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**New
Meadowlands**



The New Meadowlands

project by:

MIT CAU + ZUS + URBANISTEN
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commissioned by:

Rebuild by Design
An Initiative of the President's
Hurricane Sandy Rebuilding Taskforce

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THE NEW MEADOWLANDS PROJECT

Executive Summary

The 'New Meadowlands' project articulates an integrated vision for protecting, connecting, and growing this critical asset to both New Jersey and the metropolitan area of New York. The Meadowlands emerged out of a larger regional analysis that mapped a maximal spectrum of risks to a comprehensive set of vulnerabilities, combining flood risk with social vulnerability, vital network vulnerability, pollution risk, etc. Wherever this *hazard sandwich* reaches its greatest thickness, federal investments in protection make most sense. This analysis highlights the Meadowlands area as an urgent priority.



Overview of the New Meadowlands project as a regional attractor for New Jersey and the New York metropolitan area.

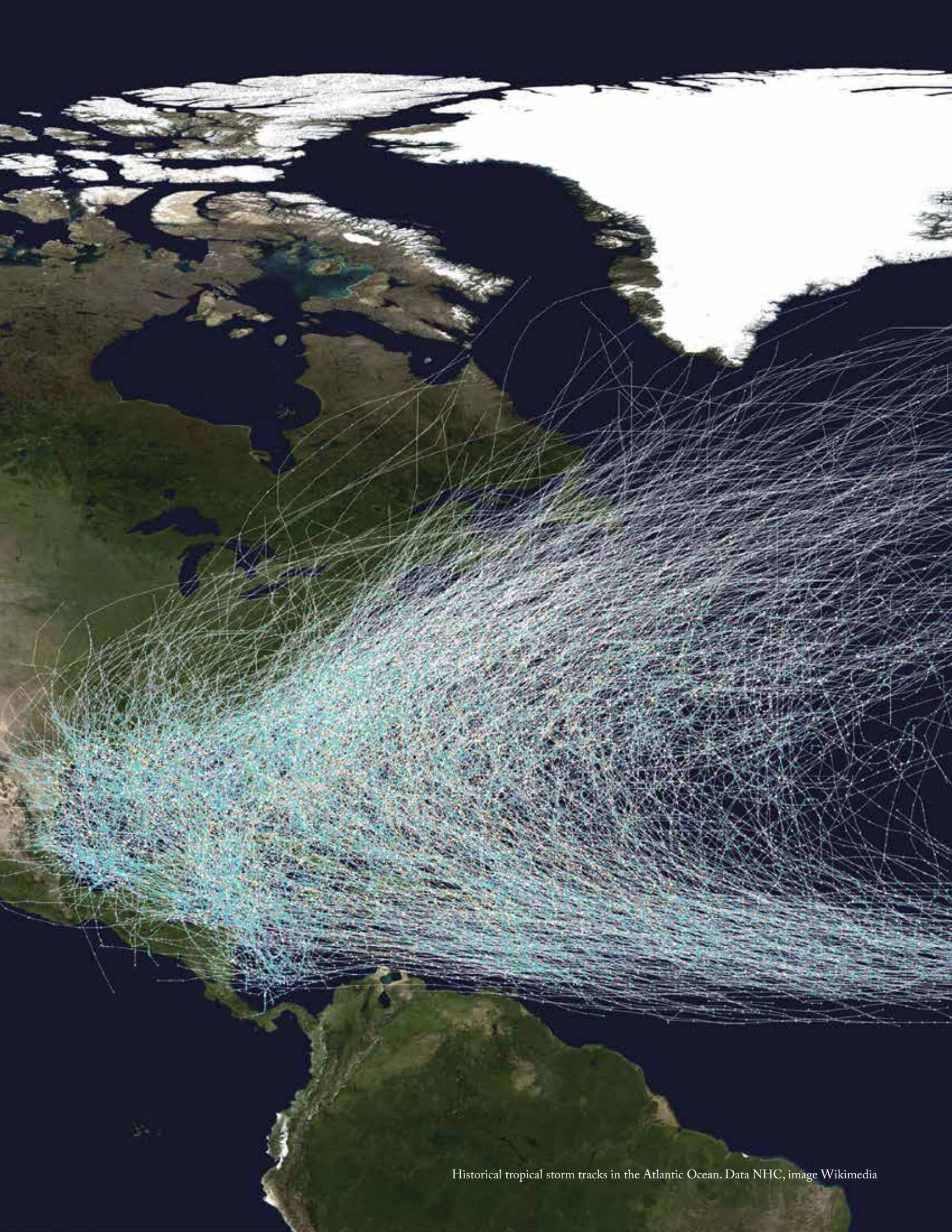
The proposal offers primary protection against flooding. An elongated green infrastructure 3rd generation berm with occasional gates along the edges of the Meadowlands and most of its developed areas will protect against flooding from surges coming in from the Atlantic Ocean. Within the protected areas, several substantial fresh-water basins will absorb rainwater flooding, substantially reducing the storm water runoff into sewer lines and therefore almost eliminating local rainwater flooding from sewer overflow.

An absolutely critical and innovative element is *design integration*. Designing both systems in full integration with other parts of the area (transportation, ecology, development) will bring benefits to both wildlife ecology and economic development that otherwise remain unaccounted for. Integrated design will allow for the various past and ongoing marshland

restoration efforts by the Meadowlands Commission to become connected and legible as one large, regional wildlife refuge, to be made accessible at appropriate places for visitors. We propose to call this the *Meadowpark*. Integrated design will also allow for this large reserve to act as a major value adder and opportunity for the surrounding development areas. We propose to call the key element to this integrated design the *Meadowband*. The Meadowband is a civic amenity consisting of a local street, a Bus Rapid Transit-line, and a string of public spaces, recreation zones, and wildlife reserve access points on top of the outer berm and its slopes. The Meadowband is the missing link in the Meadowlands basin: a public space that mediates between the different systems (ecology, development) and the different scales (very local to interstate). In doing so, it provides a critical connective tissue on the scale of the Meadowlands

itself – literally taking on the scale of the protection infrastructure. We envision that the audience for this linear, meandering amenity consists of the inhabitants of the existing towns, the residents in new residential developments aligning the Meadowband, as well as tourists and visitors from the region, seeking access and recreation at what will be its biggest regional park.

The fundamental principle of this project is a new *grand bargain*. In order to be worthy of substantial federal investment in protecting land from future flooding, it is imperative to use that land more effectively. That means we propose shifting from a suburban-type land-use zoning (single story, freestanding, open-space parking around structure), to a more urban-type land-use zoning. Single-story warehouse zones should be up-zoned to become multi-story; areas around the Meadow-



Historical tropical storm tracks in the Atlantic Ocean. Data NHC, image Wikimedia

New Meadowlands

introduction

band would be zoned to include multi-story residential opportunities. Development footprints along the Meadowband can become smaller in plan, and taller in section.

These decisions over time will enhance the brand and identity of the basin, drive up the value of the land, and the ratable tax returns for the towns concerned. Currently, the Cost-Benefit Analysis for this project yields a factor of 2. That is a significant benefit, itself the result of an integrated design strategy. It is important to acknowledge that the overall result is the essence of a good plan: *to bake the cake such that it increases the size of the different parts*. This project is not a zero-sum game. It will be critical for the success of this venture that good design, planning and integration of parts continue to play a major role should the different projects proposed be executed. The integration

effort remains the most fragile, yet most essential to realize the value of the project. We suggest a continuous path of design quality and integration, weaving the different interventions back, with every new move, into a dynamically evolving masterplan that guarantees that the benefits calculated, will effectively be realized.

Finally, the team has engaged in substantive outreach efforts with various municipalities in the area, with the State of New Jersey, with the Meadowlands Commission. It has worked closely with environmental groups such as the Hackensack Riverkeeper; as well as with the Meadowlands Chamber of Commerce; it has also included major vital network operators and owners such as the NYNJ Port Authority and PSEG. Overall, the notion of a new 'grand bargain' has been well received, and aforementioned

stakeholders have decided to participate in several consecutive gatherings and workshop sessions.

Clearly, this design and planning phase for this project is not over, but 3 pilot areas have been identified for immediate further development and construction. These areas are the northern edge (comprised of sections of Little Ferry, Moonachie, Carlstadt, Teterboro and a sliver of South Hackensack); the eastern part (Secaucus, with a portion of Jersey City); and the southern tip (South Kearny and the western waterfront of Jersey City). In each of these areas, the project consists of a mix of actions, specifically (a) Meadowband berms and public space design and construction; (b) rezoning; and (c) integration with other ongoing initiatives.



Aerial view including Moonachie, East Rutherford, Secaucus, Jersey City,

New Meadowlands introduction

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Flooding in South Hackensack after Superstorm Sandy.

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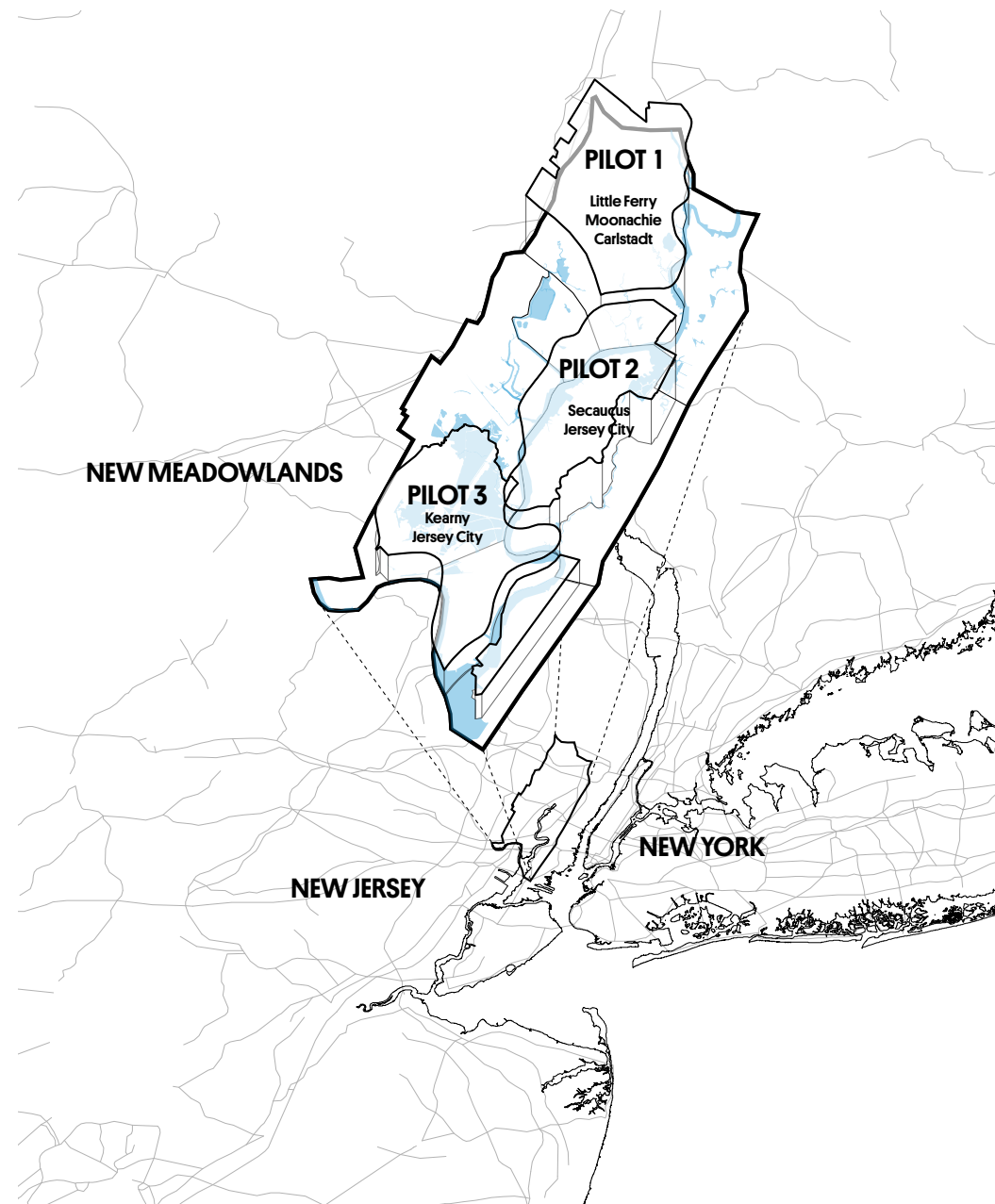
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FROM REGIONAL ANALYSIS TO PILOT PROJECTS

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Process Overview



When the Rebuild By Design initiative selected the MIT CAU + ZUS + Urbanisten team, a two-stage research and design process ensued. The various partners in the team collaborated in a flawless manner, working together on both research, design and planning. Alexander D’Hooghe and Kristian Koreman coordinated the MIT and Dutch expertise respectively, brain and production power. During the first stage, described below, an exhaustive process of mapping and testing led to the identification of priority areas for federal investment in protection. RBD refers to this as Stage II, Stage I being the team selection process.

In order to establish these priority areas, the team marshaled the resources of MIT to engage in a fast-paced, but comprehensive *mapping of risks and vulnerabilities (a)*. With the Dutch partners, this mapping was overlaid with an analysis of *coastal flood landscapes (b)* in the area. This analysis looked at regional landscapes and urban systems broadly in order to define spatially contiguous zones of consistency in the relation between water dynamic and urban development. Simultaneously, the team engaged in *opportunity testing (c)*. The team tested and envisaged opportunities for various areas appearing early in the mapping process. This opportunity testing engaged both early design speculations, as well as a survey of existing initiatives and projects.

This effort yielded 4 priority areas for investment: Sandy Creek (Brooklyn), Lower East (Manhattan), Hoboken/Jersey City eastern waterfront (NJ), and the biggest and most challenging of all – the Meadowlands area (NJ). After presenting these recommendations to the RBD jury and HUD on October 28, the team was asked to focus on the Meadowlands area

and to develop an innovative strategy for its protection and future development. This decision heralded the beginning of the second phase of our work. RBD refers to this as *Stage III*.

The Meadowlands area contains substantial areas of no less than 14 different municipalities spread out over 2 counties, with a unified zoning authority – the Meadowlands Commission – regulating an area roughly the size of 8.5 x 4.2 miles. Given the enormous scale of the project area, a new wave of analyses ensued. Simultaneously, the team began to identify priority areas for pilot projects within the area in order to calculate cost-benefit ratios and maximize a measurable correlation between protection, eco-system improvement and economic and urban development opportunity. From this process, *3 pilot areas* have become apparent: the northern edge, the eastern edge, and the southern tip. The northern edge contains portions of Little Ferry, Moonachie, Carlstadt (extending protection to these towns plus South Hackensack and Teterboro). The eastern edge is in the municipalities of predominantly Secaucus and a sliver of the west edge of Jersey City, and would extend protection to both. The southern tip is predominantly in South Kearny, again with a sliver of the western waterfront of Jersey City. Flood protection and wave absorption here would have measurable benefits for the communities north.

Each of these pilot areas can be protected and supported independently with the specific measures proposed in this report. However, they belong to a broader masterplan to extend protection to the entire Meadowlands. The 3 pilot areas comprise of about 40-50% of the protection measures required for the overall Meadowlands area. There are *3 additional*

areas within the masterplan, each requiring interventions. This is an north-eastern edge (Union city, North Bergen), a south-western edge (East Rutherford, northern portions of Kearny, Lyndhurst, North Arlington, including the Metlife Stadium area) which define two critical additional areas requiring protection.

The presence of an *overall dynamic masterplan* is critical and sets the stage for a series of future interventions, funding applications and means to integrate the various actions undertaken in the Meadowlands. A study of the current land-use patterns reveals that most of the existing fragments, whether in transportation, or in real estate, or even in wetland reconstruction, are self-contained and isolated from immediate neighbors, as a result of which the benefits to these adjacent areas remain untapped. Composed of a series of self-enclosed, self-referential fragments, the Meadowlands urgently needs the kind of master planning that realizes the ‘proximate principle’ (realizing multiplier effects between adjacent land uses). Both urban fabric and ecosystem benefit from continuity and contiguity. For that reason, the team did not exclusively focus on the pilot areas but made continuous efforts to integrate them with the other 3 areas requiring investment.

The current masterplan proposes two critical concepts for such continuity; the *Meadowband* and the *Meadowpark*, both described in the summary and in chapters below.

The mission statement of the team, when setting out its work at the beginning of Stage III, can be found in adjacent inset.

Exploded Axonometric showing the greater meadowlands area, the 6 areas within the Meadowlands for project definitions, and the 3 pilot areas.

Mission Statement

NEW MEADOWLANDS: Productive City + Regional Park

A Resilient District combining an innovative urban mix of residential and logistics around a regional tidal park.

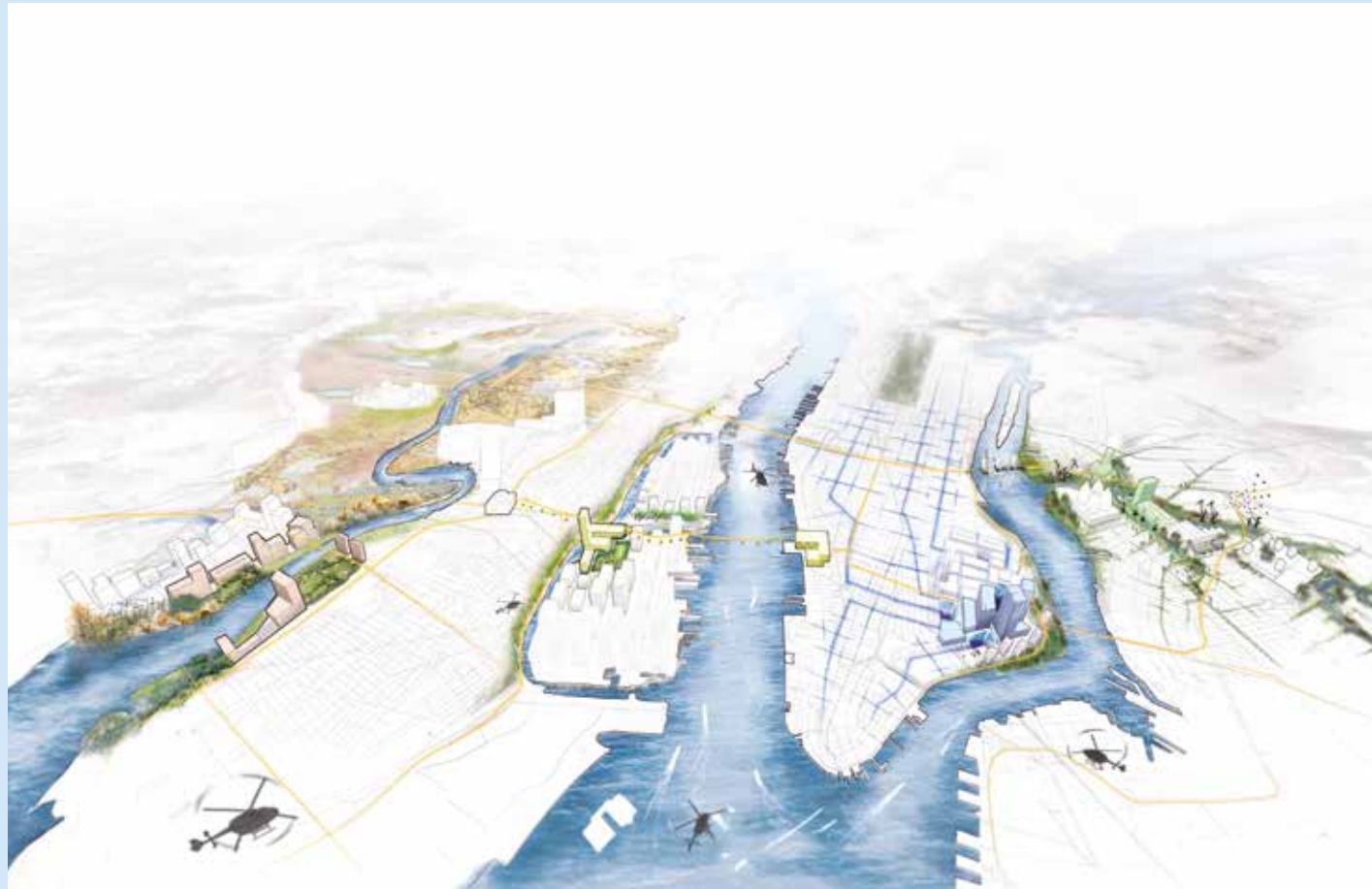


Image of the 4 areas in critical need of resiliency measures after Sandy. Part of the Stage II report submitted to RBD. The Meadowlands site is to the left.

The Meadowlands area emerges from a regional analysis aimed at identifying areas where a broad portfolio of risks are apparent. The underlying policy argument is that a federal dollar is best spent when it helps address not just flood risk, but rather the combined effects of flooding, heat islands, pollution, social vulnerability and vital network protection. Furthermore, the Meadowlands Commission is a case study in inter-municipal collaboration, positioning it well for a coalition-building effort. Our proposal will contribute to a new balance by rebuilding eco-system as water storage landscapes with recreational use. These will add value and create new development opportunities along the edges of the Meadowlands. We will focus efforts on including and defining edge zones between the natural and urban systems. Importantly, the development adjacent to this ecosystem could become a model for a new kind of co-existence of industrial (logistics) and residential programs. Investing in

the right urban typologies and parcels constitutes an important dimension. Interweaving these programs and exploiting their proximity will reinforce the growing ties between job sites and residences of working populations in the municipalities around the Meadowlands. The concept of a resilient district also entails measures to provide emergency amenities allowing critical supplies, data access, energy and waste management to adjacent communities for a 2-3 week period after a disaster. It also includes a careful study of evacuation routes to high ground. Furthermore, zooming in, the southern edge of the Meadowlands, the west half of Jersey City, Kearny and Secaucus are strategically located for flood control while also carrying the burden of urbanization pressure emanating from Manhattan. Several project processes are already underway along the Hackensack riverfront. Fitting these into a bigger project, and infusing them with resiliency measures, will unlock this strategic location with benefits

for the entire region: a resilient district of residences and logistics built around a large park. This district also contains critical logistics and utility clusters. In this collusion of pressures, we believe an important project is possible; and today is the moment to build a coalition for its realization. The vision includes a gradual conversion of substantial parts of the Meadowlands into a regional landscape and infrastructural park that protects the edges from floods, rebuilds biodiversity lost over the past century, absorbs water and hosts recreational civic programs. Along the edges, a mix of new residential density and other uses could take advantage of the park as a civic amenity. This scenario will maximize benefits from the close proximity to Manhattan but keeps the area attractive and desirable to a mix of audiences.

FROM RISK TO OPPORTUNITY

Staging the New Meadowlands

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A High-Risk Basin. Risks, Vulnerabilities, Flood Landscapes

The Meadowlands appears as a high priority area for federal investment based on the team's *mapping of risks and vulnerabilities*, overlaid with an analysis of *coastal flood landscapes* in the area, and measured against the possibility of engaging in ambitious design and coalition building through *early opportunity testing*. Upon completing this analysis for the tri-state metropolitan area, we have zoomed and repeated this process within the Meadowlands basin at a finer grain.



Overview map of the five coastal flood landscape categories.

COASTAL FLOOD LANDSCAPES

The metropolitan region of NY-NJ is a delta within which the Hudson River, the East River, the Hackensack and the Passaic all converge. In this confluence a diversity of coastal and semi-inland flood landscapes appear. The team mapped these as separate categories of landscapes, because they respond to flooding in different ways and are accompanied by different risks and vulnerabilities to the urban environments that they host.

We could imagine the geomorphology of the estuary as a large mould onto which the metropolitan area has settled and where salt and fresh water are exchanged every day, filling and emptying the low-lying area. During great floods the process becomes more intense and different flood landscapes respond to the pressure in different ways. The water does not overflow from the river in the same way as it overflows the marshes for instance, and planning will do well to take this difference into account. Our analysis has identified 5 types of coastal flood landscapes, represented by columns in the accompanying ‘hazard sandwich’ graphic.

The landscapes are coasts, tidal marshes, creeks, river floodplains and islands. Each of these coastal environments has distinct patterns of urbanism and resilience. In analyzing them we extend the Dutch Delta Works and Delta Alliance four-layer model of coastal development to five layers that include the cultural level of urbanism (fig 2).¹ The conventional “Layer Model” includes a Base Layer of coastal eco-hydrologic processes, a Network Layer of infrastructural systems, and an Occupation Layer of human settlement and activities (Bucx, 2010, p. 20). The five types of coastal flood landscapes are elaborated below:

Coasts in this area are mostly sandy beaches with dunes, behind which in most cases they have relatively suburban, low-density pattern of development settled in a low-lying area. These areas are under full influence of the ocean and its waves. The currents form the shape of the coastline.

Tidal marshes are places where the wave force is relatively modest. Here salty water meets fresh water runoff from higher grounds and river discharge. They occur sometimes behind the dunes (Jamaica Bay); in other cases they appear in river deltas. In the Meadowlands, the Hackensack ends in a salty marsh. Marshes have only partially developed because every new building development needs to be accompanied by a land-making effort first. They are extremely vulnerable to both ocean and rainwater flooding. About 85% of the historical marshes have been lost to development handicapped by such vulnerability.

Creeks occur when a relatively small volume of fresh water flows through a clearly delineated section, and the alongside of the section is high enough to be dry. Creek beds occur on either side of the high ridge running parallel to the coastal line land inward. Development can occur without additional land-making investments. Creeks are vulnerable to ocean flooding. Because they have only limited tributaries and watersheds, they are less vulnerable to rainwater event inundation.

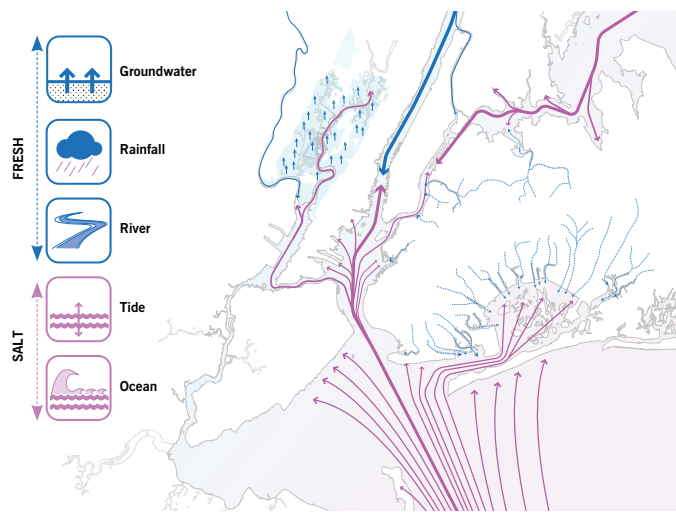
River floodplain. Rivers accumulate freshwater volumes from much larger watersheds and create a wide delta of floodplains where they discharge into the ocean. These floodplains are dynamic bodies that can frequently flood in a natural situation. In urban areas these

places have been substantially urbanized along their edges. Also land has been reclaimed on these plains, often for water related activities like the harbor. These low lying urban environments along rivers are vulnerable to rainwater event flooding upstream as well as ocean flooding. When both happen at the same time consequences can be extremely severe.

