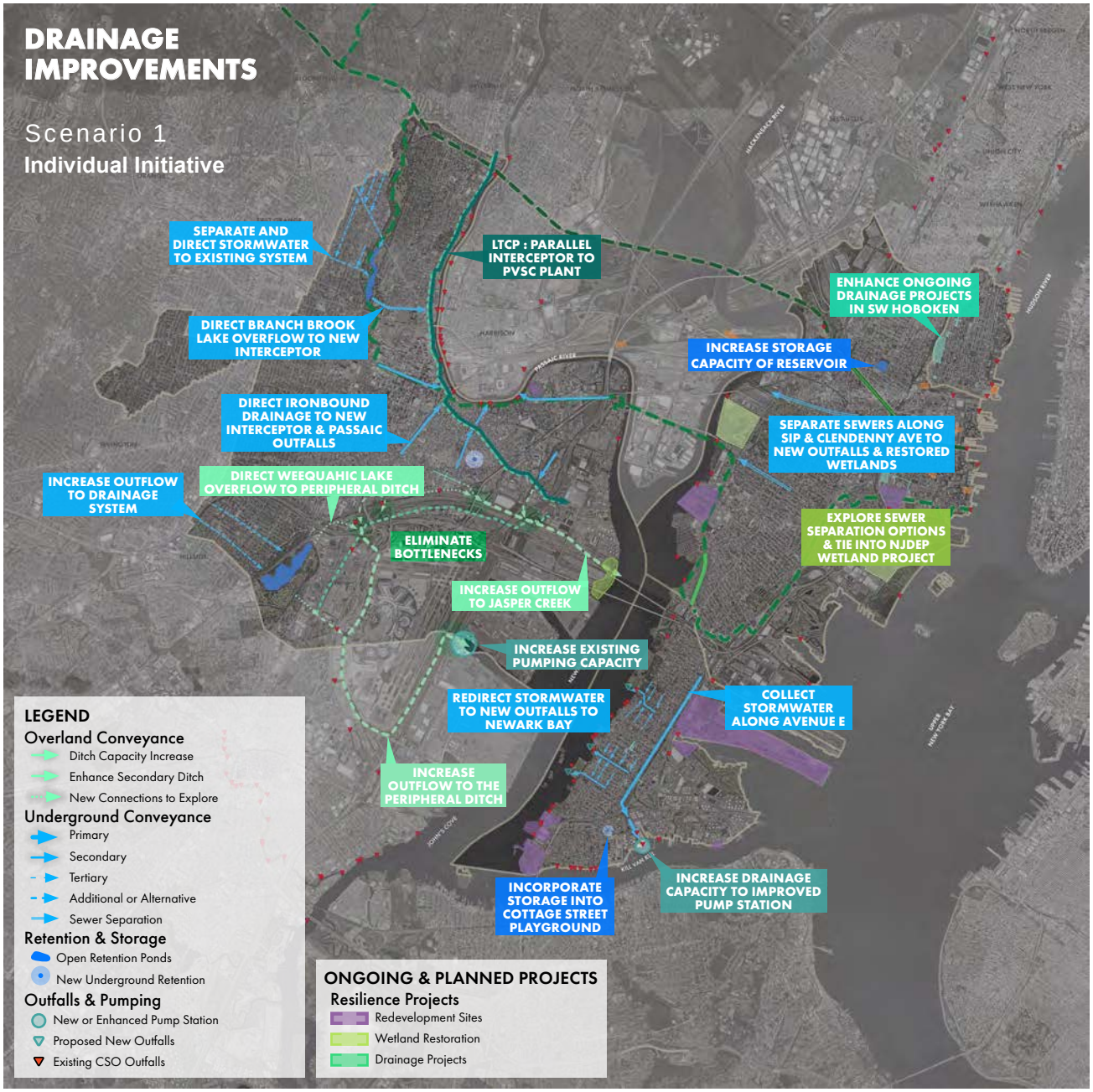
INLAND ROAD ELEVATION
Miami Beach, Florida

KEY CONSIDERATIONS

ISSUES TO CONSIDER

Flood barrieers sited along public rights-of-way can be implemented by the city, **BUT** parts of the community would be left out of the area of protection and could be cut off from critical services during storm events.

PHYSICAL SOLUTIONS: DRAINAGE | Scenario 1

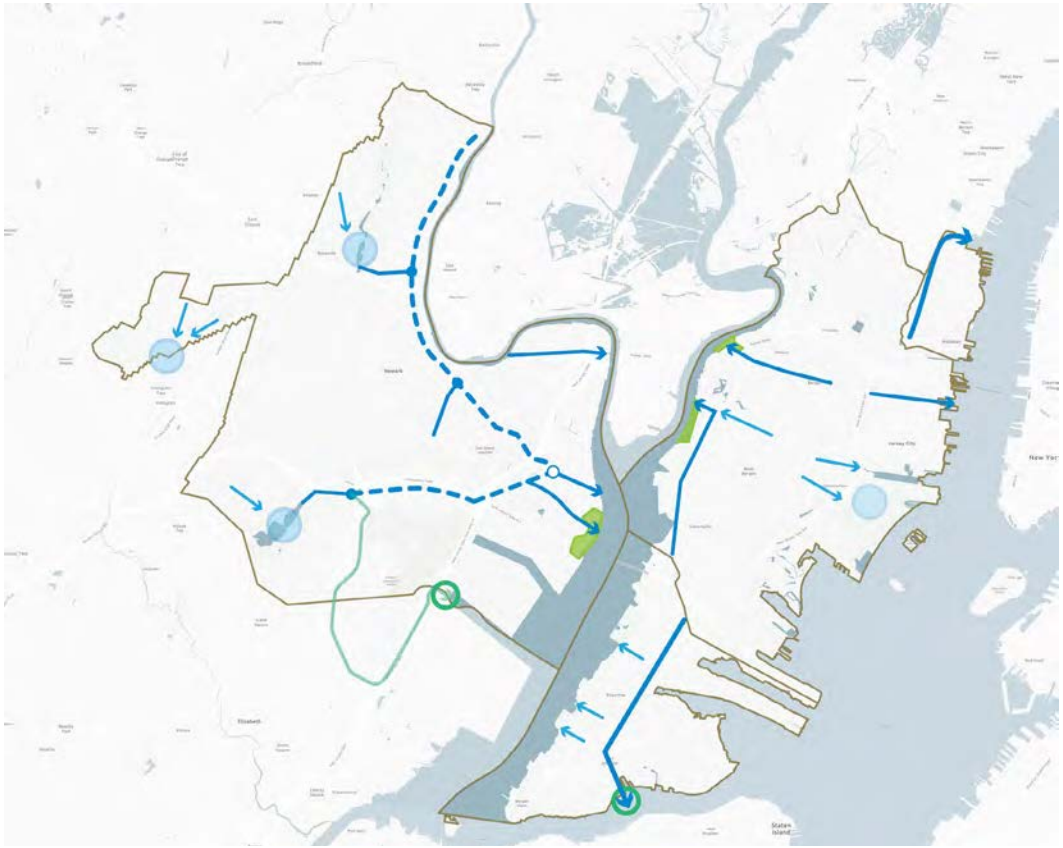


KEY FEATURES OF SCENARIO 1: DRAINAGE SOLUTIONS

- Increase capacity of existing flow paths, drainage, & retention
- Expand outflow to existing & planned drainage infrastructure & increase existing capacity
- Expand outflow to existing ditch drainage systems & pumps
- Explore tie-ins with existing & planned wetland projects

DRAINAGE OBJECTIVES

Enhance current system capacity and outflows and address problem roads and underpasses.



EXAMPLE CHANGES

URBAN STORMWATER RETENTION PARKS

Venice Island, Philadelphia

IMPROVED STORMWATER SURFACE CONVEYANCE

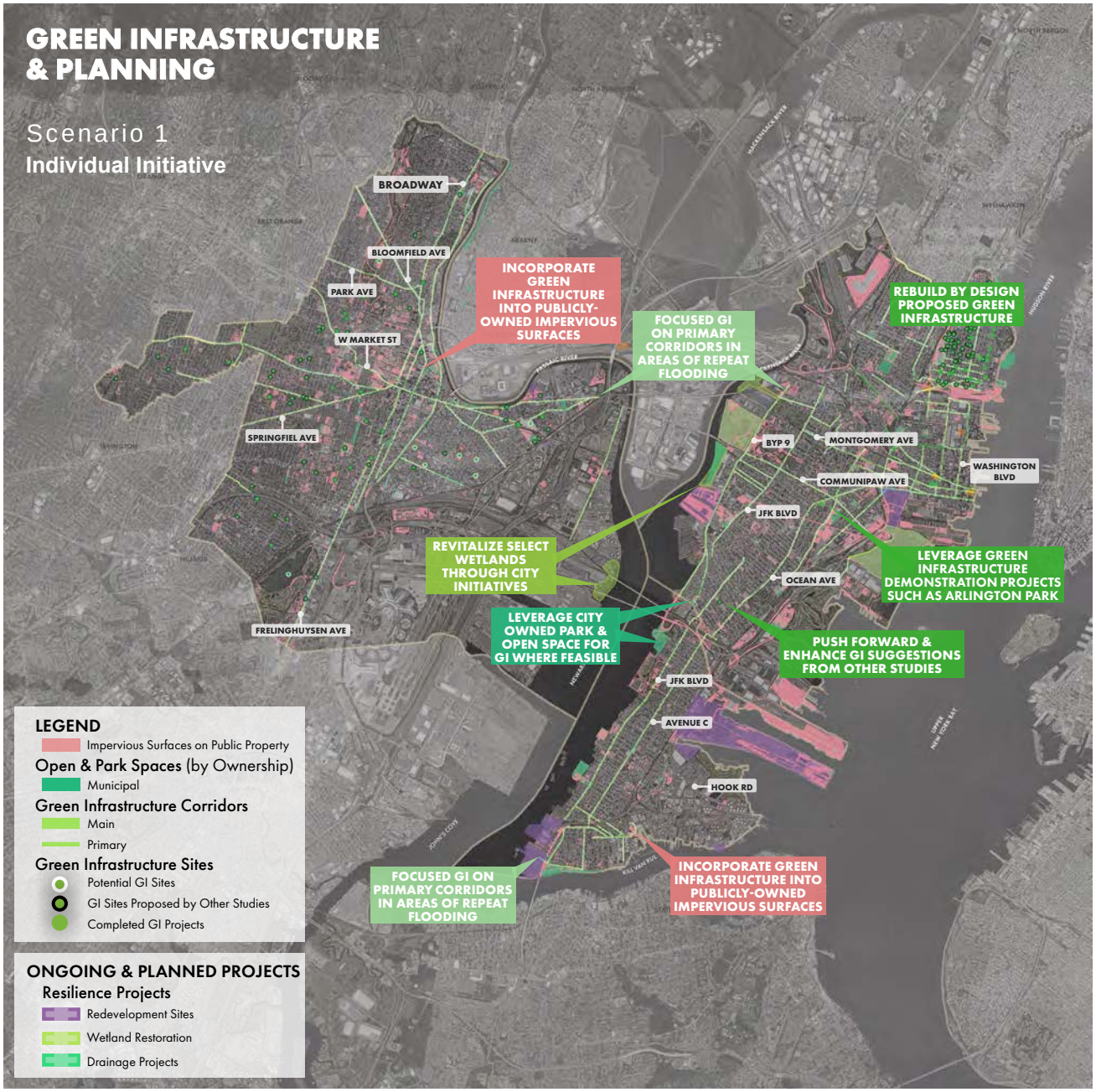
Waterplein Benthemplein, Rotterdam, Netherlands

KEY CONSIDERATIONS

ISSUES TO CONSIDER

Upgrades to the current system can be phased to facilitate construction and provide immediate benefit, **BUT** upgrades to the existing system will not greatly expand the existing sewer capacity and could exceed treatment plant capacity.

PHYSICAL SOLUTIONS: GREEN INFRASTRACTURE | Scenario 1

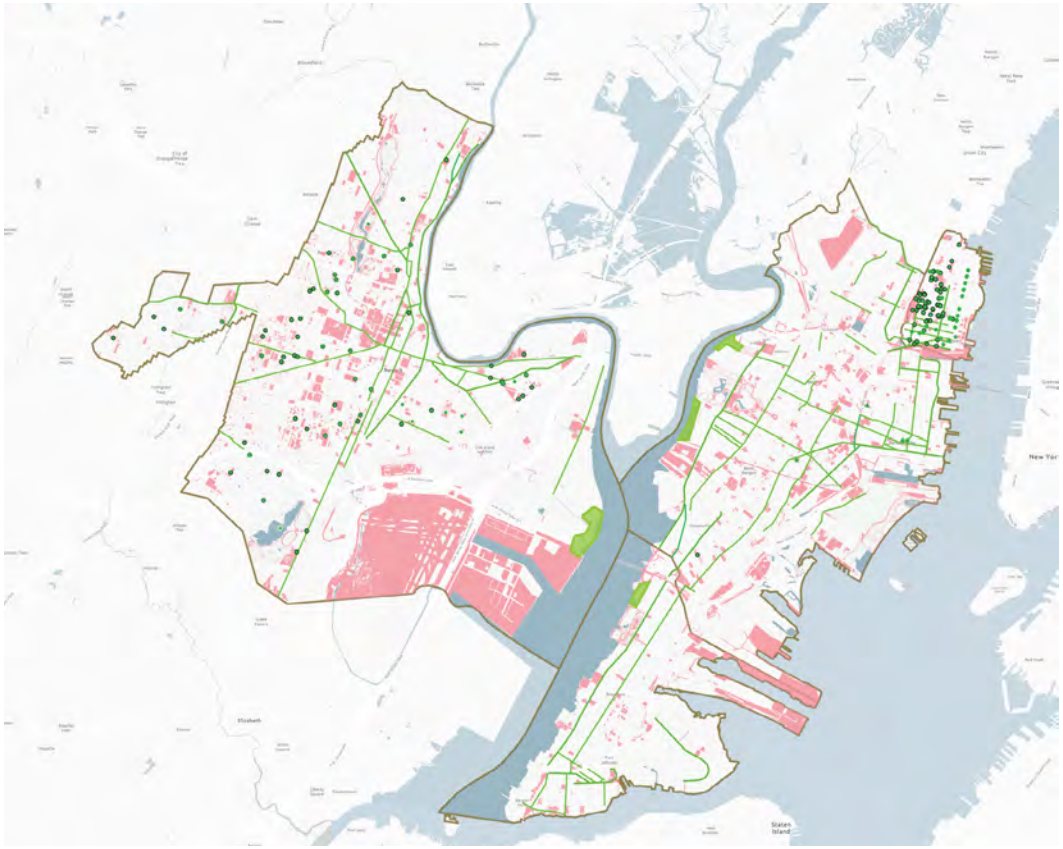


KEY FEATURES OF SCENARIO 1: GREEN INFRASTRUCTURE SOLUTIONS

- Municipal impervious lots are transformed (possible candidates shown in pink)
- Proposed & new green infrastructure (GI) projects on public land, targeted resilience hubs
- Existing city-owned open & vacant land leveraged for new GI projects
- GI in street right-of-way along key corridors

GREEN INFRASTRUCTURE OBJECTIVES

Expand GI installations on public property, targeting key primary corridors and lots with significant impervious area.



EXAMPLE CHANGES

RIGHT-OF-WAY GREEN INFRASTRUCTURE
Queens, NY

PERMEABLE PARKING SURFACES
TU Delft Netherlands

KEY CONSIDERATIONS

ISSUES TO CONSIDER

GI projects can treat stormwater at the source and add other benefits to the city, **BUT** they will compete with other needs in the public right-of-way and are limited in treating large storm events.

NON-PHYSICAL SOLUTIONS FOR FLOODING

Scenario 1

Scenario 1 focuses primarily on non-physical solutions that municipalities or the state can lead or expand independently. Some highlights of these solutions include the following:

- **Promote and incorporate resident flood reporting.** This refers to each city having a system in place to use community knowledge about where flooding is happening, in real time, to be able to guide response to and understanding of local flooding. Several of the Resilient NENJ cities have created interactive flood mappers to accomplish this.
- **Adopt ordinances to state models and guidance.** Cities have local policies, or ordinances, that set requirements for developments or construction in regulated flood areas and define how these developments manage their stormwater. The cities would adopt stricter standards through these ordinances to restrict certain uses in flood areas, require more developments to store stormwater on site, and take measures, such as require disclosure of past flooding when selling a home.
- **Expand municipal trash clean-up / catch basin program & waste reduction campaign.** Community members have provided consistent feedback about trash building up in streets and clogging catch basins, making it hard for stormwater to enter the drainage system. Some solutions that would address these issues include expanding or creating “adopt-a-catch-basin” program, which provide a kit and guidance to residents to clean up trash from problem catch basins. A waste reduction campaign would also involve outreach and education to help people understand the role trash plays in flooding and other problems.
- **Municipal stormwater utility.** This concept is a relatively new one in New Jersey that allows local governments to establish a utility to collect fees from properties with impervious surface. Several cities in the region have started to evaluate the concept of establishing such a utility would allow the city to make the developments financially responsible for the level of flooding that they are causing.

REPORT FLOODING WITH INTERACTIVE FLOOD MAPPERS

Community members have first-hand knowledge of where flooding occurs around them. Responding to feedback, each of the Resilient NENJ cities is developing a mapper where residents can report flood locations as they occur. Having this information can help the cities respond to flooding as it happens and to track repeat locations of flooding. Links to the live interactive flood mappers are below:

Newark: https://bit.ly/nwkfloodmapper
Hoboken: https://tinyurl.com/hobokenfloodmap
Jersey City and Bayonne are coming soon.

HOBOKEN RESILIENT BUILDING GUIDELINES

In 2015, Hoboken released Resilient Building Guidelines to summarize requirements for properties in regulated flood hazard areas and to provide strategies for residents to mitigate flooding for their homes. This is an example of a best practice that could be implemented by other cities in the region. Hoboken is in the process of amending the 2015 guidelines as part of Hoboken Ready.

NON-PHYSICAL FLOOD RISK MANAGEMENT SOLUTIONS, SCENARIO 1

COASTAL PROTECTIONS

Policy based measures are needed for areas outside of protections & for areas integrated with inland alignments.

DRAINAGE IMPROVEMENTS

Programs, like waste reduction & catch basin maintenance, help with drainage efficiency while larger-scale measures, like a municipal stormwater utility, increase resilience equity.

GREEN INFRASTRUCTURE

Measures, like tree planting programs and GI requirements on public open-space, are essential to meeting resilience goals in Scenario 1.

★ = co-benefits for additional hazards

OUTREACH, EDUCATION & CAPACITY BUILDING

- City-led Flood Management 101 Campaign
- Resilient building design guidelines
- Continue to promote & incorporate resident flood reporting
- Outreach Ambassador Program
- Promote webpage on city website with ongoing resilience and other projects

POLICY & GOVERNANCE

- Adopt ordinances to state models and guidance
- Require GI on municipal properties
- Establish municipal stormwater utility
- State guidelines to facilitate stormwater projects on open space
- Track and publish development & construction activities in a publicly available place
- Expand state-managed databases to provide complete information on resilience-related factors
- Cities assess feasibility of transformation of contaminated sites with integration of resilience through EPA funding programs

SERVICE & PROGRAM DEVELOPMENT

- Expand municipal trash clean-up / catch basin program & waste reduction campaign
- Lean into tree canopy increase programs
- Resilience hubs at city-agency properties
- Technical assistance and financing programs to assist property owners to make resiliency upgrades (targeted to buildings outside of coastal protections)

EMERGENCY RESPONSE & PREPAREDNESS

- Improved warnings through text messages, phone calls, etc., including targeted warnings to vulnerable groups
- Using NJ Register Ready to plan for those with additional needs
- Emergency sheltering options with pet areas
- Public works or police barricade repeat flood streets in advance of storms
- Join and engage in NWSChat from the National Weather Service for real time information about hazardous weather
- Install sensors for real time data on flooded areas

Solutions for Emergency Response & Preparedness are preliminary and will be advanced for the Action Plan

NON-PHYSICAL SOLUTIONS FOR ADDITIONAL CLIMATE-RELATED HAZARDS

Scenario 1

The Climate Hazards Assessment, released separately, details a regional assessment of future climate-related hazards and their potential impacts to the NENJ region. Hazards addressed in addition to flooding include severe weather, groundwater rise and quality, drought and water supply, extreme heat, air quality, invasive species and vector-borne illness, wildfire, and ocean acidification. As part of this process, the project team developed a Climate Hazard Resilience Toolbox of approaches specifically designed to address these additional hazards. The project team developed non-physical solutions to address these hazards for each scenario based on that toolbox as well as a consideration of existing efforts in the region, referred to as Scenario 0. Although the focus of the additional hazards solutions presented herein is on non-physical approaches, the goal of many of those solutions is to result in physical or nature-based actions, ranging from a site-specific to a regional scale. These have been identified with a green circle, where appropriate. Additionally, many of the non-physical solutions identified for flood risk management also have the potential to provide co-benefits to address other hazards. For example, flood risk solutions that aim to implement GI can also help mitigate extreme heat or poor air quality, depending on how they are implemented. To avoid redundancy, these cross-hazard solutions are not included with the additional hazards solutions and are instead marked with a blue star on the previous page.

Scenario 1 focuses primarily on non-physical solutions that municipalities or the state can lead or expand independently. Some highlights of these solutions include the following:

- **Adopt ordinances and building codes to state, national, and international models and guidance and consider higher standards.** Although a similar solution is also presented for flood risk mitigation, the policies and ordinances that the cities or the state can adopt to help mitigate hazards, such as extreme heat, poor air quality, and water shortages, largely differ from those applicable to mitigating flood hazards. Standards to look to include 2021 federal U.S. Department of Labor Occupational Safety and Health Administration (OSHA) standards, including inspection guidance for heat-related hazards, in line with the National Emphasis Program (NEP) on heat inspections (effective April 2022); 2021 International Energy Conservation Code (IECC) on energy efficiency and performance as well as spot-ventilation, isolation, and insulation of electrical and mechanical heat systems; federal U.S. Environmental Protection Agency (USEPA) air quality standards; World Health Organization (WHO) Global Air Quality Guidelines; 2018 International Residential and Plumbing Codes water conservation and efficiency standards; and 2018 International Green Construction Code water conservation and efficiency standards.
- **Require outdoor heat mitigation on municipal properties.** In addition to a GI requirement that may be applicable both to flood hazard as well as other hazards. Outdoor heat mitigation would include things like canopy cover or photovoltaic (PV) shade canopies, water-based cooling stations, or cool pavements.
- **Water conservation rate tied to municipal water utilities.** Water conservation rate structures would be tied to public water utilities based on the amount of water volume consumed as a method of reducing water demand during (or preempting) droughts to mitigate the risk of water shortages. This could be seasonal and be based on allowances/thresholds or involve decoupling water utility sales from earnings/profits, as recommended in the 2017-2022 NJ Water Supply Plan. Any such structure must be equitable and be designed to not burden low-income households.
- **Identify high-opportunity contaminated sites for green space placement in underutilized and non-municipal land.** Green space access is a major factor in resilience to additional hazards, especially extreme heat and poor air quality. However, green space in the study area is inequitably distributed and many low-income households live further than ¼ mile away.