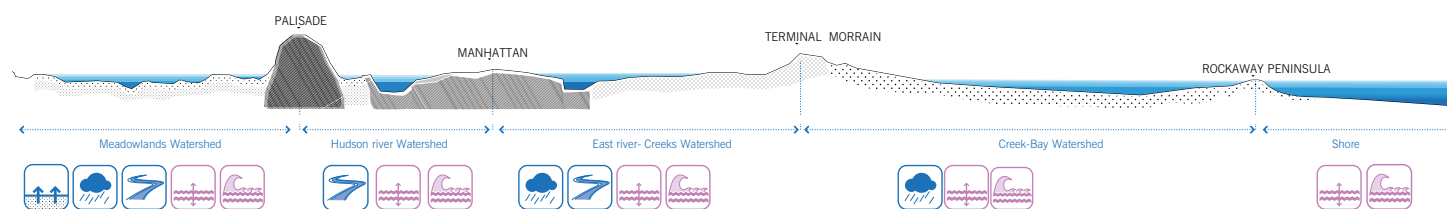
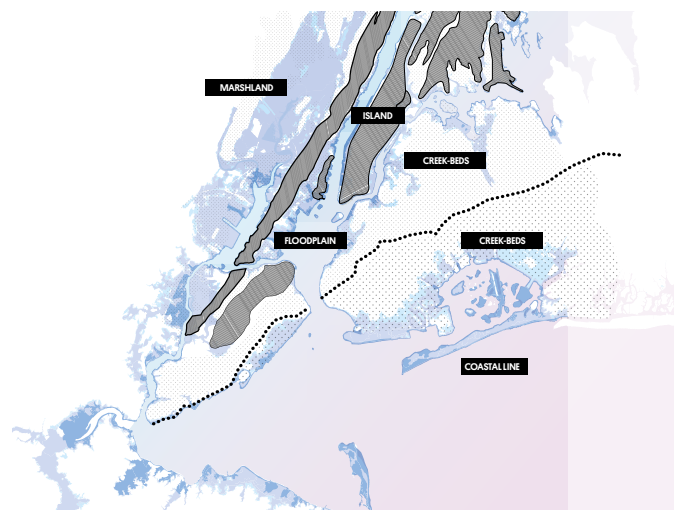
Islands are naturally higher situated grounds surrounded by water. Depending on their height they can be prone to flooding. Mostly the edges of an island are most vulnerable, as can be seen at the lower tip of Manhattan where river discharge and ocean flooding meet. When as densely urbanized as Manhattan flooding is possible if the sewer system is inadequately wired and dimensioned.

Overall, the team has assessed that the full spectrum of flooding risks is highest along semi-developed marshes in urban areas. For that reason, both the Meadowlands, Hoboken/Eastern Jersey City have appeared in our initial priority areas. In the case of the Meadowlands, the construction of the 1921 Oradell reservoir upstream the Hackensack, the development waves in the floodplain, and the built up of surrounding areas, has exacerbated the risks to flooding of all kinds.

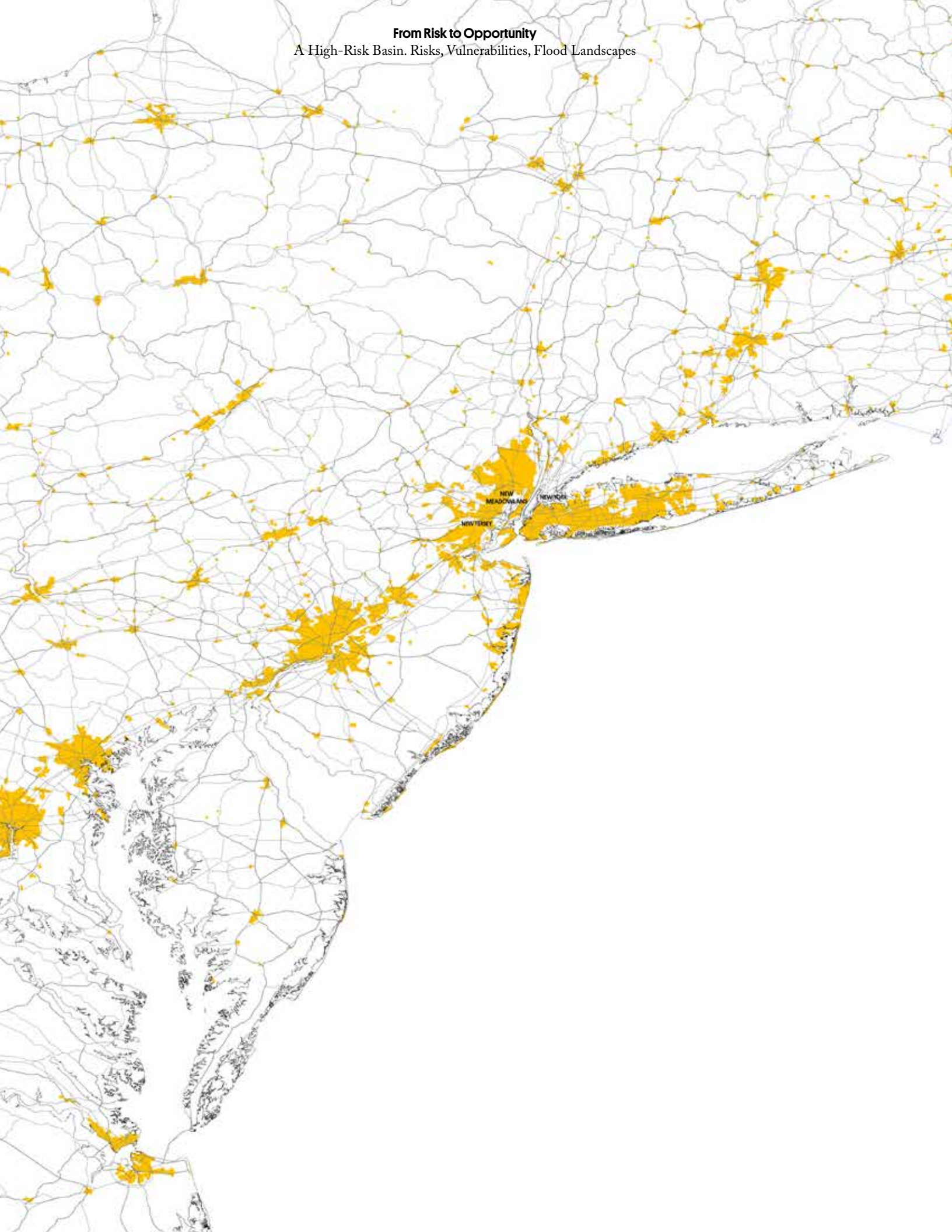
FLOOD DIRECTIONS



FLOOD PATTERN



1. Bucx, T., M. Marchand, A. Makaske, C. van de Guchte, 2010. Comparative assessment of the vulnerability and resilience of 10 Deltas – Synthesis report. Delta Alliance Report number 1. Delta Alliance



MAPPING RISKS AGAINST VULNERABILITIES

The Meadowlands region of New Jersey and New York is one of the nation's large-scale coastal ecosystems and settlement systems. Although unique, it has relevance for other coastal urban industrial ecosystems such as Baltimore-Chesapeake Bay, Boston Harbor, New Orleans, south Chicago, Los Angeles, and Seattle. Solving design challenges in this region can thus generate wider precedents. Resilience, as defined in the NRC's *Disaster Resilience: A National Imperative*, "is the ability to prepare and plan for, absorb, recover from and more successfully adapt to adverse events" (National Research Council, 2012, p. 1). Disaster risk reduction (DRR) research has developed dramatically in recent decades at every scale, from households to international development programs (National Research Council 2012; Wisner et al., 2013). Put simply, Wisner et al. have formulated disaster risk as:

DR = H x (V/C - M)

DR
disaster risk, which is a composite measure of exposure and vulnerability

H
hazards, which is the frequency, intensity, and duration of coastal storm processes

V
vulnerability to losses

C
capacity at the local scale for mitigating and responding to hazards

M
broader social mitigation of potential and actual losses

H - Hazard or Risk

Hazards or risks mapped include: storm frequency, intensity, and duration analysis; rainwater event flooding (sewer overflows); heat island effects with increasing temperatures; toxicity and pollution levels in ground, water and air.

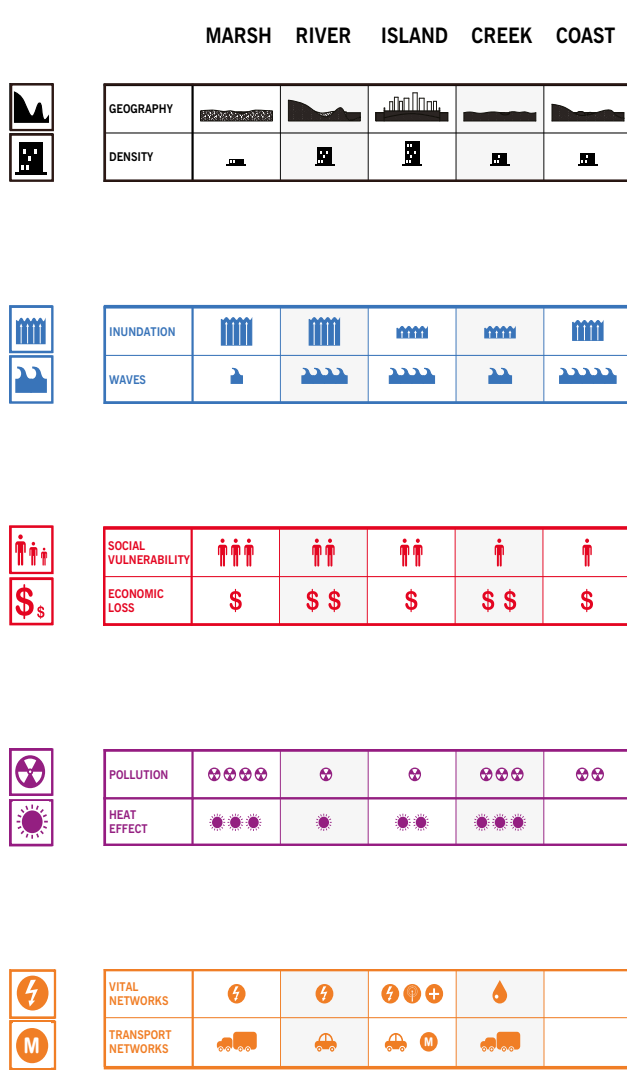
The team mapped the SLOSH models for current sea level rise and overlaid these with the updated FEMA maps. FEMA maps are conservative in that they do not factor in predicted sea level rise and precipitation increase. Led by Sarah Williams' Civic Data Design group at MIT, the team approximated rudimentarily the estimated future hazard, by building out a 100-year flood map using a 2.5ft sea level rise, predicted by the SIRR report, as a baseline.

As far as the Meadowlands is concerned, violent wave action does occur in the southern edge of the Meadowlands commission area, as well as in South Kearny and the waterfronts of Jersey City. North of this area, Meadowlands flooding is likely and will increase in the future, but is more a function of gradual inundation rather than severe wave action.

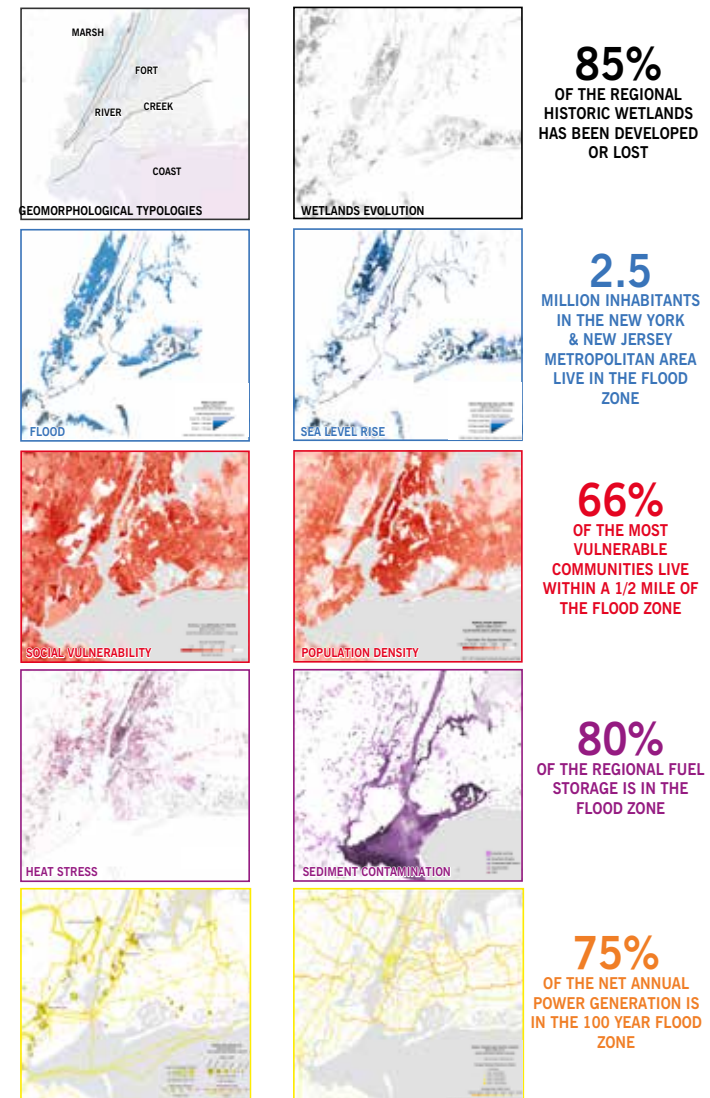
Each of these terms is extremely complex in its details and uncertainties. The terms "risk" and "hazard" are sometimes confused with one another², and this team has opted to use the term "risk". "Capacities" are less examined. For all of these reasons, it is extremely important to be clear about the analytic concepts, to build upon the most current thought about them, and to analyze how they can individually and jointly help understand disaster risk and risk reduction opportunities in the Greater Meadowlands region. Here is how we addressed each variable:

Sewer overflow hazards were often captured in this flood risk map. However, they have begun occurring much more frequently over the past decades independent of ocean flooding (e.g. Little Ferry Main street flooding; Secaucus creek flooding). The main reasons are accumulation of impervious surfaces in the watershed (immediate runoff, no absorption in soil or marsh), and a gradual increase in precipitation itself. All togeth-

MULTIPLE VULNERABILITIES / THE HAZARD SANDWICH



REGIONAL ANALYSIS



Mapping the risks and vulnerabilities across the region, for each of the coastal flood landscapes. This analysis yielded the Meadowlands as a priority investment area because of the confluence of risks and vulnerabilities.

er, about 2.5 million inhabitants in the New Jersey- New York metropolitan area live in the flood zone.

In addition, the team mapped existing and known pollution locations in the metro area. Clear concentrations in the Meadowlands area, as well as along Sandy Creek in Brooklyn became apparent. Not coincidentally, both locations have super-fund sites.

V – Vulnerability
Vulnerabilities mapped include: social vulnerability, vital network vulnerability, economic vulnerability.

This crucial dimension of risk has advanced from analysis of hazards to underlying social processes of poverty and marginalization. The Social Vulnerability Index (SOVI) developed by Susan Cutter³ includes 32 variables and is the broadest multi-variate assessment available. We map the SOVI values in the greater Meadowlands region in attached maps. Social vulnerability (SOVI) was mapped against urban density in order to understand which of the vulnerable areas contains greater concentrations of people at risk. Mapping the locations of these communities taught us that altogether about 66% of the most socially vulnerable communities live within 1/2 mile of the flood zone in the metropolitan area.

The team mapped vital network vulnerability by identifying the following critical infrastructures in the flood zone: power (sub)station, sewage plants, major trunk lines for transportation, oil tanks, airports, police and fire stations. The team mapped and learnt that about 75% of the region power generation lies in the flood zone.

The team mapped economic vulnerability by identifying primary employment areas, specifically warehousing districts in the flood zone. Warehousing districts offer jobs to low-mod income families; while being critical stations in a supply chain to get goods to Manhattan and other parts of the metro area.

C – Capacity

whereas vulnerability has received increasing research attention in recent years, the capacities and capabilities for mitigating and effectively responding to disaster have been less fully specified⁴. Early research addressed them as aspects of “choice” and “decision-making behavior,” while later research underscored how some social groups have far fewer choices than others. One of the key contributions of design is what hazards researcher Gilbert F. White called, “Expanding the range of choice” (Wescoat, 1987; White, 1960; Mitchell, 20xx)⁵. These choices includes access and mobility, work and recreation

M – Mitigation

capacity and mitigation are closely related. Mitigation refers to action taken in advance of a disaster to reduce its impacts on society and environment. The Federal Emergency Management Agency’s shift from disaster response to mitigation in the 1990s was one of the most important policy shifts in the field of disaster risk reduction. The entire proposal that forms the content of this report can be seen as an advancement of this policy.

The team engaged in intense spatial mapping of these terms for the metropolitan region in order to identify to maximum overlap areas requiring priority investment. Risks and vulnerabilities are represented as color-coded rows in the accompanying ‘hazard sandwich’ graphic. Sarah Williams, MIT Professor and in charge of the ‘Civic Data Design Lab’ put together a team of experts for this mapping exercise, with assistance of Professor James Wescoat, who assisted with this segment of the report. There are many uncertainties associated with each of these variables, which need to be examined closely. It is also important to stress that while expressed as a formula, this is not a technique for quantifying risk. Rather, this formulation helps organize the analysis of disaster risks and risk reduction in areas like the Greater Meadowlands Region.

Opportunity Testing

The team engaged in a continuous effort, even early on during the mapping phase, to understand the potentials of sites and areas to host an innovative design effort and stakeholder platform. For that reason, we engaged both in preliminary designs, as well as in early analysis of ongoing projects and efforts in different areas. Again the Meadowlands basin delivered some promising elements, such as the presence of an inter-municipal zoning agency, a sense of discontent with the status quo, a variety of low-and moderate income community, and a sizeable economic engine in the warehousing districts, supplying jobs to above mentioned communities.

Meadowlands-specific Risks and Vulnerabilities

The team also reiterated the risk and vulnerability analysis at a finer grain within the Meadowlands area, yielding a series of substantive numbers of at risk properties, neighborhoods, and landscapes. These can be found in the overview matrix.

Notes:
2. Each is also used in different ways. For example, some engineering analyses use the term “risk” to refer to the probability of an event, while the disaster research field uses it in the broader sense employed here (XX). Conversely, hazards researchers historically treated hazards as the joint product of exposure and vulnerability, while the disaster research field has converged on using it to refer to the frequency of an event.
3. Cutter, Susan. Social Vulnerability to Environmental Hazards. SOCIAL SCIENCE QUARTERLY, Volume 84, Number 2, June 2003
4. Bebbington, Anthony. 1999. Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. World Development Vol. 27, No. 12, pp. 2021-2044.
5. Clark, D.A. 2005. “The Capability Approach: Its Development, Critiques and Recent Advances.” Global Poverty Research Group Working Paper GPRG-WPS-032. www.gprg.org/pubs/workingpapers/pdfs/gprg-wps-032.pdf
Mitchell, J. Kenneth. 2008. Perspectives on alternatives: differentiation and integration in pursuit of a better fit between society and nature. Progress in Human Geography. 32,3 451-458.
Wescoat, J. L., Jr., ‘The ‘practical range of choice’ in water resources geography. Progress in Human Geography 11(1987): 41-59
White, Gilbert F. The choice of use in resource management. In Geography Resources and Environment, ed. Robert Kates and Ian Burton, pp. 143-165. Chicago, IL: University of Chicago Press, 1986 [1961].



FLOOD

2.5
million
inhabitants
in the New York &
New Jersey
metropolitan area
live in
the flood zone



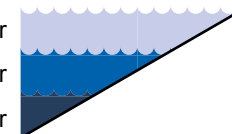
FEMA FLOOD ZONES
NEW YORK CITY/
NORTHERN NEW JERSEY REGION

FEMA Designated Flood Zones

Zone XX – 500-year

Zone A – 100-year

Zone V – 100-year

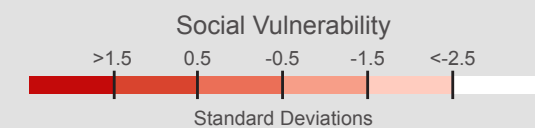


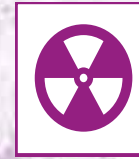


SOCIAL VULNERABILITY

66%
of the most
vulnerable
communities
live within a
1/2 mile of the
flood zone

SOCIAL VULNERABILITY INDEX
NEW YORK CITY/
NORTHERN NEW JERSEY REGION



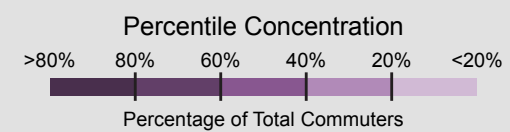


POLLUTION

80%
of the
regional
fuel storage
is in the
flood zone

- Industrial Land Use
- Brownfields Property
- Contaminant Spill Control
- Superfund Site
- CSO

SEDIMENT CONTAMINATION
SURFACE - TOP 10 cm
TOTAL PCB



From Risk to Opportunity
A High-Risk Basin. Risks, Vulnerabilities, Flood Landscapes



VITAL ELECTRICITY NETWORKS

75%
of the net annual
power generation
is in the
100 year
flood zone

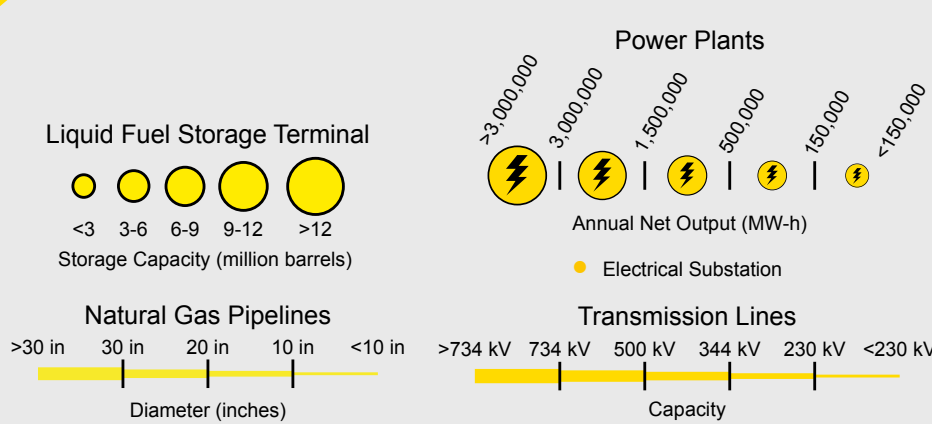
Bergen Generating Station

500MW CC
Astoria

Ravenswood

Linden Cogen Plant

**POWER AND LIQUID FUEL
NEW YORK CITY/
NORTHERN NEW JERSEY REGION**

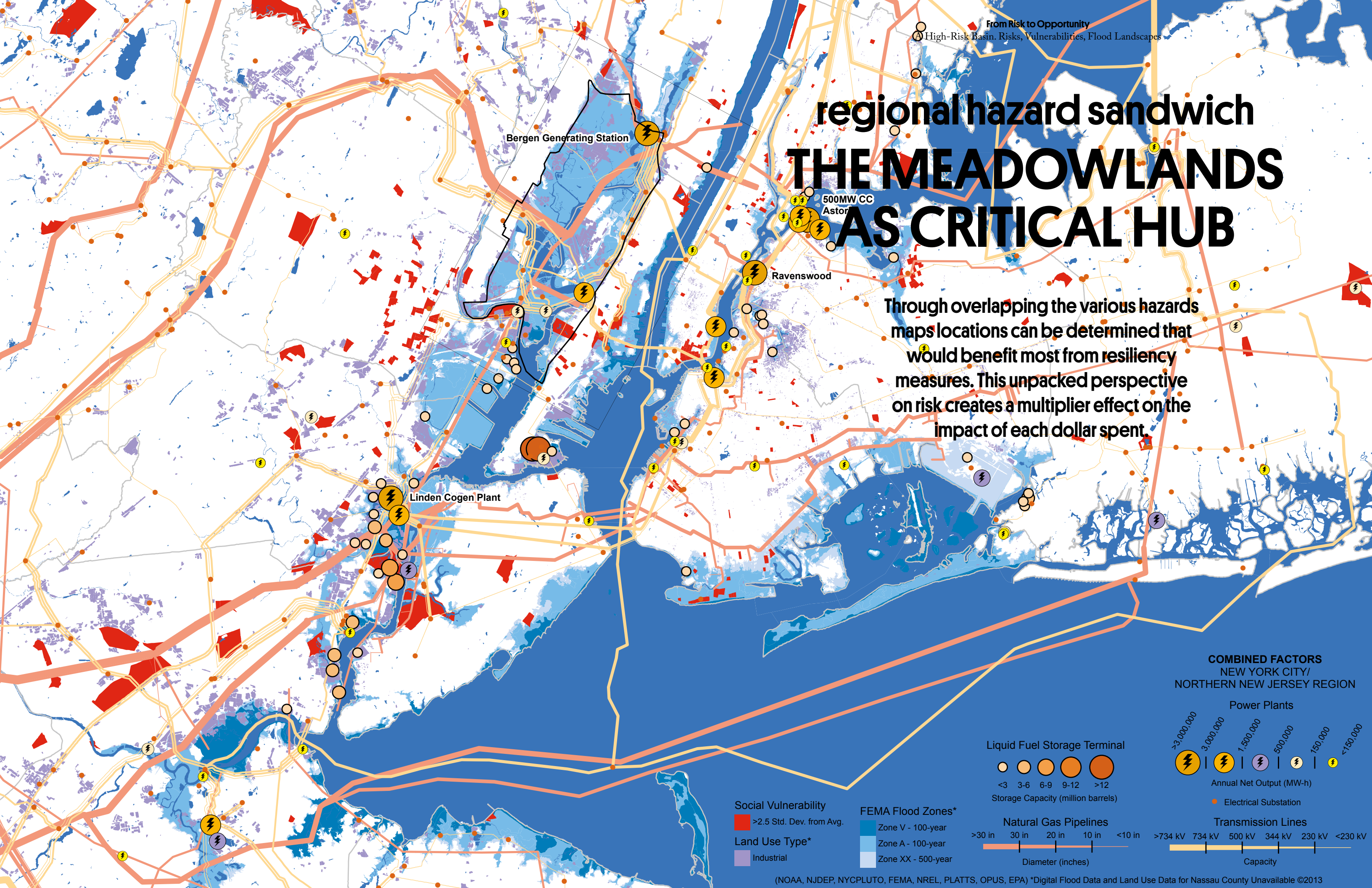


(FEMA, NREL, PLATTS, OPUS, EPA)

From Risk to Opportunity
High-Risk Basin, Risks, Vulnerabilities, Flood Landscapes

regional hazard sandwich THE MEADOWLANDS AS CRITICAL HUB

Through overlapping the various hazards maps locations can be determined that would benefit most from resiliency measures. This unpacked perspective on risk creates a multiplier effect on the impact of each dollar spent.



Social Vulnerability
Red: >2.5 Std. Dev. from Avg.

Land Use Type*
Purple: Industrial

FEMA Flood Zones*
Blue: Zone V - 100-year
Light Blue: Zone A - 100-year
Lightest Blue: Zone XX - 500-year

Liquid Fuel Storage Terminal
Circles: <3, 3-6, 6-9, 9-12, >12
Storage Capacity (million barrels)

Natural Gas Pipelines
Lines: >30 in, 30 in, 20 in, 10 in, <10 in
Diameter (inches)

**COMBINED FACTORS
NEW YORK CITY/
NORTHERN NEW JERSEY REGION**

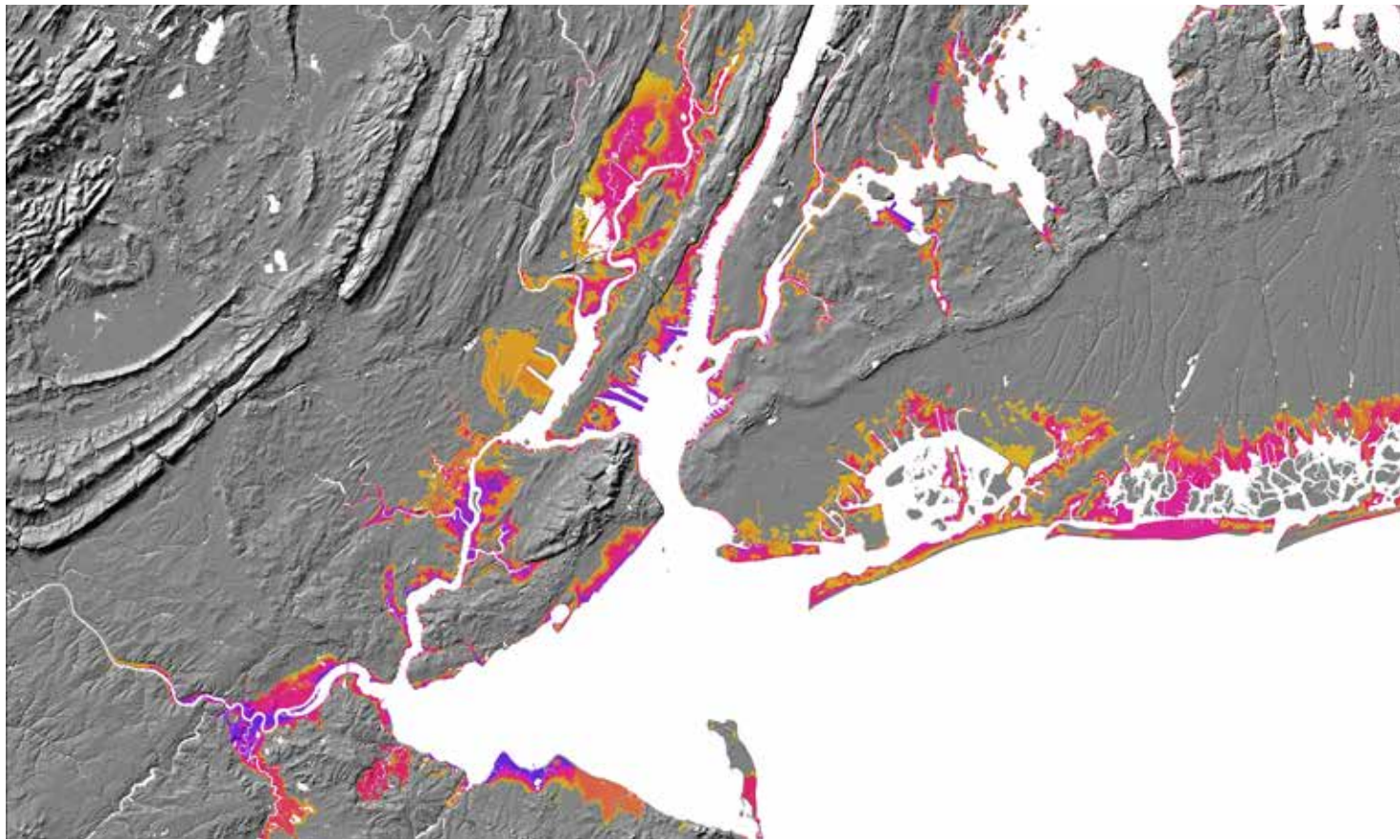
Power Plants
Lightning bolts: >3,000,000, 3,000,000, 1,500,000, 500,000, 150,000, <150,000
Annual Net Output (MW-h)

Orange dot: Electrical Substation

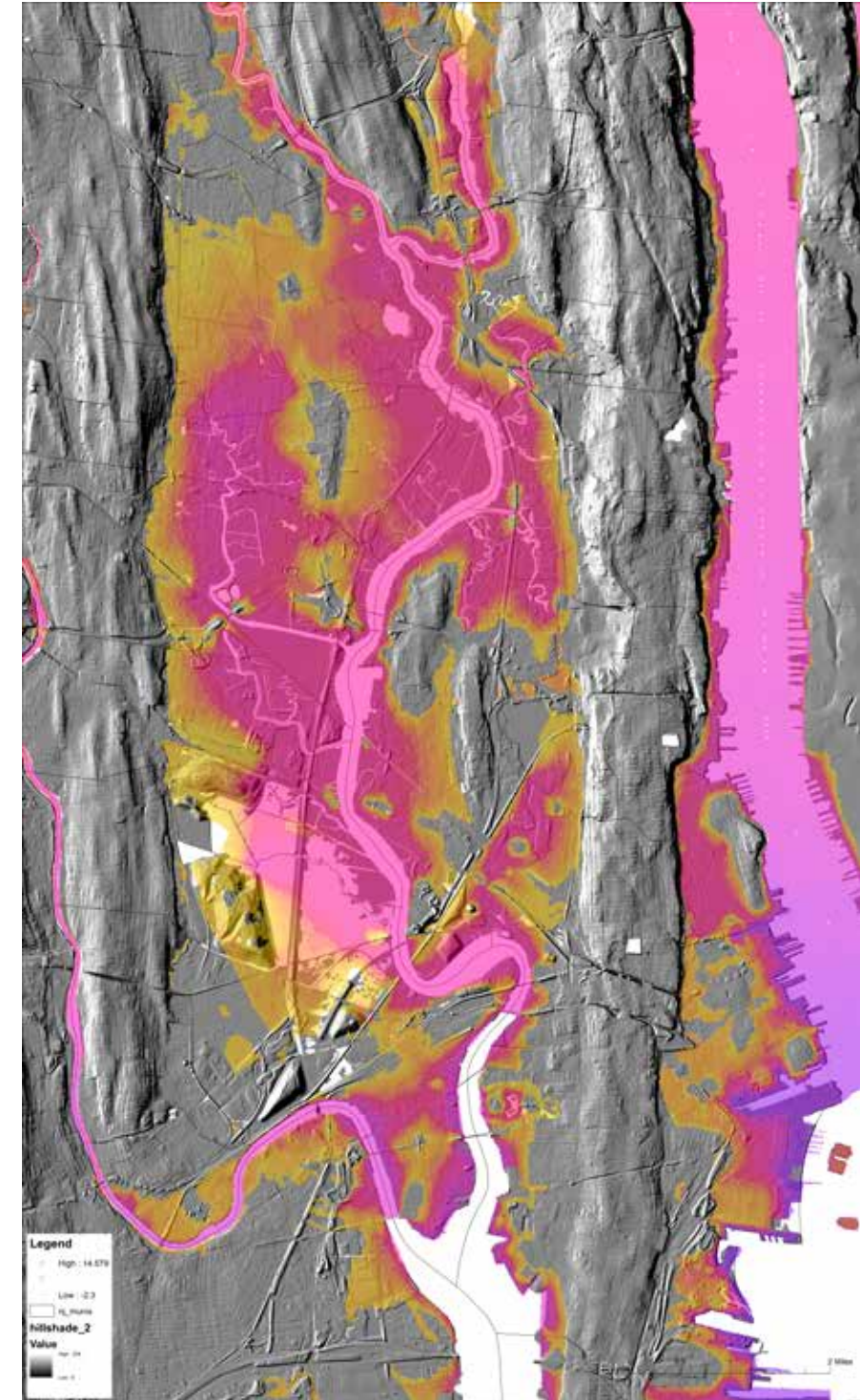
Transmission Lines
Lines: >734 kV, 734 kV, 500 kV, 344 kV, 230 kV, <230 kV
Capacity

(NOAA, NJDEP, NYCPLUTO, FEMA, NREL, PLATTS, OPUS, EPA) *Digital Flood Data and Land Use Data for Nassau County Unavailable ©2013

Sandy Affected Regional Map



Sandy Affected Meadowlands Map





The bend in the Hackensack. Southern Secaucus to the left, Kearny peninsula to the right.
Source unknown.

Historical development and causes for adjustment



Crospey Jasper Francis, Hackensack Meadows, 1891, watercolor and pencil on paper 16 x 26 inch

FOR SALE AT CHRISTIES

\$37,500 (Set Currency)

Estimate

\$25,000 - \$35,000

Sale Information

SALE 2171 —

IMPORTANT AMERICAN PAINTINGS,
DRAWINGS, AND SCULPTURE

20 May 2009

New York, Rockefeller Plaza

source:

www.christies.com

The Meadowlands basin historically was a large marshland, contained between the Palisades eastward, and a parallel western ridge, both running roughly in north-south direction. A freshwater delta into which the Hackensack river discharged before connecting with the Upper Bay of the Hudson river, it did receive rather little development for a long time, while dry and higher ground around it urbanized; Manhattan first, but the palisades and other Jersey towns on the western ridge developed around the basin.

That urban growth would initially circle the Meadowlands area was logical, since the basin would flood regularly both from river and occasional ocean flooding. When the Oradell reservoir dam was built in 1921 upstream on the Hackensack, the Meadowlands ecosystem changed dramatically. Suddenly bereft of most of its freshwater intake, the basin became increasingly tidal, with brackish waters and a greater susceptibility to marine flooding. Plant and fish species changed, and the area transformed from a forested freshwater marsh, to a tidal marsh with low grassy vegetation. After WW2, conspicuous pollution patterns further impoverished the ecosystem to favor the few species able to survive the now harsh environment. Over the last century, the

marshland itself also shrank to less than a third of its original size.

This shrinkage follows a historical trajectory of first being encircled by urbanization, and then later, with the dramatic vertical accumulation of matter, energy, and consumption in Manhattan, of being inundated by that same urbanization. The Meadowlands thus found a role as a back-stage for Manhattan. Larger and wider than Manhattan itself, the basin has gradually collected a series of functions and programs that are essential to the functionality of a global front-stage urban setting, but invisible to its audience. During the 20th century, the rapid densification and development of Manhattan required an equally rapid development of electrical power systems and stations, and perhaps most importantly – of a enormous logistics and supply chain system necessary to feed Manhattan and the region on a daily basis with furniture, food, clothing, construction elements, decors, cleaning supplies, etc.

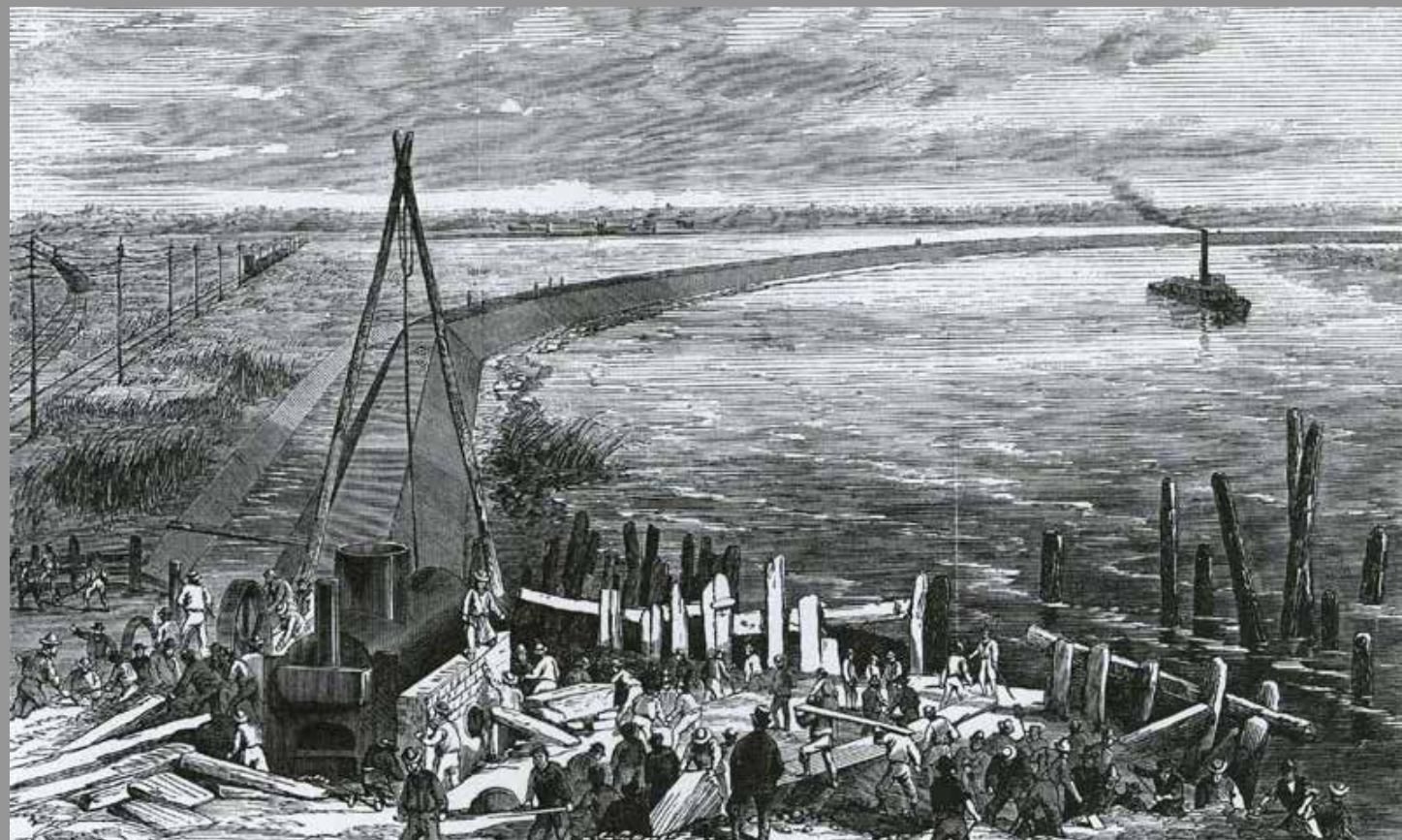
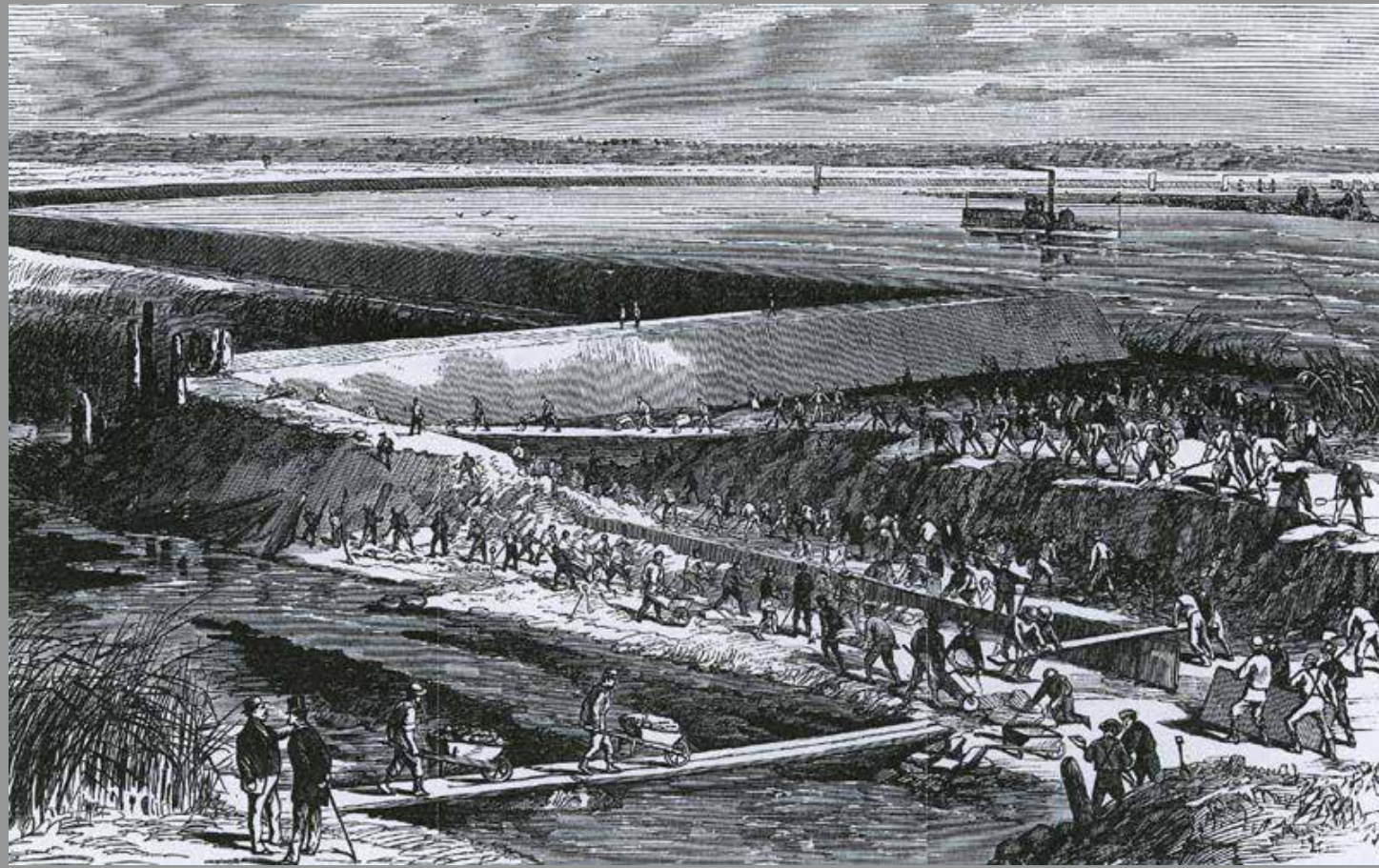
Many of these support programs had large footprints, making it exceedingly difficult to fit them into the tight grids of the six boroughs and the surrounding New Jersey towns. The sole remaining area to host the supply chain, with immediate proximity to

Manhattan, was the Meadowlands basin. That the basin was already being crossed by a series of important feeder railroad lines and highways only increased its attraction as a supply chain hub for the region.

Existing Visions from Development to Ecology

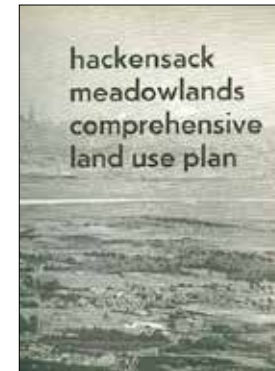
As part of the study undertaken, the team has undertaken an overview of the plans and projects of the last few decades and before. There exists a breadth of projects, plans and ambitions, many of which contradict each other. Primary agents have been the development community, the ecological community, and the port authority. As far as recent history is concerned, 3 overall visions stand out in mutual contrast. They demonstrate an evolution in thinking away from developing the Meadowlands area, and more towards its protection as an ecological resource.

The Hackensack Meadowlands Comprehensive Land Use Plan of 1970 presented a bold vision for the Meadowlands region. As a precursor to more recent planning documents, the report describes the Meadowlands as “a land resource of vast potential” that can bring “nationwide distinction to New Jersey.” Its main features include the improvement of environmental conditions, envisioning Berrys Creek



engravings depicting pre-20th century efforts at making berms in the Meadowlands, in order to create dry land, passage, and mosquito protection.

**HACKENSACK MEADOWLANDS
COMPREHENSIVE LAND USE PLAN**



1970

- district is 20 times as large as Central Park
- 1000 acres of public park and 500 acres of commercial recreation space
- build new residential islands in wetlands area
- 1,500 acres of marshland conservation, 4300 acres of commercial development
- proposes various flood control mechanisms, such as levees and tidal gates
- recommended elevation of new land 10 feet above mean sea level
- 70,000 units of residential development
- 23 million sq. ft. of commercial/office space
- 90 million sq. ft. of industrial/warehouse space

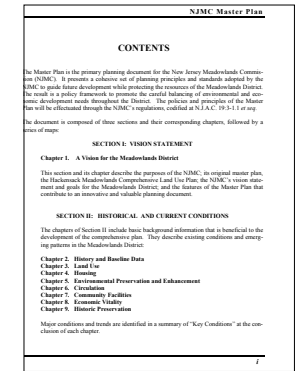
**SPECIAL AREA MANAGEMENT
PLAN (SAMP)**



1995

- less than one page devoted to flood control issues and management
- core goal to preserve, restore and enhance natural resources
- 749.8 acres of wetland fill
- 1688.9 acres of total development proposed in planning and satellite areas
- 17.75 million sq. ft. of offices, 2.7 million sq. ft. of commercial and 13.9 million sq. ft. of residential
- 40 dwelling units per acre proposed in Carlstadt

**NEW JERSEY MEADOWLANDS
COMMISSION MASTER PLAN**



2005

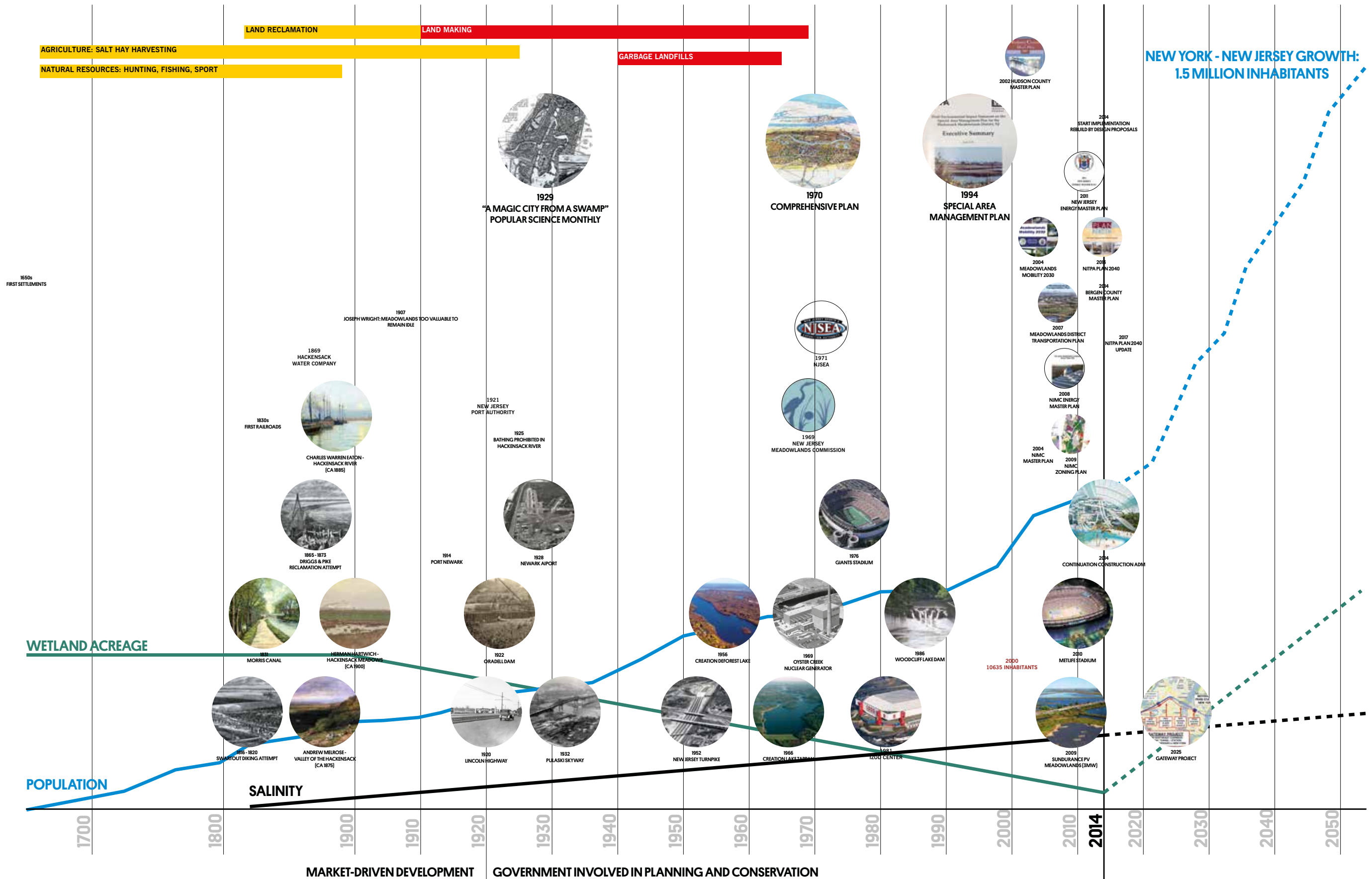
- protection, enhancement and preservation of 8400 acres of wetlands
- removal of 3.5 million sq. ft. of existing structures for redevelopment
- 3741 new units of residential development
- 14.5 million sq. ft. of new commercial/office development
- 12.1 sq. ft. of new industrial development

Canal as a commercial and civic hub and an expansion of residential communities and transit nodes into industrial land and wetlands. While seeking to conserve 1500 acres of marshland, the Plan calls for reclaiming a large swath of existing marshland for new residential development and the creation of new nodes of commercial activity. In recognition of tidal surges affecting the Meadowlands, the Plan proposes a tidal barrier across the Hackensack River and a pumping plant to alleviate “unanticipated storm water flow.” Additionally, the Plan urges the construction of levees to protect against high storm surges and recommends elevating filled land at least 10 feet above the mean sea level.