NON-PHYSICAL ADDITIONAL CLIMATE-RELATED HAZARDS SOLUTIONS, SCENARIO 1

OUTREACH, EDUCATION & CAPACITY BUILDING

- Start a local education campaign with resources for individual mitigation and to promote advocacy related to extreme heat exposure, air quality, drought, groundwater contaminants, and Lyme disease/West Nile Virus risk
- Implement a public health hotline for extreme heat to alert officials of high-risk or distressed individuals, tied to public programs to assist residential mitigation
- Coordinate training within communities to create a local career-pipeline for urban foresters to manage fire risk and invasive species and to promote growth of tree canopy

POLICY & GOVERNANCE

- Adopt ordinances and building codes to state, national, and international models and guidance and consider higher standards (e.g., 2021 International Energy Conservation Code, 2018 International Green Construction Code)
- Pursue local regulations specific to environmental justice issues and cumulative impacts (e.g., Newark Environmental Justice/Cumulative Impacts ordinance). Develop a streamlined standard operating procedure for integrating review of all potentially impactful development activity
- Require outdoor heat mitigation on municipal properties (e.g., canopy/PV shade, water-based cooling stations, cool pavements) ●
- Enhance enforcement of existing local and state regulations (e.g., NJ Stormwater Rule, landlord mosquito protection regulations)
- Investigate tying water conservation rate structures to municipal water utilities (based on amount consumed) to regulate seasonal water demand. Must be structured to not burden low-income households
- Plan for accessible and equitable public, multi-modal transportation infrastructure (e.g., sidewalk improvements, bike infrastructure, better public transit mixed-used zoning, electric/zero-emissions buses, public charging stations)

SERVICE & PROGRAM DEVELOPMENT

- Identify high-opportunity contaminated sites for green space placement in underutilized and non-municipal land
- Provide municipal-led technical assistance for heat mitigation implementation, water efficiency, site remediation efforts, and forest/wildlife improvement practices

EMERGENCY RESPONSE & PREPAREDNESS

- Develop municipal-scale response and/or contingency plans with clear actions to address heatwaves, water supply emergencies and severe food shortages, aquifer contamination and/or hazardous plumes, severe wildfire smoke, and West Nile virus outbreaks
- Identify high-priority areas to expand the scope and concentration of universally accessible community centers for provision of relief and resources during extreme events. Resilience hubs could be leveraged

● = could result in physical or nature-based solutions

SCENARIO 2:
Shared Responsibility

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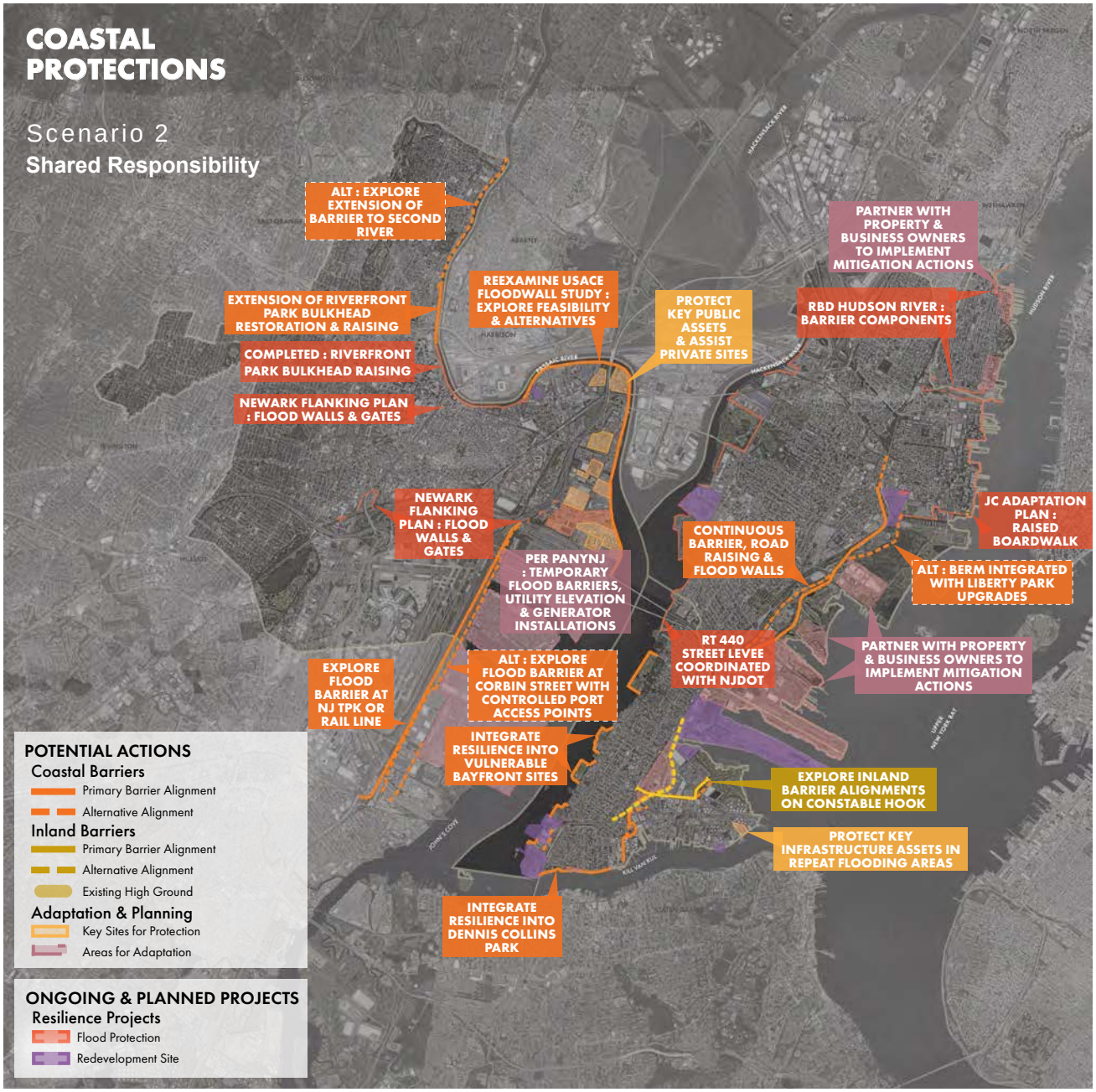
PHYSICAL SOLUTIONS: COASTAL | Scenario 2

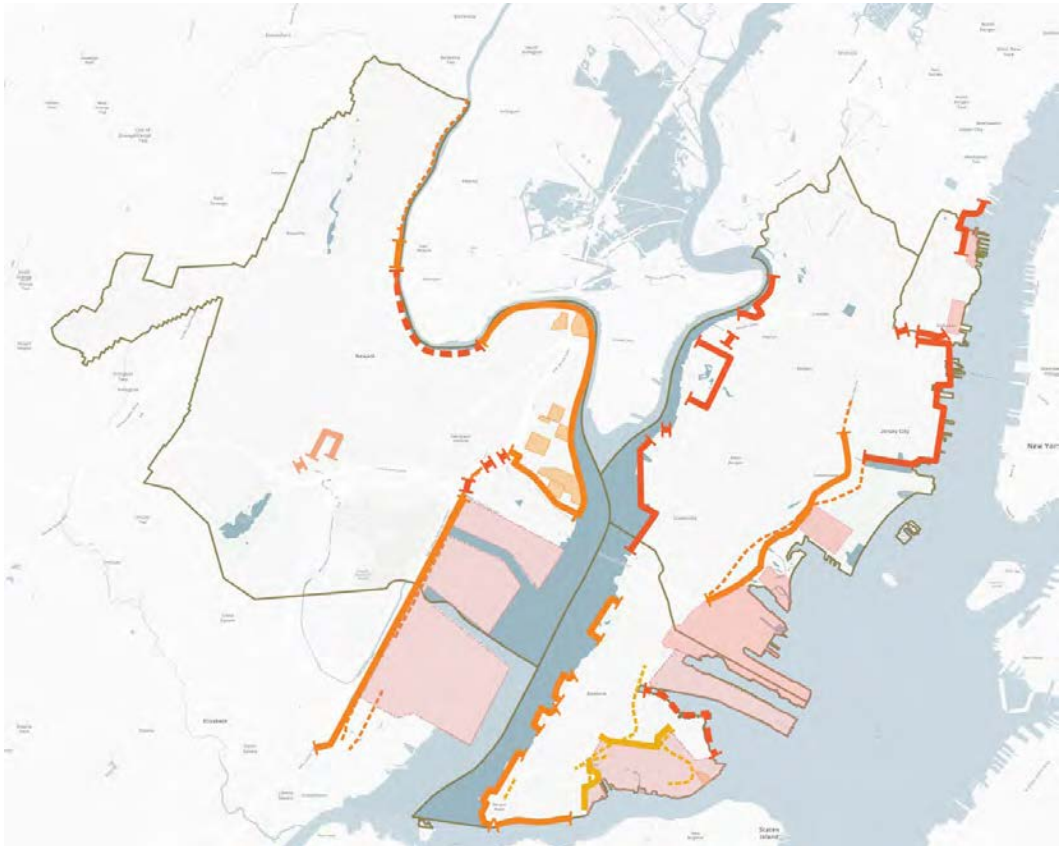


KEY FEATURES OF SCENARIO 2: COASTAL SOLUTIONS

- Existing planned coastal defenses are enhanced
- Partnerships open new alignments for coastal barriers
- Key sites and assets are adapted through partnerships
- Neighborhoods explore street raising & inland barrier options
- Partners assist adapting areas outside of coastal protections

COASTAL OBJECTIVES

Integrate flood protections with already planned projects and tie into areas of higher elevation.



EXAMPLE CHANGES

ELEVATED BOARDWALK INTEGRATED WITH NATURE-BASED COASTAL PROTECTIONS
Pier 26, Hudson River Park, New York City

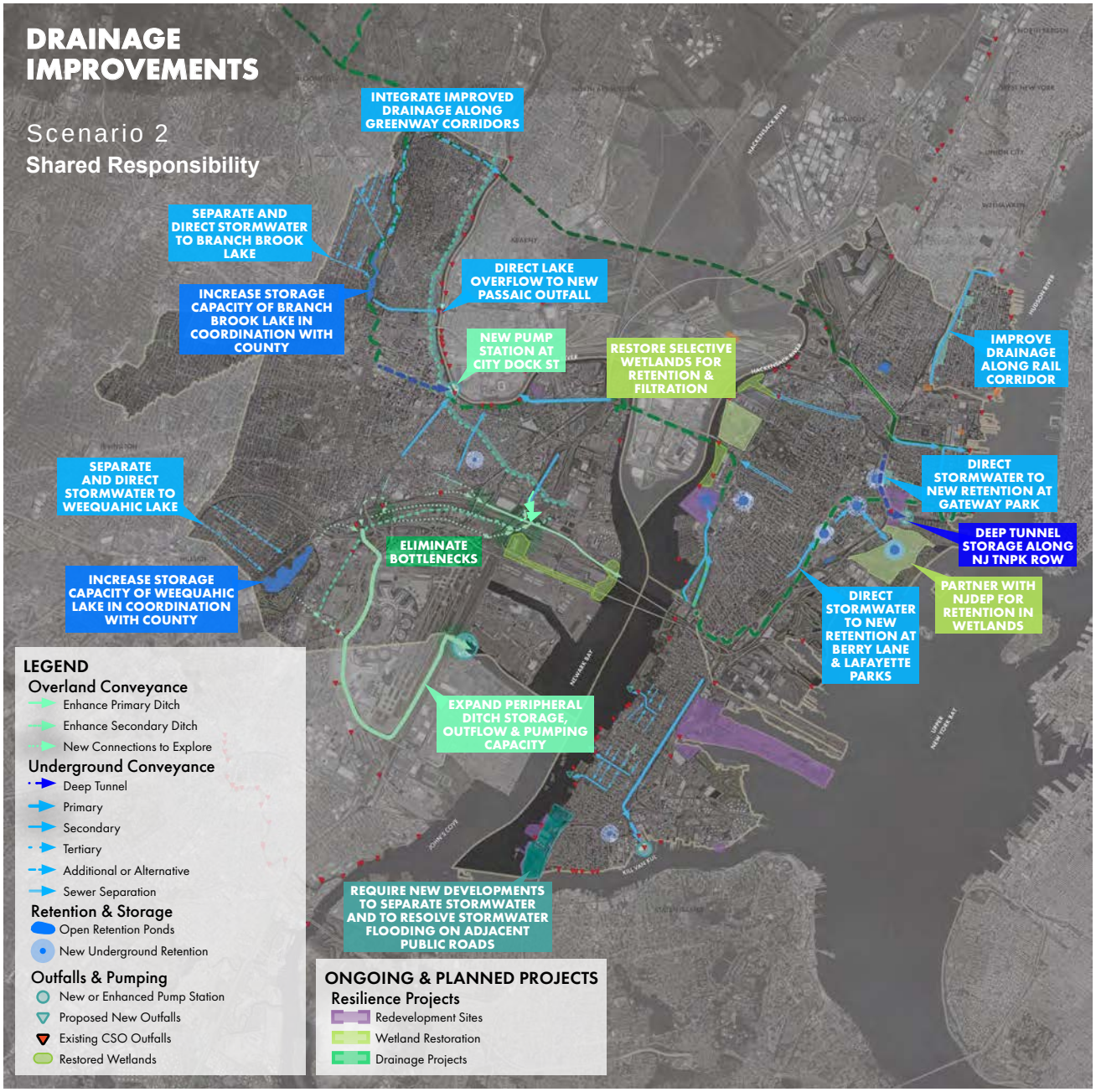
RAISED AND REINFORCED ROADWAY
Mount Cotton Road Queensland, Australia

KEY CONSIDERATIONS

ISSUES TO CONSIDER

Building on planned projects can take advantage of existing momentum, **BUT** extending protection would require additional coordination with property owners to provide protection.

PHYSICAL SOLUTIONS: DRAINAGE | Scenario 2

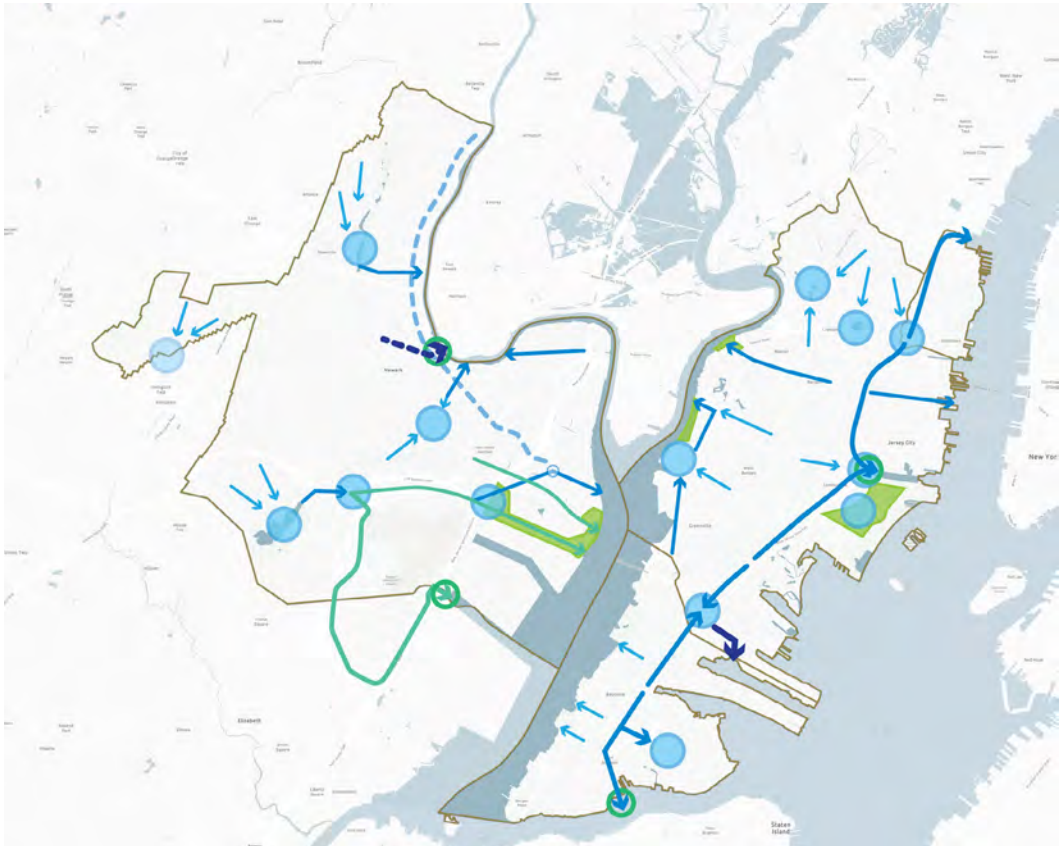


KEY FEATURES OF SCENARIO 2: DRAINAGE SOLUTIONS

- Utilize partnerships for expanded retention & conveyance projects
- Expand & separate systems through partnerships & create new pumps & outfalls to waterbodies
- Expand capacity of existing ditch drainage systems & pumps and explore new system connections
- Work with partners to create & revitalize greater wetlands areas

DRAINAGE OBJECTIVES

Consolidate drainage infrastructure to create new and expanded conveyance pathways and expand retention areas in conjunction with partners.



EXAMPLE CHANGES

IMPROVED PERCOLATION ALONG RAILWAY LINE
Severn Tunnel East, UK

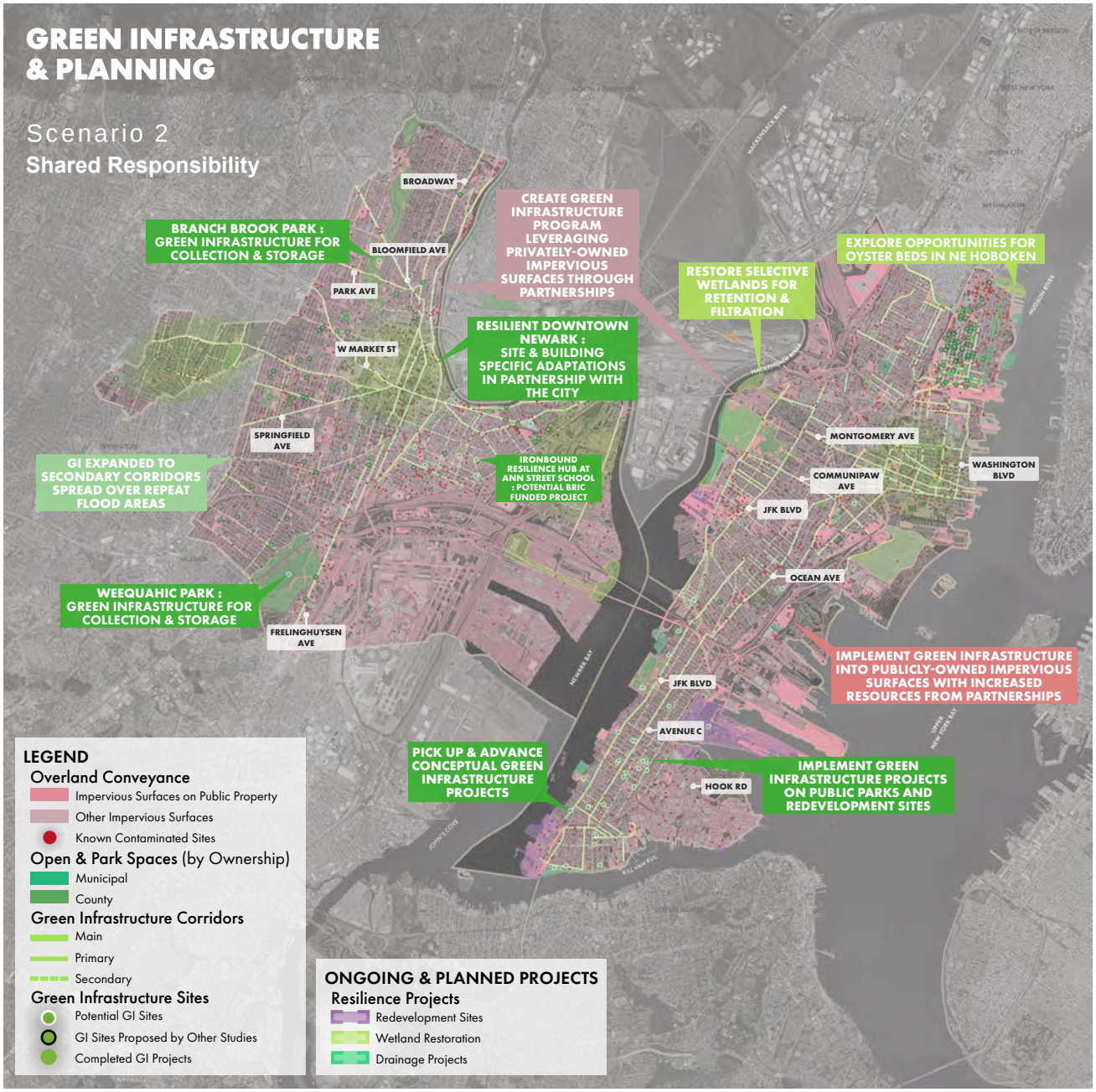
URBAN STORMWATER RETENTION PARK
Qunli Stormwater Wetland Park, Haerbin, China

KEY CONSIDERATIONS

ISSUES TO CONSIDER

Separating stormwater and directing to new outfalls gets water out of the sewer system and improves water quality **BUT** requires significant investment and coordination before benefits can be realized.

PHYSICAL SOLUTIONS: GREEN INFRASTRUCTURE | Scenario 2

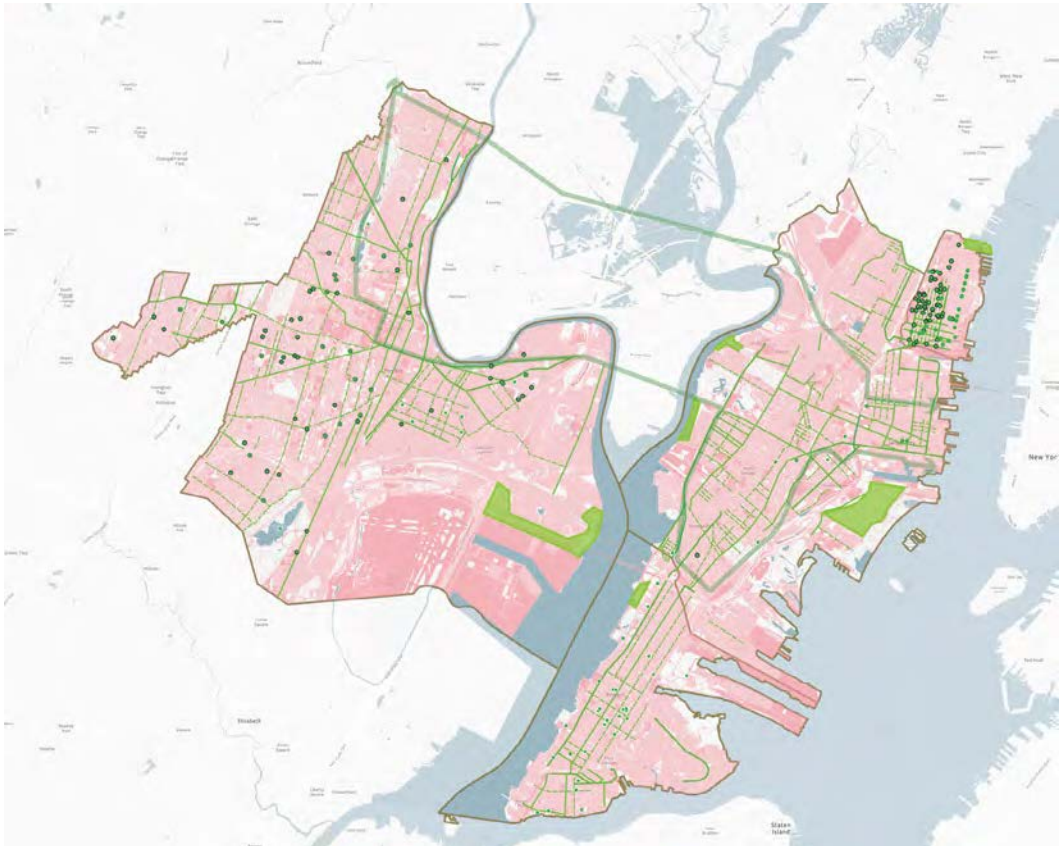


KEY FEATURES OF SCENARIO 2: GREEN INFRASTUCTURE SOLUTIONS

- Impervious lot transformations expand to private & agency land (pink candidates)
- Proposed & new green infrastructure (GI) projects expand to private & agency land, brownfield sites, neighborhood resilience hubs
- Existing open & vacant land leveraged for new GI projects as feasible through partnerships
- Street GI & tree program expands to more streets with partnership funding & coordination

GREEN INFRASTRUCTURE OBJECTIVES

Expand GI to secondary corridors and beyond public sites to incentivize additional GI on private properties.

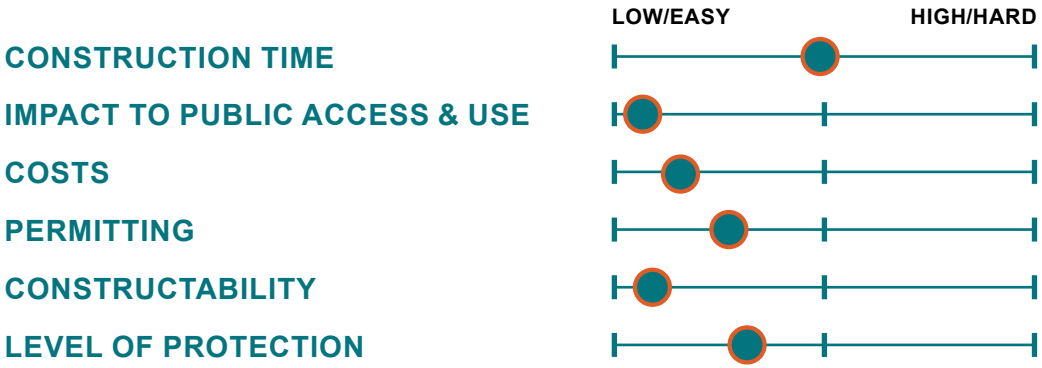


EXAMPLE CHANGES

GREEN INFRASTRUCTURE ON PRIVATELY OWNED SPACES,
First Avenue Water Plaza, Manhattan, NY

BLUE & GREEN ROOFS
Osbourne Association,
South Bronx, NY

KEY CONSIDERATIONS



ISSUES TO CONSIDER

Expanding GI to private properties provides broader watershed management **BUT** results in a greater number of assets that need to be inspected and maintained to provide protection.

NON-PHYSICAL SOLUTIONS FOR FLOODING

Scenario 2

The non-physical solutions in Scenario 2 involve collaboration and coordination across groups, such as community organizations, schools, and individual residents, as well as policies that would require, incentivize, or facilitate actions from individual residents.

- **Flood Management 101 Campaign.** This solution came directly out of feedback received about the importance of outreach to inform people what to do when there is a flood warning and to communicate the importance of action to address flooding and increase resilience. The Flood Management 101 Campaign would include a handbook, handouts, social media, ad campaigns, videos, and more. It would cover topics, such as what is flood risk, what contributes to flooding, how to prepare for flooding, how to protect your home, and how to access resources after a flood event. The Flood Management 101 materials would be developed by each city in partnership with community groups. Training sessions would be held for stakeholders, such as community groups or schools, to help citizens become outreach ambassadors and spread the word.
- **Flood overlay zone and retrofit grants for green infrastructure.** This action aims to increase the creation of GI on private properties, including vacant or abandoned lots that are currently paved over and contributing to runoff. Specific solutions include a flood overlay zone to require GI, tax incentives, grant programs and guidance to help individual owners install GI.
- **Resilience hubs through partnerships.** A resilience hub is a place that serves as a center for sharing information, a place for people to go during and after climate events, and a place that directly contributes to reducing impacts from things like flooding or heat (read more about resilience hubs on the USDN site here). The cities would work to create resilience hubs in places that already act as community spaces and could be adapted to do even more, such as schools, places of worship, or community centers. The outreach ambassadors or other community groups could help manage these centers and distribute Flood Management 101 content through them. In the Scenarios by Study Area section of this report, locations of resilience hubs (marked by triangles) are example locations where resilience hub projects could be advanced. These locations were identified through a combination of community feedback and screenings for possible community centers, schools, housing, or shelters that could be upgraded into resilience hubs.

JERSEY CITY FLOOD OVERLAY ZONE ORDINANCE

The Jersey City Flood Overlay Zone Ordinance applies to all properties located in the current 1 percent annual chance floodplain. It includes requirements for GI and resilient site design for new developments in the AE or VE zones (based on regulatory FEMA maps). Strategies, such as vegetated walls, green roof, permeable pavement, bioretention, and WaterSense fixtures, can be used to meet these requirements.

IRONBOUND RESILIENCE HUB

In January 2022, the City of Newark, through Resilient NENJ and with collaboration across multiple city departments, submitted a funding application for the design and construction of the Ironbound Resilience Hub at Ann Street School. The resilience hub will include stormwater storage beneath the school's parking lot, solar panels on the school, changes to allow the school to act as a cooling center, and related educational programming at the school. The hub can act both as a place that community members go during extreme heat and flooding while directly addressing flooding, heat, and increasing the capacity for the community to withstand flood or heat events. Resilient NENJ is looking for opportunities to expand this concept to other locations

NON-PHYSICAL FLOOD RISK MANAGEMENT SOLUTIONS, SCENARIO 2

COASTAL PROTECTIONS

Policy based measures are needed to integrate coastal strategies into existing and new waterfront development.

DRAINAGE IMPROVEMENTS

Collaboration with community groups on flood awareness campaigns and management of resilience hubs is key to this scenario.

GREEN INFRASTRUCTURE

Policy based measures like zoning tools to incentivize GI and programs like rain barrel distribution complement the physical strategies.