In June 1995 U.S. Army Corps of Engineers released an Environmental Impact Statement (EIS) on the Special Area Management Plan (SAMP), a comprehensive plan aimed at “natural resources protection, remediation of pollution and reasonable economic growth.” The core goal of SAMP was to preserve, restore and enhance the natural resources of the District, while

addressing a need for residential and commercial growth. SAMP devotes less than a page to flood control issues and improvements, proposing a regional flood study and the construction of tide gates, as well as dredging “existing waterways” to “increase flood storage capacity” (p. 2-6). It is also suggested to study localized flooding in Little Ferry and Kearny. In addition to developing a set of environmental guidelines, SAMP evaluates “out-of-district” development schemes and six “in-district” options each ranked by their environmental impact on wetlands, water quality, terrestrial species, transportation and other natural resources. Based on this analysis, SAMP adopted a “preferred alternative” of a more robust environmental management program and guided development opportunities in 15 project areas. In light of SAMP’s proposal to substantially increase regions of development and reduce the acreage of existing wetlands, opposition mounted towards the plan, which resulted in a significant modification of the proposal, as officially published in a 1999 Federal Registry Notice.

In comparison to previous plans, the 2005 New Jersey Meadowlands Commission (NJMC) Master Plan abandons any proposed fill of wetlands and instead emphasizes a strategy of redevelopment. The NJMC Plan also envisions a new wildlife estuary and other conservation areas in need of stronger protection, while “thoughtfully balancing” redevelopment with developments on new sites. Moreover, the NJMC Plan discusses funding opportunities associated with newly designated brownfield sites and identifies a need to both retain and grow jobs in the region. In a further departure from the 1970 Plan, the NJMC Plan cites an integrated and sustainability approach that advances “intermodal” transportation options and utilizes detailed economic and demographic data. In contrast to the aforementioned plans, the NJMC Plan repeatedly mentions concerns over flooding caused by storm surges, heavy rain and imminent sea level rise. The report also suggests better strategies for “flood modeling” and a “reduction of impervious surfaces that contribute to flooding” in areas located within the floodplain.



Today's challenges

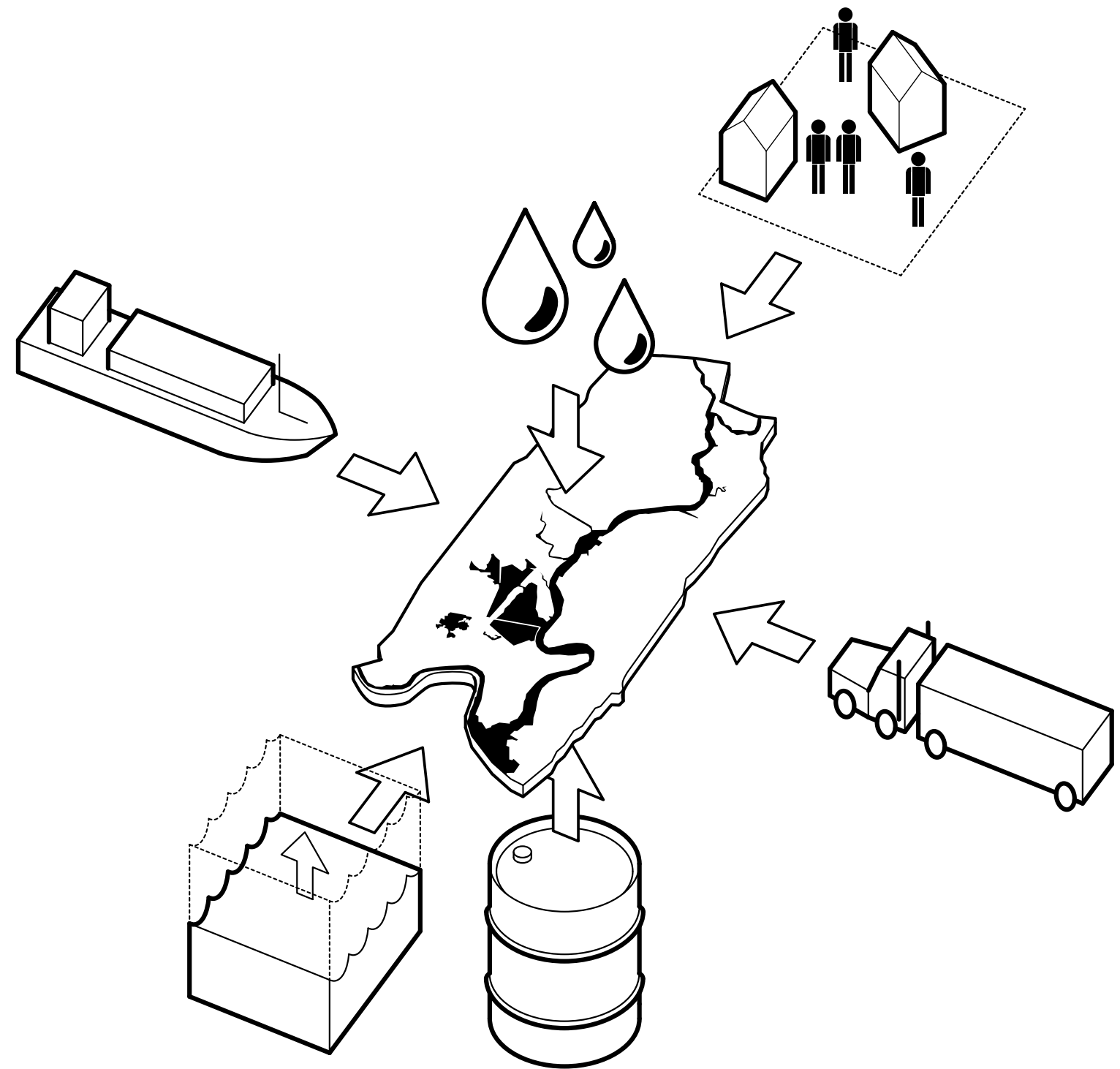
High-risk flooding, competing residential and supply chain development pressure, pollution, ecological remediation pressures, and lack of intermediate connectivity

The results of the above described pattern of historical development concerns both critical supply chain elements and vital networks, as well as their workforce in adjacent low and moderate income communities. Both find themselves in a high-risk flood zone, further aggravated by pollution patterns. There are no science-driven scenarios that foresee a future reduction in flooding. Most see a sea level rise and an increase in precipitation, both of which increase risks for the region⁶. In addition, the arrival of large post-panamax ships in the New York harbor will likely increase the demand for supply chain functions (warehousing, railroads, etc.). At the same time, projected population growth for the greater metropolitan area of New York includes 1.5 million new residents over the next 2 decades. For both of these de-

velopment pressures, planning experts largely agree that their occurrence in closer proximity to main urban centers may reduce travel times and concurrent co2 emissions, and yield a more sustainable growth pattern. In other words, current evolutions will only aggravate the tensions in the Meadowlands basin between ecological, residential, and supply chain needs for space, and existing developments will become insecure in the near future due to increased flood risk. On a more local level, the connections within the Meadowlands remain weak and for now incapable of taking advantage of adjacencies that may offer temporary relief during emergency.

⁶. p.28 of chapter 2 'climate analysis' of the SIRR Report, NY, 2013.

TODAY'S CHALLENGES
High-risk flooding,
competing residential
and supply chain
development pressure,
pollution, ecological
remediation pressures,
lack of intermediate
connectivity

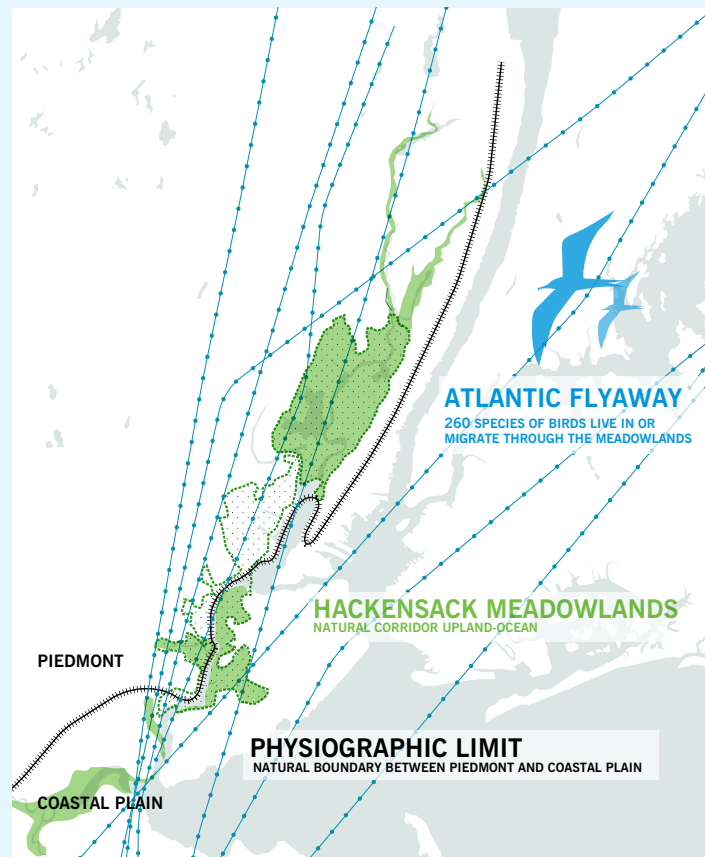


A Coalition of the Willing, using a Model of Inter-municipal Collaboration

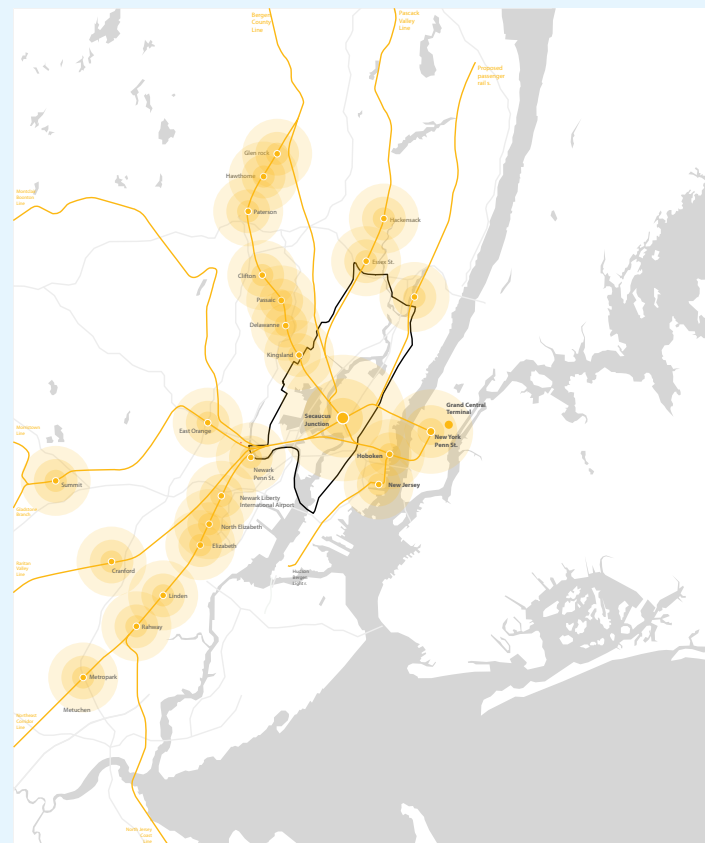


Workshop at Secaucus Public Library on March 10th. Mayor Gonnelli of Secaucus in the foreground, Mayor Raguseo of Little Ferry in the background.

Today's Major Opportunities



Key eco system



Transit Oriented Development

A Unique intersection of opportunities
The team has detected a unique constellation of opportunities, at the crossroad of which it is entirely possible propose a bold project to make the Meadowlands resilient, with benefits far beyond protection against flooding alone. First and most important of these opportunities is a willingness to move beyond the status quo. We found a coalition of the willing amongst many conversation partners, whether mayors of municipalities, ecological activists, business owners or developers, a real will and desire to think bigger and transform the Meadowlands from its current state to a far better, stronger, and more attractive basin. In addition, the gradual efforts at ecological restoration undertaken by the Commission in the past years, have led to a new reality on the ground. The contours of a regional landscape park, as a wildlife refuge, are becoming visible. It is now possible to envisage a completion of this project. At the same moment, we see an increasing development pressure, not only for more logistics and supply chain functions, but also for residential development. These pressures can and should be accommodate in the region if appropriate mass transit options are made available.

A Coalition of the willing, using a Model of Inter-municipal Collaboration
The Meadowlands already has a model in place to think and act on a regional scale, addressing inter-municipal problems such as a flooding as well as other risks effectively on an inter-municipal scale. The Meadowlands Commission and its predecessors provide for a powerful instrument to

plan for and coordinate improvements on a large scale. This is a unique location, better fitted for a large-scale regional protection project than most other localities in the tri-state area. In addition, we have observed a remarkable will among the conversation partners in this area to engage with bold ideas to complete historical processes of both protection and development and agree to a new grand bargain, ushering in an era when both environment and development will find a new mode of co-existence. The essence of the new grand bargain is that investment in protection will on the one hand create a large regional floodable park; and that the areas now protected will need to make that protection worth its cost by increasing the density of development and gradually convert from their current low-density land use pattern to a more dense and urban pattern of adaptive re-use and redevelopment. In short, more marshes, more berms, more cleaning, and in return substantial up-zoning of primarily non-residential areas within the now protected towns.

Ecological Remediation Successes
The Meadowlands is less polluted, less degraded than it has been in a long time. Several policies have contributed to this. First of all, the Meadowlands commission has engaged in a gradual process of wetland restoration soliciting funding from various federal, state and county resources. It has also accumulated land parcels in a Meadowlands land trust. Landfills (often referred to as 'historic fills') have been

completed, and only one is still operational. These landfills will never welcome development because the layers of soil and textile protecting their toxic content should not be punctured. These facts have begun to add up and now begin to suggest the contours of a grand, regional landscape and wildlife reserve. Continuing and completing this project is realistic. Making the natural areas contiguous, and creating access along their edges, will result in the creation of a park figure.

Logistics and Supply Chain
Its location between the port and Manhattan makes a future role for the Meadowlands in the supply chain inevitable and necessary. Various older Port Authority initiatives such as the Portway project, as well as current ones such as the planning for new warehousing needs, can be accommodated if planned in integration with the protection project and in accordance with the new 'grand bargain'.

Transit Oriented Development
There exist various mass transit stops in the Meadowlands area. Most of these do not have enough density within walking distance to warrant optimal use. Most prominent of these is Lautenberg station (or Secaucus Junction), which deserves a thorough study for a high-density walkable district in direct vicinity or atop the CSX railroad yards nearby. Other stations deserve further study as well, and a conversation with NJ Transit would be a priority in the next phase, in order to understand capacity increase potentials or needs on these lines as a result of the proposal.



Flooded streets in Little Ferry after Superstorm Sandy, October 20, 2012. Source unknown.



LITTLE FERRY
POLICE

A BROAD COALITION FOR A NEW GRAND BARGAIN

Guiding Principles	p.65
Stakeholder Alliance	p.67
Overview of Outreach Efforts and Responses	p.69
Key Lessons	p.75
Grand Bargain	p.77

Guiding Principles

We understand that long term implementation will depend on building a resilient coalition of diverse stakeholders who will continue to advocate for this initiative. Below, we outline in detail our extensive outreach efforts. These are informed by several overarching principles that will continue to guide our outreach efforts going forward:

Transparency

We are committed to making every aspect of our work and of our process accessible to all stakeholders as well as to the general public.

Capacity-building

We are committed to educating the stakeholders so that they understand how to be partners in the implementation of the plan.

Inclusiveness

We are committed to reaching as many different constituencies as possible, from government, to business interests, to civic organizations and the general public. We are committed to a diversity of formats for the way we engage stakeholders.

Responsiveness

We are committed to shaping the project based on the input we get through our process.

Coalition-building is especially important in the Meadowlands where the surrounding communities have been cut off from this fragmented landscape and therefore do not feel as if they have a shared interest in its future.

Stakeholder Alliance

The Meadowlands area is blessed with a dense constellation of stakeholders and players, as represented by the overview diagram. The following is an overview of those stakeholders with whom the team has established a relationship demonstrated by various meetings and phone calls.

The primary stakeholder and candidate for the CDBG grant is the State of New Jersey. Primary contact here has been the Office for Recovery and Rebuilding. The team has built a constructive relation with the office's representatives, both at RBD meetings and in private meetings in Trenton and in the Meadowlands.

Another stakeholder is the Meadowlands Commission. The team has met its executive director, Marcia A. Karrow during two official meetings and has interacted in depth with staff during three working sessions and through individual meetings and phone calls. These sessions have proven to be very helpful and instructive as the Commission's knowledge and expertise of the Meadowlands area is the best in the area. This organization, because their jurisdiction extends across municipalities, will be a key partner in implementing the plan.

A third layer of stakeholders is formed by the 14 municipalities, whose jurisdiction overlaps with that of the Meadowlands Commission.. The team focused its efforts on working with towns in the pilot areas, and met with the mayors and leading administrators of Little Ferry, Moonachie, Secaucus, Jersey City, and Kearny. These sessions and interactions took place during and after the public sessions described below.

Another critical stakeholder is the Port Authority of New York and New Jersey. The team has engaged the real estate leadership of this organization, represented by Michael Francois, as well as staff with responsibilities for sustainability, logistics and supply chain.

This initiative depends on bringing together both the business interests and the environmental community. The team has identified the Riverkeeper (Capt. Bill Sheehan) as a primary representative of the environmental community, and has had several working sessions with him. It is highly likely that the Riverkeeper will play a role in the further elaboration of the project as a strategic partner. The team has also engaged Rutgers University, specifically Beth Ravit, Ph.D. and associate professor Wolfram Hoefler, The latter two have been invited, and have joined the team.

For the business community, the team has identified the Meadowlands Chambers of Commerce as a representative stakeholder. Regular work sessions with James Kirkos, the Chamber's executive director, and with Alex Klatskin, property owner and supporter of the proposal have been instrumental in helping define challenges, pitfalls. The Chamber has been a steadfast supporter of the bold ambitions of the proposal, including the many civic and environmental agendas

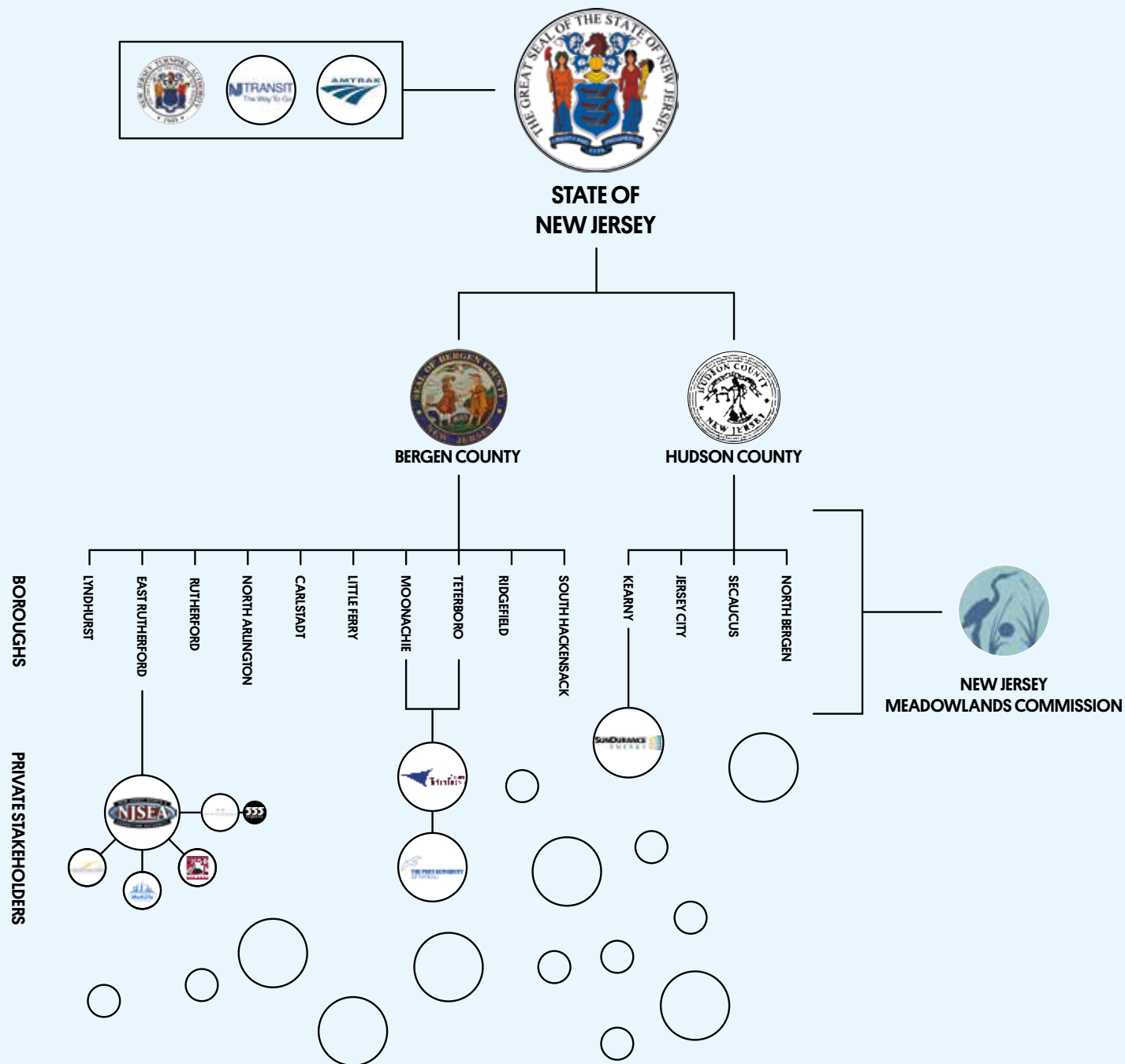
that are not immediate business interests.

Residents, business owners, developers, municipal leaders, and environmental groups are several of the largest stakeholders in the project area.

General concerns include: level and success of flood protection; use of eminent domain; effect on access and views of the water; the opportunity to develop new structures and create development value; the preservation of existing community character; the size and characteristic of the meadowband; the project's effect on the current industrial nature of certain areas.

Northern sub-district: From community outreach in the northern sub-district, residents and municipal leaders expressed strong support for increased flood protection, even if it meant taking some properties in the process (saying that many of the most flood-prone homes have dropped in value and are un-insurable). More concern was expressed about what value the property might be taken at than whether it should be.

Some of the large warehouse owners also expressed interest in the scheme and a willingness to trade some property for protection and the potential for increased development within a much more desirable Meadowlands system.



The 14 municipalities that comprise the Meadowlands
Interests/concerns include:
 Loss of ratables as a result of some land given back to nature (especially in the southern sub-district)
 Curiosity about what impact increased residential development will have on educational expenditures
 Ensuring that strong flood protection is provided (northern sub-district)
 Job creation
 Involvement in decision-making processes

PANYNJ:
 The effect on goods movement through the area (truck routes, rail connections)
 The effect of proposed development on flight patterns into and out of Teterboro Airport and of the berm on keeping the airport open during what are currently flood events

NGO:
Hackensack Riverkeeper Meadowlands Conservation Trust
Interests/concerns include:
 Not losing further habitat to development
 Ensuring that protected land actually provides ecosystem services and needed habitat rather than just land that is undeveloped

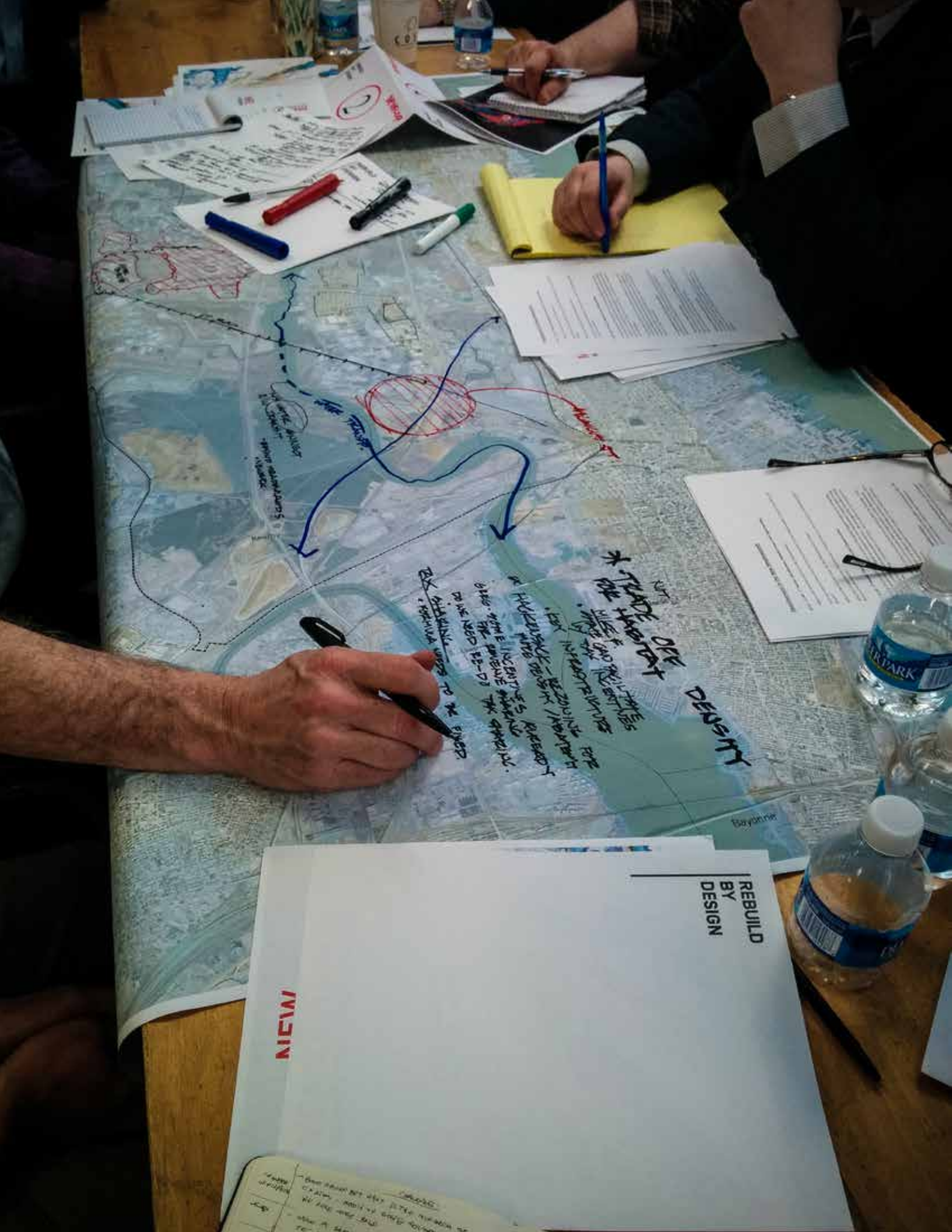
Private sector:
PSEG: concerns about increased residential development causing difficulty in their ability to continue operating power plants in the area
Warehouse owners: interest in the potential for higher value development as a result of flood protection and attractive waterfront

Meadowlands Commission:
Interests/concerns:
 How the project dovetails with their own goals for the Meadowlands
 Coordination mechanism and players involved in decision-making

Federal government agencies:
EPA: relates to their Superfund cleanup of Berrys Creek and the impact of this project on natural systems
Army Corps of Engineers: as it relates to reshaping the coast and undertaking a large-scale coastal construction project

Overview of most public and some private stakeholders with interests in the Meadowlands area and a stake in the proposal.

Overview of Outreach Efforts and Responses



Already during *Stage II*, the team initiated early outreach efforts in the Meadowlands to test the interest of local stakeholders in participating and supporting a bold and ambitious proposal. These early efforts, with the city halls of Jersey City and Kearny, were positive. As *Stage III* allowed the team to focus exclusively on the Meadowlands, a broad and coordinated outreach effort was set in motion, including meetings with large groups of diverse stakeholders; meetings in smaller groups; meetings with individuals, phone calls and emails. On February 5th, MIT began a parallel design studio project in the Meadowlands, in consultation with the team as whole, allowing for additional outreach and contacts to be organized. This studio, and its associated outreach, will conclude on May 14th 2014.

The team organized three public sessions, on January 30th, February 18th, and March 10th of 2014. The following is a short report on the participation level, tone, and effect of these meetings.

On January 30th, the team organized its first large outreach session at the Meadowlands Commission assembly room targeting state, county and municipal political leadership, the business community, ecology interest groups, local academics. There were over sixty participants, contributing diverse perspectives. Notable participants included the mayor of Little Ferry (with a large delegation), a representative from Moonachie, representatives from Bergen County, the former executive director of the Meadowlands Commission, the Riverkeeper (2 people), Chamber of Commerce (executive director and business leaders in the area). MIT+ZUS+URBANISTEN brought 6 team members to assist the participants; and RBD brought an additional 6 facilitators to help coordinate discussions.

The event started at 8:30am and lasted until 5:00pm. During the morning session, the RBD leadership introduced its process. The MIT team then introduced the contours of the proposal, followed by

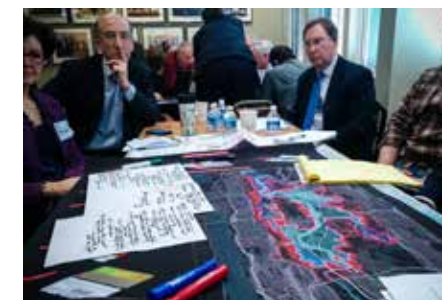
a Q+A session with the participants. At 10:30, the team reorganized the room, breaking up into small group working tables on the discrete themes of energy, water/protection, economy, and transportation. Teams took notes during these working sessions, as each table had both an RBD and an MIT+ZUS+URBANISTEN team representative. These working tables reported back their conclusions to the audience by 12:30. The participants articulated the three pilot areas as key ones for the team. This coincided with the team's own analysis. In the afternoon, small group working sessions continued with a smaller group of participants who volunteered to stay and work with the team throughout the day. This 'hard core' included members of the Port Authority, the River Keeper, representatives of different towns, and business owners. For this session the working groups were organized not by theme, but by geography, with different tables focusing on different pilot areas: Little Ferry/Moonachie/Carlstadt; Secaucus; and South Kearny/Jersey City.



This public event was highly successful and most participants stayed for the entire time. Input was vocal and passionate. Most importantly, various follow-up individual meetings came out of this, among others with: the town of Little Ferry; the Meadowlands Chamber of Commerce; the State of New Jersey (office of Sustainability); the Riverkeeper (Capt. Bill Sheehan); the Port Authority, and others.

On February 18, the team organized two outreach sessions in Little Ferry with community members from Little Ferry, Moonachie, and Carlstadt. One session was at 3pm, the other at 6:30pm. The first session was well attended (about 25 participants), the second session drew a smaller audience. These sessions, which were reported in the local paper, were specifically targeted to the inhabitants of Little Ferry, Moonachie and Carlstadt. A large majority of participants were inhabitants of Little Ferry.

These events were successful as well, because while participants displayed skepticism at the outset of the meeting, the atmosphere changed markedly and towards the end there was a considerable enthusiasm and support for the proposals. It is important to highlight that at this stage, the proposal for Little Ferry included an option to relocate a specific outlying neighborhood in the flood zones; and that the inhabitants living in this neighborhood declared their openness and willingness to move.



On March 10th, the team, with the help of Secaucus Mayor Michael Gonnelli, organized a large public session in the Secaucus Public Library, for the communities of Secaucus, Little Ferry/Moonachie/Carlstadt, and Kearny. The session began at 6:30pm and lasted until 9:30pm. The team also invited the participants of the first January session back to this event. As a result, the audience was a mix of local residents and regional political and thought leadership. About 120 people attended this event. RBD brought 6 facilitators; and the team brought about 10 members to the session. After a brief introduction by Secaucus Mayor Gonnelli, and a short introduction by the RBD leadership, the team proceeded to present its plan, including both a general overview as well as new work. Specifically the development of proposals for the pilot areas, first located during the January 30 session, were shown with flood models and proposals for berms, fresh water basins, and new development opportunities. After a short Q+A, the audience reorganized around workshop tables for the different pilot areas: Little Ferry, South Kearny, and several tables for Secaucus.

This event was very well attended and the proposals were positively received. The team gathered reports of the working sessions of the breakout tables. The pilot areas were confirmed and many requests for follow-up conversations were made, among others with the Environmental Defense Fund; and with local land owners and developers. Because the process of RBD was nearing completion, some of these conversations will continue in the next phase.



STAGE TWO

RBD opening meeting
08/06/13

RBD Regional meeting
09/04/13

RBD Regional meeting
09/11-12/13

RBD Regional meeting
09/18-19/13

Staten Island
09/26-27/13

Bridgeport Connecticut
10/04-05/13

Jersey City and
Kearney meetings
08/10/13

Meeting with GORR
10/10/13

RBD session
10/17-18/13

Final presentation
for 2nd phase
10/28/13

Final document
submission
11/03/13

STAGE THREE

Stage three kick
off meeting
11/06/13

Meeting in NY
with Henk Ovink
1/20/14

Stakeholder meetings
01/13-15/14

CBA session in NY
01/22/14

One on One
with Henk Ovink
01/28/14

NJ Meetings
01/29/14

First Large Stakeholder
Workshop in the NJMC
01/30/14

NJ Meeting
01/31/14

RBD mid term submission
02/05/14

Meeting with GORR
02/06/14

Little Ferry
community workshops
02/18/14

Secaucus workshop
03/10/14

Kearney Meetings and
GORR+NJMC meetings
03/11/14

NJMC meetings
03/12/14

Key Lessons

In moving forward, the team recommends continuing the outreach process. Communities are fragile and sensitive to being part of these efforts to protect their livelihood and well being. Also, valuable lessons have been learned so far, and these have effectively impacted the proposal itself. Examples of this impact include:

At the January 30th event, the team presented 4 layers as equally important: ecology/protection, economy, transportation and energy. Participants almost universally valued protection and public transportation, took sides on ecology vs. economy; and displayed less interest in energy. This feedback was very instructive and helped the team prioritize its efforts.

During the same event, participants recommended the three pilot sites in this report, at a moment when the team had not identified them during its presentation. This provided for an important confirmation that these areas would be broadly supported as priorities.

The tax-sharing mechanism of the Meadowlands commission has been severely criticized by many stakeholders as being dysfunctional, discouraging both development, investment in ecology & protection.

Mayors of various pilot areas have identified changes in the amount and size of ratable properties, which generate tax income for the towns, as a challenge for the proposal. Any scenario that engages in a transformation of the taxable property stock raises understandable concerns. Since the protection project includes rezoning and up-zoning, the team sees the tax evolution of each town as fundamentally positive. We are confident that the towns' valid concerns will be adequately resolved. The Cost-Benefit analysis of this report indicates important preliminary numbers confirming the fundamentally positive effect for the town's balance sheets. The team has indicated a willingness to work, in a future phase, with various towns to detail the tax income changes and their likely improvements for the towns.

During various events, participants identified the importance of addressing early on regulatory hurdles at State and Federal levels, from the State DEP and EPA; the Army Corps of Engineers; and the National Fish and Wildlife Service. The team has identified these steps in the implementation process and hurdle analysis, and has also identified means to engage these early on, such as the MIMAC group at the Meadowlands Commission, an inter-agency collaboration effort. Nevertheless, the team also recommends that future steps will include work sessions at a federal level to clear remaining hurdles. In the meantime, the proposal has also evolved to eliminate the most obvious hurdles in the trajectory location of berm, Meadowpark and Meadowband.



Grand Bargain

While aware of a history of internal oppositions based on diverging interests, the team has found a tremendous amount of good will and support for the proposal from those very diverging interests. Each of the presentations included the 'grand bargain'. In exchange for investment in protection of developed areas, the development in these areas should become worth that protection by transforming into a more dense, compact form of settlement.

Our labor has therefore included not only the work on the berms and the wildlife park; but also contains recommendations for up-zoning, redefining future parcel sizes, and including public transportation options such as a BRT line. This grand bargain has been well received.

If carefully developed with continuing efforts to seek consensus and support, it will transform the dynamics of the social and civic fabric of the Meadowlands from one of blocking opposing interests to seeking joint opportunities.



Image during breakout session of workshop at the Meadowlands commission on January 30th, 2014. To the right, RIverkeeper Cpt. Bill Sheehan; left, Alex Klatskin, with an interest in the well-being of redevelopment areas.

New Meadowlands

A Resilient Masterplan

Protect, Connect, Grow!

p.81

Protect: The Meadowpark

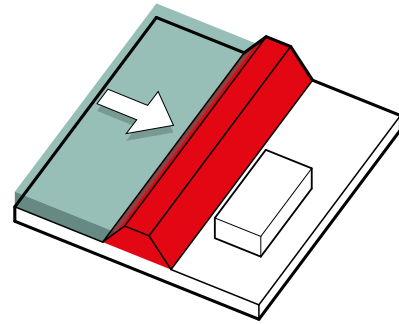
p.87

Connect: The Meadowband

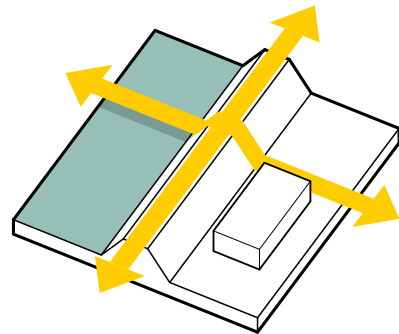
p.123

Grow: Development Opportunities

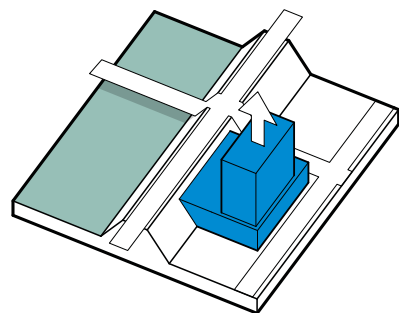
p.137



PROTECT
Berm & 'Meadow Park'



CONNECT
'Meadowband'

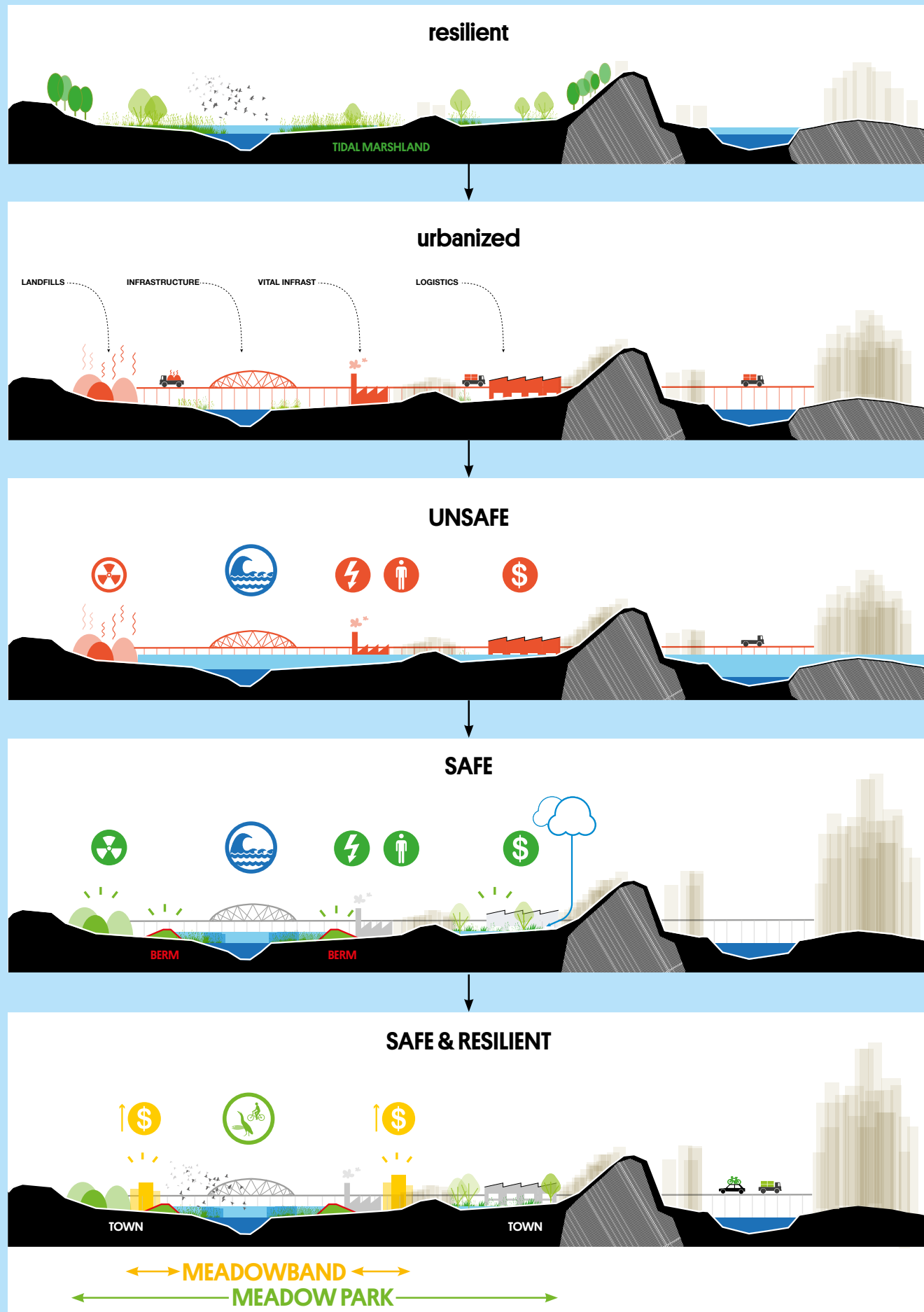


GROW!

Protect, Connect, Grow!

The proposal for the
'New Meadowlands'
rests on two key concepts:

the Meadowpark
and
the Meadowband.



Sectional diagram of the history and the future of the Meadowlands basin. The lower two section illustrate the project scenario.

Both terms are interlinked by intricate systems of higher and lower berms, defining both marshes and freshwater basins

These provide the primary flood protection of the area from ocean flooding respectively rainwater flooding in the constituent towns. The result is a series of water chambers, each with a different composition, some more polluted, others less; some fresh, others brackish; some with high berms, others with low berms. The design's ingenuity is in mobilizing this watery landscape to provide a full protection package that will also reduce flooding issues beyond the municipalities on whose territory the berms would be constructed. The team proposes to make the resulting overall, contiguous landscape accessible (along the berms), and provide occasional recreational and cultural opportunities. This big figure covering the central area of the Meadowlands is called 'the Meadowpark'.

The outer edge berm, which defines the edge of the landscape and the beginning of the development and urban areas, is called 'the Meadowband'. This term describes a civic amenity, with a berm covered by a street lined with addresses of business, retail and residential opportunities, overlooking the park. The street would allow for local traffic and should have an affordable mass transit option, preferably a BRT line. Entrance points to the park, as well as a chain of public spaces – boardwalks, sports fields, sculptures, playgrounds – define the Meadowband as a civic amenity. Development opportunities align the band, all facing the park. Each of the aforementioned elements – Meadowpark, berms, Meadowband and redevelopment zones appear in each of the pilot areas.

PROTECT

The Flood Protection Berm p.89

The Wetland p.97

Fresh Water Basins p.105

Biodiversity p.108

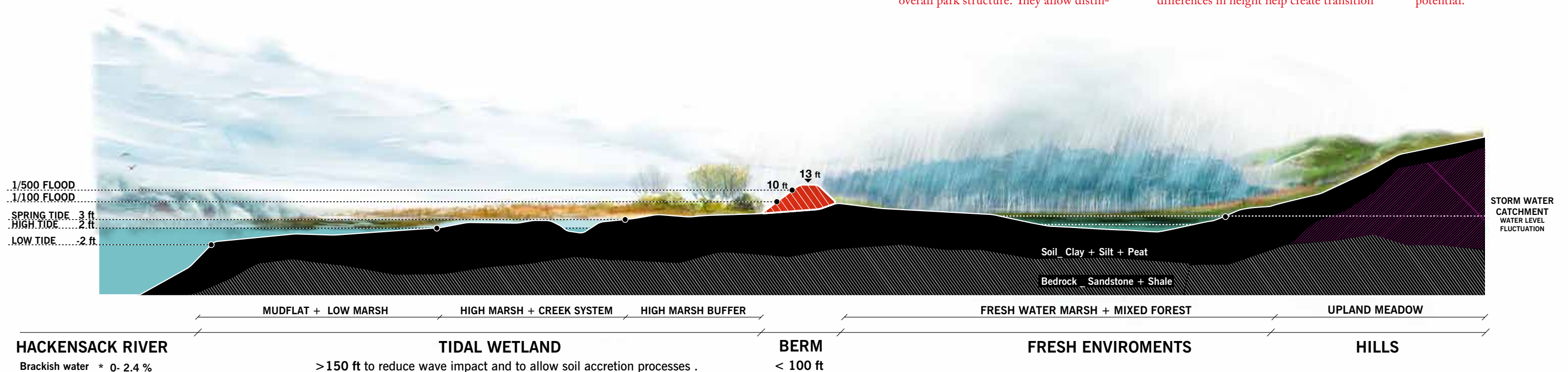
Recreation and Leisure p.115

The Meadow Park

The Meadowpark is to a large degree composed of 7,800 existing acres of wetland already present in the Meadowlands. A large part of this wetland is tidal, but it also includes freshwater marshes. The Meadowpark is bordered by Meadowband (see next chapter). Since the Hackensack river is dammed upstream it is mostly a saline estuary. The low-lying urbanized part of the area needs to be protected from flood events. A protective berm is critical but not sufficient. By integrating green berms into the wetland system they become more resilient and participate in the overall park structure. They allow distin-

guishing between high and low marshes, a distinction which is useful for active wetland restoration. High marshes break waves and add substantial stability to the berms. On top of the berms bike paths or emergency access can be allowed. Such berms connect marshes and towns. But there is more to the Meadowpark than just tidal wetland and protective berms. Behind the primary protection berm fresh water marshes and forests can be found. These can play an active role in storm water management of the park and are highly enjoyable places at the same time. Even subtle differences in height help create transition

areas between high and low habitats, as well as between salt and freshwater habitats. These create a great potential for biodiversity. The Meadowpark is a place for recreational sports, engaging with nature, and we also foresee cultural events – sculpture parks – to bring visitors to the park. Finally, the landfills offer opportunities for recreational use as well, with bicycle paths and trails circulating across all elements in an integrated fashion. The Meadowpark can be thematically deconstructed into a flood protection berm, tidal wetland, fresh water basins, biodiversity and recreational potential.



Sectional diagram with flood protection berm in red in the middle. Freshwater basins or contaminated chamber wetlands to the right.



Near the Laurel Hill area of Southern Secaucus.

The Flood Protection Berm

The team proposes to build a berm around most of the developed area in order to ensure safety for the communities that live and work in the Meadowlands. This flood protection berm connects to higher-lying areas in order to enclose and secure low-lying areas from the ocean surge. This berm may have different sections in different locations, ranging from completely soft to hybrid to hard, in response to availability of sediment material (sand, clay, soil) and available space. This berm will emulate the recently developed and proven third generation Dutch dike system. If the second generation is the present dominant hard engineering approach, the third generation adopts a new risk philosophy using building with nature concepts, providing multifunctional use and flexibility towards changing performance criteria, while being extremely durable. Dutch precedents include recommendations about multifunctional use as well, since these uses help anchor the status and maintenance of the berm.



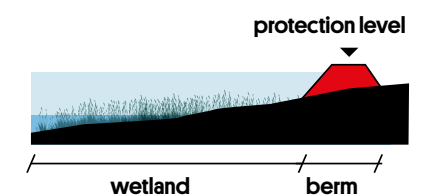
Soft Berm

Berm height is dimensioned to withstand maximum high water levels and have the lowest acceptable level of risk. The relative height of the berm is dependent on local topography: lower lying land will require a higher berm. Standard widths are minimum 10 feet wide top and a 1 to 3 slope on both sides. Depending on wave action this can go up to a 1 to 6 slope. Such a berm base would be built with a sand/soil core and a clay cladding and grass or shrub cover. This basic berm will be stable against known dike failure mechanisms and will be integrated into topography, infrastructures, wetlands and even multifunctional developments in order to ensure extra stability and to provide a maximum amount of services. Such a berm will be robust and will not fail even when it is overtopped, if a more severe flood event than expected occurs. Multifunctional dike reinforcement is pursued here through integration of the berm system with the concept of the Meadowband.

The berm height corresponds to the level of a 1 in 500 years flood event. Depending on the location, the team proposes to add another few feet to this level in order to mitigate the effect of wave action. This is the case in the south Kearny, Jersey City and South Secaucus. In addition, the team proposes to protect vital infrastructure to a higher level of flood event, namely 1 in 2000 years. This concerns power plants, railway hubs and sewage plants. If any of these functions were to fail, flooding will have a more regional,

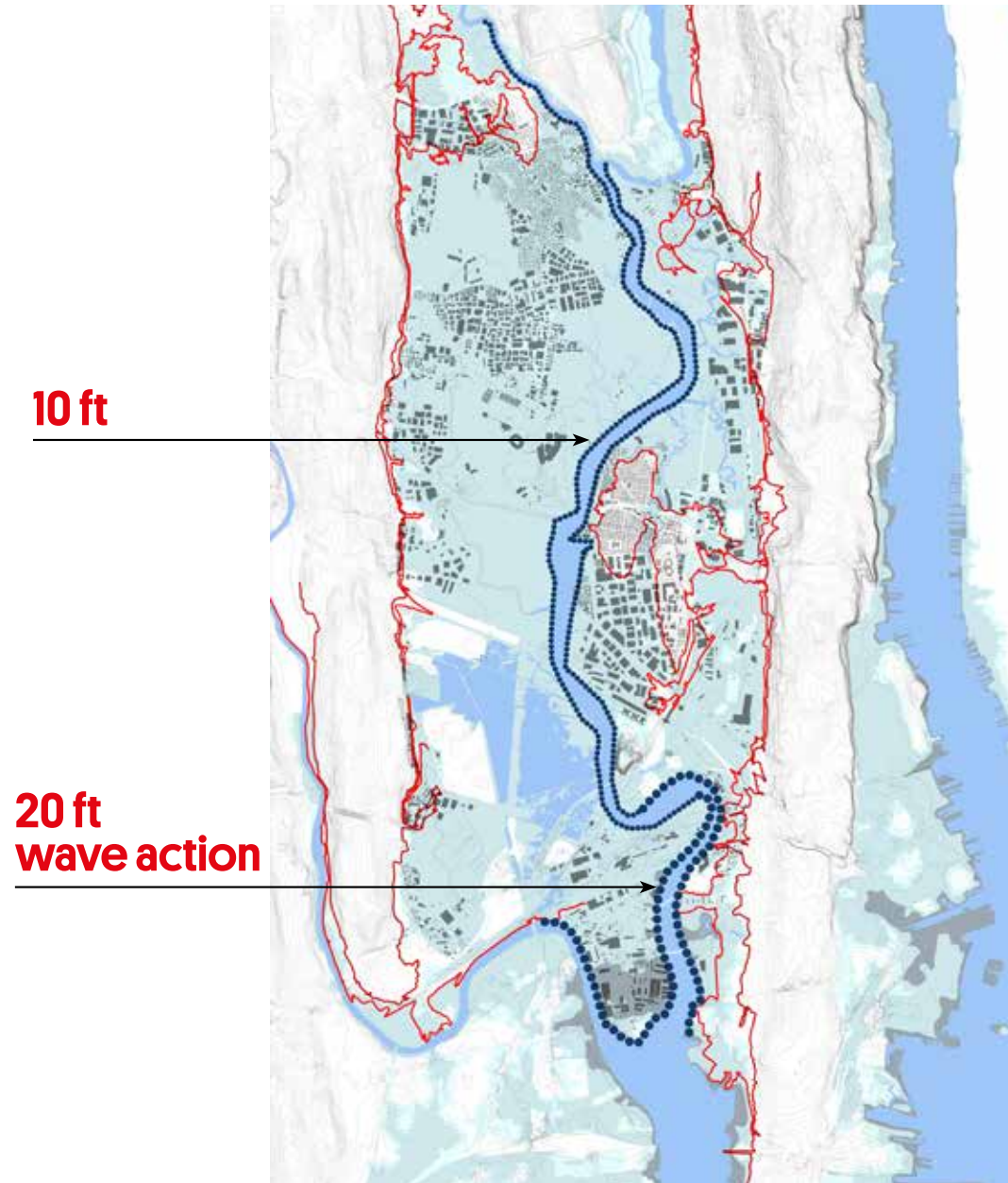
more severe impact with a longer reconstruction time. In order to establish the optimal berm heights, the cost-benefit approach presented in this document will be refined further. This procedure will save money while maximizing safety of the system as a whole against flooding.