★ = co-benefits for additional hazards

OUTREACH, EDUCATION & CAPACITY BUILDING

- Resilience leader outreach and training program
- Flood Management 101 campaign in partnership with schools and community groups
- Engage deaf and non-English speaking community advocates to collaborate on needs
- Crowd-source flood reports (and other input) in coordination with CBOs and academia

POLICY & GOVERNANCE

- Incorporate resilience into redevelopment and work with property owners to integrate resiliency measures into developed sites
- Flood overlay zone to incentivize GI on private properties
- Provide retrofit grants for GI
- Development of municipal or regional climate risk assessment and Action Plan for contaminated & remediated sites
- Standardize coordination process between municipal & infrastructure entities

SERVICE & PROGRAM DEVELOPMENT

- Rain barrel distribution & guide for installation
- Partner with non-profits to manage resilience hubs and offer climate related programming
- Municipal composting program in partnership with housing complexes
- Trash clean-up days and community gardens through partnerships

EMERGENCY RESPONSE & PREPAREDNESS

- Public / private partnership with garages to provide parking spaces for people to move cars before storms ★
- Public / private partnership for community education program about flood insurance, including options for those outside of FEMA-mapped flood areas
- Encourage or require coordination between industrial stakeholders on emergency plans ★
- Establish post-disaster funding support contract ★
- Training for emergency managers through the National Disaster Preparedness Training Center ★

Solutions for Emergency Response & Preparedness are preliminary and will be advanced for the Action Plan

NON-PHYSICAL SOLUTIONS FOR ADDITIONAL CLIMATE-RELATED HAZARDS

Scenario 2

The non-physical additional hazards solutions in Scenario 2 involve collaboration and coordination across groups (such as community organizations, schools, and individual residents) and other key non-municipal stakeholders (such as business organizations) that may need to be involved in discussions (such as capital improvements decisions or site-specific planning). Some highlights of these solutions include the following:

- **Partner with the academic community to develop a study and indices specific to heat and air quality vulnerability.** While large-scale indices of social vulnerability and community resilience, such as those developed by the United States Centers for Disease Control and Prevention and the University of South Carolina Hazards Vulnerability & Resilience Institute, are useful for comparing general measures of these qualities across census tracts and municipalities, they can be blunt instruments when it comes to decision-making and prioritizing interventions. Environmental and socio-demographic variables may need to be factored in differently, depending on the type of hazard being addressed as well as the localized context of the communities in question. A study of these factors can be used to develop hazard-specific indices reflecting conditions at a municipal and/or regional scale, similar to the New York State Heat Vulnerability Index and its use of targeted vulnerability categories based on a 2017 study of relevant individual and community-level factors.
- **Work with community-based organizations to conduct public health studies of localized current-day "invisible" effects of air quality.** Poor air quality in the region is not merely a future issue. The NENJ population is currently at extremely high risk, relative to the rest of the state, for air toxics-related cancer and respiratory health impacts. As such, it is highly likely that communities are already experiencing these effects, especially communities with higher rates of elderly people, people with existing health conditions (such as asthma), low-income households with limited access to health care, and communities in areas with little access to green space and high urban heat island effect. This solution can be paired with another that recommends public health monitoring and screening programs.
- **In accordance with the 2018 American Water Infrastructure Act, develop risk and resilience assessments for drinking water systems that consider climate change impacts.** This solution can be paired with another that recommends partnering with the Lead Service Line Replacement program to prioritize capital improvement projects that replace and/or renew deteriorating and inefficient pipelines and water supply assets, including water mains at risk of bursting.
- **Develop site-specific plans for contaminated sites,** especially those located in environmental justice communities. This solution would likely require extensive engagement and partnerships with private property owners and other key stakeholders. As groundwater levels rise, it will also be increasingly essential to develop site-specific plans to remediate contaminated plumes, which could include full soil removal replaced with new topsoil.

NON-PHYSICAL ADDITIONAL CLIMATE-RELATED HAZARDS SOLUTIONS, SCENARIO 2

OUTREACH, EDUCATION & CAPACITY BUILDING

- Convene municipal, cross-sector working groups with key stakeholders to advance specific actions related to heat and air quality
- Partner with the academic community to develop a study and indices specific to heat and air quality vulnerability with targeted community-level factors applicable at the municipal and/or regional scale (e.g., access to health insurance, access to air conditioners, etc., possibly weighted in collaboration with communities)
- Partner with the academic community to support statewide ocean acidification initiatives to protect marine habitats and mitigate regional impacts
- Work with CBOs to conduct public health studies of localized current-day "invisible" health effects traceable to poor air quality in vulnerable communities

POLICY & GOVERNANCE

- Implement groundwater protection zoning overlay districts that protect any water within the 1-, 5-, or 10-year Time of Travel zones for contaminants, or buffer distances around groundwater intakes (e.g., a 1-year Time of Travel zone describes the radius around a well within which it would take 1 year for contaminants to reach the well)
- Ensure compliance with American Water Infrastructure Act (AWIA) requirements for comprehensive assessments of the existing water main networks for identification of aging assets and vulnerabilities
- Identify high-priority hazardous waste sites in environmental justice communities to develop site-specific remediation plans, including for remediation of contaminated plumes (e.g., full soil removal) ●
- Partner with Lead Service Line Replacement Program to prioritize capital improvement projects to replace and/or renew deteriorating and inefficient pipelines and water supply assets (including water mains at risk of bursting) ●
- Develop specific zoning restrictions to address fire risk (e.g., adequate buffers for industrial-residential uses)

SERVICE & PROGRAM DEVELOPMENT

- Explore public-private partnerships to limit vehicular heat and pollution by starting or expanding bike share programs and exploring streets to shut down for pedestrian experience
- Partner with CBOs to initiate public programs to distribute risk-mitigating resources (e.g., air conditioners, clean energy technology, soil moisture sensors, water quality test kits, at-home water filtration, sprays and screen protections for ticks and mosquitoes) with installation assistance
- Partner with CBOs and academia to set up accessible public health monitoring and screening programs (e.g. water quality monitoring) to identify environmental justice communities requiring targeted assistance

EMERGENCY RESPONSE & PREPAREDNESS

- Partner with CBOs to undertake a community science initiative to forecast/monitor localized risk (e.g., heat, air quality) tied to a community alert system
- Work with local civic groups and mutual aid networks to conduct preparedness capacity building, train disaster response networks, establish spaces for civic organizing and advocacy to advance immediate actions, and provide additional community resources

● = could result in physical or nature-based solutions

SCENARIO 3:
Regional Coordination

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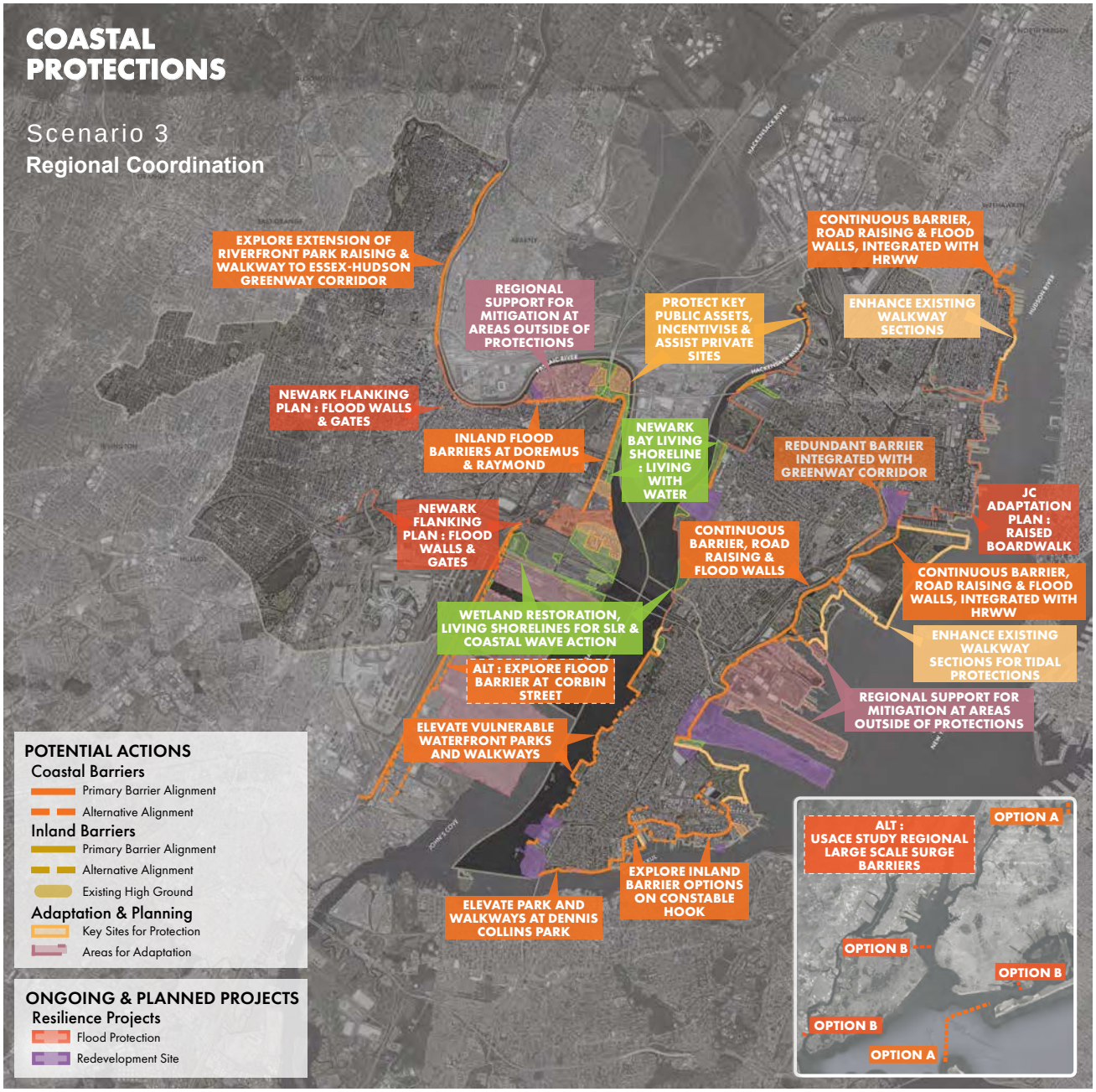
PHYSICAL SOLUTIONS: COASTAL | Scenario 3

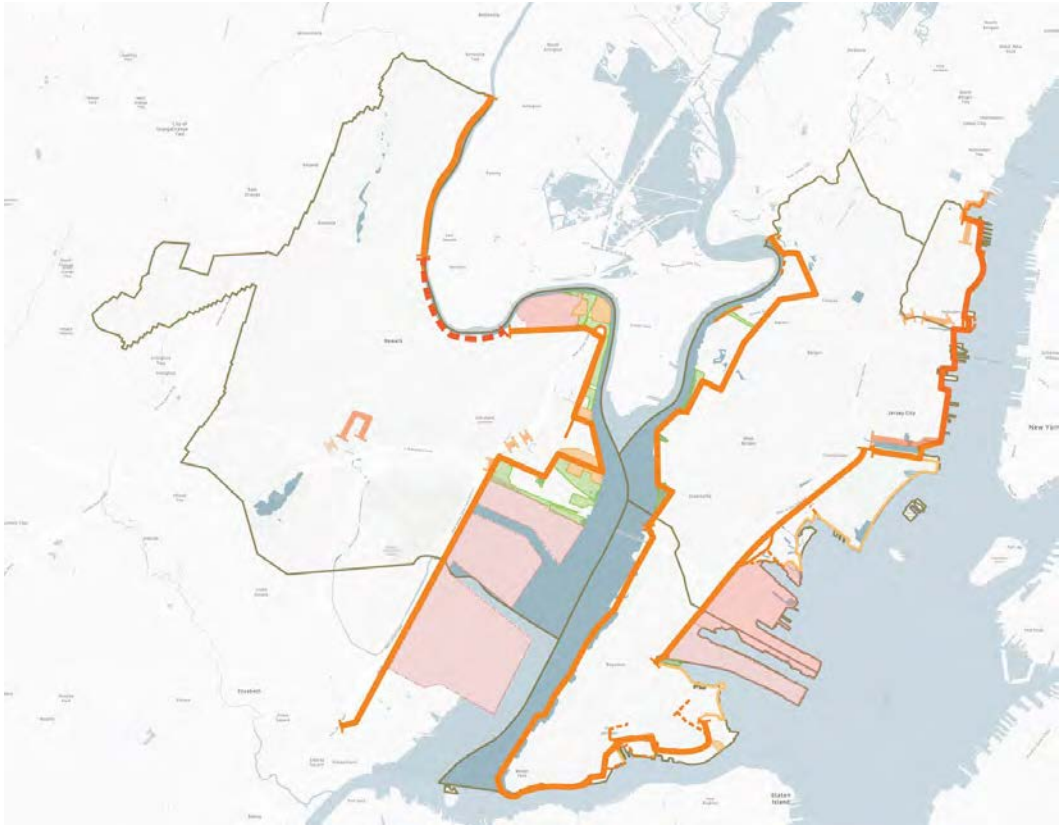


KEY FEATURES OF SCENARIO 3: COASTAL SOLUTIONS

- Existing planned coastal defenses are supplemented in key areas
- Continuous & co-beneficial coastal barriers coordinated by region, emphasizing 'dig-once'
- Key infrastructure sites that cannot be relocated are protected
- Enhanced coastal circulation corridors
- Few areas left outside of protections are assisted in adaptation

COASTAL OBJECTIVES

Utilize existing walkway and park infrastructure for integrated protections along the waterfront.



EXAMPLE CHANGES

FLOOD PROTECTIONS INTEGRATED WITH PUBLIC INFRASTRUCTURE
Chicago Riverwalk

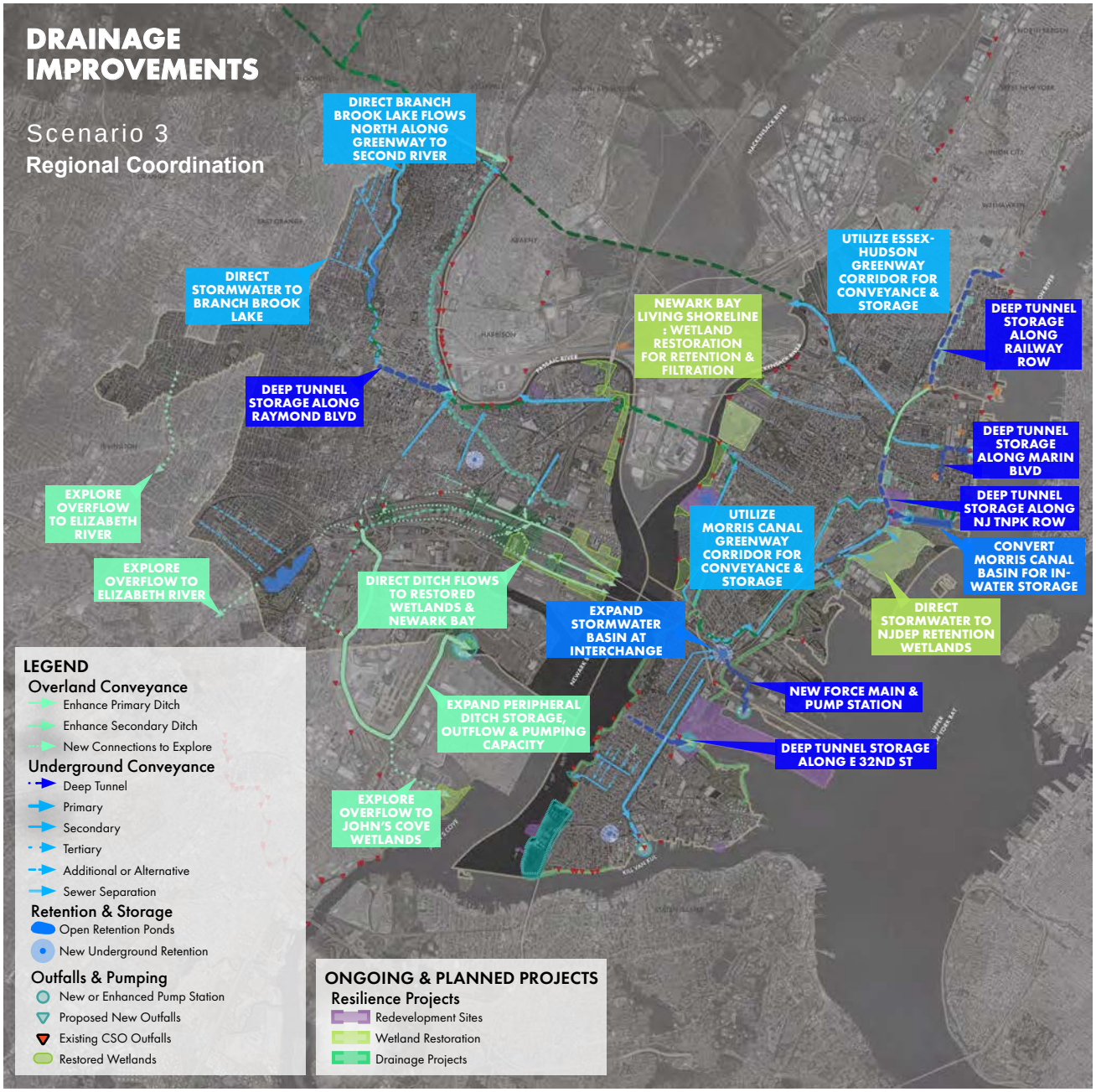
RIVERTRAIL INTEGRATED WITH GREEN INFRASTRUCTURE COASTAL PROTECTIONS
Hunters Point
New York City

KEY CONSIDERATIONS

ISSUES TO CONSIDER

A barrier along the Hudson ensures all properties are protected **BUT** would greatly change the character of the shoreline at a significant cost.

PHYSICAL SOLUTIONS: DRAINAGE | Scenario 3



KEY FEATURES OF SCENARIO 3: DRAINAGE SOLUTIONS

- Regional drainage corridors along coordinated pathways and new deep tunnel storage & conveyance
- Expanded & separated systems coordinated at the regional level along shared corridors
- Revitalized ditch & wetland system increases outflow capacity
- Coordinated regional wetlands program restores & leverages key natural habitats

DRAINAGE OBJECTIVES

Drainage is integrated with greenway corridors & wetland projects as well as deep tunnels that direct flows to expanded pumping stations.

EXAMPLE CHANGES

DEEP TUNNEL STORMWATER CONVEYANCE & STORAGE
DigIndy, Indianapolis, Indiana

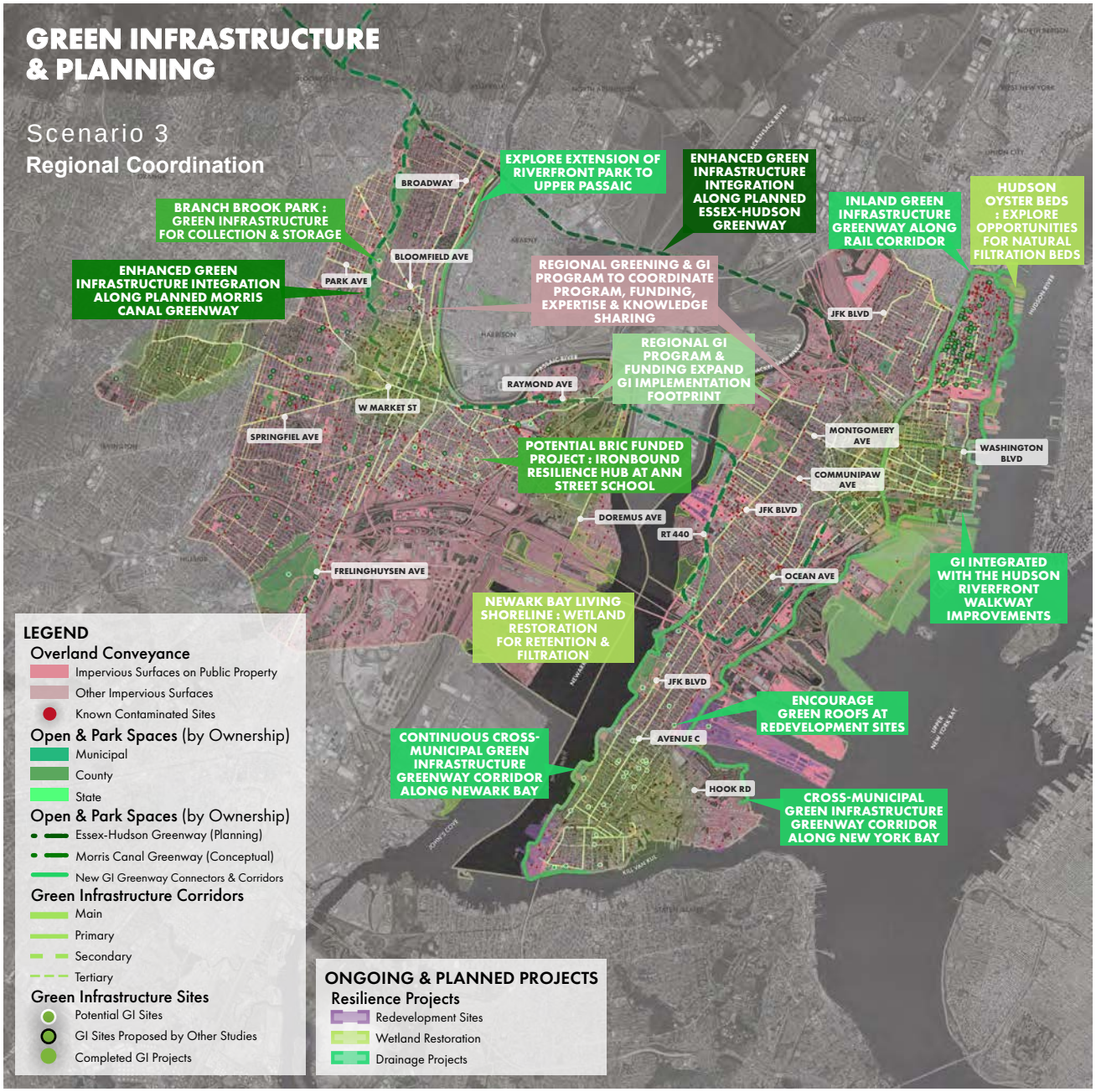
RAIL TRAIL WITH INTEGRATED PROTECTIONS AND DRAINAGE
Ashokan Rail Trail,West Hurley, New York

KEY CONSIDERATIONS

ISSUES TO CONSIDER

Interior drainage corridors align with natural topography **BUT** require land use changes for surface conveyance or expensive deep tunnels and pumping for subsurface conveyance.

PHYSICAL SOLUTIONS: GREEN INFRASTRACTURE | Scenario 3

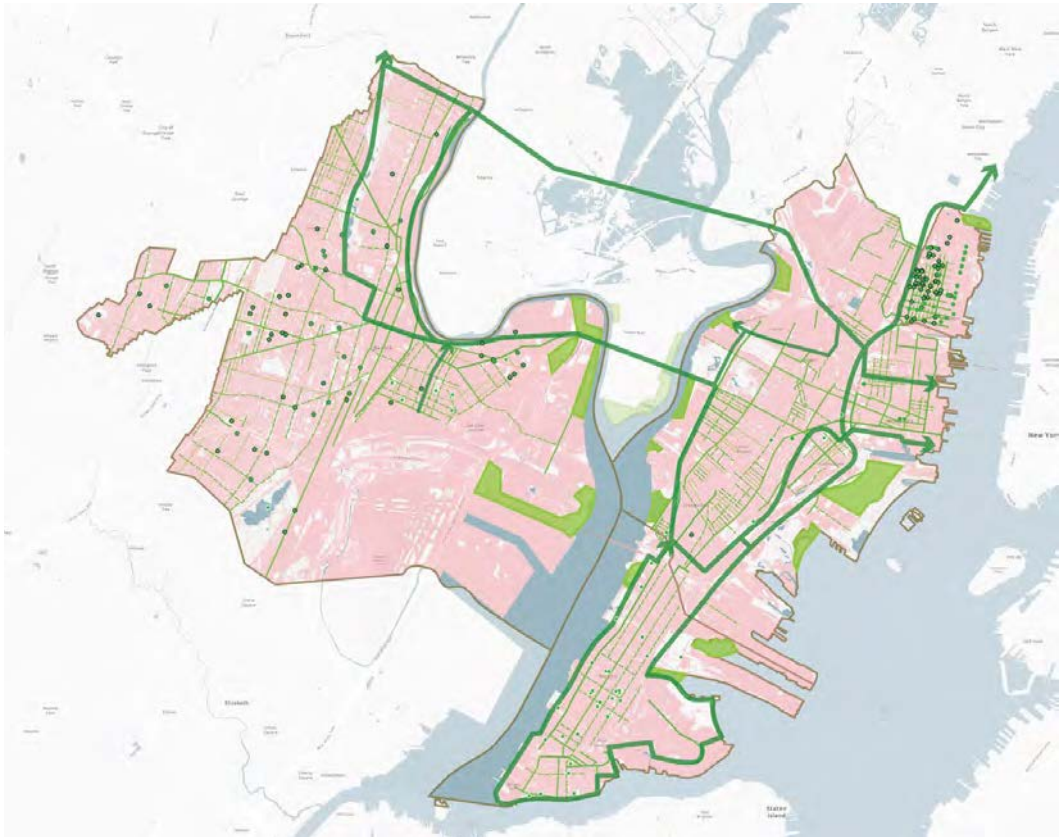


KEY FEATURES OF SCENARIO 3: GREEN INFRASTUCTURE SOLUTIONS

- Impervious lot program funded & coordinated by regional entity (possible candidates shown in pink)
- Regionally coordinate GI implementation in key areas & greenway corridors, regional network of resilience hubs
- Existing open & vacant land program at regional level for expanded footprint
- Street GI & tree program is coordinated at region level & expanded

GREEN INFRASTRUCTURE OBJECTIVES

GI is expanded beyond site level retrofits to focus on regional GI Greenway corridors and coastal habitat restoration.



EXAMPLE CHANGES

REGIONAL URBAN GREENWAY,
The BeltLine,
Atlanta, Georgia

GI INTEGRATED STORMWATER SYSTEM
Swale on Yale, Seattle, Washington

KEY CONSIDERATIONS

ISSUES TO CONSIDER

GI at larger scales can provide additional benefits to water quality and habitat protection **BUT** offer limited direct protection from large storm events.

NON-PHYSICAL SOLUTIONS FOR FLOODING

Scenario 3

Scenario 3 includes many of the non-physical solutions from Scenarios 1 and 2 but is implemented at a regional scale. It also includes possible solutions for statewide programs.

- **Continuation of Resilient NJ Program.** This solution is related to the long-term vision for the Resilient NJ program, which was established to create an Action Plan for the region and has evolved to be multi-faceted. The program would continue to act as an engagement platform and coordinate ideas or programs, such as the Flood Management 101 Campaign, ambassador programs, and resilience hubs at a regional level, so that information is shared consistently across the region. A stormwater utility would be implemented at the regional level to promote consistency. The region would also establish a regional tree planting program to pool resources and help increase greening in the area.
- **Develop pipeline of sites for stormwater management / resilient transformation & state/regional climate risk assessment for contaminated / remediated areas.** The region is crowded with contaminated sites due to the history of factories and industry in the area. Contaminated sites are concerning because of toxic flooding, and they should be properly cleaned up with climate change in mind. These sites can also be opportunities to manage stormwater or implement flood protection. Resilient NENJ has been meeting with multiple stakeholders at the local and state levels to try to facilitate the cleanup of contaminated sites; address issues, such as stormwater storage; and consider converting these areas into parks that would have GI or flood barriers.
- **Long-term control plans.** The Long Term Control Plan (LTCP) is a system wide evaluation of the sewage infrastructure, and the hydraulic relationship between the sewers, precipitation, treatment capacity and overflows. LTCPs are currently in draft form regionwide. Resilient NENJ recommends ensuring that the new tanks or pump stations that are built through the LTCPs are considering climate change and that they are sized and sited appropriately to make sure that they can withstand future sea level rise and storms.

EDUCATIONAL VIDEO SERIES

In response to community calls for condensed, clear information about flooding, Resilient NENJ is developing a video series to define concepts like risk and resilience, talk about how resilience planners approach challenges (such as flooding), and provide information on how to get involved in the program.

LONG-TERM CONTROL PLANS

Most of the areas of Resilient NENJ have combined sewer systems that collect both rainwater and wastewater from homes and businesses. These systems were designed to release untreated sewage to waterbodies during heavy rainfall to avoid damage to the wastewater treatment plant. The sewer utilities have been required to prepare Long-Term Control Plans (LTCPs) to reduce these overflows by taking actions, like creating additional sewage in their systems, piping more to the treatment plants, separating the rainfall pipes from wastewater pipes, and installing GI. These projects are opportunities to create additional stormwater storage that can also reduce flooding from rainfall. Resilient NENJ is coordinating with the LTCPs to ensure these efforts are aligned.

NON-PHYSICAL FLOOD RISK MANAGEMENT SOLUTIONS, SCENARIO 3

COASTAL PROTECTIONS

Regional coordination across municipal boundaries is critical to implement comprehensive coastal protection for the region.

DRAINAGE IMPROVEMENTS

Increasing codes for floodplain construction and stormwater management beyond standards at a regional level ensures consistency of development standards.

GREEN INFRASTRUCTURE

Regional coordination is also key to advancing larger scale GI strategies that utilize right-of-ways that cross municipal boundaries and are under state jurisdiction.

★ = co-benefits for additional hazards

OUTREACH, EDUCATION & CAPACITY BUILDING

- Continuation of Resilient NJ Program ★
- Expansion of sustainability measures of livability ★
- Regional-scale distribution of Flood Management 101 campaign
- Leverage RNJ as a coordinated engagement platform around resilience-related issues ★
- Create a 'single source of truth' and go-to resource/ messaging for all things resilience-related ★

POLICY & GOVERNANCE

- Ensure LTCP projects incorporate climate change considerations ★
- Regional coordination to increase standards beyond minimum ★
- Regional GI champions training program ★
- Develop pipeline of sites for stormwater management/resilient transformation process ★
- State/regional climate risk assessment for contaminated/ remediated areas ★
- Create regional Infrastructure Coordination Council (and dig once) ★
- Regional stormwater utility

SERVICE & PROGRAM DEVELOPMENT

- Regional tree planting program ★
- Regional network of resilience hubs ★
- Regional program development and support for composting and waste reduction campaigning

EMERGENCY RESPONSE & PREPAREDNESS

- Coordination between municipalities, emergency managers, and transportation agencies for early warning systems for storms (e.g., sirens, highway warnings) ★
- Expand capacity on or create redundant emergency evacuation routes
- Expanding NJ Register Ready to include deaf and hard of hearing, and improve warnings to these people ★

Solutions for Emergency Response & Preparedness are preliminary and will be advanced for the Action Plan

NON-PHYSICAL SOLUTIONS FOR ADDITIONAL CLIMATE-RELATED HAZARDS

Scenario 3

Scenario 3 includes some of the non-physical solutions from Scenarios 1 and 2 but implemented at a regional scale. It also includes possible solutions for statewide programs. Many of these solutions include partnerships with regional environmentalist groups and/or academic and research organizations. Some highlights of these solutions include:

- **Working with environmental justice groups to start an accessible, regional incentives program(s).** Such programs can be used to incentivize widespread private action to address a multitude of additional climate hazards, ranging from large businesses and landowners to small residential property owners. These programs can include incentives for heat-mitigating strategies, such as green roofs, cool (high albedo) roofs, façades and glass glazing with low U-values (e.g., triple-pane or triple-glazed glass), and sun control and exterior shading features; outdoor heat mitigation and landscaping features; actions that would reduce vehicular emissions, such as car-sharing and private investment in vehicle charging stations; residential and commercial indoor and outdoor water conservation retrofits and practices, such as water audits, low-flow fixture and plumbing retrofits, limitations on irrigable acreage, and water-efficient appliances; encouraging rainwater collection practices; hazardous site remediation efforts that include elimination of stagnant water sources and/or maintenance and drainage of surface water to prevent development of adult mosquitoes; cost-sharing and technical assistance to private landowners for forest stand improvement practices and wildlife habitat improvements; and installation of noncombustible screens (e.g., over attic vents), safe storage of propane tanks, and access to water for firefighters to address wildfire risk.
- **Aligning cross-municipal regional planning around environmental practices that can address multiple hazards at once.** Large-scale habitat restoration and sustainable agroforestry practices cannot only reduce greenhouse gas emissions but also reduce local heat; improve regional air quality; protect water supply sources; increase natural filtration; improve groundwater recharge; keep surface water systems, such as wetlands and lakes, in good health to minimize risk of contaminants; promote native plants that require fewer fertilizers while keeping out invasive species; manage freshwater inflows into estuaries with implications for coastal ecosystems already experiencing stress from ocean acidification; minimize tick presence; and minimize wildfire risk.
- **Partnering with the research community to develop best-available regional data and models/projections of future risk for additional hazards.**

NON-PHYSICAL ADDITIONAL CLIMATE-RELATED HAZARDS SOLUTIONS, SCENARIO 3

OUTREACH, EDUCATION & CAPACITY BUILDING

- Start a regional drought response outreach program with detailed guidelines for municipalities to facilitate alignment
- Start a regional education campaign with resources to mitigate extreme heat exposure, air quality, drought, groundwater contaminants, and Lyme disease/ West Nile Virus risk
- Identify key regional stakeholders to advance ocean acidification and marine life conservation initiatives

POLICY & GOVERNANCE

- Coordinate with neighboring municipalities and the state to implement load restrictions for older roads, bridges, and rail to mitigate risk due to heat stress
- Adopt statewide regulatory amendments needed to require American Water Works Association (AWWA) water loss audits
- Streamline standard operating procedures (SOPs) to obtain Water Allocation Permits for Reclaimed Water for Beneficial Reuse
- Update and expand the scope of the New Jersey Source Water Assessment Program Plan to develop a contaminant source inventory that can be used for future groundwater modeling
- Align cross-municipal planning around habitat restoration, forest stand improvements, sustainable agroforestry, and integrated water resources management, with key regional environmentalist organizations to address regional heat, air quality, water supply, wildfire, and invasive species with implications for NENJ ●
- State mandate for routine water supply asset management planning, with consideration of future water demand and availability conditions. Creation of standardized metrics and reporting of conditions to support prioritization of Drinking Water State Revolving Fund
- Establish regional goals around transportation planning for urban heat and air quality
- Update Strategic Management Plan for Invasive Species
- Develop a regional Integrated Mosquito Management Plan
- Partner with the research community (e.g., CCRUN) to develop best-available regional data and models/ projections of future risk for additional hazards

SERVICE & PROGRAM DEVELOPMENT

- Work with environmental justice groups (e.g., NJ Environmental Justice Alliance) to start an accessible, regional incentives program for structural retrofits, heat-mitigating and water-efficient landscaping practices, reduction of private car ownership, and fire fuel-reduction practices ●
- Partner with the research community to develop regional projections/models of future high-risk Lyme disease contraction areas to target areas for conversion into “tickscapes” ●

EMERGENCY RESPONSE & PREPAREDNESS

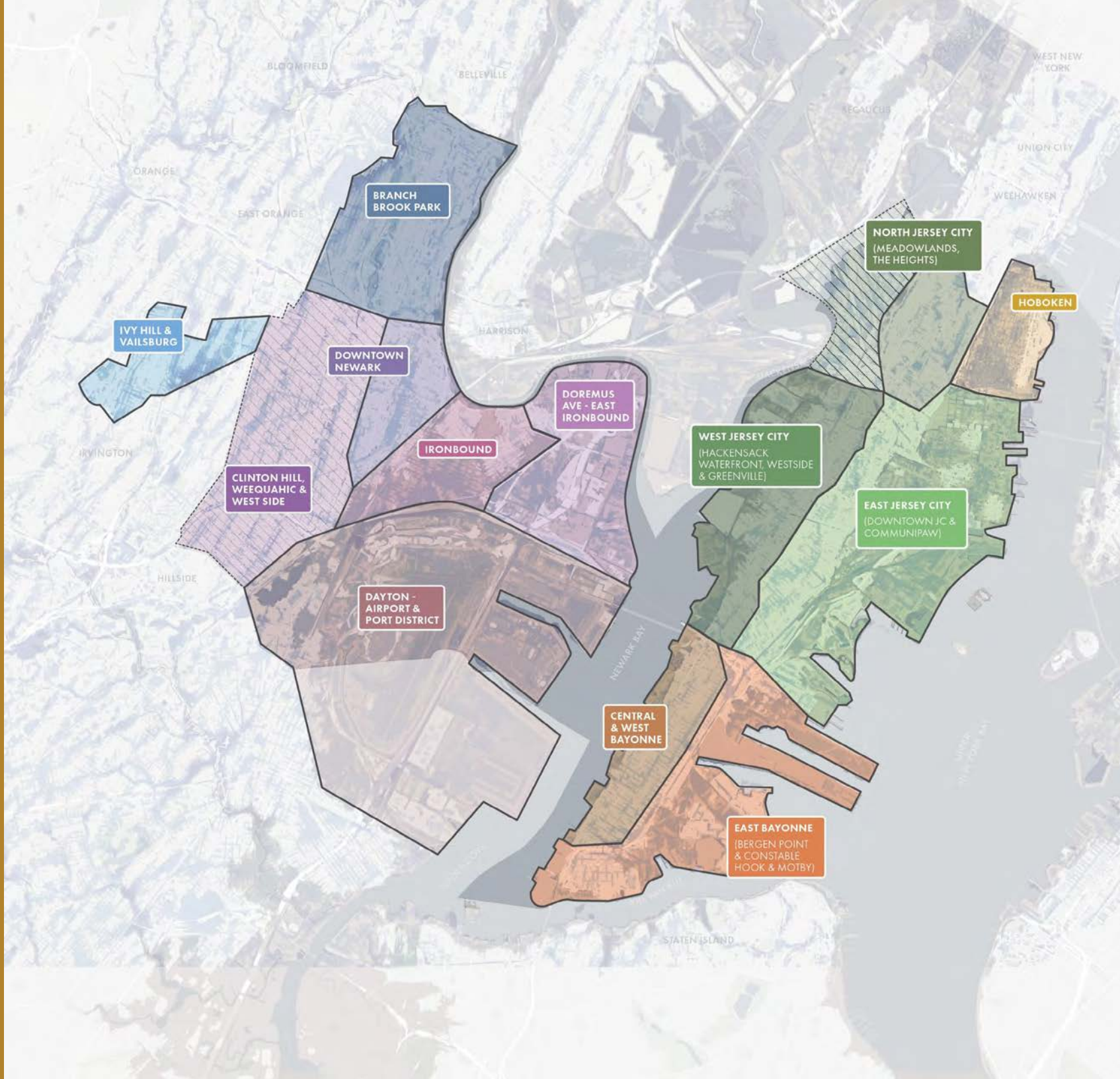
- Work with neighboring states to develop a regional Drought Early Warning System (DEWS) that includes New Jersey
- Partner with the research community (e.g., Rutgers Center for Remote Sensing and Spatial Analysis) to implement regional High Resolution Rapid Refresh 48-hour modeling of severe weather and PM2.5 transport plumes to support early warning systems at various scales

● = would result in physical or nature-based solutions

SCENARIOS BY STUDY AREA

This section presents possible physical actions that would address flooding or actions that would involve construction of projects that change our built environment. These actions were developed with consideration of flood impacts and where they are most significant, which is detailed in the separate Flood Impact Assessment report. This report is focused on the actions themselves and how they are grouped into the three scenarios. Information about the extent to which the actions would address flooding will be included in the Action Plan.

Non-physical solutions are described at the regional level for each scenario within the Three Regional Scenarios section.


BRANCH BROOK PARK
IVY HILL & VAILSBURG
DOWNTOWN NEWARK
DOREMUS AVE - EAST IRONBOUND
IRONBOUND
CLINTON HILL, WEEQUAHIC & WEST SIDE
DAYTON - AIRPORT & PORT DISTRICT
CENTRAL & WEST BAYONNE
EAST BAYONNE (BERGEN POINT & CONSTABLE HOOK & MOTBY)
NORTH JERSEY CITY (MEADOWLANDS, THE HEIGHTS)
HOBOKEN
WEST JERSEY CITY (HACKENSACK WATERFRONT, WESTSIDE & GREENVILLE)
EAST JERSEY CITY (DOWNTOWN JC & COMMUNIPAW)
BLOOMFIELD
BELLEVILLE
ORANGE
EAST ORANGE
HARRISON
IRVINGTON
HILLSIDE
NEWARK BAY
WEST NEW YORK
SECAUCUS
UNION CITY
WEEHAWKEN
STATEN ISLAND

JERSEY CITY

Image Source: Nosha

JERSEY CITY
Hudson / East

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HUDSON RIVER / EAST

Scenario 1 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Consider inland flood barrier alignment along Washington Street (due to the coordination needed along the waterfront, a waterfront coastal protection alignment is not included in Scenario 1 – Individual Initiative)
- Consider flood barrier along Philip Street in Liberty State Park and barriers at key flood pathways south of Liberty State Park along the NJ Turnpike
- Protecting individual sites, such as electrical infrastructure and public housing
- Municipal guidance and technical assistance for site protection of coastal industrial areas

Drainage:

- Sewer separation at select locations in downtown, as prescribed by the LTCP
- Increase piping capacity and size combined sewer retention tanks appropriately to mitigate flooding in addition to reducing combined sewer overflows
- Construct subsurface stormwater retention at public sites similar to the concept proposed at McGovern Park in Country Village (BRIC application)

Green infrastructure:

- Incorporate GI into public rights-of-way (e.g., roads, city-owned parks)
  - Example locations: Johnston Avenue, Communipaw Avenue, Christopher Columbus Drive, Montgomery Street, Grand Street

MCGOVERN PARK RESILIENCE PROJECT

In response to feedback about integrating stormwater management into parks, Jersey City, through Resilient NENJ, submitted a funding application in January 2022 to advance a stormwater storage project beneath McGovern Park. The project will reduce flooding to approximately 80 homes in the Country Village area, where there can be significant rainfall flooding.

TIATIVE

HACKENSACK RIVER

PROTECT KEY ELECTRICAL INFRASTRUCTURE ASSETS

EXPLORE INLAND FLOOD BARRIER ALIGNMENT AT WASHINGTON AS AN ALTERNATIVE TO BOARDWALK RAISING

STRENGTHEN COORDINATION WITH HOBOKEN'S RBD FLOOD BARRIERS FOR MUTUAL BENEFITS

IMPROVE OUTFLOW TO MAIN DRAINAGE CORRIDORS & REEXAMINE LTCP RETENTION TANKS

SEWER SEPARATION PRESCRIBED BY LTCP

PROTECT KEY HOUSING ASSETS

EXPLORE SEWER SEPARATION WITH RETENTION AT FEASIBLE CITY SITES, POTENTIAL TIE IN TO NJDEP WETLAND PROJECT

REVIEW & STRENGTHEN RESILIENCE MEASURES OF PLANNED REDEVELOPMENT

CREATE A BARRIER AT PHILIP ST (ROAD RAISING OR FLOODWALL) POSSIBLY LEVERAGING NJDEP WETLAND PROJECT

CREATE BARRIERS AT KEY FLOOD PATHWAYS INTEGRATED WITH HIGHWAY UNDERPASSES

CITY ENFORCED ADAPTATION REGULATIONS FOR INDUSTRIAL AREAS OUTSIDE OF PROTECTIONS

HUDSON RIVER / EAST

Scenario 2 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Elevate the Hudson River Waterfront Walkway in downtown Jersey City (as recommended in the Jersey City Resiliency Master Plan)
- Construct coastal barriers to protect larger areas, such as along the NJ Turnpike extension or integrated with NJDEP's wetland restoration project in Liberty State Park

Drainage:

- Identify opportunities to redirect stormwater and store it, such as integrated with possible elevation of the Hudson River Waterfront Walkway and at parks like Gateway Park, Berry Lane Park, and Lafayette Park
- Explore deep tunnel stormwater storage with a new pump station beneath the NJ Turnpike from Montgomery Street to the Morris Canal Basin
- Expand concepts, like McGovern Park resilience project, to private, vacant properties, possibly converting unused, impervious sites to park space

Green infrastructure:

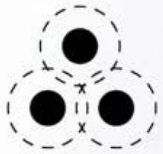
- Incentivize or require GI on private sites through grants, tax incentives, and requirements

JERSEY CITY RESILIENCY MASTER PLAN

A series of plans prepared by the City of Jersey City, including the Resiliency Master Plan, an Adaptation Master Plan, and a separate summary document, outlined coastal strategies to protect six priority areas. These recommendations have been reviewed and incorporated into scenario development for Resilient NENJ.

LIBERTY STATE PARK WETLAND RESTORATION

NJDEP is working on the design to restore 234 acres within Liberty State Park. The project will create restored wetlands, saltmarsh, and recreational space in a contaminated portion of the park.



SCENARIO 2

SHARED RESPON

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- LTCP STORAGE TANKS
- PROPOSED GREENWAY CORRIDORS (BY OTHERS)

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- PUMP STATIONS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- REDEVELOPMENT AREAS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

NSIBILITY

DEEP TUNNEL STORAGE ALONG NJ TPKE R.O.W.

DIRECT STORMWATER TO NEW RETENTION AREAS AT GATEWAY PARK

DIRECT STORMWATER TO NEW RETENTION AREAS AT BERRY LANE & LAFAYETTE PARKS

IMPROVE ALL OUTFLOW CAPACITY & INTRODUCE NEW RETENTION TANKS

EXPLORE PUBLIC/PRIVATE RETENTION OPPORTUNITIES IN WALKWAY RECONFIGURATION

IMPROVE & ADVANCE CITY PLANS TO ELEVATE BOARDWALK & STREET CORRIDORS ALONG THE HUDSON WATERFRONT

NEW PUMP STATION TO MORRIS CANAL BASIN

EXPLORE PARTNERSHIP TO COORDINATE NJDEP WETLAND PROJECT WITH NEW FLOOD BARRIER

EXPLORE A CONTINUOUS BARRIER CONNECTING NATURAL HIGH POINTS, IN COORDINATION WITH AGENCIES & LAND OWNERS

HUDSON RIVER / EAST

Scenario 3 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Elevate Hudson River Waterfront Walkway and connect it across the Hudson River / New York Bay
  - Consider possible inland alignment west of Liberty State Park

Drainage:

- Integrate drainage improvements into new greenway corridors (such as the proposed Embankment and Morris Canal Greenways)
- Separate stormwater into deep tunnels for significantly expanded storage capacity. Deep tunnels require more intensive planning and construction and are larger investments than other drainage solutions
  - Example locations: Marin Blvd, along rail line and NJ Turnpike right-of-way west of downtown

Green infrastructure:

- Expand natural storage of water in waterbodies, like the Morris Canal Basin, and through wetland restoration at Liberty State Park led by NJDEP
- Explore a regionally coordinated living shorelines program for wetland restoration along the coasts in conjunction with new stormwater outfalls, such as along Liberty State Park. Living shorelines would help reduce wave action, improve connection to waterfront, and expand valuable green space while bringing water quality benefits

ORDINATION

DEEP TUNNEL STORAGE ALONG MARIN BLVD
DEEP TUNNEL STORAGE ALONG RAIL LINE & NJ TPKE R.O.W. INTEGRATED WITH NEW GREENWAY CORRIDOR
INTEGRATE GI & DRAINAGE IMPROVEMENTS ALONG GREENWAY CORRIDOR
CONCENTRATE NEW DRAINAGE IMPROVEMENTS ALONG GREENWAY & BOARDWALK CORRIDORS FOR "DIG ONCE" BENEFITS
CONCENTRATE NEW DRAINAGE IMPROVEMENTS ALONG GREENWAY & BARRIER CORRIDORS FOR "DIG ONCE" BENEFITS
CONVERT THE MORRIS CANAL BASIN TO BE USED FOR IN-WATER STORAGE
TIE-INTO & EXPLORE RAISING OF EXISTING HUDSON WATERFRONT WALKWAY CORRIDOR FOR TIDAL AND WAVE ACTION ATTENUATION
LEVERAGE NJDEP WETLAND PROJECT FOR NATURAL RETENTION & FILTRATION POTENTIAL
CREATE NEW INLAND PATH FOR HUDSON RIVER WALKWAY INTEGRATED WITH FLOOD PROTECTIONS & SURROUNDING PROJECTS
INLAND WALKWAY
STORMWATER RETENTION WETLANDS
12TH ST
MONTGOMERY ST
LIBERTY STATE PARK
BASIN
1-78

JERSEY CITY
Hackensack / West

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HACKENSACK / WEST

Scenario 1 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Protect individual sites, such as electrical infrastructure and public housing

Drainage:

- Implement sewer separation at select locations and install new stormwater outfalls
  - Example locations: Sip Ave and Clendenny Ave
- Construct the sewage storage tank on Sip Ave, as proposed in the Jersey City Municipal Utilities Authority (JCMUA) Long-Term Control Plan (LTCP) and ensure it is sized appropriately to mitigate flooding in addition to reducing combined sewer overflows

Green infrastructure:

- Incorporate GI into public rights-of-way (e.g., roads, city-owned parks)
  - Example locations: Sip Ave, Communipaw Ave, Clendenny Ave, Route 1-9 / Route 440, West Side Ave
- Expand wetland restoration to areas north and south of Lincoln Park, where a wetland restoration project was already completed

LINCOLN PARK WEST WETLAND RESTORATION PROJECT

This completed project included restoration of 34 acres of wetlands and 11 acres of transitional wetland areas at a former landfill site. The project created recreational opportunities, including a golf course and nature walk in Lincoln Park.

Imagery via Google Earth Pro

SCENARIO 1

INDIVIDUAL INIT

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- LTCP STORAGE TANKS
- PROPOSED GREENWAY CORRIDORS (BY OTHERS)

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- PUMP STATIONS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- REDEVELOPMENT AREAS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENT & MUNICIPAL COORDINATION

TIATIVE

PASSAIC RIVER

STORMWATER STORAGE TANK PRESCRIBED BY LTCP

HACKENSACK RIVER

PULASKI SKYWAY

REVITALIZE SELECT WETLANDS THROUGH CITY INITIATIVES

SEPARTE SEWERS ALONG SIP AND CLENDENNY AVES TO NEW STORMWATER OUTFALLS & WETLANDS

4 FOCUSED GI ON PRIMARY CORRIDORS IN AREAS OF REPEAT FLOODING THROUGH POLICY

1 REVIEW & STRENGTHEN RESILIENCE MEASURES OF PLANNED BAYFRONT I REDEVELOPMENT

CITY ENFORCED ADAPTATION REGULATIONS FOR INDUSTRIAL AREAS

JC ADAPTATION PLAN : RAISED WALKWAY

EXPLORE INLAND BARRIER ALIGNMENTS IN WESTSIDE

SIP AVE

DUNCAN AVE

COMMUNIPAW AVE

JFK BLVD

BERGEN AVE

WEST SIDE AVE

NEWARK BAY

8

2

4

2

5

8

HACKENSACK / WEST

Scenario 2 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Construct a raised waterfront walkway along Society Hill (as recommended in the Jersey City Resiliency Master Plan)
- Construct a street levee along Route 440 in coordination with New Jersey Department of Transportation (NJDOT) to protect Country Village

Drainage:

- Identify opportunities to redirect stormwater, separate it from the combined system, and store it
  - Example locations: sewer separation along Sip, Duncan, and Clendenny Avenues; new retention areas or storage at West Side Car Park and Lincoln Park; and new stormwater outfalls at Lincoln Park and Bayfront
- Expand concepts, like McGovern Park resilience project, to private, vacant properties, possibly converting unused, impervious sites to park space
  - Incorporate subsurface stormwater storage with Bayfront redevelopment project, with stormwater redirected from south of the site

Green infrastructure:

- Foster public-private-partnership for impervious surface conversion and GI projects at Hudson Mall west of Route 440
- Incentivize or require GI on private sites through grants, tax incentives, and requirements

NSIBILITY

PASSAIC RIVER

HACKENSACK RIVER

PULASKI SKYWAY

RESTORE WETLANDS FOR RETENTION AND FILTRATION

SEPARTE SEWERS ALONG SIP, DUNCAN AND CLENDENNY AVES TO PARKS, NEW STORMWATER OUTFALLS & WETLANDS

IMPERVIOUS SPACE CONVERSION VIA PUBLIC PARTNERSHIP

2

WORK WITH RESILIENCE MEASURES OF PLANNED BAYFRONT I REDEVELOPMENT

1

DIRECT STORMWATER TO NEW RETENTION AREAS AT BAYFRONT I, WEST SIDE CAR PARK & LINCOLN PARK

3 4 5

CITY ENFORCED ADAPTATION REGULATIONS FOR INDUSTRIAL AND COMMERCIAL AREAS

2

JC ADAPTATION PLAN : RAISED WALKWAY

RT 440 STREET LEVEE COORDINATED WITH NJDOT

NEWARK BAY

HACKENSACK / WEST

Scenario 3 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Integrate coastal barriers with proposed greenway corridors, such as the Hackensack Greenway Plan, a Hudson County Plan

Drainage:

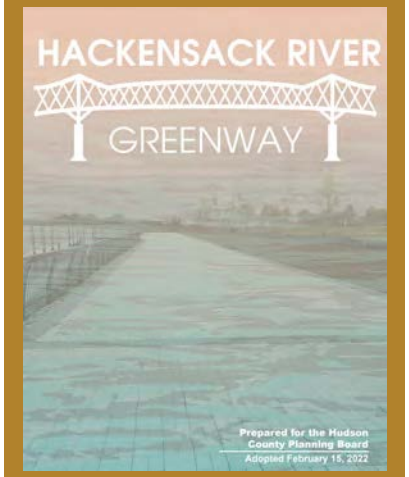
- Explore drainage solutions proposed in Scenario 2 (storm sewer separation with redirection to new retention areas and new stormwater outfalls) and expand to additional areas

Green infrastructure:

- Explore a regionally coordinated living shorelines program for wetland restoration along the Newark Bay. Living shorelines help reduce wave action, improve connection to waterfront, and expand valuable green space while providing water quality benefits
- Integrate GI in proposed greenway corridors and additional roadways

HACKENSACK RIVER GREENWAY PLAN

Hudson County's February 2022 plan outlines recommendations for improvement and completion of a continuous greenway along the Hackensack River that would span from Secaucus, through Jersey City, to the southern tip of Bayonne.