The team proposes to position the berm in the landscape to ensure maximum stability by consolidating with robust existing elements. Examples include the design of marshland in front of the berm, in order to reduce current flood speeds and waves and generate extra dike stability. Second, we suggest a short perimeter whenever possible, in order to save unnecessary costs. For example: the Jersey turnpike can provide for an alignment, especially in a location where it has sufficient altitude. The soil body of the highway also provides additional stability to the berm, positioned eastward. The berm also can run adjacent to existing landfills. Besides extra berm stability, such a location also caps any pollution leakage from the landfills into the wetland.



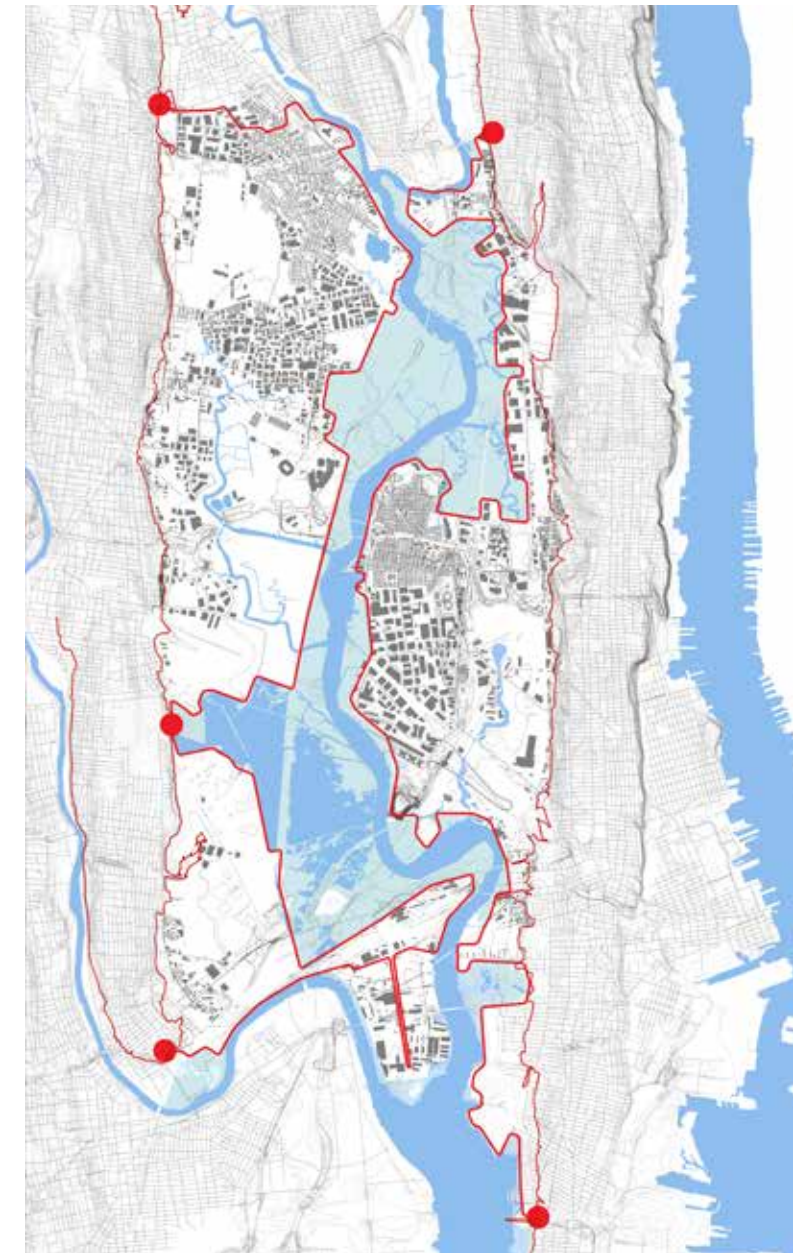
The Basin Ridge is the flood boundary ...

The flood oscillates between 10 and 20 ft.
In addition, Southern areas such as Kearny, Jersey City and Southern Secaucus suffer from violent wave action



FEMA flood map showing the flood zone for the 1 in 500 year storm

... so we propose a berm system to protect the developments within the basin..



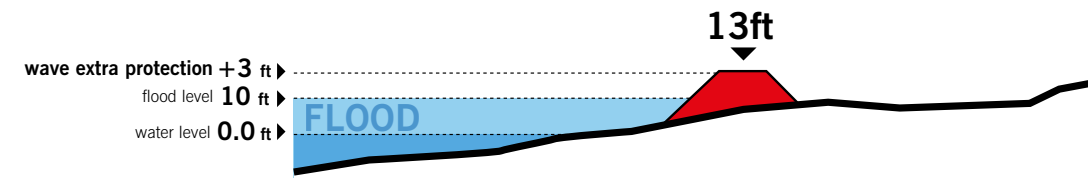
Thick red line shows the location of the flood protection berm

What is protected:

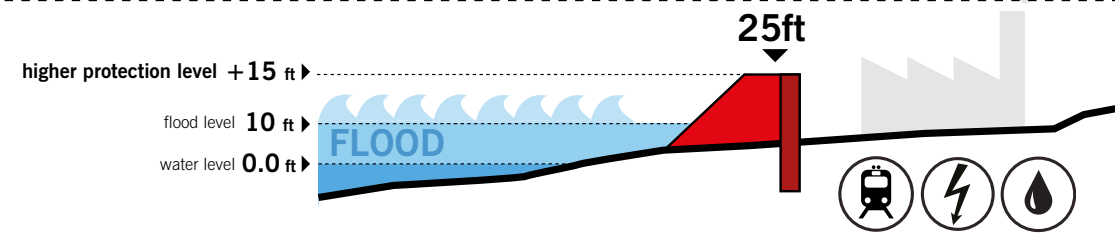
- 154,000 persons who work here
- 9,322 businesses
- 47,916 persons who live here
- 11,294 households with a mortgage
- 3 power plants and 21 substations
- 2,261 acres of rail yards (logistics and transportation)
- 2 sewage plants
- 5 metro nodes
- 1 airport
- 7 superfund sites on the national priority list (heavy pollution)

The berms have different dimensions...

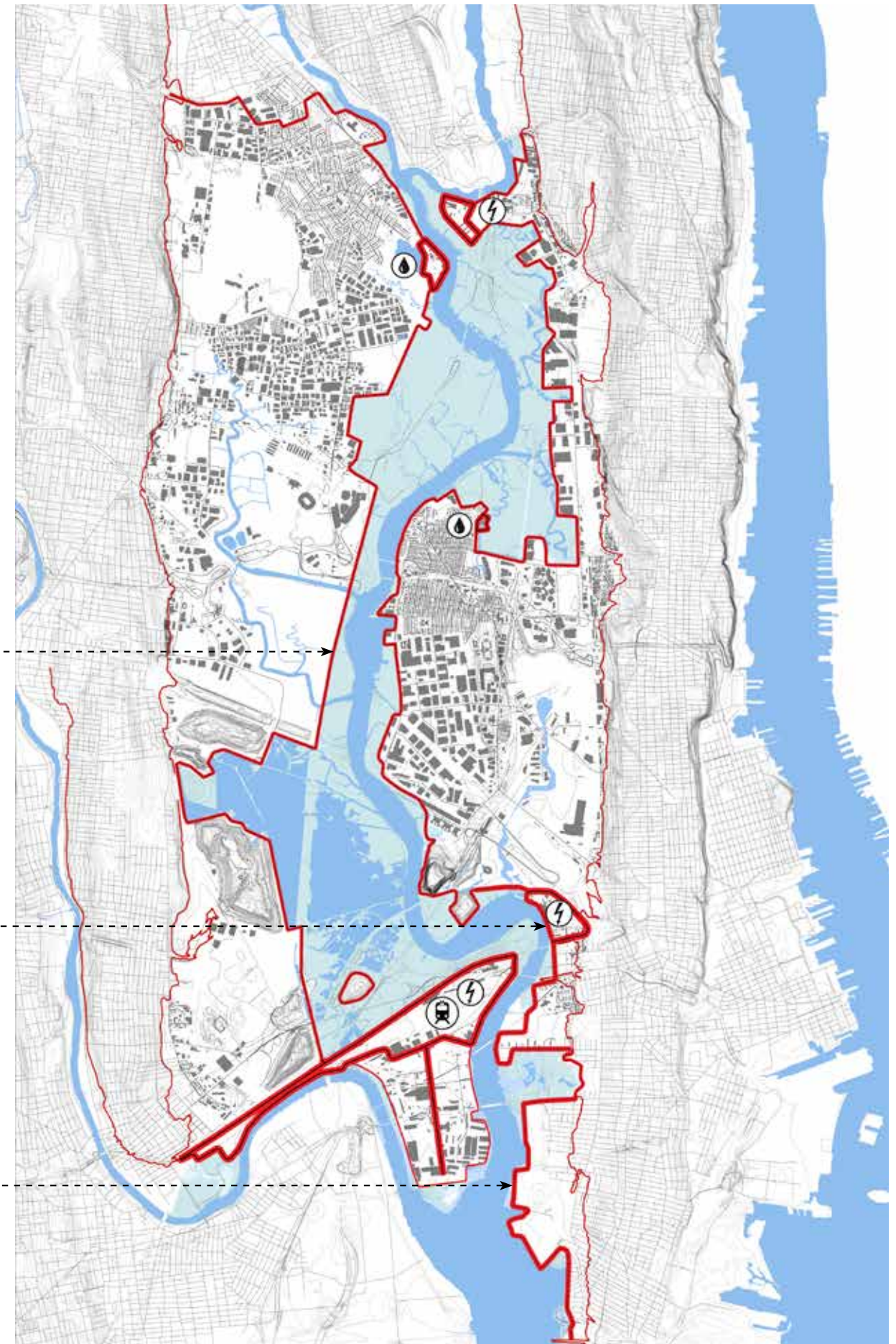
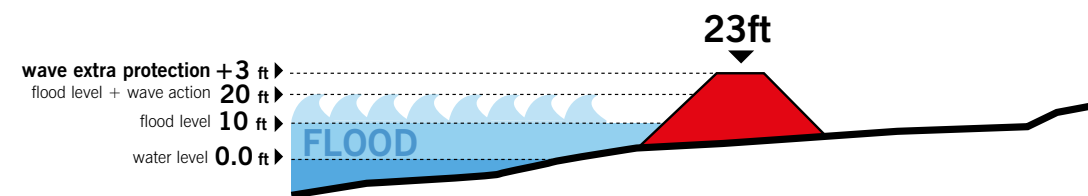
Berm



Vital infrastructure



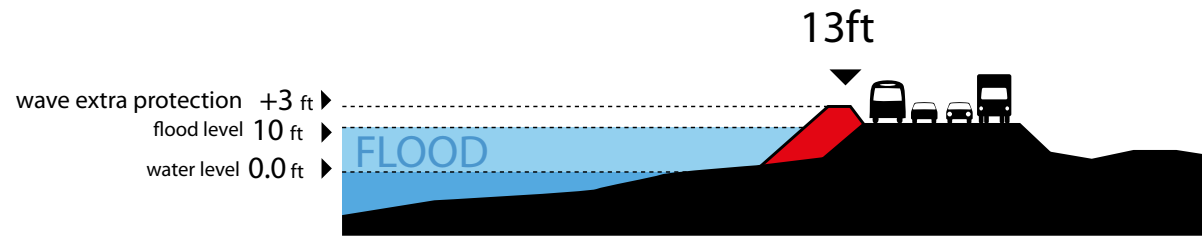
Wave action berm



A

Infrastructure could be used as a berm.

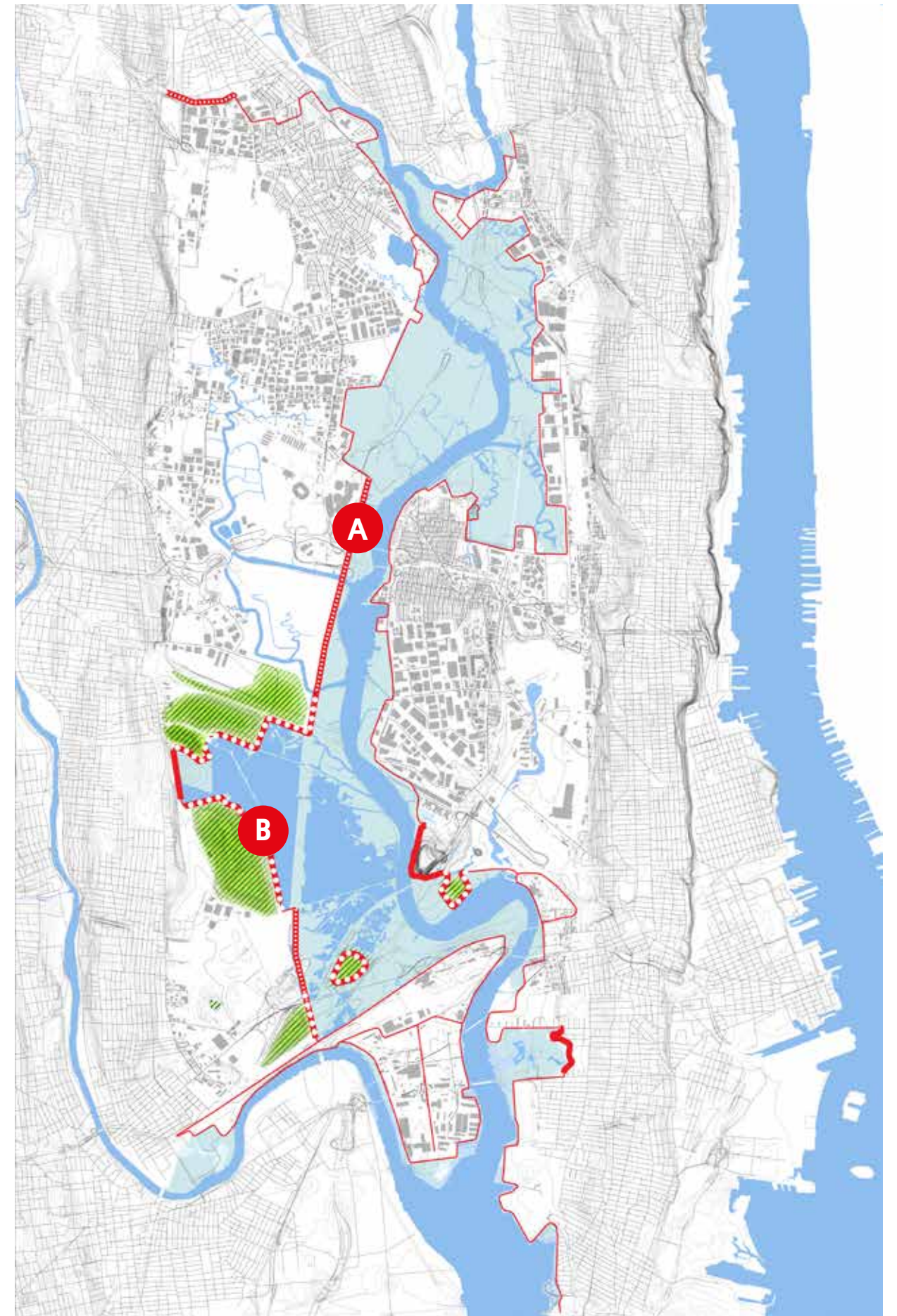
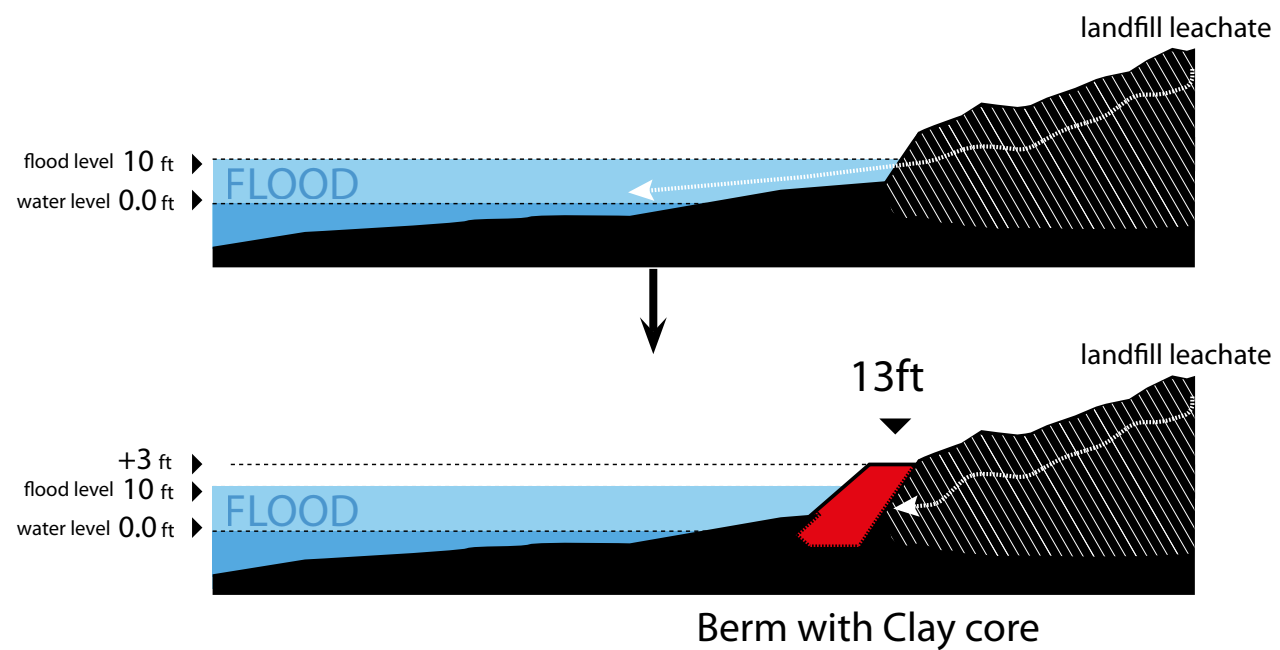
berms that have a shorter perimeter and use existing higher land and infrastructure are cheaper



B

Many of the hills are polluted landfills.

Berms against landfills not only protect against flooding but also cap leaking fills. The berm's clay core stops leaks.



The Wetland

The existing wetlands in the Meadowlands help break waves and will grow higher due to gradual soil accretion, more or less matching rising sea levels. We propose a limited expansion of the wetland, specifically in the area between Berrys creek and the Jersey Turnpike, just north of the Metlife stadium. This area currently has an open water connection to the Hackensack via Berrys creek. The proposed flood protection berm would cut this area off from the Hackensack. However, in order to keep the tidal effect on a daily basis, it will be important to maintain an open connection. Two open connections will be equipped with flood gates that can be closed when a storm is expected to come in. However, maintaining the tidal opening will expose this wetland to the effects of sea level rise but will

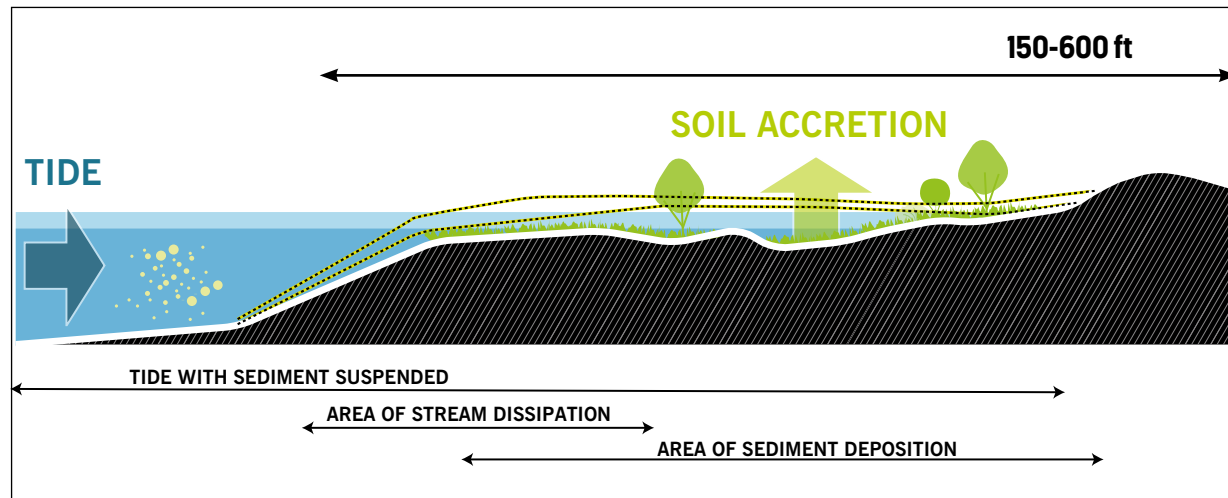
also promote the import of sediment and soil accretion. Nevertheless, the gates will cause residual risks of flooding of the urban area of Carlstadt, Moonachie and Stadium City around it. Furthermore, Berrys creek wetland is polluted with mercury and other heavy contaminants. Pollutant expansion as well as flooding should be prevented. For that reason we propose a secondary berm between the neighborhoods/developed areas and the wetland. This protection layer can be modestly sized because the floodgates will close whenever a severe weather event is expected. A berm of 6 feet high should suffice, which will mostly mean that it elevates itself approximately 3 feet from local topography and is integrated in the landscape, acting as migration route for certain species, a walkway or bike road.

The currently polluted wetland will grow in time and the soil accretion will cover and cap pollution in time. Gradually, a clean top layer will be formed, suitable for recreational use. This is a long-term perspective requiring a 30 to 50 year time span. A good reference is the Dutch Biesbosch project. Until that time, it is important to limit access to this wetland. The advantage is that wildlife can flourish here because it will be largely undisturbed by human behavior. Once the secondary berm is installed, the primary berm along the turnpike will not have to be adjusted to future sea level rise. It can be overtopped by waves that will be buffered in the wetland sanctuary. The secondary berm will keep the built area from flooding.

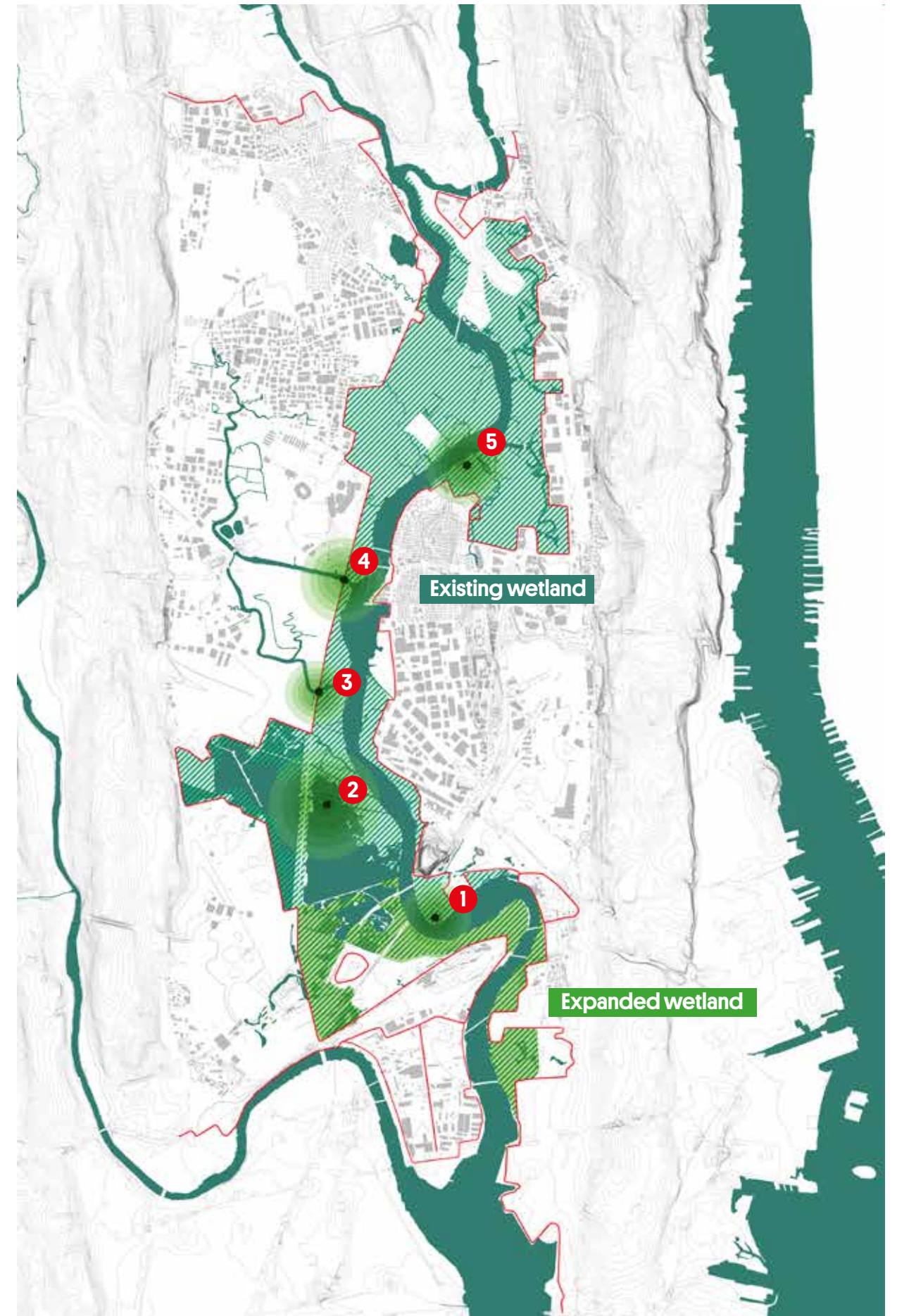
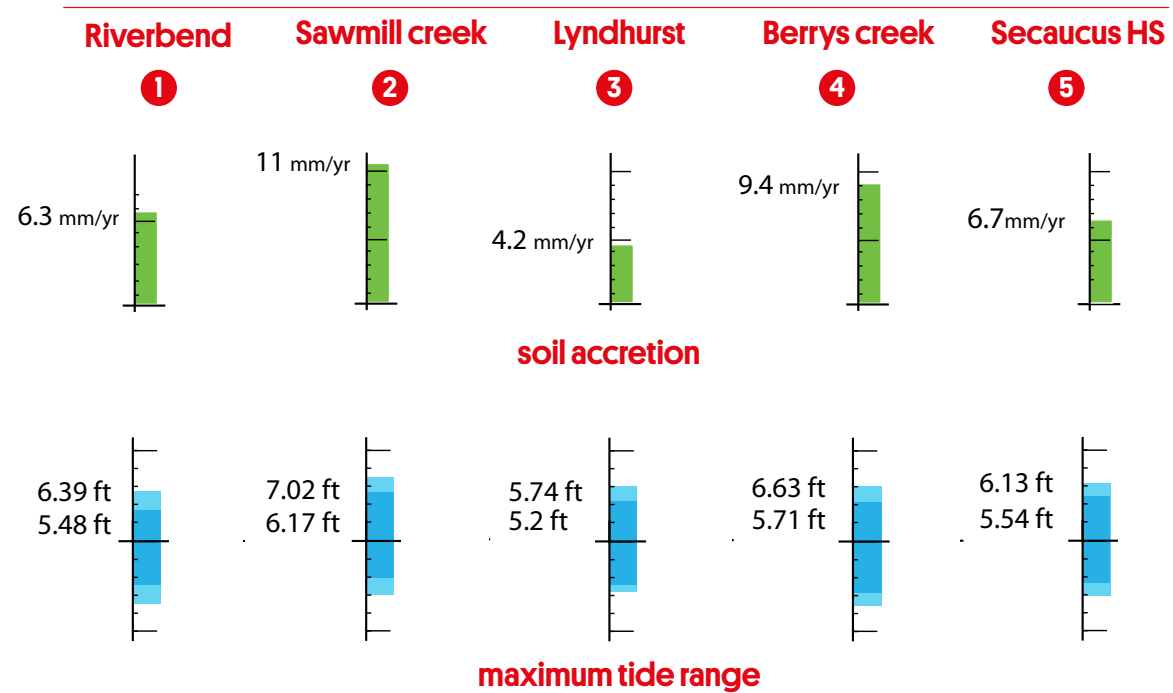
Wetlands and their capacity for gradual transformation form a critical part of the design.