SCENARIO 3
REGIONAL COO

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- LTCP STORAGE TANKS
- PROPOSED GREENWAY CORRIDORS (BY OTHERS)

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- PUMP STATIONS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- REDEVELOPMENT AREAS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. CREATE A "SINGLE SOURCE OF TRUTH" FOR RESILIENCE-RELATED INFORMATION AND RESOURCES
2. REGIONAL GI CHAMPIONS TRAINING PROGRAM
3. DEVELOP PIPELINE OF SITES FOR STORMWATER MANAGEMENT / RESILIENT TRANSFORMATION OF BROWNFIELDS & CONTAMINATED SITES
4. REGIONAL TREE PLANTING PROGRAM
5. REGIONAL NETWORK OF RESILIENCE HUBS
6. REGIONAL PROGRAM DEVELOPMENT AND SUPPORT FOR COMPOSTING AND WASTE REDUCTION CAMPAIGNING

ORDINATION

REGIONALLY COORDINATED NEWARK BAY LIVING SHORELINE: LIVING WITH WATER INITIATVE WETLANDS FOR RETENTION AND ECOSYSTEM SERVICES

INTEGRATE COASTAL BARIERS WITH GREENWAY CORRIDORS FOR MULTI-PURPOSE INFRASTRUCTURE

REVIEW & STRENGTHEN RESILIENCE MEASURES OF PLANNED BAYFRONT I REDEVELOPMENT

CITY ENFORCED ADAPTATION REGULATIONS FOR INDUSTRIAL AND COMMERCIAL AREAS

JC ADAPTATION PLAN : RAISED WALKWAY

CONCENTRATE NEW DRAINAGE IMPROVEMENTS ALONG GREENWAY CORRIDORS FOR "DIG ONCE" BENEFITS

SEPARTE SEWERS ALONG SIP, DUNCAN AND CLENDENNY AVES TO PARKS, NEW STORMWATER OUTFALLS & WETLANDS

DIRECT STORMWATER TO NEW RETENTION AREAS AT BAYFRONT I, WEST SIDE CAR PARK & LINCOLN PARK

JERSEY CITY
North Jersey City

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NORTH JERSEY CITY

Scenario 1 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- The Jersey City Heights area is at a higher elevation and is not projected to be vulnerable to present or future coastal flooding
- The western portion of this area is under jurisdiction of the New Jersey Sports & Exposition Authority (NJSEA), which incorporated climate change considerations in its 2020 Hackensack Meadowlands District Master Plan Update

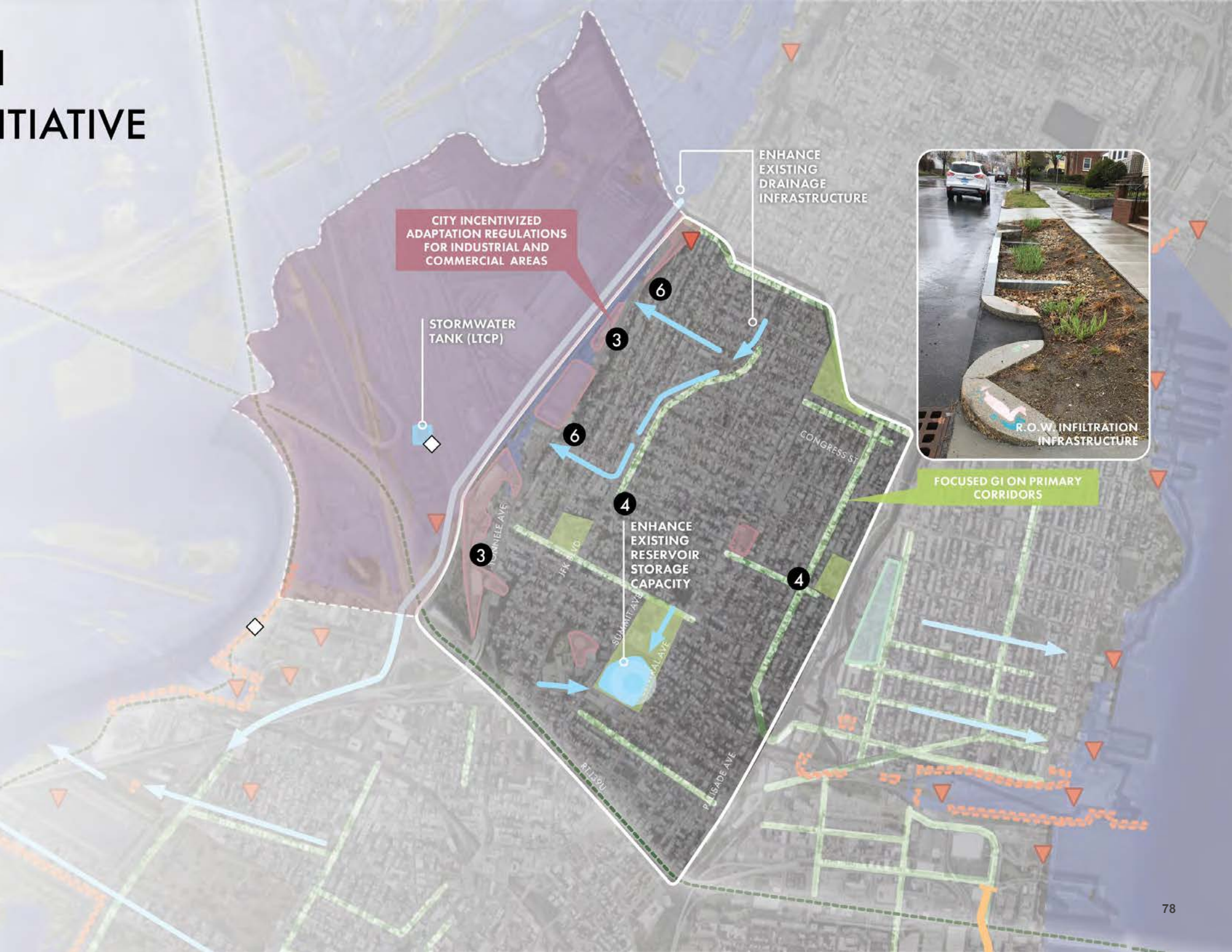
Drainage:

- Construct the sewage storage tank on Sip Ave, as proposed in the Jersey City Municipal Utilities Authority (JCMUA) Long-Term Control Plan (LTCP) and ensure it is sized appropriately to mitigate flooding in addition to reducing combined sewer overflows
- Expand storage capacity within the decommissioned Jersey City Heights Reservoir #3
- Increase capacity of drainage infrastructure in the area to prevent back-ups

Green infrastructure:

- Incorporate GI into public rights-of-way (e.g., roads, city-owned parks)
  - Example locations: Palisade Ave, Manhattan Ave, JFK Blvd

ITIATIVE


ENHANCE EXISTING DRAINAGE INFRASTRUCTURE
CITY INCENTIVIZED ADAPTATION REGULATIONS FOR INDUSTRIAL AND COMMERCIAL AREAS
STORMWATER TANK (LTCP)
6
3
6
4
3
4
ENHANCE EXISTING RESERVOIR STORAGE CAPACITY
CONGRESS ST
JFK BLVD
SUMMIT AVE
PALISADE AVE
R.O.W. INFILTRATION INFRASTRUCTURE
FOCUSED GI ON PRIMARY CORRIDORS

NORTH JERSEY CITY

Scenario 2 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Opportunity for coastal barriers at the former Public Service Electric & Gas Company (PSE&G) site along the Hackensack River. Note: this site is undergoing redevelopment into a warehouse facility, with a plan already approved by New Jersey Sports and Exposition Authority (NJSEA). This limits opportunity for a possibly coastal barrier at the site.

Drainage:

- Explore opportunity for stormwater storage at the former PSE&G development site. Note: due to the ongoing redevelopment that has already been approved, feasibility of stormwater management incorporation at the site is limited
- Identify opportunities to redirect stormwater and store it, such as at Riverview-Fisk, Pershing Field, Leonard Gordon, and Washington Parks

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements

SCENARIO 2
SHARED RESPO

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

2
ONSIBILITY

NORTH JERSEY CITY

Scenario 3 | Jersey City

Examples of solutions for this scenario include the following:

Coastal:

- Opportunity for coastal barriers at the former PSE&G site integrated with the proposed Hackensack Greenway. Note: this site is undergoing redevelopment by a private developer into a warehouse facility, with a plan already approved by NJSEA. The developer has been engaged in discussions with the State and other partners about integration of the Hackensack Greenway and Essex-Hudson Greenway along portions of the site. However, PSE&G maintains easements over some areas of the site along the shoreline for access to remaining infrastructure. The remaining PSE&G infrastructure, along with existing plans for redevelopment, limit opportunities for a possible coastal barrier at the site and may prevent the Hackensack Greenway corridor from being sited along the waterfront. The site owner will need to be engaged as a key stakeholder for any potential future coastal barriers.

Drainage:

- Concentrate drainage improvements into new regional greenway corridors, such as within the proposed Essex-Hudson Greenway route in this area
- Explore opportunity for stormwater storage at the former PSE&G development site. Note: due to the ongoing redevelopment that has already been approved, feasibility of stormwater management incorporation at the site is limited

Green infrastructure:

- Integrate green infrastructure projects in the proposed Essex-Hudson Greenway and Hackensack Greenway corridors as feasible

3
ORDINATION

INCREASE CAPACITY OF EXISTING FLOW PATHS

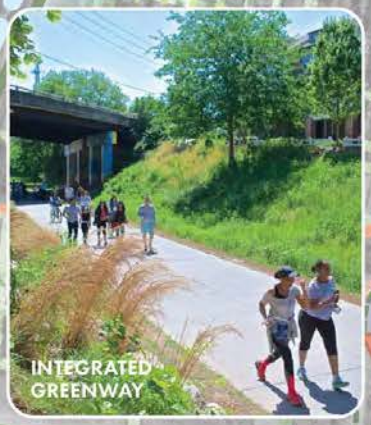
UTILIZE ESSEX-HUDSON GREENWAY FOR CONVEYANCE & STORAGE

STORMWATER TANK (LTCP)

DIRECT STORMWATER TO MAIN DRAINAGE CORRIDORS

INTEGRATE COASTAL BARIERS WITH GREENWAY CORRIDORS FOR MULTI-PURPOSE INFRASTRUCTURE

CONCENTRATE NEW DRAINAGE IMPROVEMENTS ALONG GREENWAY CORRIDORS FOR "DIG ONCE" BENEFITS



NEWARK

Image Source: Ken Lund

NEWARK
East Ironbound & Doremus

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EAST IRONBOUND & DOREMUS

Scenario 1 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Protect individual sites such as key energy, transportation, corrections, and industrial infrastructure through initiatives led by the city or individual agencies and property owners
  - Example sites: Covanta Essex, PSE&G Essex Generating Station, Essex County Correctional Facility, Ironbound Bus Garage
- Create a resilience hub at the Ironbound Recreation Center, like the proposed project at the Ann Street School, to serve the area as a single source of knowledge and for assistance leading up to and following climate events
- Provide municipal guidance and technical assistance for site protection of coastal industrial areas

Drainage:

- Increase pumping and drainage capacity at problem underpasses, such as the underpass beneath Route 1/9 at Rome Street
- Tie into and expand planned LTCP projects set to increase retention and pumping capabilities at several points in the city
  - Advance the proposed sewer interceptor that will run parallel to existing sewers across Newark to convey additional combined sewage to the PVSC Wastewater Treatment Plant

Green infrastructure:

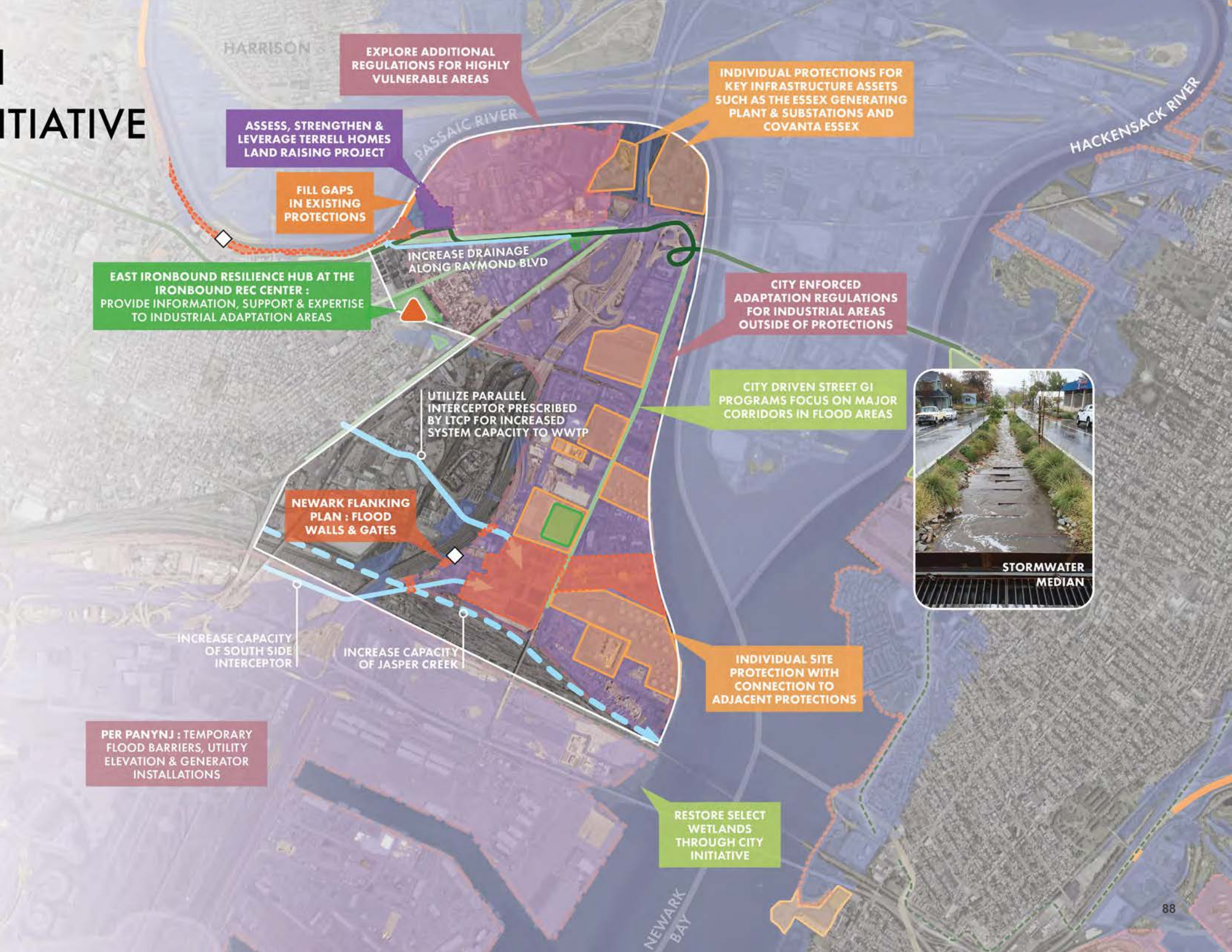
- Incorporate GI into key public rights-of-way (e.g., roads, city-owned parks)
  - Example roadways: Doremus Ave, Raymond Blvd

TERRELL HOMES CLIMATE RESILIENCE

Terrell Homes, a Newark Housing Authority property, is being redeveloped by the housing authority and a private developer into new senior and low-income public housing, along with a waterfront community space and pedestrian connections to Essex County Riverfront Park. As part of the redevelopment, the site is being elevated to protect it from coastal flooding from the adjacent Passaic River, an example of a project that is both preserving public housing and increasing climate resilience.

SCENARIO 1
INDIVIDUAL IN

ITIATIVE


HARRISON
PASSAIC RIVER
HACKENSACK RIVER
EXPLORE ADDITIONAL REGULATIONS FOR HIGHLY VULNERABLE AREAS
INDIVIDUAL PROTECTIONS FOR KEY INFRASTRUCTURE ASSETS SUCH AS THE ESSEX GENERATING PLANT & SUBSTATIONS AND COVANTA ESSEX
ASSESS, STRENGTHEN & LEVERAGE TERRELL HOMES LAND RAISING PROJECT
FILL GAPS IN EXISTING PROTECTIONS
INCREASE DRAINAGE ALONG RAYMOND BLVD
EAST IRONBOUND RESILIENCE HUB AT THE IRONBOUND REC CENTER : PROVIDE INFORMATION, SUPPORT & EXPERTISE TO INDUSTRIAL ADAPTATION AREAS
CITY ENFORCED ADAPTATION REGULATIONS FOR INDUSTRIAL AREAS OUTSIDE OF PROTECTIONS
CITY DRIVEN STREET GI PROGRAMS FOCUS ON MAJOR CORRIDORS IN FLOOD AREAS
UTILIZE PARALLEL INTERCEPTOR PRESCRIBED BY LTCP FOR INCREASED SYSTEM CAPACITY TO WWTP
NEWARK FLANKING PLAN : FLOOD WALLS & GATES
STORMWATER MEDIAN
INCREASE CAPACITY OF SOUTH SIDE INTERCEPTOR
INCREASE CAPACITY OF JASPER CREEK
INDIVIDUAL SITE PROTECTION WITH CONNECTION TO ADJACENT PROTECTIONS
PER PANYNJ : TEMPORARY FLOOD BARRIERS, UTILITY ELEVATION & GENERATOR INSTALLATIONS
RESTORE SELECT WETLANDS THROUGH CITY INITIATIVE
NEWARK BAY

EAST IRONBOUND & DOREMUS

Scenario 2 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Investigate feasibility of continuous coastal barrier through coordination and agreement between property owners

Drainage:

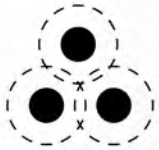
- Increase drainage along Raymond Blvd to alleviate flooding in surrounding streets
- Expand conveyance in Jasper Creek by removing bottlenecks and reconfiguring and reinforcing the creek

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
  - Consider a green and blue roof program or public-private partnerships to create these installations on large industrial buildings and warehouses

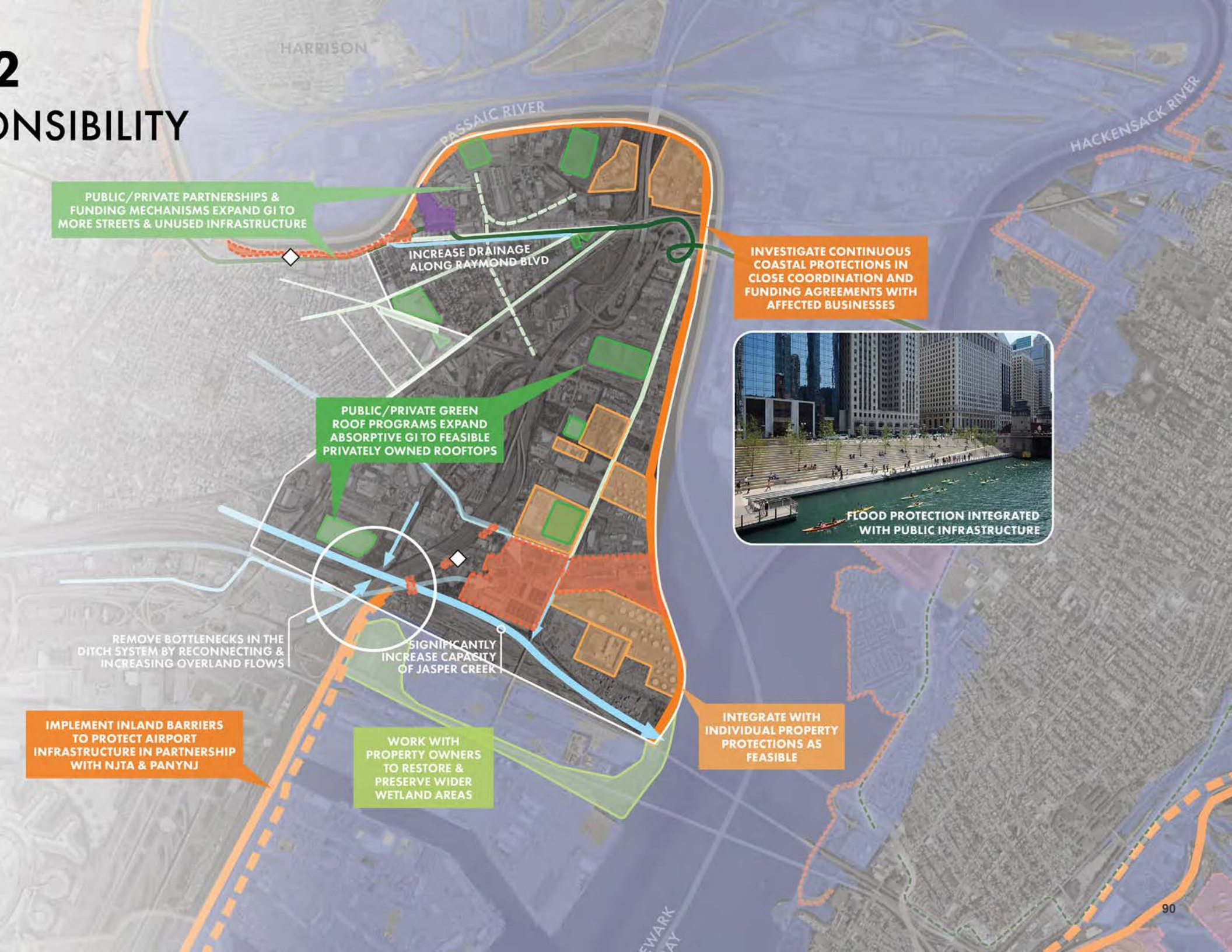
FORWARD BOUND DOREMUS

Forward Bound Doremus is an ongoing planning and engagement process to create a vision for redevelopment in the industrial areas around Doremus Ave. Resilient NENJ is tracking the plan and coordinating with the planning team to ensure that the resilience Action Plan is aligned with the Forward Bound Doremus Plan.



SCENARIO 2
SHARED RESPO

2
ONSIBILITY



EAST IRONBOUND & DOREMUS

Scenario 3 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Integrate continuous coastal protections along the proposed Morris Canal Greenway along Raymond Blvd as an opportunity to insert both **coastal** protections, **drainage** improvements, and GI in a single project
- Create an inland flood barrier along Doremus Ave, through a raised roadway or adjacent structure, tying into individual property protections that are already planned or completed
- In conjunction with the inland flood barrier, consider implementation of an incentivized retreat strategy east of Doremus Ave, in areas that may see daily tidal inundation by 2070. These areas would be restored to wetlands and become part of the living shoreline system discussed below.

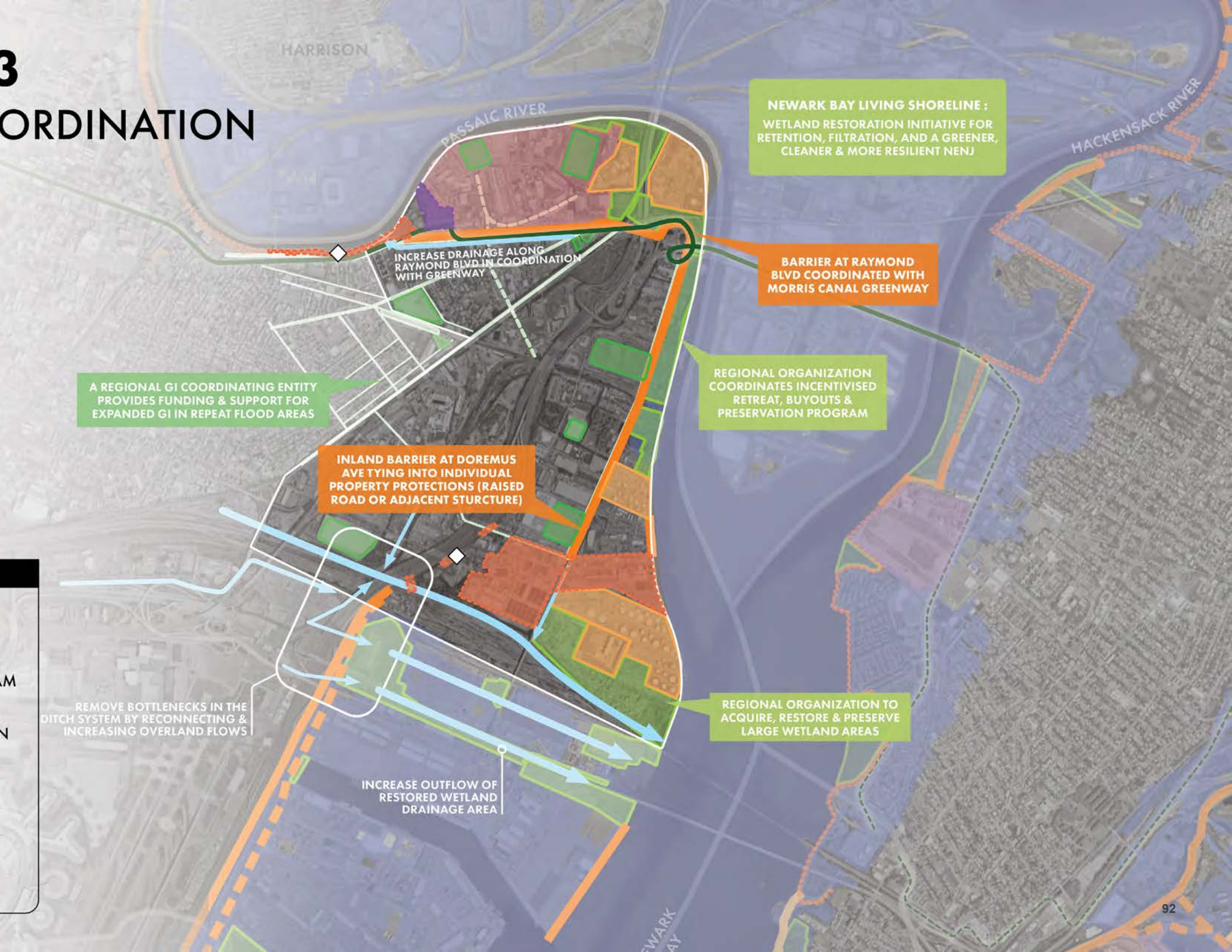
Drainage:

- Integrate drainage improvements into the proposed Morris Canal Greenway

Green infrastructure:

- Explore a regionally coordinated living shorelines program for wetland restoration along the Newark Bay and Passaic River. This will help filter the runoff before it hits regional waterways, resulting in a healthier ecology and cleaner water for all in the region.
- Incorporate GI practices in the proposed Morris Canal Greenway

3
ORDINATION



NEWARK
Port Newark, Newark Airport & Dayton

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PORT NEWARK, NEWARK AIRPORT & DAYTON

Scenario 1 | Newark

This area is largely under the jurisdiction of the Port Authority of New York and New Jersey (PANYNJ), which owns and operates Port Newark facilities and Newark-Liberty International Airport. PANYNJ is advancing their own climate resilience strategy to protect their assets.

Additional solutions that would apply to this area include the following:

Coastal:

- Restore wetlands, led by the City of Newark, in select locations along the Newark Bay

Drainage:

- Increase outflow of the peripheral ditch around Newark Airport by increasing pumping capacity at its mouth, which is under jurisdiction of the City of Newark Department of Water & Sewer

ITIATIVE

INCREASE OUTFLOW TO THE PERIPHERAL DITCH
INCREASE OUTFLOW TO JASPER CREEK
DIRECT WEEQUAHIC LAKE OVERFLOW TO PERIPHERAL DITCH
REVITALIZE SELECT WETLANDS THROUGH CITY INITIATIVES
INCREASE EXISTING PUMPING CAPACITY

PORT NEWARK, NEWARK AIRPORT & DAYTON

Scenario 2 | Newark

This area is largely under the jurisdiction of PANYNJ, which owns and operates Port Newark facilities and Newark-Liberty International Airport. PANYNJ is advancing their own climate resilience strategy to protect their assets.

Additional solutions that would apply to this area include the following:

Coastal:

- Explore the possibility of a flood barrier east of the airport along the NJ Turnpike, Corbin Street, or the rail line through coordination with the NJ Turnpike Authority or NJ TRANSIT.
  - If flood protection is constructed along Corbin Street, it would require gates to allow access to port areas

Drainage:

- Coordinate with Essex County Parks to increase storage within Weequahic Lake and direct outflow to an increased capacity peripheral ditch

2
ONSIBILITY

PORT NEWARK, NEWARK AIRPORT & DAYTON

Scenario 3 | Newark

This area is largely under the jurisdiction of the PANYNJ, which owns and operates Port Newark facilities and Newark-Liberty International Airport. PANYNJ is advancing their own climate resilience strategy to protect their assets.

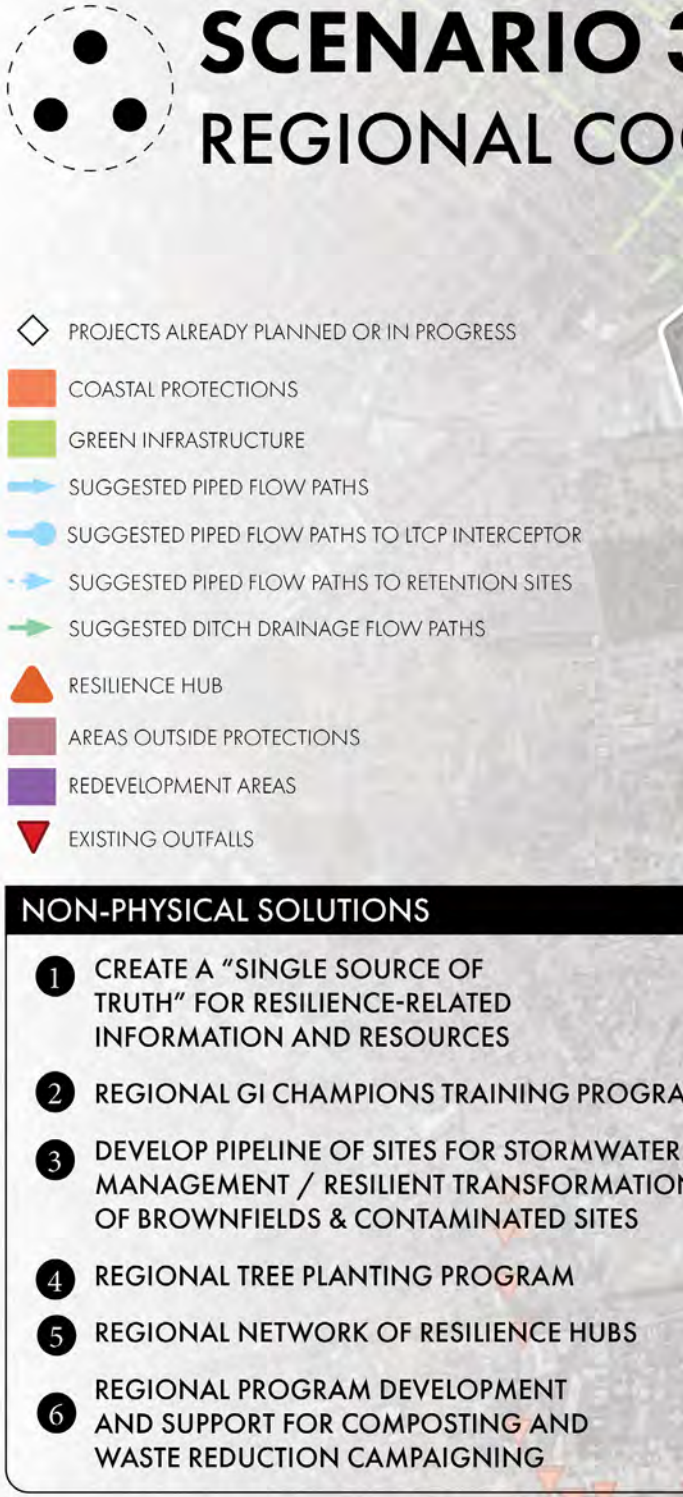
Additional solutions that would apply to this area include the following:

Drainage:

- Direct surface water in Newark's ditches to restored wetlands along the Newark Bay, to supplement expansion of Jasper Creek capacity further north
  - Explore possible overflow of the peripheral ditch into the Elizabeth River and flowing to wetlands along the Newark Bay

Green infrastructure:

- Explore a regionally coordinated living shorelines program for wetland restoration along Newark Bay. This will help filter the runoff before it hits regional waterways, resulting in a healthier ecology and cleaner water for all in the region



3
ORDINATION

NEWARK
Ironbound

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IRONBOUND

Scenario 1 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Advance the Newark Flanking Plan, which would reduce coastal flooding to much of the Ironbound

Drainage:

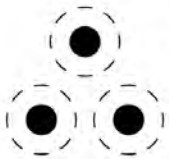
- Advance more projects in city-owned properties, such as the proposed Ironbound Resilience Hub that includes stormwater storage at the Ann Street School
  - Possible additional location: Independence Park
- Explore options to convey sewage from the South Ironbound into the new parallel interceptor proposed in the regional LTCP alternative

Green infrastructure:

- Incorporate GI into key public rights-of-way (e.g., roads, city-owned parks)
  - Example roadways: South Street, Market Street, Raymond Blvd, Ferry Street, Jackson Street

NEWARK FLANKING PLAN

The United States Army Corps of Engineers (USACE) Passaic River Tidal Area Project is in the design phase for the selected alternative, which is referred to as the Newark Flanking Plan. This project proposes storm surge protections for the Ironbound area by cutting off flood pathways with a network of floodwall segments, levee segments, road closure structures, a railroad closure structure, and interior drainage features. When completed, the project may play a significant role in reducing storm surge flood impacts in Newark by potentially reducing up to $4.6 billion in expected losses based on data for Resilient NENJ's flood impact assessment.



SCENARIO 1

INDIVIDUAL INIT

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- PROPOSED LTCP INTERCEPTOR

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENT & MUNICIPAL COORDINATION

TIATIVE

RETENTION AREA AT RIDGE STREET SCHOOL
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
CITY DRIVEN PUBLIC HOUSING PROTECTION
STORMWATER RETENTION SITE AT NEWARK SCHOOLS STADIUM
SEPARATE AND DIRECT STORMWATER TO EXISTING SYSTEM
DIRECT BRANCH BROOK LAKE OVERFLOW TO NEW INTERCEPTOR
1
2
3
4
6
VERONA AVE
HELLER PKWY
MT PROSPECT AVE
SUMMER AVE
BROADWAY
MCCARTER HWY
BLOOMFIELD AVE
LAKE ST
N 12TH ST
ROSEVILLE AVE
PARK AVE
7TH AVE
CLAY ST

IRONBOUND

Scenario 2 | Newark

Examples of solutions for this scenario include the following:

Coastal:

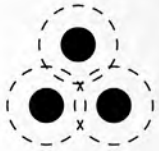
- Advance the Newark Flanking Plan, which would reduce coastal flooding to much of the Ironbound

Drainage:

- Redirect stormwater to new storage locations and out of the Ironbound, which is at a lower elevation than many of the surrounding areas, by increasing capacity to existing outfalls and creating a new outfall at City Dock Street on the Passaic River. Increase flow to the expanded peripheral ditch (see Port Newark, Newark Airport & Dayton section)
- Through policy, incentivize stormwater storage on private properties, especially vacant, impervious spaces

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
- Increase green space through related non-physical measures, such as tree canopy and adopt-a-green street programs



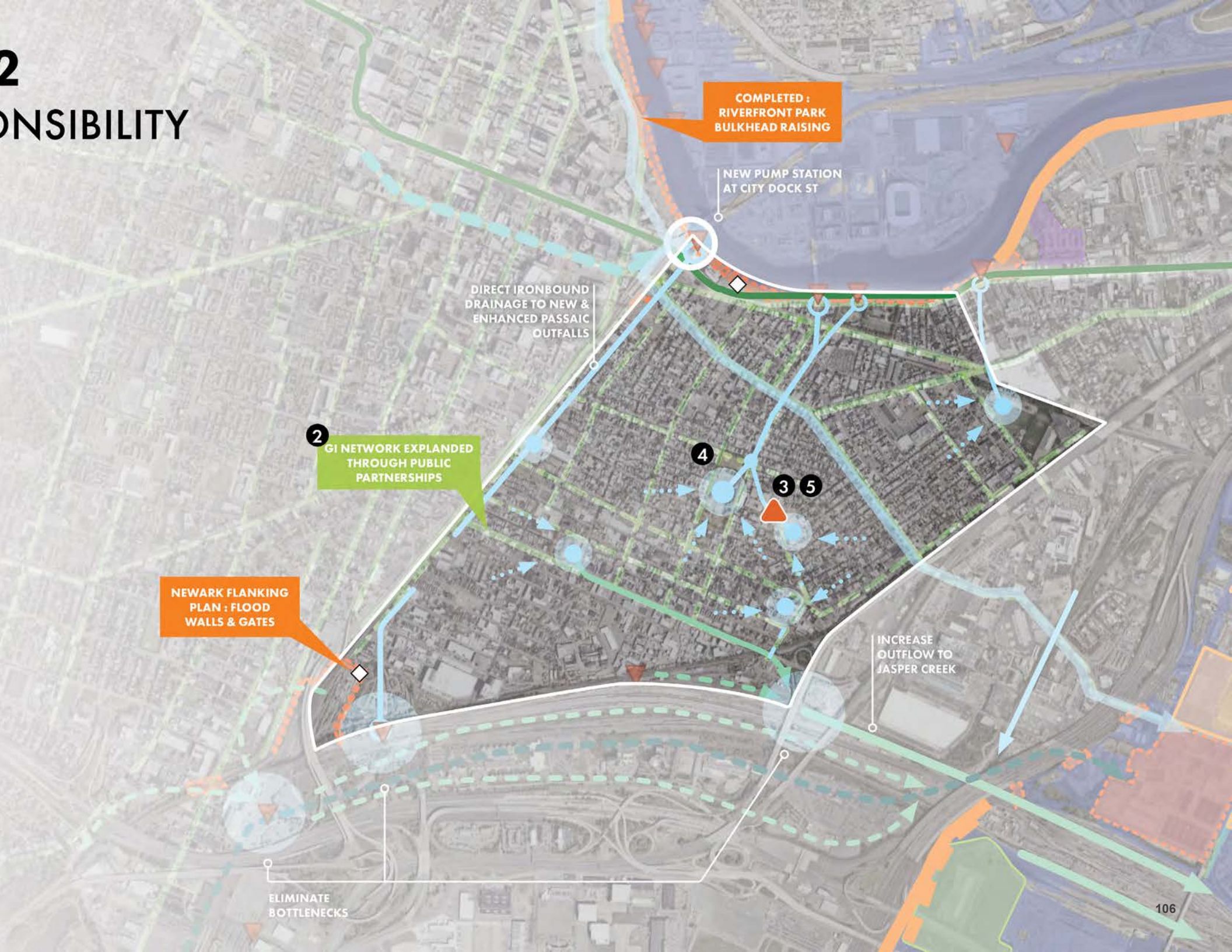
SCENARIO 2
SHARED RESPO

PROJECTS ALREADY PLANNED OR IN PROGRESS
COASTAL PROTECTIONS
GREEN INFRASTRUCTURE
SUGGESTED PIPED FLOW PATHS
SUGGESTED PIPED FLOW PATHS TO LTCP INTERCEPTOR
SUGGESTED PIPED FLOW PATHS TO RETENTION SITES
SUGGESTED DITCH DRAINAGE FLOW PATHS
RESILIENCE HUB
AREAS OUTSIDE PROTECTIONS
REDEVELOPMENT AREAS
EXISTING OUTFALLS

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

2
ONSIBILITY



IRONBOUND

Scenario 3 | Newark

Examples of solutions for this scenario include the following:

Coastal:

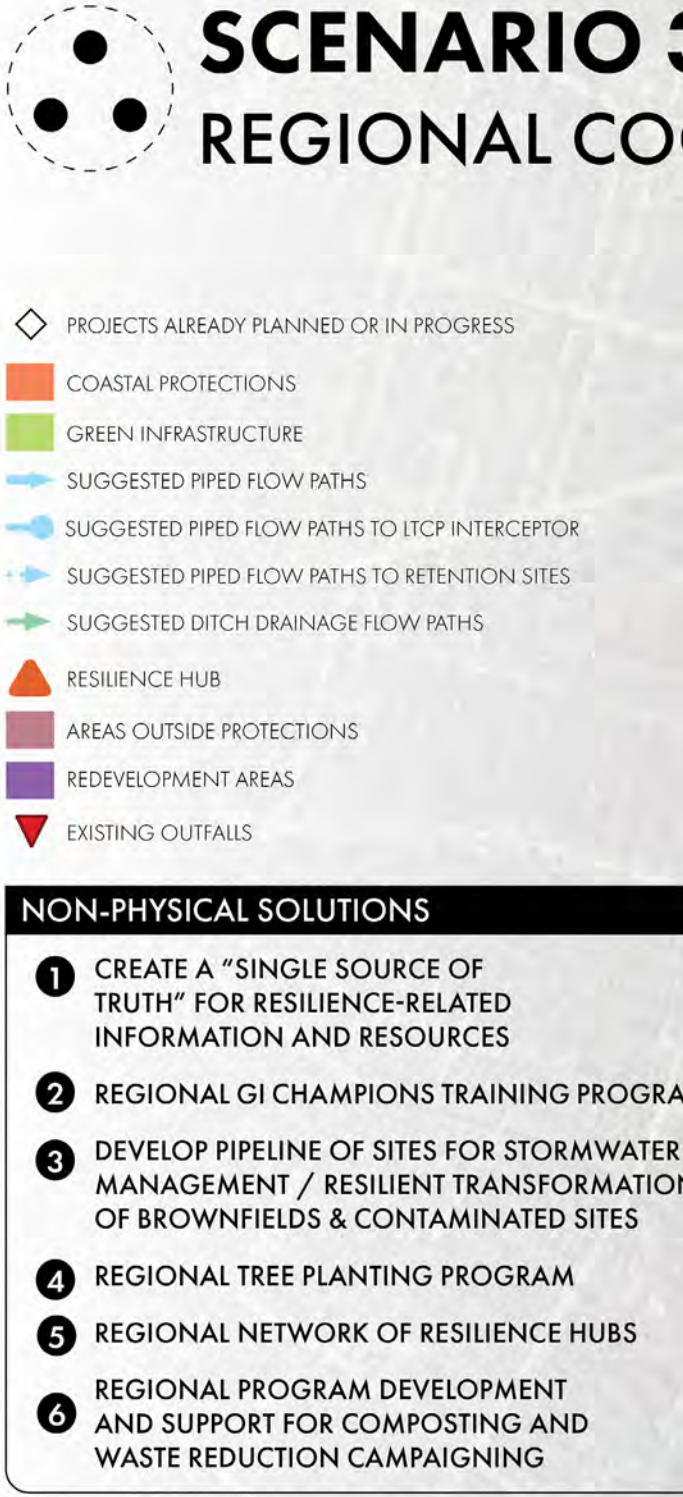
- Advance the Newark Flanking Plan, which would reduce coastal flooding to much of the Ironbound

Drainage:

- Scenario 3 drainage solutions are largely the same as those in Scenario 2 but would include increased flow of stormwater to the ditch systems that run to Newark Bay

Green infrastructure:

- Incorporate GI practices in the proposed Morris Canal Greenway



3
ORDINATION

NEWARK
Downtown

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DOWNTOWN

Scenario 1 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Create a resilience hub(s) at schools or existing shelters, such as at Essex County Community College

Drainage:

- Support advancement of the proposed sewer interceptor that will run parallel to existing sewers across Newark to convey additional combined sewage to the Passaic Valley Sewerage Commission (PVSC) Wastewater Treatment Plant, and direct additional flows to the new interceptor
- Create additional stormwater storage on city-owned properties to reduce the amount of water that enters the sewer system during storms

Green infrastructure:

- Incorporate GI into key public rights-of-way (e.g., roads, city-owned parks)
  - Example roadways: Raymond Blvd, Market Street, Washington Street, University Ave, Broad Street, and along McCarter Highway (Route 21)

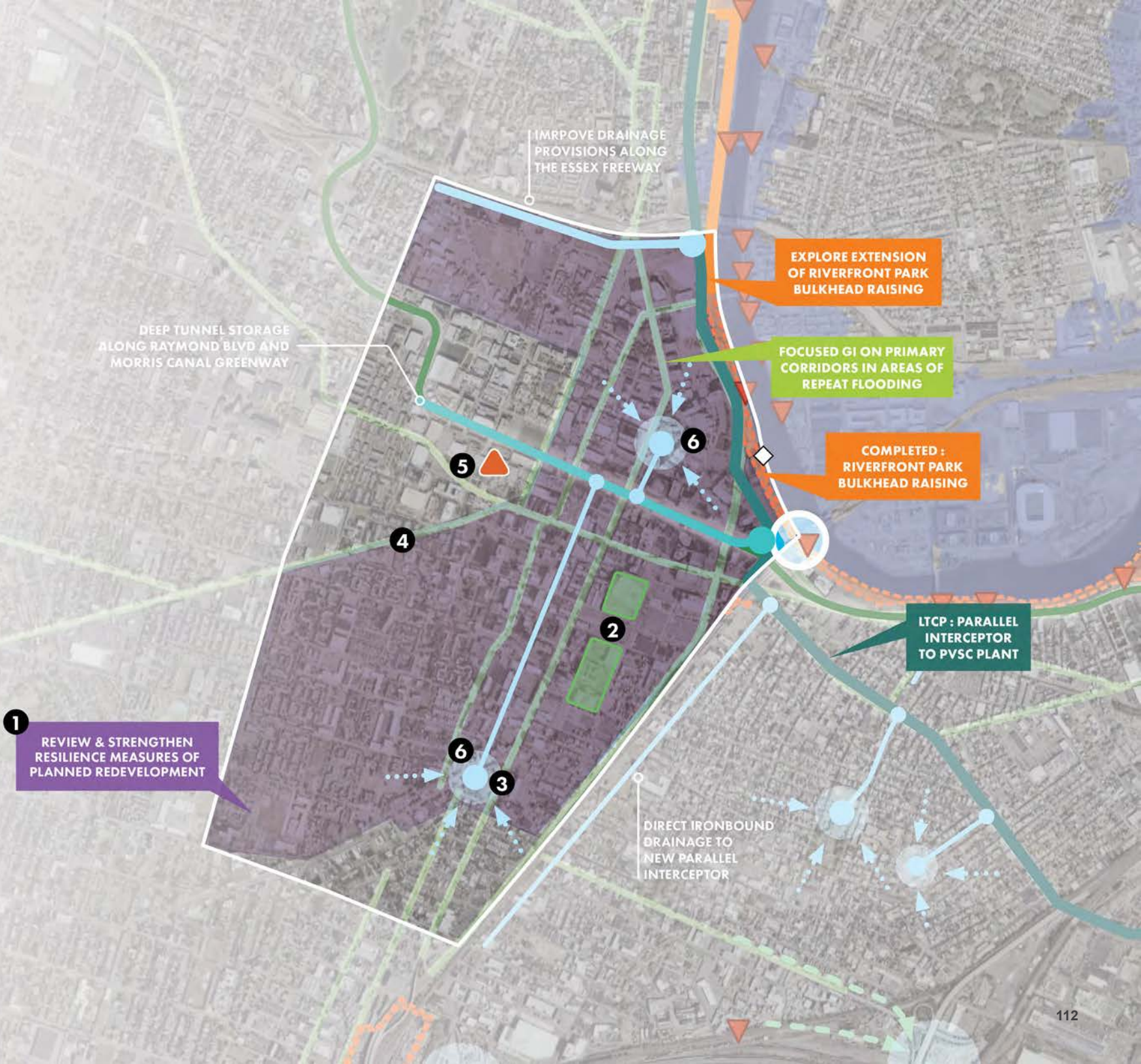
NEWARK RIVERFRONT PARK PROJECT

The Newark Riverfront Park project is a joint effort between USACE, NJDEP, the City of Newark, and the Trust for Public Land. USACE is responsible for bulkhead construction and raising along the Passaic River, which is being completed in phases. The City of Newark and Trust for Public Land created a new waterfront walkway and park between the river and Raymond Blvd, which was completed in 2016.

ITIATIVE

DANCE

TION



DOWNTOWN

Scenario 2 | Newark

Examples of solutions for this scenario include the following:

Coastal:

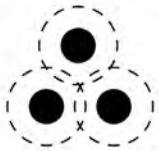
- Consider raising bulkheads along the Passaic River further north than what is already in progress through the USACE Newark Riverfront Park / Joseph G. Minish Passaic River Waterfront Park and Historic Area project, for which design plans extend through Bridge Street

Drainage:

- Consider separation of stormwater and redirection to deep tunnel storage beneath Raymond Blvd. Direct flows to a new pump station at City Dock Street near the NJ TRANSIT train bridge
- Through policy or public private partnerships, incentivize stormwater storage on private properties, especially vacant, impervious spaces

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
- Establish partnerships with academic institutions in the area to implement GI projects



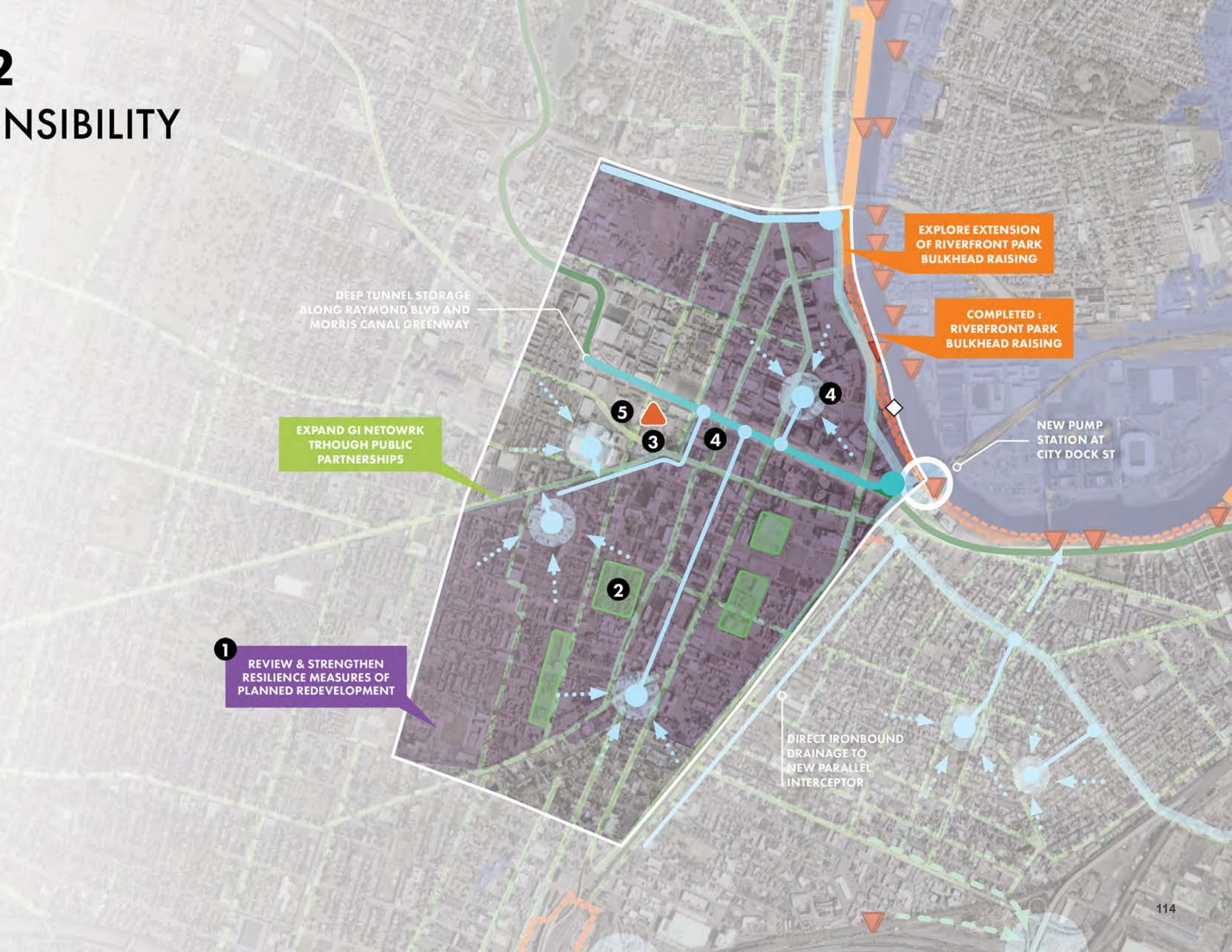
SCENARIO 2

SHARED RESPO

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

2
NSIBILITY


EXPLORE EXTENSION OF RIVERFRONT PARK BULKHEAD RAISING
COMPLETED : RIVERFRONT PARK BULKHEAD RAISING
DEEP TUNNEL STORAGE ALONG RAYMOND BLVD AND MORRIS CANAL GREENWAY
EXPAND GI NETOWRK TRHOUGH PUBLIC PARTNERSHIPS
NEW PUMP STATION AT CITY DOCK ST
1
REVIEW & STRENGTHEN RESILIENCE MEASURES OF PLANNED REDEVELOPMENT
DIRECT IRONBOUND DRAINAGE TO NEW PARALLEL INTERCEPTOR
2
3
4
4
5

DOWNTOWN

Scenario 3 | Newark

Examples of solutions for this scenario include the following:

Drainage:

- Consider integration of deep tunnel storage with the envisioned Morris Canal Greenway along Raymond Blvd

Green infrastructure:

- Incorporate GI practices in the envisioned Morris Canal Greenway

MORRIS CANAL GREENWAY

The Morris Canal is a historic canal that was built in the early 1800s to connect Phillipsburg, NJ to the east coast for transportation of coal. The Morris Canal Greenway is a proposed continuous bike and pedestrian trail along the former canal. The North Jersey Transportation Planning Authority (NJTPA) has provided funding and support for the greenway, and the Morris Canal Working Group is a group of stakeholders working to advance projects to complete the greenway. More information is available on the Morris Canal Greenway Website: https://www.morriscanalgreenway.org/. Many of the actions that are being evaluated for Resilient NENJ for Scenario 3 – Region Coordination consider integration of projects with this envisioned regional greenway.