Wetland adaptability over time is a function of soil accretion, which itself depends on using tidal sediment transportation patterns.

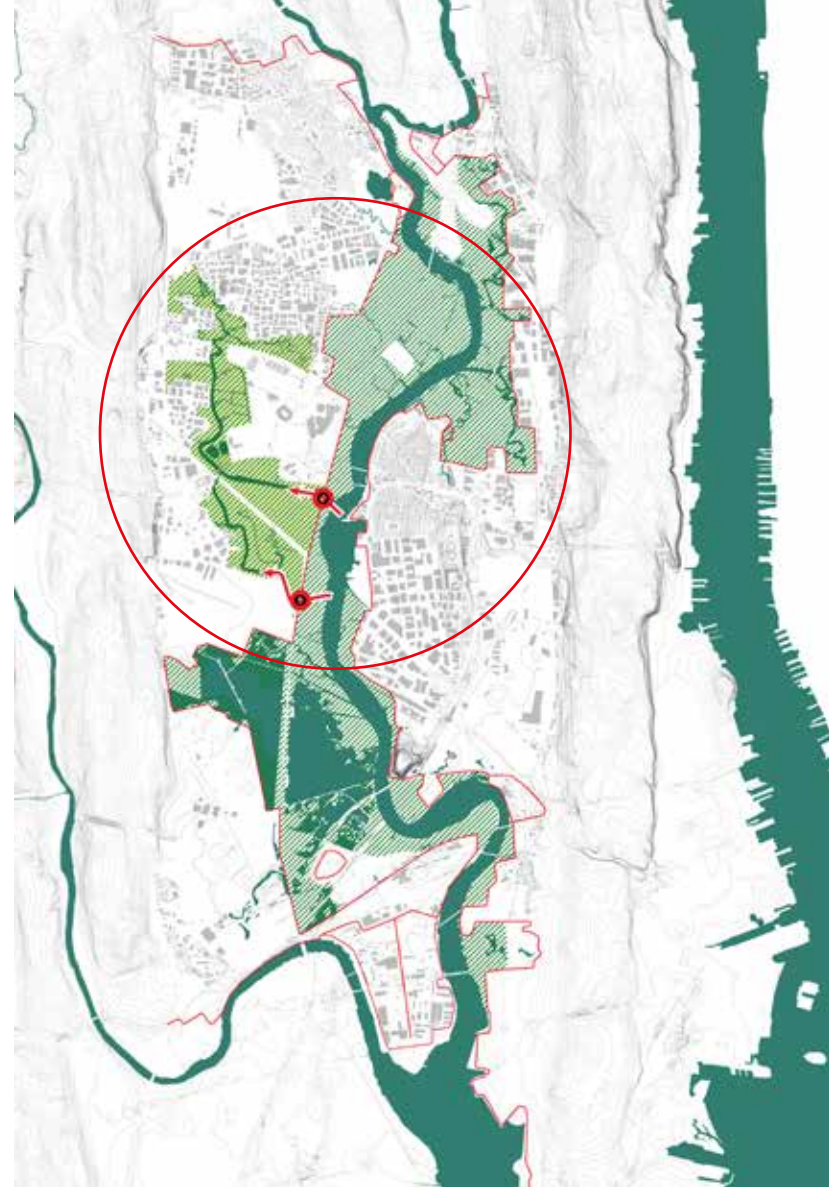
How does soil accretion work ?



Data points

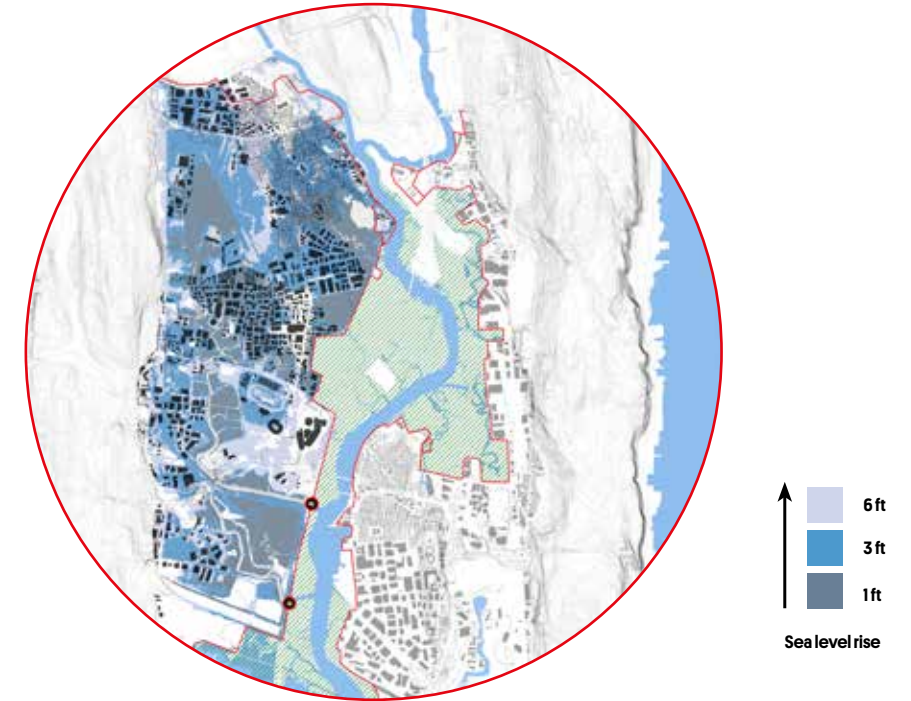


We propose to preserve existing wetlands inside the flood protection berm by using smart tide gates. These keep the wetlands connected to the river on a daily basis but will be closed during extreme weather events.

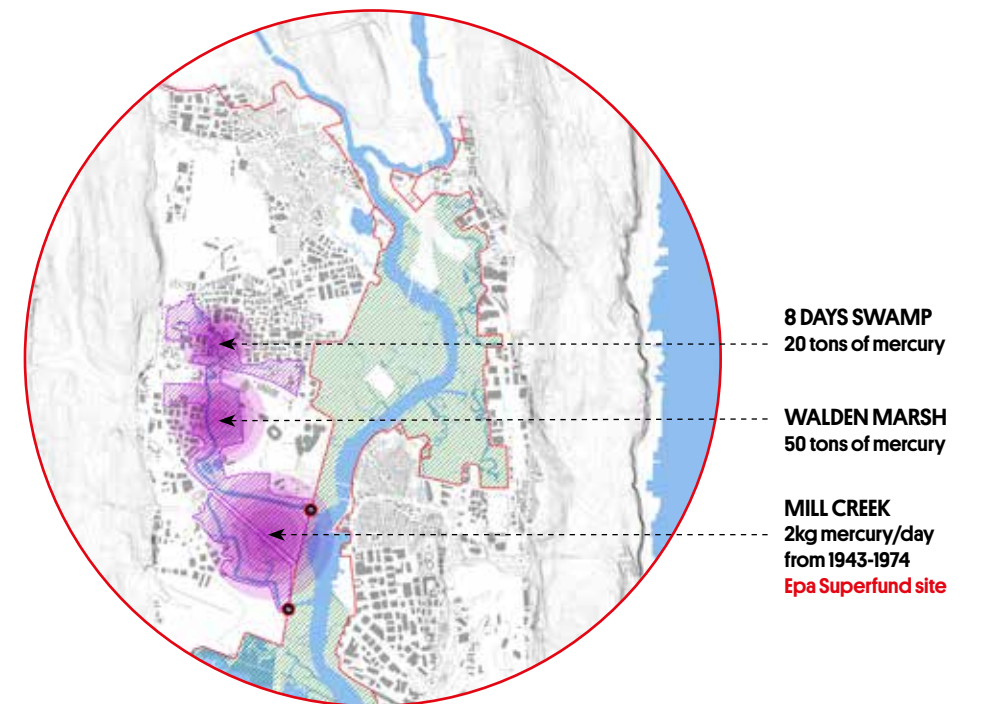


Tide Gate example

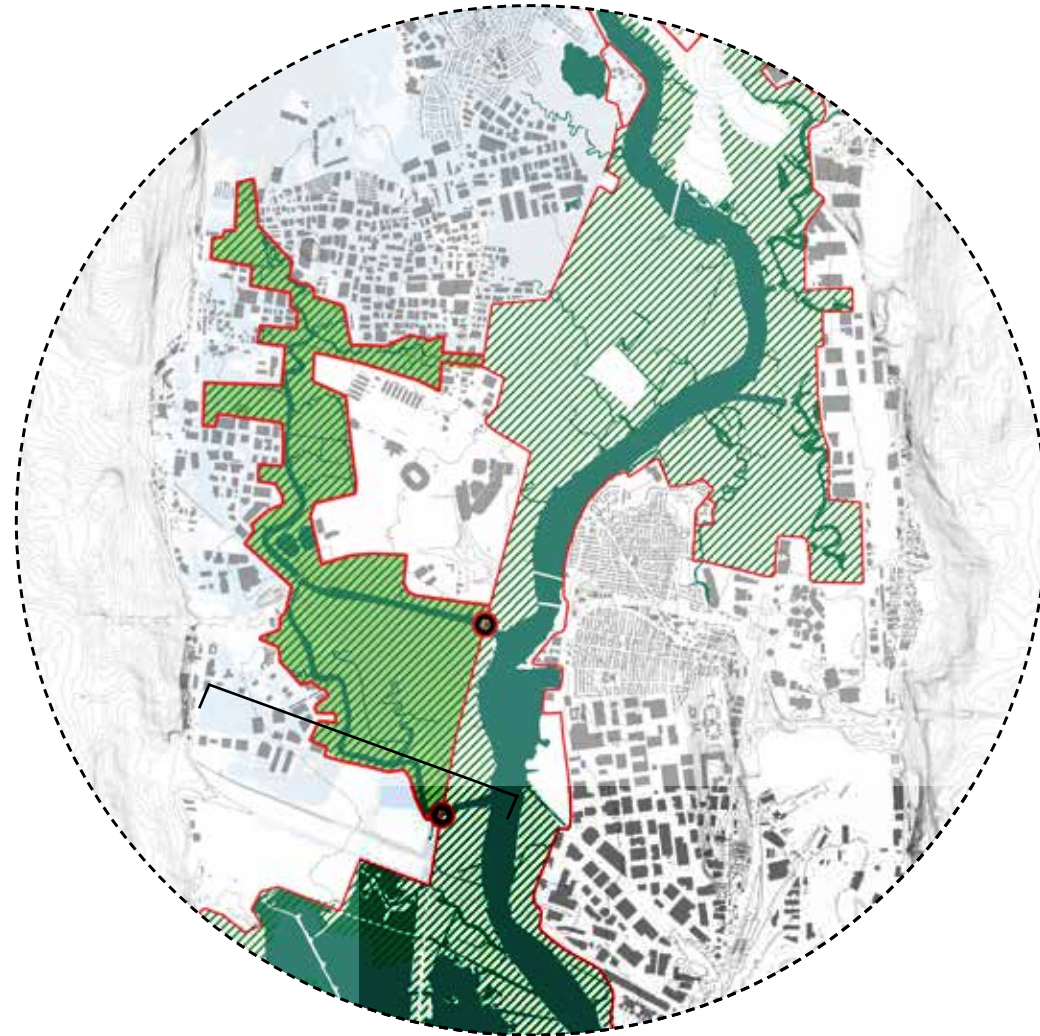
In addition, minor changes in the water level will need to be managed in those wetlands during floods.



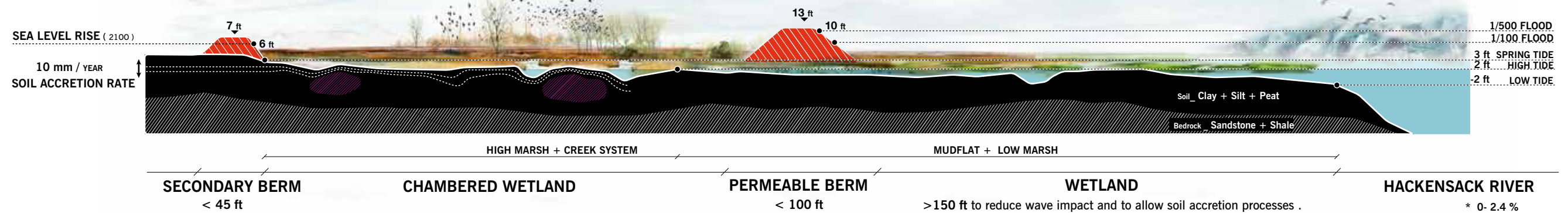
Also, areas with contamination should remain contained so no pollutants can reach adjacent neighborhoods.



We preserve the existing wetland even inside the berm by using Smart Tide Gates.
These allow tidal fluctuation on a daily basis and close off in case of flood risk.



Westerschelde: example of a flood protection berm (right) and an outer berm (left)



Fresh Water Basins

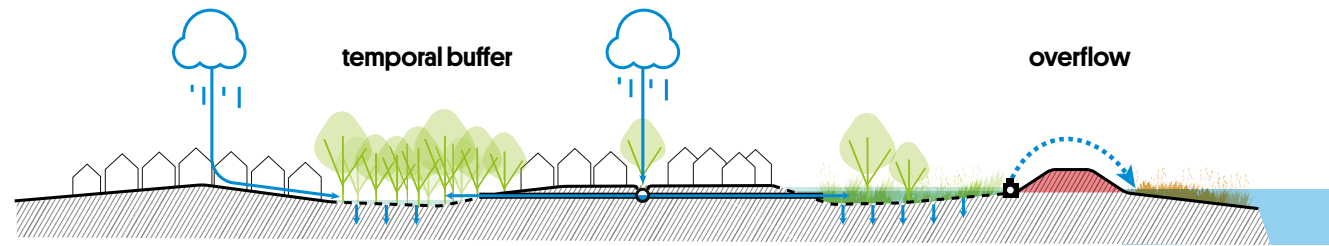
Within the protected areas, both residential neighborhoods and warehousing districts, storm water (rain water) should be captured before it is collected in the sewer system. Frequent sewer overflows demonstrate the limited capacity of the system. Existing green spaces can be used as storm water buffers. Fresh water marshes offer fluctuating water levels, forests offer soil infiltration capacity. A refined system of storm water runoff solutions should be applied: smart street design in case of sloped areas, and a split sewage system with water evacuation options into freshwater basins when there are no slopes. We would differentiate based on the system characteristics in Little Ferry /

Moonachie, Secaucus, Carlstadt, Teterboro, Rutherford, and South Kearny. It is important to integrate a more natural storm water catchment system with recreational functions so communities can enjoy the spatial benefits. In case of the lower situated zone between Secaucus and the Palisades this storm water buffer can be turned into a Cedar valley offering a pleasant route between Snake Hill park area and the wetland just south of Bergen. In case of Little Ferry, Teterboro, Moonachie and Carlstadt, a series of forested areas and fresh water marshes can be connected into a ring of public parks by the berm.

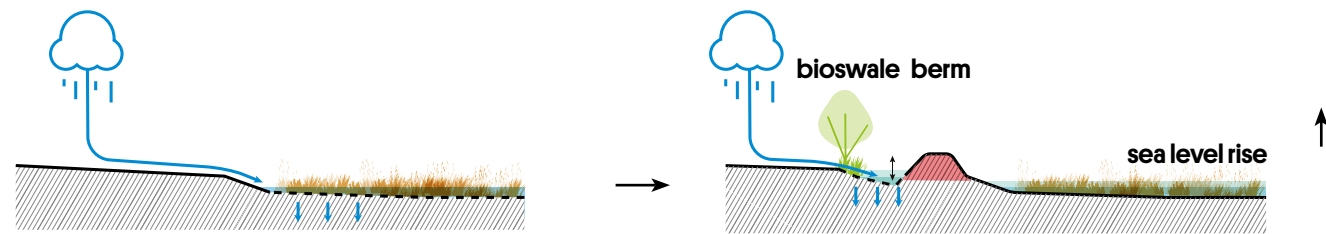


index of rainwater solutions

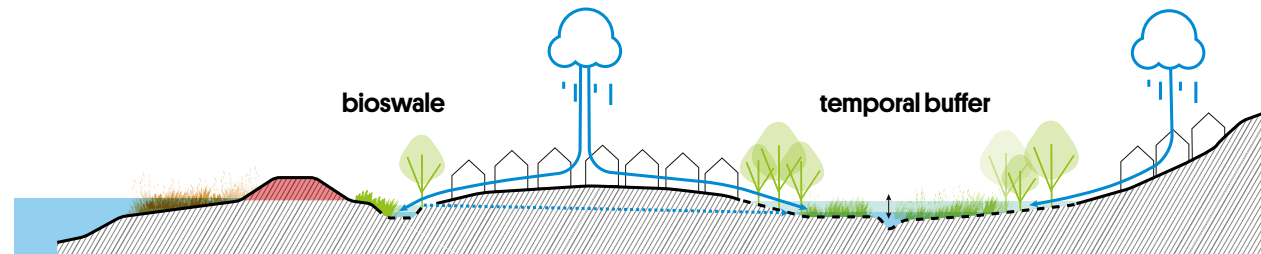
Fresh water forest



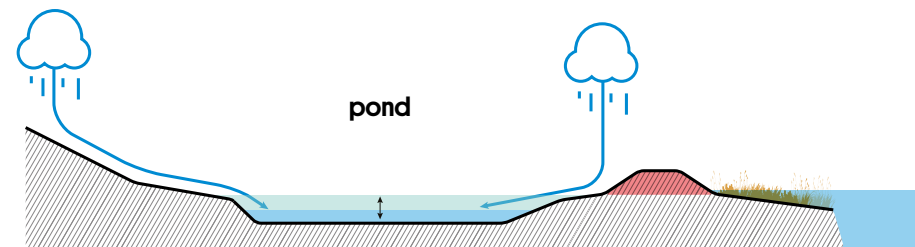
Bioswale



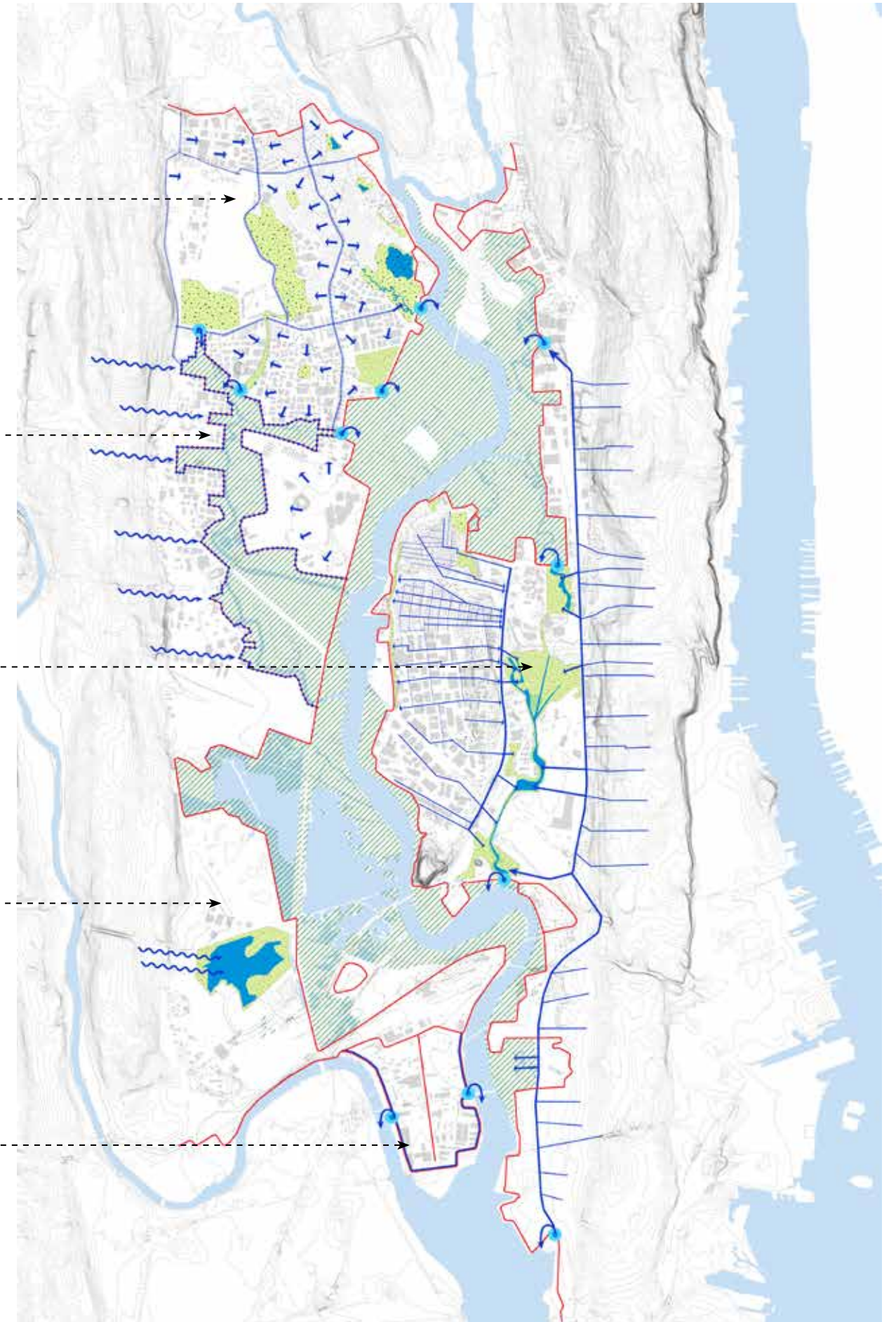
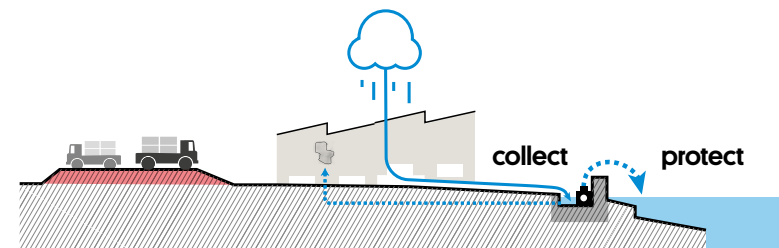
Fresh water marsh



Kearny fresh marsh



Flood wall



Biodiversity

The wetlands of the Meadowlands are a major urban biodiversity reservoir in the New York – New Jersey metropolitan region. Documented species include more than 260 species of birds, 22 mammals, more than 51 species of fishes and bees and 420 species of plants. Wetlands make up 7,800 acres of the Meadowlands and include brackish and freshwater marshes. Because of small height differences there are plentiful transition areas between

low (wet) and high (more dry) habitats as well as salt and freshwater habitats. These create a great potential for biodiversity. The team wants to further amplify these differences by creating ecosystems that directly emerge from the existing ones: the tidal Hackensack wetlands, Berry's creek tidal wetland sanctuary, Atlantic White Cedar ponds, fresh water marshes and Meadow Hills.