3
ORDINATION

NEWARK
Upper Passaic

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UPPER PASSAIC

Scenario 1 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Industrial property owners along the Passaic River are left responsible implementing their own coastal protection, with technical assistance and guidance provided by the City of Newark
- Replicate the concept of the proposed Ironbound Resilience Hub at additional locations

Drainage:

- Support advancement of the proposed sewer interceptor that will run parallel to existing sewers across Newark to convey additional combined sewage to the PVSC Wastewater Treatment Plant, and direct additional flows to the new interceptor
- Consider redirecting outflow from Branch Brook Lake to the new interceptor to reduce inflow into the limited capacity Clay Street sewer / pump station

Green infrastructure:

- Incorporate GI into key public rights-of-way (e.g., roads, city-owned parks)
  - Example roadways: Broadway, McCarter Highway (Route 21)

SCENARIO 1

INDIVIDUAL INIT

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- PROPOSED LTCP INTERCEPTOR

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENT & MUNICIPAL COORDINATION

TIATIVE

RETENTION AREA AT RIDGE STREET SCHOOL
CITY DRIVEN PUBLIC HOUSING PROTECTION
STORMWATER RETENTION SITE AT NEWARK SCHOOLS STADIUM
SEPARATE AND DIRECT STORMWATER TO EXISTING SYSTEM
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
INCENTIVIZE INDUSTRIAL SITE & STRUCTURE BASED RESILIENCE MEASURES
EXPLORE EXTENSION OF RIVERFRONT PARK BULKHEAD RAISING
DIRECT BRANCH BROOK LAKE OVERFLOW TO NEW INTERCEPTOR
VERONA AVE
HELLER PKWY
MT PROSPECT AVE
SUMMER AVE
BROADWAY
MCCARTER HWY
LAKE ST
1ST AVE
ROSEVILLE AVE
7TH AVE
4
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6

UPPER PASSAIC

Scenario 2 | Newark

Examples of solutions for this scenario include the following:

Coastal:

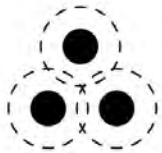
- Consider raising bulkheads along the Passaic River further north than what is already in progress through the USACE Newark Riverfront Park / Joseph G. Minish Passaic River Waterfront Park and Historic Area project, for which design plans extend through Bridge Street
- Explore possible continuous coastal protection along the Passaic River through coordination with property owners. This would manifest as an extension of Newark Riverfront Park through an easement or a different type of flood barrier.

Drainage:

- Through policy or public private partnerships, incentivize stormwater storage on private properties, especially vacant, impervious spaces
- Rather than redirecting the Branch Brook Lake water to the proposed PVSC interceptor, consider directing it to a new outfall along the Passaic River

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
- Increase green space through related non-physical measures, such as Tree Canopy and Adopt-a-Green Street programs



SCENARIO 2
SHARED RESPON

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- PROPOSED LTCP INTERCEPTOR

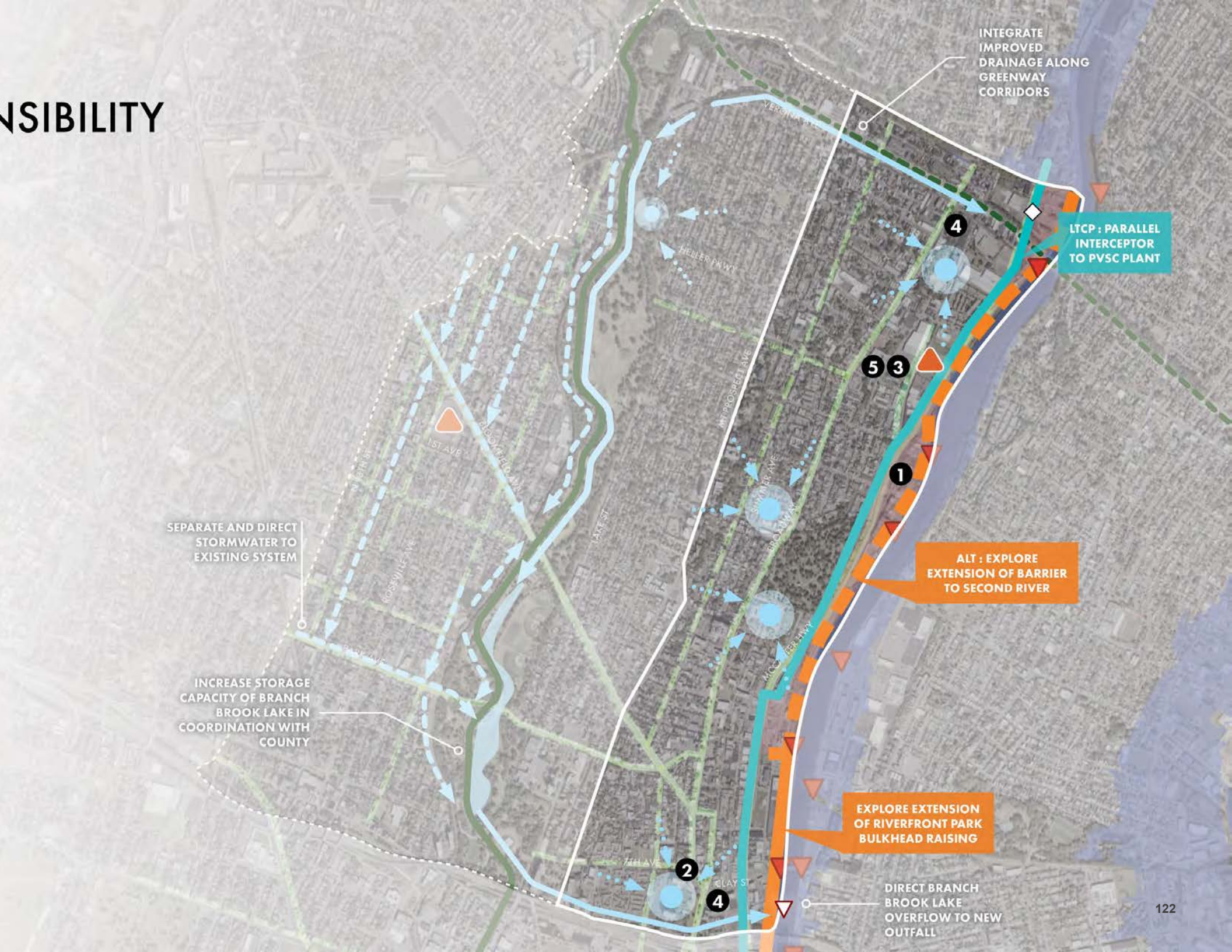
RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

NSIBILITY


INTEGRATE IMPROVED DRAINAGE ALONG GREENWAY CORRIDORS
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
ALT : EXPLORE EXTENSION OF BARRIER TO SECOND RIVER
EXPLORE EXTENSION OF RIVERFRONT PARK BULKHEAD RAISING
DIRECT BRANCH BROOK LAKE OVERFLOW TO NEW OUTFALL
SEPARATE AND DIRECT STORMWATER TO EXISTING SYSTEM
INCREASE STORAGE CAPACITY OF BRANCH BROOK LAKE IN COORDINATION WITH COUNTY
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HELLER PKWY
MT PROSPECT AVE
BROADWAY
LAKE ST
1ST AVE
7TH AVE
CLAY ST

UPPER PASSAIC

Scenario 3 | Newark

Examples of solutions for this scenario include the following:

Coastal:

- Integrate continuous coastal protections along the Newark Bay with Hudson County's proposed Hackensack River Greenway, whose corridor plans to run along the full length of western Bayonne

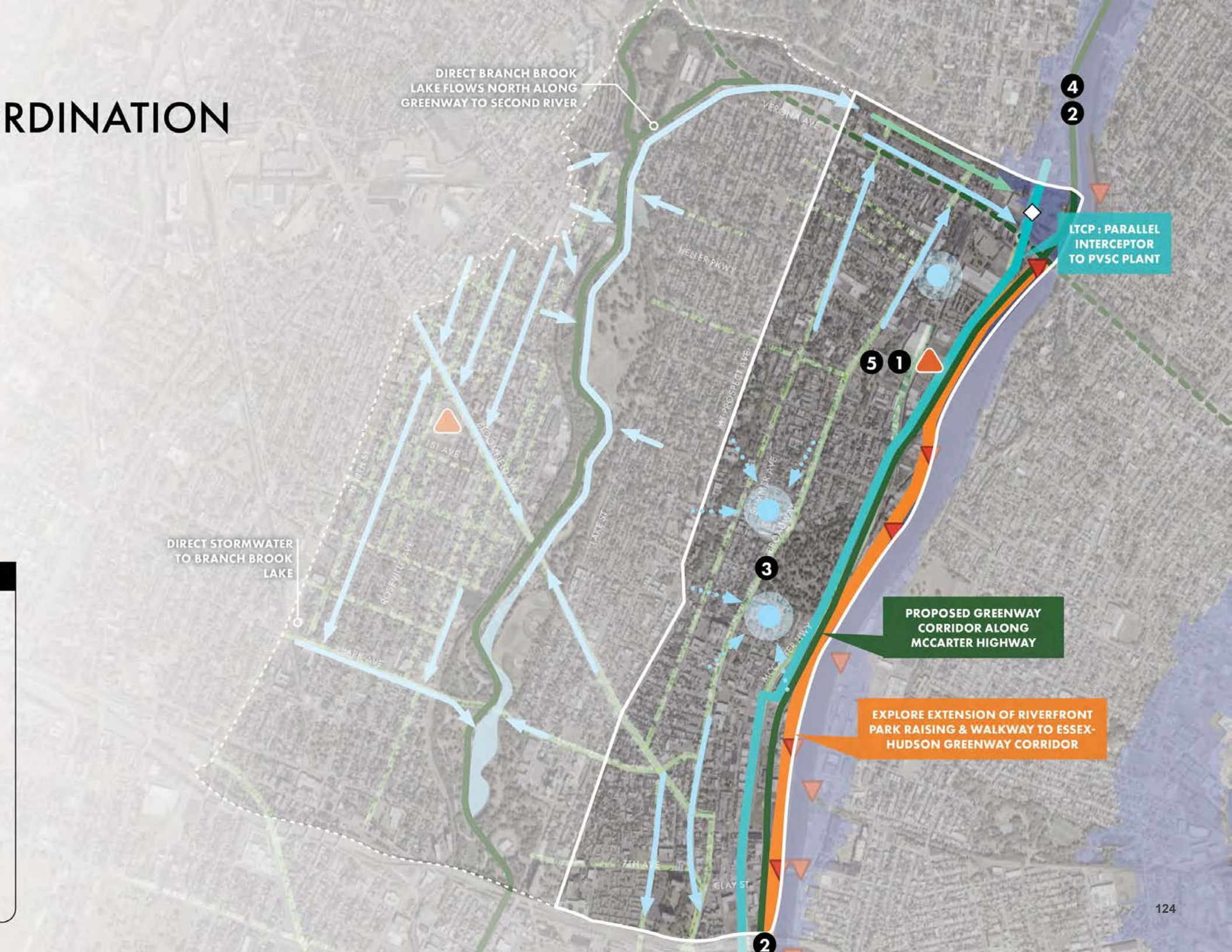
Drainage:

- Integrate drainage capacity with the proposed Essex-Hudson Greenway that would pass through the northern edge of Newark

Green infrastructure:

- Explore creation of a greenway with GI along McCarter Highway
- Explore extension of Newark Riverfront Park north to the proposed Essex-Hudson Greenway corridor near the northern edge of Newark

RDINATION


DIRECT BRANCH BROOK LAKE FLOWS NORTH ALONG GREENWAY TO SECOND RIVER
DIRECT STORMWATER TO BRANCH BROOK LAKE
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
PROPOSED GREENWAY CORRIDOR ALONG MCCARTER HIGHWAY
EXPLORE EXTENSION OF RIVERFRONT PARK RAISING & WALKWAY TO ESSEX-HUDSON GREENWAY CORRIDOR
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VERONA AVE
HELLER PKWY
MT PROSPECT AVE
BROOMFIELD AVE
1ST AVE
LAKE ST
ROSEVILLE AVE
PARK AVE
7TH AVE
CLAY ST
MCCARTER HWY

NEWARK
Ivy Hill & Vailsburg

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IVY HILL & VAILSBURG

Scenario 1 | Newark

Examples of solutions for this scenario include the following:

Drainage:

- Create resilience hubs at publicly owned spaces to provide resources and information to residents before, during, and after emergencies and to incorporate direct drainage benefits
  - Example location: Boylan Street Recreation Center
- Create stormwater storage areas at publicly owned parks, schools, and recreation centers to take stormwater out of the existing systems that have limited capacity
  - Example locations: Vailsburg Park, Boylan Street Recreation Center, Lincoln School, Ivy Hill Elementary School

Green infrastructure:

- Incorporate GI into key public rights-of-way (e.g., roads, city-owned parks) in areas of repeat flooding
  - Example roadways: Route 510, 18th Ave, Maybaum Ave

IVY HILL SITE VISIT

In response to feedback from community members in the Ivy Hill neighborhood about significant damages from flooding during the remnants of Hurricane Ida, the Resilient NENJ team conducted a site visit to a portion of Ivy Hill in April 2022 to gather feedback about flooding in the area.

SCENARIO 1
INDIVIDUAL INIT

ROW GREEN INFRASTRUCTURE

SUGGESTED BLUE AND GREEN ROOFS

SUGGESTED PIPED FLOW PATHS

SUGGESTED PIPED FLOW PATHS TO RETENTION SITES

SUGGESTED DITCH DRAINAGE FLOW PATHS

RESILIENCE HUB

AREAS TO ADAPT

NON-PHYSICAL SOLUTIONS

1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENT & MUNICIPAL COORDINATION

TIATIVE

STORMWATER RETENTION AREAS AT BOYLAN ST RECREATION CENTER
CITY INCENTIVIZED ADAPTATION REGULATIONS FOR AREAS OUTSIDE OF PROTECTIONS
FOCUSED GI ON PRIMARY CORRIDORS IN AREAS OF REPEAT FLOODING
WATER RETENTION AT LINCOLN SCHOOL AND IVY HILL ELEMENTARY
STUYVESANT AVE
SANFORD AVE
18TH AVE
GARDEN CITY E PARKWAY
STORMWATER RETENTION AREAS AT VAILSBURG PARK
CITY INCENTIVIZED PERMEABLE SURFACE PARKING LOT
EXPLORE OVERFLOW INTO ELIZABETH RIVER
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IVY HILL & VAILSBURG

Scenario 2 | Bayonne

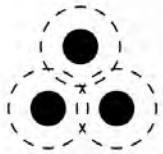
Examples of solutions for this scenario include the following:

Drainage:

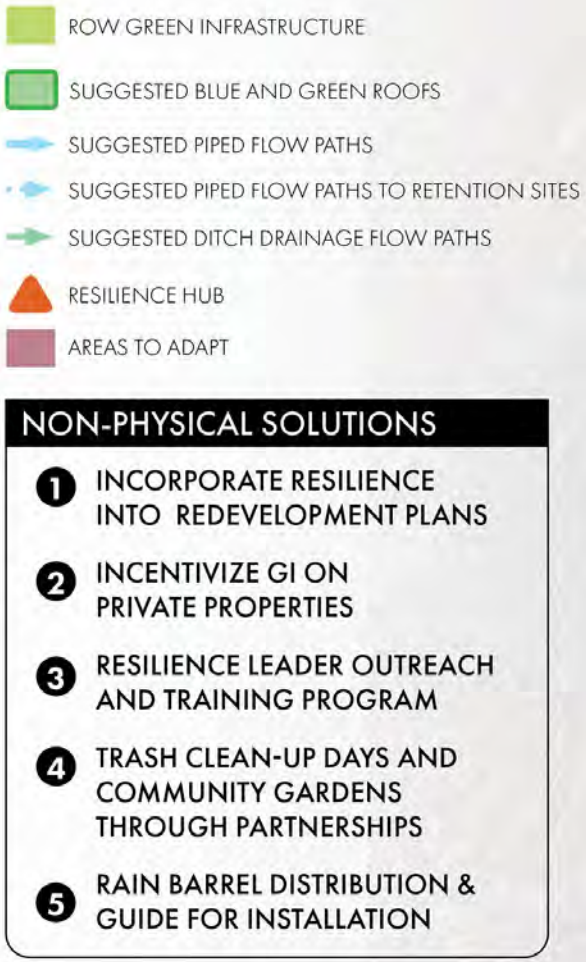
- Partner with Seton Hall University to significantly increase drainage capacity in the areas surrounding their properties
- Through policy, require or incentivize increased stormwater storage on private sites, especially vacant, unused properties with impervious surfaces

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements



SCENARIO 2
SHARED RESPON



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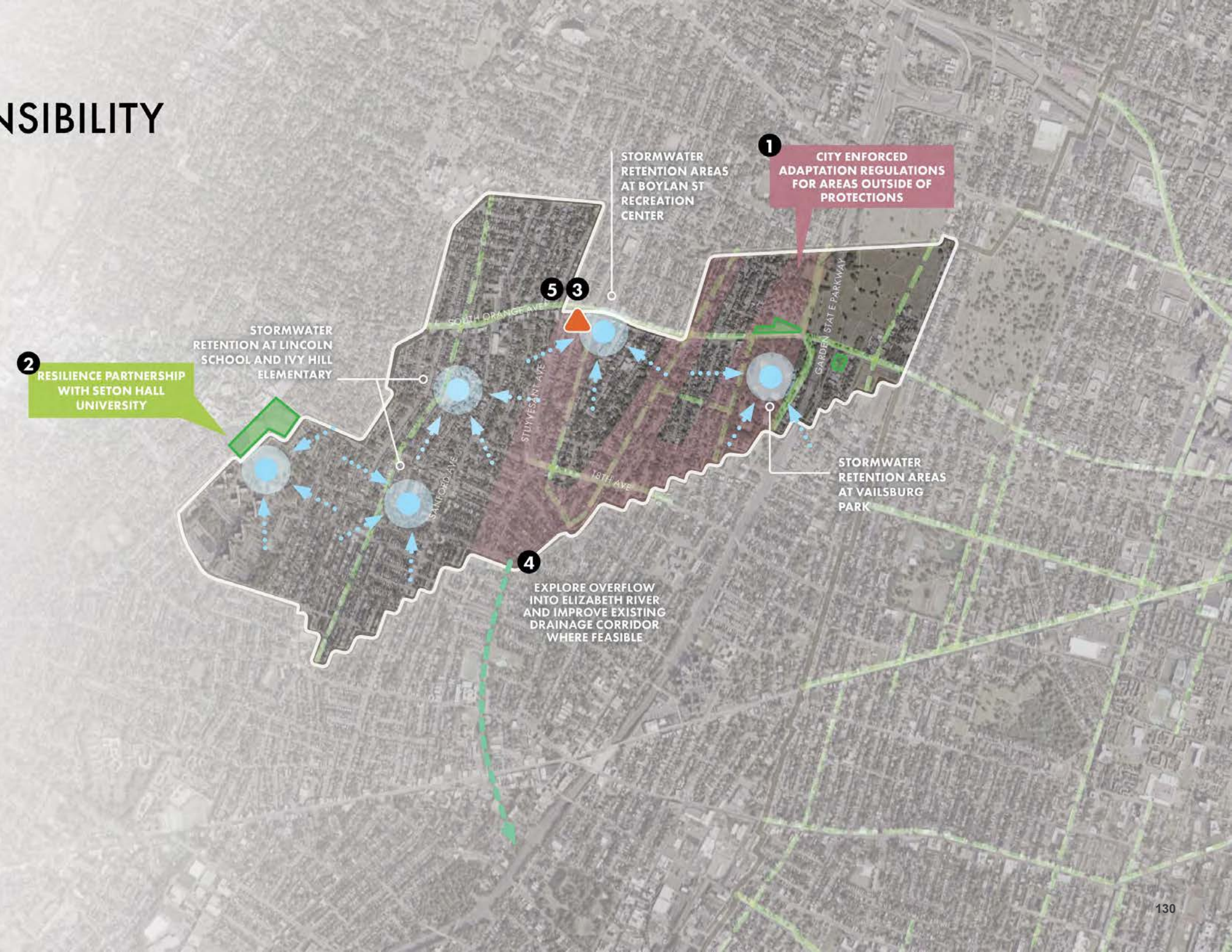
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CITY ENFORCED ADAPTATION REGULATIONS FOR AREAS OUTSIDE OF PROTECTIONS
STORMWATER RETENTION AREAS AT BOYLAN ST RECREATION CENTER
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SOUTH ORANGE AVE
GARDEN STATE PARKWAY
STUYVESANT AVE
18TH AVE
SANFORD AVE
2
RESILIENCE PARTNERSHIP WITH SETON HALL UNIVERSITY
STORMWATER RETENTION AT LINCOLN SCHOOL AND IVY HILL ELEMENTARY
STORMWATER RETENTION AREAS AT VAILSBURG PARK
4
EXPLORE OVERFLOW INTO ELIZABETH RIVER AND IMPROVE EXISTING DRAINAGE CORRIDOR WHERE FEASIBLE

IVY HILL & VAILSBURG

Scenario 3 | Bayonne

Examples of solutions for this scenario include the following:

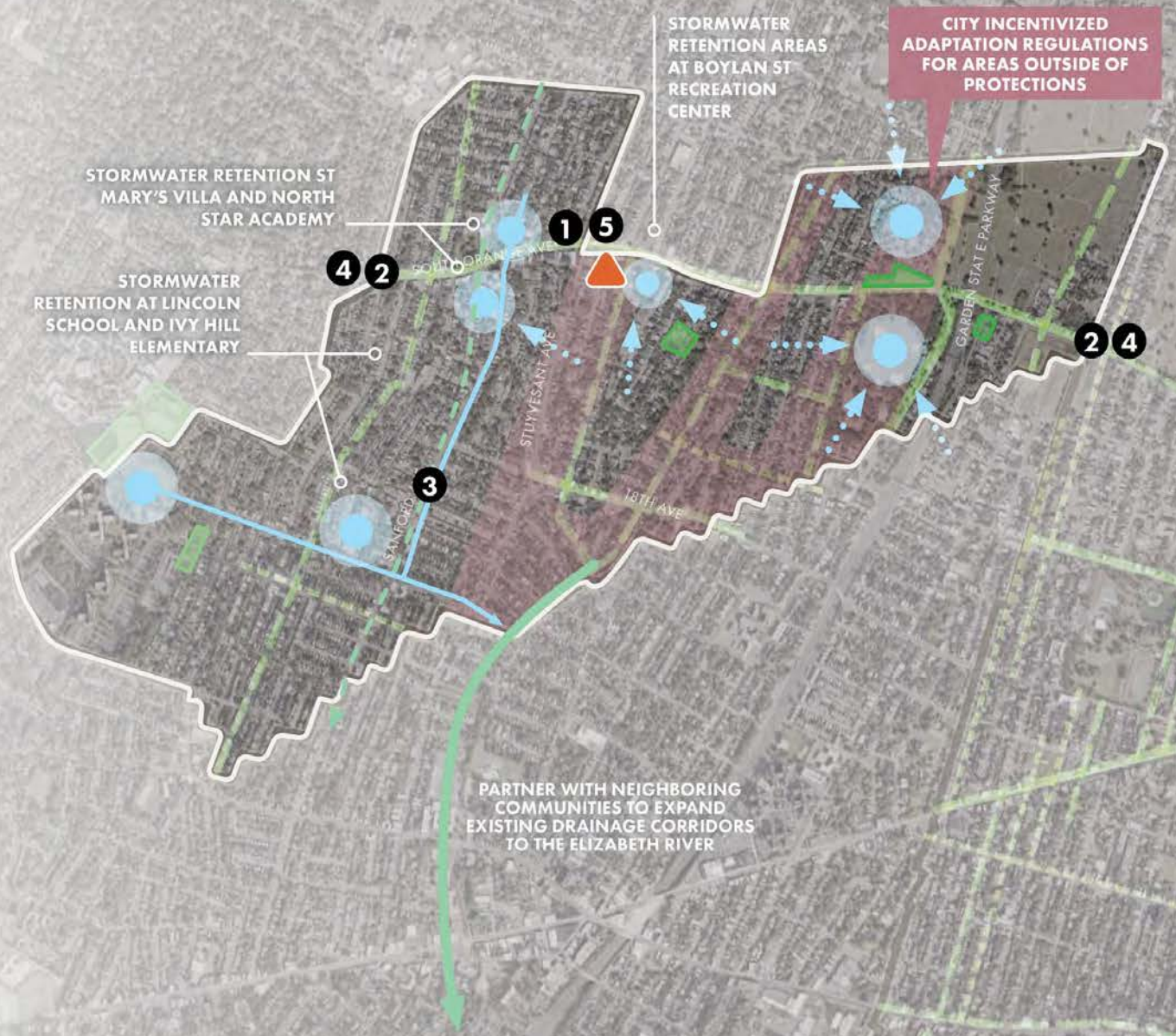
Drainage:

- Explore directing stormwater to the Elizabeth River south of Newark, through its channelized tributary, to bring stormwater out of repeat flood areas
- Expand stormwater storage onto additional sites, such as Mary's Villa and North Star Academy

Green infrastructure:

- Expand GI and increased tree canopy in right-of-way to additional streets through regional funding programs

ONSIBILITY


STORMWATER RETENTION AREAS AT BOYLAN ST RECREATION CENTER
CITY INCENTIVIZED ADAPTATION REGULATIONS FOR AREAS OUTSIDE OF PROTECTIONS
STORMWATER RETENTION ST MARY'S VILLA AND NORTH STAR ACADEMY
STORMWATER RETENTION AT LINCOLN SCHOOL AND IVY HILL ELEMENTARY
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STUYVESANT AVE
18TH AVE
GARDEN STAT E PARKWAY
PARTNER WITH NEIGHBORING COMMUNITIES TO EXPAND EXISTING DRAINAGE CORRIDORS TO THE ELIZABETH RIVER

NEWARK
Branch Brook Park

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BRANCH BROOK PARK

Scenario 1 | Newark

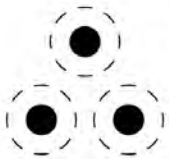
Examples of solutions for this scenario include the following:

Drainage:

- Implement flood mitigation projects at city-owned properties, such as public housing properties
- Create stormwater storage areas at publicly owned parks, schools, and recreation centers to take stormwater out of the existing systems, which have limited capacity
  - Example locations: Newark Schools Stadium, Ridge Street School
- Consider redirecting outflow from Branch Brook Lake to the proposed PVSC parallel interceptor to reduce inflow into the limited capacity Clay Street sewer / pump station

Green infrastructure:

- Incorporate GI into key public rights-of-way (e.g., roads, city-owned parks)
  - Example roadways: Bloomfield Ave, Park Ave



SCENARIO 1

INDIVIDUAL INIT

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- PROPOSED LTCP INTERCEPTOR

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENT & MUNICIPAL COORDINATION

TIATIVE

RETENTION AREA AT RIDGE STREET SCHOOL
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
CITY DRIVEN PUBLIC HOUSING PROTECTION
STORMWATER RETENTION SITE AT NEWARK SCHOOLS STADIUM
SEPARATE AND DIRECT STORMWATER TO EXISTING SYSTEM
DIRECT BRANCH BROOK LAKE OVERFLOW TO NEW INTERCEPTOR
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VERONA AVE
HELLER PKWY
MT PROSPECT AVE
SUMMER AVE
BROADWAY
MCCARTER HWY
BLOOMFIELD AVE
LAKE ST
N 12TH ST
ROSEVILLE AVE
PARK AVE
7TH AVE
CLAY ST

BRANCH BROOK PARK

Scenario 2 | Newark

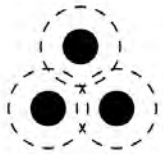
Examples of solutions for this scenario include the following:

Drainage:

- Explore a partnership with NJ TRANSIT to improve drainage along the Newark Light Rail corridor that runs parallel to Branch Brook Park
- Consider expanding storage capacity of Branch Brook Lake in coordination with Essex County Parks
- In combined sewer areas, explore opportunities to separate sewers and direct stormwater to Branch Brook Lake
- Through policy, require or incentivize increased stormwater storage on private sites, especially vacant, unused properties with impervious surfaces

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
- Increase green space through related non-physical measures, such as Tree Canopy and Adopt-a-Green Street programs



SCENARIO 2
SHARED RESPON

EXISTING CONDITIONS

- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- PROPOSED LTCP INTERCEPTOR

RESILIENT NJ MEASURES

- COASTAL PROTECTION ALIGNMENTS
- POTENTIAL ALTERNATE COASTAL ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- NEW STORMWATER OUTFALLS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

NSIBILITY

INTEGRATE IMPROVED DRAINAGE ALONG GREENWAY CORRIDORS
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
EXPLORE PARTNERSHIP WITH NJT TO IMPROVE DRAINAGE ALONG LIGHT RAIL
SEPARATE AND DIRECT STORMWATER TO EXISTING SYSTEM
INCREASE STORAGE CAPACITY OF BRANCH BROOK LAKE IN COORDINATION WITH COUNTY
VERONA AVE
HELLER PKWY
MT PROSPECT AVE
1ST AVE
BLOOMFIELD AVE
ROSEVILLE AVE
LAKE ST
SUMMER AVE
BROADWAY
MCCARTER HWY
7TH AVE
CLAY ST
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BRANCH BROOK PARK

Scenario 3 | Newark

Examples of solutions for this scenario include the following:

Drainage:

- Redirect flow associated with Branch Brook Lake north to the Second River, integrating, where possible, with a possible greenway. Redirecting flows will reduce flooding for other areas of Newark by taking this stormwater out of the combined sewer system and redirecting it elsewhere.
  - In conjunction, direct additional separated stormwater to the Branch Brook Lake, to be conveyed to the Second River

Green infrastructure:

- Explore a possible greenway connection from Branch Brook Park to the proposed Essex-Hudson Greenway that is envisioned to run north of Verona Ave

RDINATION

DIRECT BRANCH BROOK LAKE FLOWS NORTH ALONG GREENWAY TO SECOND RIVER
LTCP : PARALLEL INTERCEPTOR TO PVSC PLANT
DIRECT STORMWATER TO BRANCH BROOK LAKE
VERONA AVE
HELLER PKWY
MT PROSPECT AVE
BLOOMFIELD AVE
LAKE ST
ROSEVILLE AVE
HARK AVE
MCCARTER HWY
7TH AVE
CLAY ST
1
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HOBOKEN

Image Source: Senya82

HOBOKEN

Scenario 1

Examples of solutions for this scenario include the following:

Coastal:

- Municipal guidance and technical assistance for site protection of properties outside of the Rebuild by Design-Hudson River flood barrier alignment
- Explore opportunities for oyster bed projects along shoreline of the Hudson River

Drainage:

- Increase piping capacity to redirect water away from southwest Hoboken
- Reexamine storage tanks for LTCP to achieve greater storage capacity

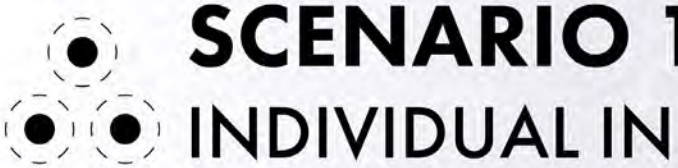
Green infrastructure:

- Expand GI installations in public rights-of-way (e.g., roads, city-owned parks)

HIGHLIGHTS OF HOBOKEN'S RESILIENCE STRATEGY

In recent years, Hoboken has completed or initiated a variety of projects as it endeavors to address its challenges with flooding. These projects are often in partnership with the North Hudson Sewerage Authority (NHSA), which operates the combined sewers in Hoboken, and NJDEP.

The Rebuild by Design-Hudson River project, which was awarded funding by HUD and is currently underway, involves construction of permanent and deployable flood barriers in the northern and southern portions of the city. This project is expected to reduce storm surge risk for 85 percent of Hoboken's population that resides within the 100-year FEMA-mapped flood hazard area. The project also includes stormwater management and GI components that complement Hoboken's long list of other ongoing and planned projects, such as resiliency parks like Northwest Resiliency Park, sewer separation, and pump station improvements.



PROJECTS ALREADY PLANNED OR IN PROGRESS
COASTAL PROTECTIONS
DRAINAGE IMPROVEMENTS
GREEN INFRASTRUCTURE
SUGGESTED FLOW PATHS
RESILIENCE HUB
AREAS OUTSIDE PROTECTIONS
EXISTING OUTFALLS

NON-PHYSICAL SOLUTIONS

1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE AT STATE LEVEL
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. EXPAND MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENTAL COORDINATION FOR ADVANCEMENT OF PROJECTS

ITIATIVE

EXPLORE THE ADDITION OF OYSTER BEDS ON CITY OWNED COASTLINE

RBD HUDSON RIVER : BARRIER COMPONENTS

ADAPT AREAS OF REPEAT FLOODING OUTSIDE OF PROTECTIONS

ENHANCE ONGOING RBD DRAINAGE PROJECTS IN WEST HOBOKEN

ENHANCE RESERVOIR STORAGE CAPACITY

IMPROVE OUTFLOW TO MAIN DRAINAGE CORRIDORS & REEXAMINE LTCP RETENTION TANKS

EXPLORE THE ADDITION OF OYSTER BEDS ON CITY OWNED COASTLINE

FOCUSED GI ON PRIMARY CORRIDORS IN AREAS OF REPEAT FLOODING THROUGH POLICY

HOBOKEN

Scenario 2

Examples of solutions for this scenario include the following:

Coastal:

- Partner with property owners that are outside of Rebuild by Design-Hudson River alignment to implement mitigation projects for their properties

Drainage:

- Utilize Hudson Bergen Light Rail (HBLR) corridor along western border of Hoboken for expanded drainage, through coordination with NJ TRANSIT
- Consider subsurface stormwater storage at select locations near outfalls
- Expand concept of resiliency parks across private, vacant properties, possibly converting unused, impervious sites to park space

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
- Explore public-private partnerships for implementation of GI projects in public spaces

SCENARIO 2
SHARED RESPO

NON-PHYSICAL SOLUTIONS

1. INCORPORATE RESILIENCE INTO REDEVELOPMENT PLANS
2. INCENTIVIZE GI ON PRIVATE PROPERTIES
3. RESILIENCE LEADER OUTREACH AND TRAINING PROGRAM
4. TRASH CLEAN-UP DAYS AND COMMUNITY GARDENS THROUGH PARTNERSHIPS
5. RAIN BARREL DISTRIBUTION & GUIDE FOR INSTALLATION

2
ONSIBILITY

IMPROVE DRAINAGE ALONG RAIL CORRIDOR

PARTNER WITH PROPERTY & BUSINESS OWNERS TO IMPLEMENT MITIGATION ACTIONS

RBD HUDSON RIVER : BARRIER COMPONENTS

UTILIZE ESSEX-HUDSON GREENWAY FOR CONVEYANCE & STORAGE

STRENGTHEN & EXPAND RBD DRAINAGE PROJECTS IN SW HOBOKEN

HUDSON OYSTER BEDS EXPANDED

EXPAND GI NETOWRK THROUGH PUBLIC PARTNERSHIP PROGAMS

RBD HUDSON RIVER : BARRIER COMPONENTS

HOBOKEN

Scenario 3

Examples of solutions for this scenario include the following:

Coastal:

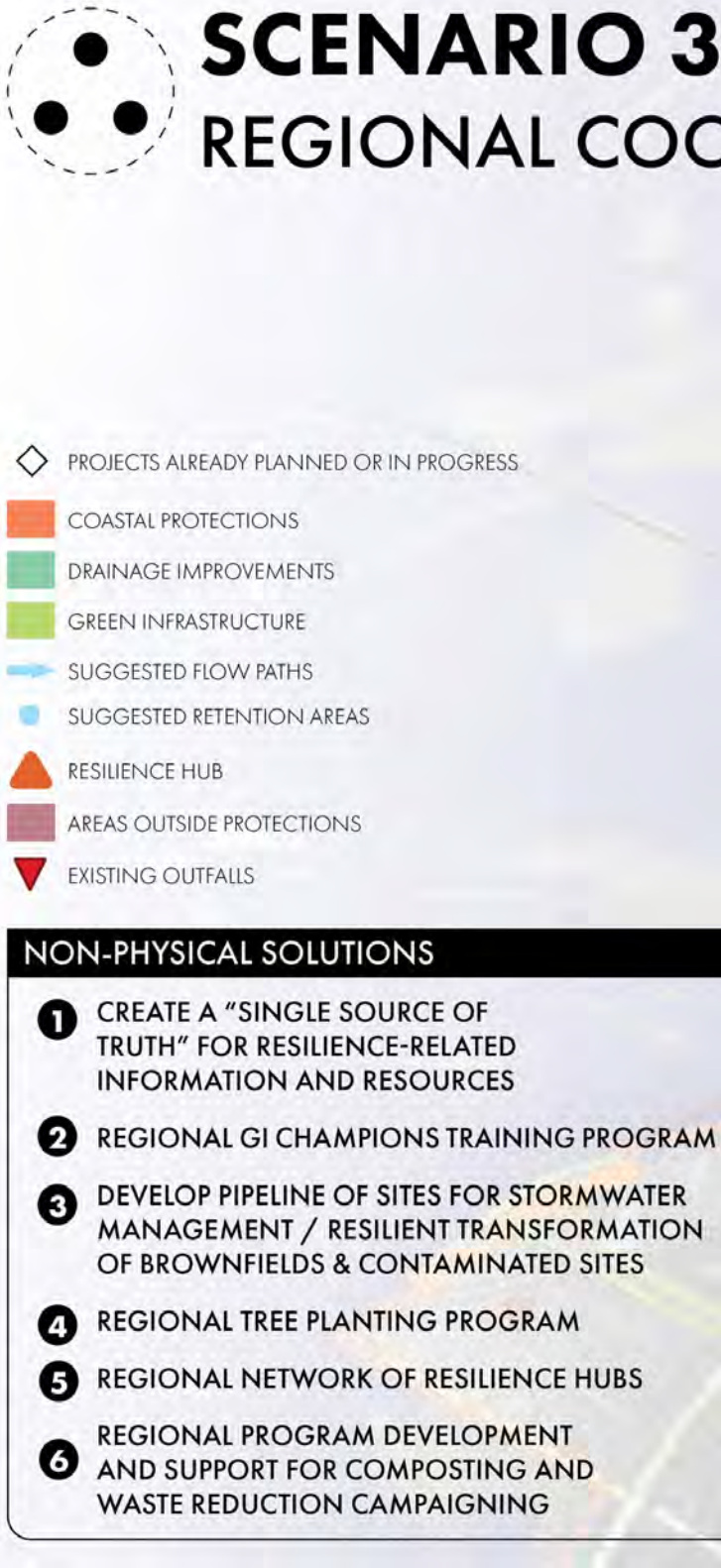
- Consider raising Hudson River Waterfront Walkway and adjacent road, where appropriate, for integration in a regional elevated walkway, and incorporate GI throughout
- Explore in-water protection for the ferry terminal at the Hoboken Terminal

Drainage:

- Consider deep tunnel storage for stormwater along the Hudson Bergen Light Rail (HBLR) corridor along the western border of Hoboken

Green infrastructure:

- Consider a GI corridor along the HBLR corridor



ORDINATION

DEEP TUNNEL STORAGE ALONG RAILWAY ROW

EXPAND OYSTER BEDS TO DOCKS AS SITES FOR NATURE BASED FILTRATION

INLAND GREEN INFRASTRUCTURE GREENWAY ALONG RAIL CORRIDOR

RETENTION AND PUMPING ALONG COASTAL WALKWAY / BARRIER

GI INTEGRATED WITH THE HUDSON RIVERFRONT WALKWAY IMPROVEMENTS

CONTINUOUS BARRIER, ROAD RAISING & FLOOD WALLS, INTEGRATED WITH HRWW

UTILIZE ESSEX-HUDSON GREENWAY FOR CONVEYANCE & STORAGE

INTEGRATE EXISTING DRAINGAGE IMPROVEMENTS WITH REGIONAL STRATEGY

ENHANCE EXISTING WALKWAY SECTIONS

EXPAND OYSTER BEDS TO DOCKS AS SITES FOR NATURE BASED FILTRATION

EXPLORE IN-WATER PROTECTION FOR FERRY TERMINAL

BAYONNE

Image Source: Resilient NENJ

BAYONNE

East (Bergen Point, Constable Hook, MOTBY)

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EAST (BERGEN POINT, CONSTABLE HOOK, MOTBY)

Scenario 1 | Bayonne

Examples of solutions for this scenario include the following:

Coastal:

- Protect individual sites, expanding on what is already being done in redevelopment sites
- Develop and provide municipal guidance and technical assistance for site protection of coastal industrial areas

Drainage:

- Increase piping capacity, including increasing flow along Avenue E and conveying to an expanded pump station at E 5th Street
- Construct subsurface stormwater retention at Cottage Street Park and increase flow capacity along Cottage Street, and identify other public sites where stormwater storage can be incorporated

Green infrastructure:

- Incorporate GI into public rights-of-way (e.g., roads, city-owned parks)

FITZPATRICK PARK AND COTTAGE STREET PARK PROJECTS

In late 2021, the City of Bayonne, in partnership with the county and state, opened the renovated Fitzpatrick Park that included stormwater storage beneath the park and sewer separation in nearby streets. In 2022, the City prepared a funding application for a similar project at Cottage Street Park, which would reduce flooding to 32 nearby structures.

SCENARIO
INDIVIDUAL IN

EXISTING CONDITIONS
- PROJECTS ALREADY PLANNED OR IN PROGRESS
- EXISTING OUTFALLS
- LTCP STORAGE TANKS
- PROPOSED GREENWAY CORRIDORS (BY OTHERS)

RESILIENT NJ MEASURES
- COASTAL PROTECTION ALIGNMENTS
- GREEN INFRASTRUCTURE CORRIDORS
- SUGGESTED FLOW PATHS
- SUGGESTED RETENTION AREAS
- PUMP STATIONS
- PROPOSED GREENWAY CORRIDORS
- AREAS OUTSIDE PROTECTIONS
- REDEVELOPMENT AREAS
- SITES TO ADAPT
- POSSIBLE RESILIENCE HUB LOCATION

NON-PHYSICAL SOLUTIONS
1. ADOPT ORDINANCES TO STATE MODELS & GUIDANCE
2. GI PROGRAM FOR CITY PROPERTIES
3. GUIDELINES FOR GI ON OPEN SPACE
4. TREE CANOPY PROGRAMS
5. RESILIENCE HUBS AT CITY PROPERTIES
6. MUNICIPAL TRASH CLEANUP & CATCH BASIN PROGRAMS
7. PROMOTE & INCORPORATE RESIDENT FLOOD REPORTING
8. INTER-DEPARTMENT & MUNICIPAL COORDINATION

ITIATIVE

NEWARK BAY
45TH ST STATION
34TH ST STATION
22ND ST STATION
8TH STREET STATION
E 5TH ST
BROADWAY
HOOK RD
INCREASE DRAINAGE & PUMPING CAPACITY AT PROBLEM UNDERPASSES
COTTAGE ST PARK RETROFITS WITH SUBSURFACE RETENTION
INDUSTRIAL AREAS OUTSIDE OF PROTECTIONS PROVIDED WITH TECHNICAL ASSISTANCE
INCREASE OUTFLOW ALONG AVENUE E TO RETENTION TANK & EXPANDED E 5TH ST PUMP STATION
REVIEW & STRENGTHEN RESILIENCE MEASURES OF PLANNED REDEVELOPMENT
RELY ON DEVELOPERS TO PROTECT SITES WITH CITY COORDINATION OF BARRIER ALIGNMENTS
1
4
6

EAST (BERGEN POINT, CONSTABLE HOOK, MOTBY)

Scenario 2 | Bayonne

Examples of solutions for this scenario include the following:

Coastal:

- Make waterfront parks and walkways resilient to flooding.
  - Consider siting inland alignments at higher elevations to reduce barrier height (to reduce cost)

Drainage:

- Expand opportunities for stormwater detention/retention. A possible retention location is near the NJ Turnpike toll plaza
- Consider opportunities to redirect stormwater out of problem areas, like the underpasses beneath the Hudson Bergen Light Rail (HBLR)
  - Northern area of Bayonne: separate and redirect to MOTBY
  - Southern area of Bayonne: separate and redirect to Kill Van Kull and Newark Bay
- Expand concept like Fitzpatrick Park to private, vacant properties, possibly converting unused, impervious sites to park space
- Install new pumping facilities at outfalls

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements

2
NSIBILITY

NEWARK BAY
NJ TURNPIKE
45TH ST STATION
34TH ST STATION
22ND ST STATION
E 30TH ST
HOOK RD
BROADWAY
E 5TH ST
4
EXPAND STORMWATER BASIN AT INTERCHANGE WITH NEW FORCE MAIN TO EXPANDED PUMP STATIONS
PARTNER WITH NJDOT & TRANSIT TO INCREASE DRAINAGE & PUMPING CAPACITY AT PROBLEM UNDERPASSES
5
3
INLAND CONSTABLE HOOK BARRIER, COORDINATE WITH REDEVELOPMENT
EXPAND DRAINAGE SEPARATION IN COORDINATION WITH REDEVELOPMENT SITES
4
2
REVIEW & STRENGTHEN RESILIENCE MEASURES OF PLANNED REDEVELOPMENT
CREATE NEW INLAND STORM SURGE BARRIER ALONG AVENUE A. INTEGRATE RESILIENCE INTO DENNIS COLLINS PARK.

EAST (BERGEN POINT, CONSTABLE HOOK, MOTBY)

Scenario 3 | Bayonne

Examples of solutions for this scenario include the following:

Coastal:

- Expand alignments for coastal barriers along private properties by involving private property owners or other stakeholders
- Elevate waterfront parks and walkways

Drainage:

- Separate stormwater into deep tunnels for storage and management at the outfall with a pump station
  - Example location: E 32nd Street

Green infrastructure:

- Incorporate nature-based solutions along the coast, such as coastal wetlands areas and living shorelines, to improve water quality and quantity management

3
ORDINATION

BAYONNE
Central & West

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CENTRAL & WEST

Scenario 1 | Bayonne

Examples of solutions for this scenario include the following:

Coastal:

- Protect individual sites along the Newark Bay through city- or county-led protection of their respective assets, such as city-owned park service buildings or fields
- Create a Resilience Hub at Bayonne High School that would serve as a single source of knowledge and for assistance pre- and post-disaster

Drainage:

- Increase pumping and drainage capacity at problem underpasses, such as underpasses along the Hudson Bergen Light Rail corridor, to avoid blockages to mobility and stranded residents and vehicles
  - E 22nd Street underpass is already being examined
- Advance more projects in city-owned properties, like the underground retention system recently installed as Fitzpatrick Park near City Hall
- Tie into and expand planned LTCP projects set to increase retention and pumping capabilities at several points in the city
  - Explore sewer separation along the same suggested corridors from the LTCP
  - Pipe stormwater to new possible retention areas and dedicated outfalls in parks along the Newark Bay
  - Example locations: Outfalls at W 16th Street, W 22nd Street, W 35th Street

Green infrastructure:

- Incorporating GI into key public rights-of-way (e.g., roads, city-owned parks)
  - Example roadways: Avenue A and Broadway

ITIATIVE

NEWARK BAY
SEPARATE DRAINAGE IN WEST BAYONNE WITH NEW OUTFALLS TO NEWARK BAY (W 16TH ST, W 22ND ST, W 35TH ST)
APPLY RESILIENCE MEASURES TO KEY PARK ASSETS IN WESTERN BAYONNE
IMPROVE OUTFLOW TO MAIN DRAINAGE CORRIDORS & EXAMINE LTCP RETENTION TANKS FOR POTENTIAL INTEGRATION & EXPANSION
INCREASE DRAINAGE & PUMPING CAPACITY AT PROBLEM UNDERPASSES
INCREASE OUTFLOW ALONG AVENUE E TO RETENTION TANK & EXPANDED E 5TH ST PUMP STATION
4
5
2
4

CENTRAL & WEST

Scenario 2 | Bayonne

Examples of solutions for this scenario include the following:

Coastal:

- Protect vulnerable sites through public-private partnership or coordination across local and county agencies
  - Consider barriers such as raised edges and floodwalls to keep water out

Drainage:

- Separate stormwater in north Bayonne and direct it to restored wetlands in the Newark Bay around Rutkowski Park. Stormwater is taken out of problem areas and is naturally filtered in wetlands.
- Expand concepts like Fitzpatrick Park to private, vacant properties, possibly converting unused, impervious sites to park space

Green infrastructure:

- Incentivize or require GI on private sites through grants, tax incentives, and requirements
- Increase green space through related non-physical measures, such as Tree Canopy and Adopt-a-Green Street programs

Source: Hudson County Division of Planning

2
NSIBILITY

NEWARK BAY
EXPAND DRAINAGE SEPARATION TO CITY OWNED REVITALIZED WETLAND SITE
1
SEPARATE DRAINAGE IN WEST BAYONNE WITH NEW OUTFALLS TO NEWARK BAY (W 16TH ST, W 22ND ST, W 35TH ST)
3
5
INTEGRATE RESILIENCE TO PROTECT WATERFRONT PARKS FROM REPEAT FLOODING
EXPAND DRAINAGE SEPARATION IN COORDINATION WITH REDEVELOPMENT SITES
PARTNER WITH NJDOT & TRANSIT TO INCREASE DRAINAGE & PUMPING CAPACITY AT PROBLEM UNDERPASSES
EXPAND STORMWATER BASIN AT INTERCHANGE WITH NEW FORCE MAIN TO EXPANDED PUMP STATIONS
NJ TURNPIKE
E 30TH ST
E 22ND ST
HOOK RD
AVE E
BROADWAY
E 5TH ST

CENTRAL & WEST

Scenario 3 | Bayonne

Examples of solutions for this scenario include the following:

Coastal:

- Integrate continuous coastal protections along the Newark Bay with Hudson County's proposed Hackensack River Greenway, whose corridor plans to run along the full length of western Bayonne

Drainage:

- Separate stormwater into deep tunnels for significantly expanded storage capacity. Deep tunnels require more intensive planning and construction and are larger investments than other drainage solutions
  - Example location: E 32nd Street

Green infrastructure:

- Explore a regionally coordinated living shorelines program for wetland restoration along the coasts in conjunction with new stormwater outfalls. This will help filter the runoff before it hits regional waterways, resulting in a healthier ecology and cleaner water for all in the region

3
ORDINATION

NEXT STEPS

DEVELOPING A PREFERRED SCENARIO AND ACTION PLAN

Resilient NENJ process for Action Plan development

This report presents three scenarios of actions that would reduce current and future impacts from flooding and other climate-related hazards and that align with the region's vision. The scenarios incorporate community feedback gathered at community meetings, events, and through surveys and other channels. The actions presented were also shared with local, state, and infrastructure stakeholders to understand feasibility and support.

These three scenarios will be refined and consolidated into a preferred scenario, which will be the basis of the Action Plan. The results of the flood impact assessment, which are summarized in the separate Flood Impact Assessment report, along with the Climate Hazards Assessment, will help prioritize actions and understand their possible benefits. Additional community and stakeholder feedback will help identify actions to include in the Action Plan and build consensus on a path forward. The evaluation criteria will be used to ensure that the Action Plan aligns with community vision. The Action Plan will be released as a draft report in the summer of 2022 and will include a timeline for implementation, identify funding opportunities for projects, and identify parties responsible for leadership.

www.resilient.nj.gov/nenj