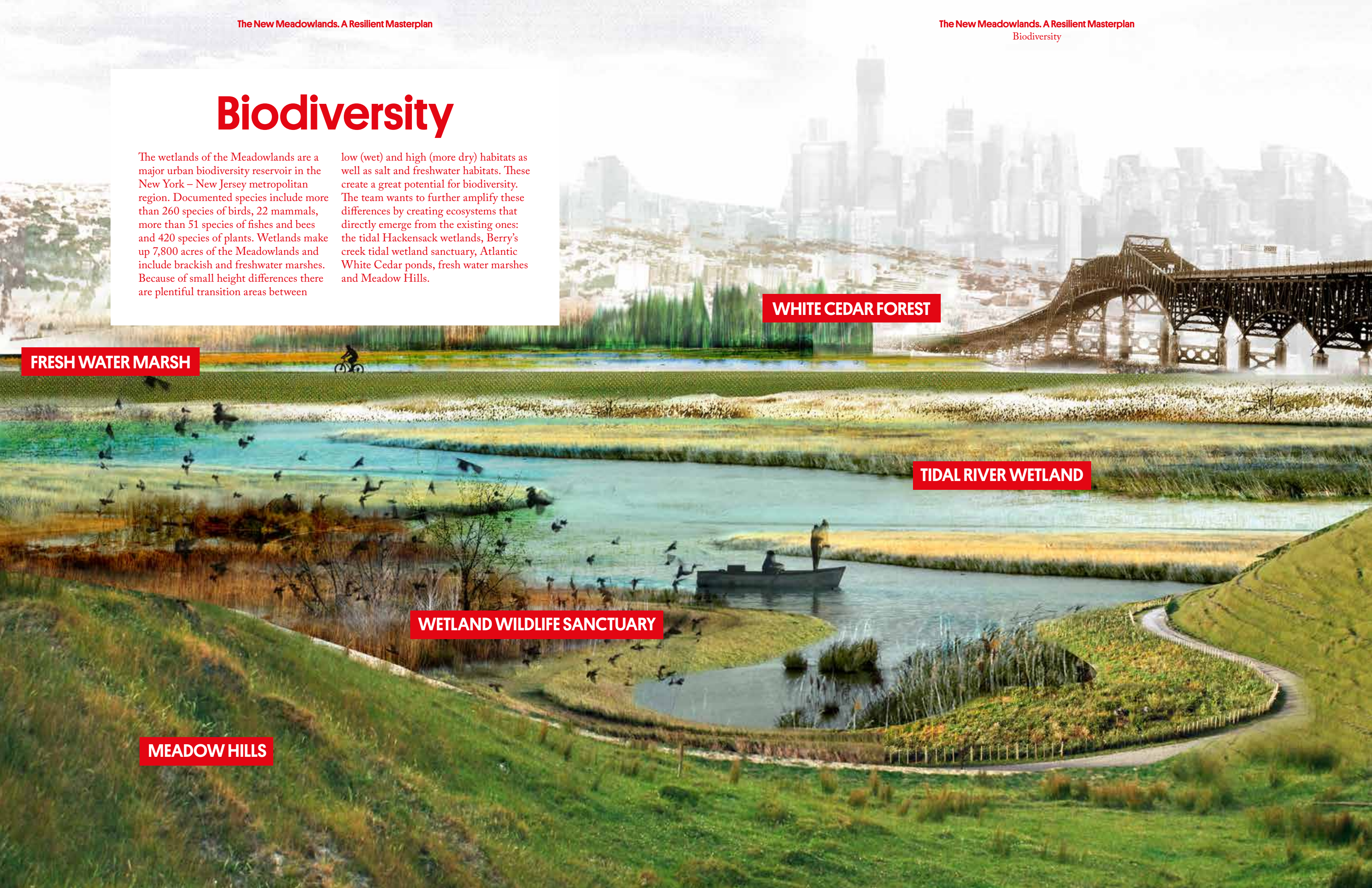
FRESH WATER MARSH

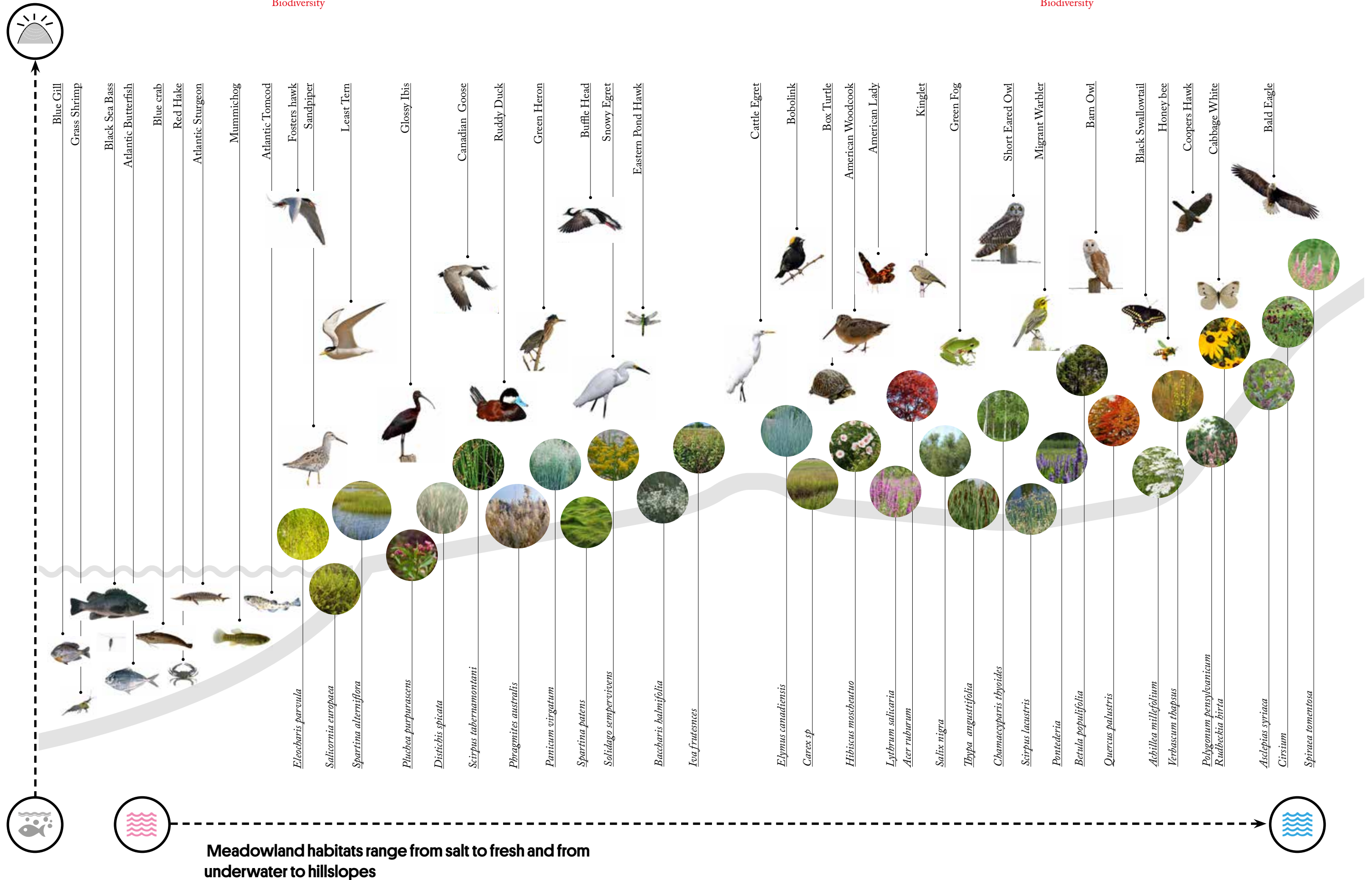
WHITE CEDAR FOREST

TIDAL RIVER WETLAND

WETLAND WILDLIFE SANCTUARY

MEADOW HILLS





Meadowland habitats range from salt to fresh and from underwater to hillslopes



ATLANTIC WHITE CEDAR

Chamaecyparis thyoides is a species of *Chamaecyparis* native to the Atlantic coast of North America from Maine to Georgia, with a disjunct population on the Gulf of Mexico coast from Florida to Mississippi. It grows on wet sites on the coastal plain at altitudes from sea level up to 50 m and more rarely in the foothills of the Appalachian Mountains up to 460 m altitude. The common name “Atlantic

White Cedar” has been rejected by the American Joint Committee on Horticultural Nomenclature as it is a cypress, not a cedar - however, it is still the most widely used name for this species. It is an evergreen coniferous tree growing to 20–28 m tall, with feathery foliage in moderately flattened sprays, green to glaucous blue-green in color. The leaves are scale-like, 2–4 mm long, and produced

in opposite decussate pairs on somewhat flattened shoots; seedlings up to a year old have needle-like leaves. The seed cones are globose, 4–9 mm diameter, with 6–10 scales, green or purple, maturing brown in 5–7 months after pollination. The pollen cones are purple or brown, 1.5–3 mm long and 1–2 mm broad, releasing their yellow pollen in spring.



ATLANTIC WHITE CEDAR, TODAY

A dead cedar stump at the Mill Creek mitigation site.
Such stumps could support invertebrates uniquely suited to this microhabitat.

Source: Urbanhabitats.org
Photographs by Erik Kiviat.

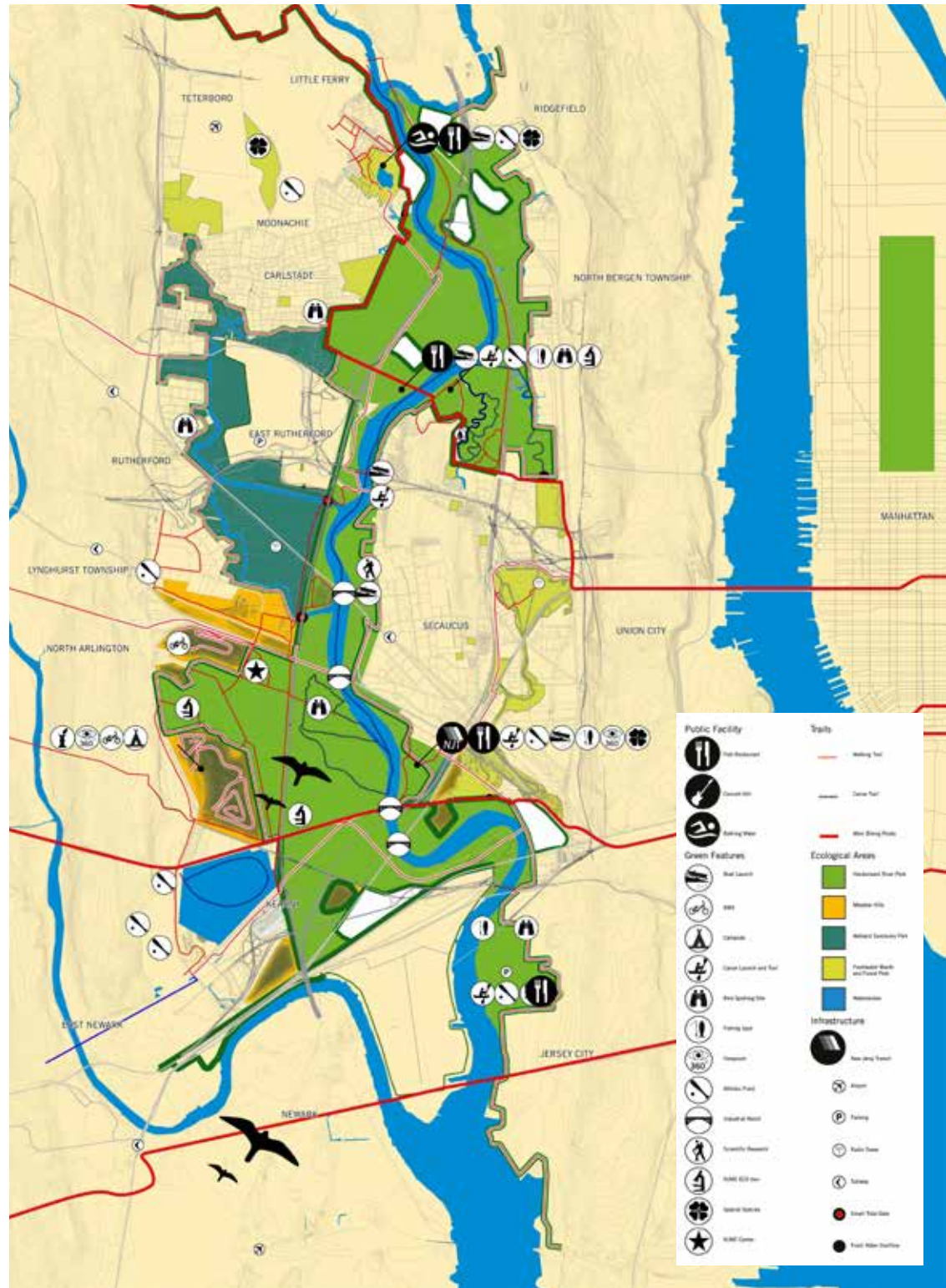
Recreation and Leisure

The Meadowpark is situated in an urban area, surrounded by millions of potential visitors. The team suggests to realize high-quality bicycle routes from Manhattan into the Meadowpark where over 80 miles of new bike trails are projected through the wetlands and over the Meadowhills. Along these routes amenities and public facilities could be situated, such as the Losensloot pool, Snake Hill beach, Meadowhill outdoor

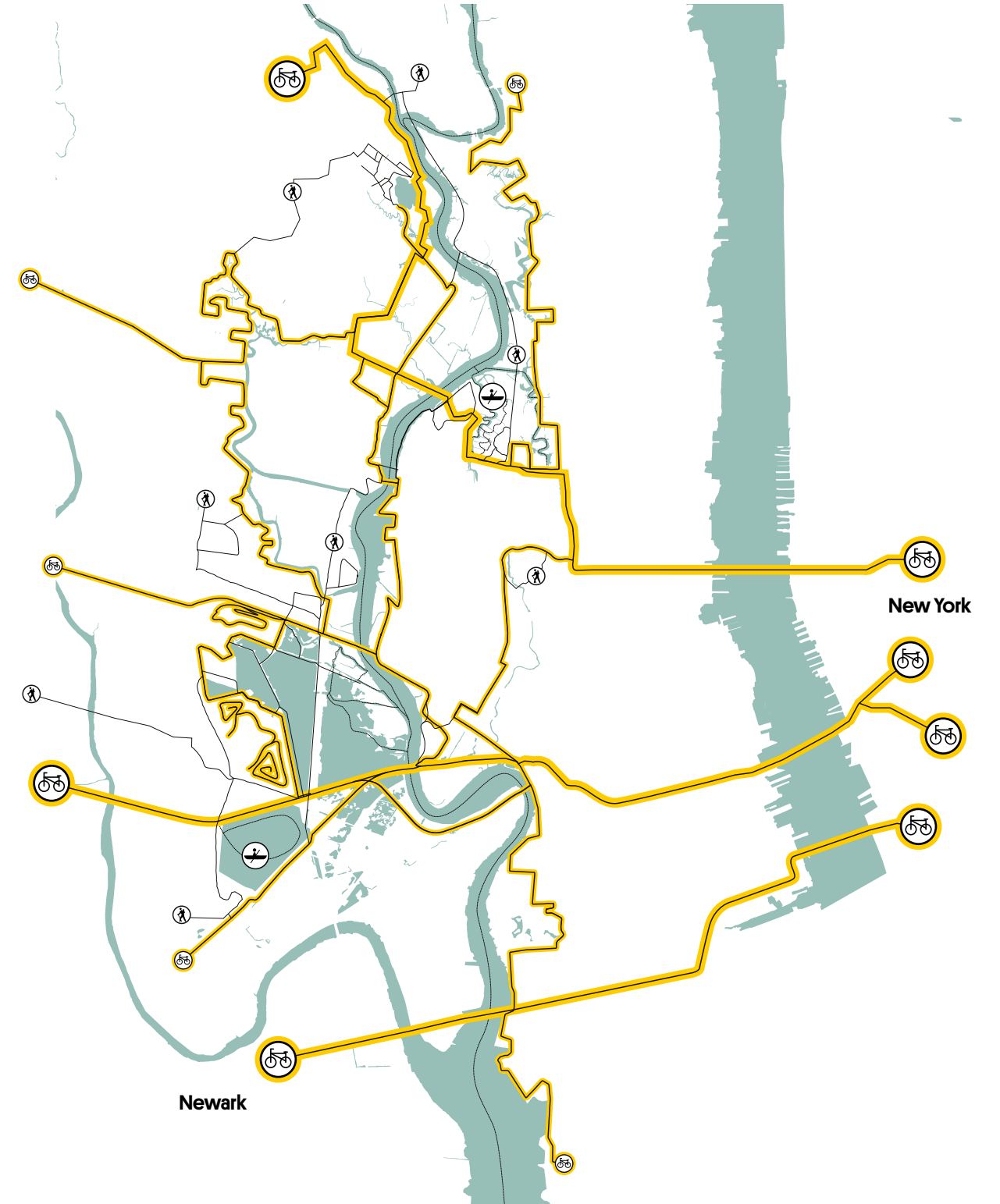
camping site and the wildlife sanctuary bird watching station. One of the key assets of the Meadowpark is the mixture of contrasting possibilities like ecotourism, urban leisure, active outdoor sports and educational program. An assertive branding and promotion campaign with clear signage in the park and promotion in both New Jersey and New York would establish this new attraction in the consciousness of the public.



The Meadowpark Green Map



Regional Bicycle Network

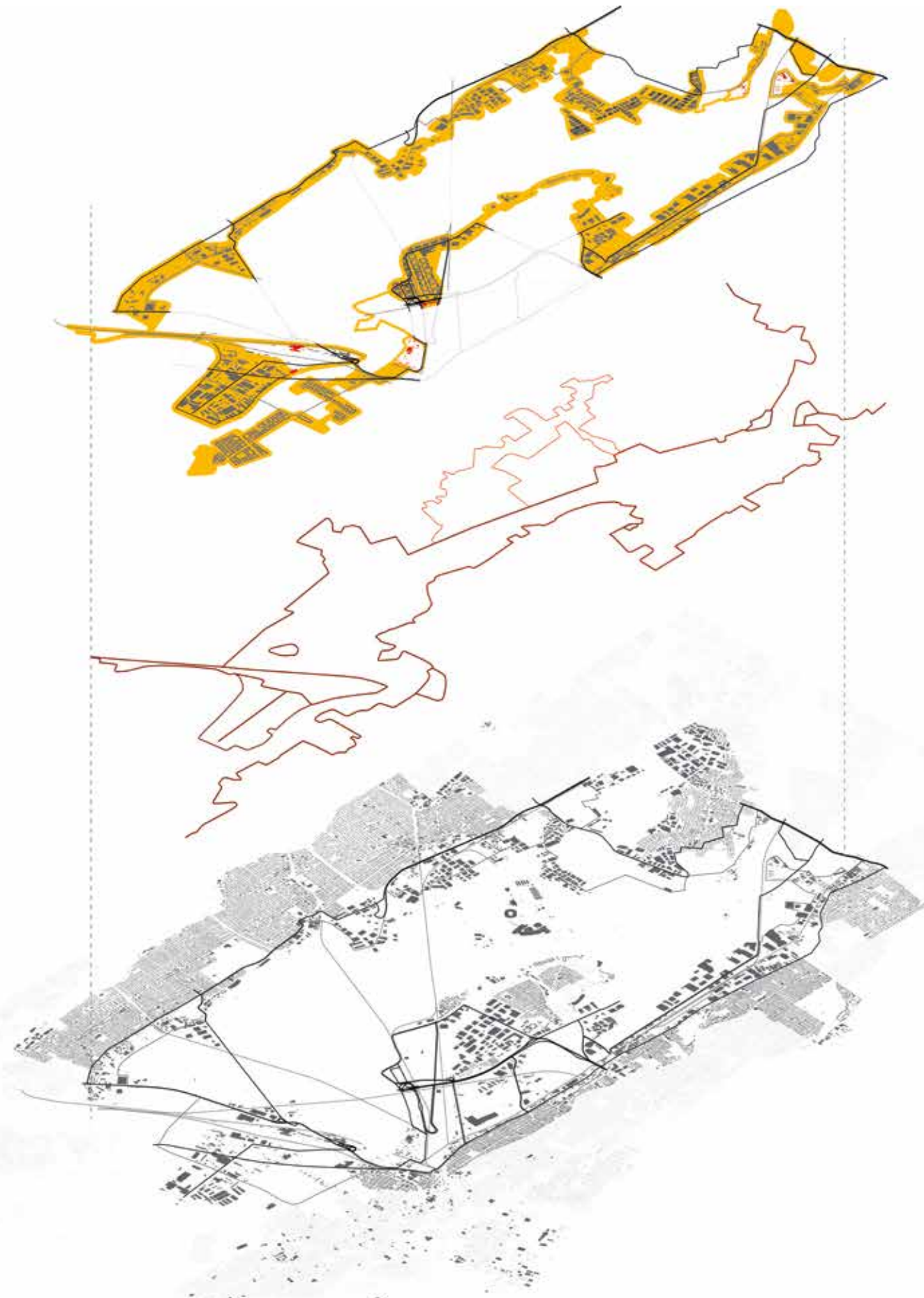




CONNECT

Lack of intermediate connectivity and associated public space	p.123
The missing link	p.125
Functionalities of the Meadowband	p.129
The BRT Line	p.129
Relation with existing Infrastructure and Development	p.129

The Meadowband



Exploded axonometric showing the Meadowband (middle) and associated redevelopment zones (above), in relation to existing roads (below)

Lack of intermediate connectivity and associated public space

The existing automobile transportation systems in the Meadowlands are reasonably efficient at connecting regionally, using I-95, Routes 3, 46, 1 and 9. Most of above-mentioned corridors are designed as limited-access highways, with access regulated by on-and-off ramps or cloverleaves. There is also a reasonable connectivity at the most local level, within each municipality.

However, the team found that an intermediate scale of connectivity was absent. Each town or development area connects directly to a regional limited-access corridor, but it does not connect to any other town or adjacent development area. As a result, short distances within the Meadowlands end up requiring detours and connecting from a local to a supra-regional road without intermediation. This is problematic for various reasons.

First, many of the towns, development areas, and green spaces within the Meadowlands should be able to enjoy from the 'proximate principle'. This term describes a multiplier effect that occurs in the value of two programs that, when placed in close proximity to each other, increase each other's worth. A good example is a park and a residential district; or a residential

area and local retail; or a hotel and a mass transit station. In these examples, proximity of both terms reinforces all. However, the lack of an intermediate connectivity destroy the value add promised by their location. In this sense, the Meadowlands as a whole is performing far below value. The biggest multiplier of the proposal is between the newly created regional park, and the (re)development areas and towns abutting it.

Second, even short local connections within the Meadowlands require automobile access. These result in a much greater traveling distance than strictly necessary since cars have to travel via regional transportation corridors for very local connections. Pedestrian, bicycle and other local connections are almost impossible.

Third, there is a notable lack of public spaces and regional destinations in the Meadowlands. At the occasion of the 2014 Superbowl, the dominant iconography used images from Manhattan, and most events were at public spaces in Manhattan. New Jersey towns and inhabitants understandably complained about their lack of recognition. However, the entire basin lacks both public spaces and iconic elements that highlight the positive identity of the area as a whole.

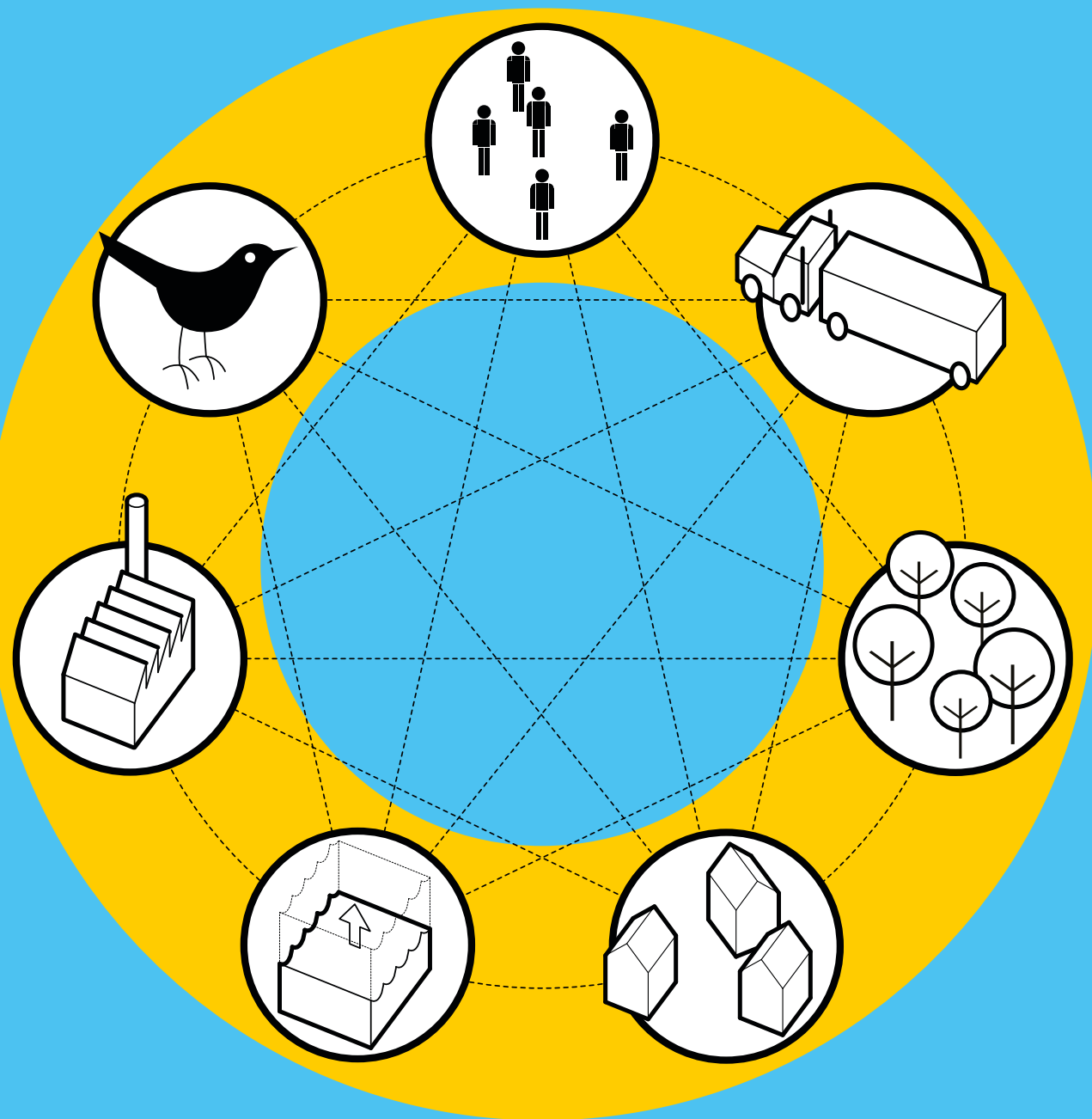
Ideally, this takes the form of a space that brings audiences and publics of adjacent localities together beyond their town, and intermingles them with visitors from the region and other states. Such a space would correspond to the definition of a public space as proposed by its most eminent scholar, Richard Sennett. If it were to be possible to use the proposal to help create such a space, it will yield and compound substantial benefits to the area over time. Most importantly, it will be an instrumental feature in the re-branding of the Meadowlands basin as a regional destination that instills pride and encourages participation of its constituents.

Fourth, the lack of intermediate connectivity is driving up costs for developers. There are examples of local developments, where the developer has been asked to include private shuttle services to the nearest mass transit station.

Fifth, and perhaps most important – the lack of access between adjacent fragments limits options for individuals caught in an extreme weather event to evacuate or find help, or others.

Meadowband

Connecting the Dots



Boardwalk at the Jersey Shore. the Meadowband would construct a similar relation to the regional park, as the boardwalk does to the beach.

The missing link

The oldest, most affordable yet most successful public space of almost any city is a street. A great street offers the most iconic views, the most important addresses, and of course also access to different neighborhoods. The Meadowlands does not have such a street. We propose that a simple street go consistently around the outer edge of the Meadowpark. Walking or driving clockwise, a resident or visitor will always have the park on the right, and a sequence of existing neighborhoods and new developments on the left. The street would provide access to both sides. It would connect currently disparate fragments and take advantage of the adjacencies and proximities between different fragments of the Meadowlands.

Streets today in the Meadowlands are either local within a municipality, or, if they exhibit continuity across towns, have been developed on both sides. As a result, the open space (park) system currently

in place is rather invisible. Current open spaces in the Meadowlands abut the backsides of properties. This reduces the visibility and accessibility of the open space system and effectively removes it from public view.

The current section, of street – property – marsh, needs to be turned around. A more appropriate section is property – street – marsh/park. With this simple flip, the park is suddenly visible. Developments suddenly have a park address. The street provides a scenographic experience of ever-changing park landscape on one side and ever different neighborhoods presenting themselves on the other side of the street.

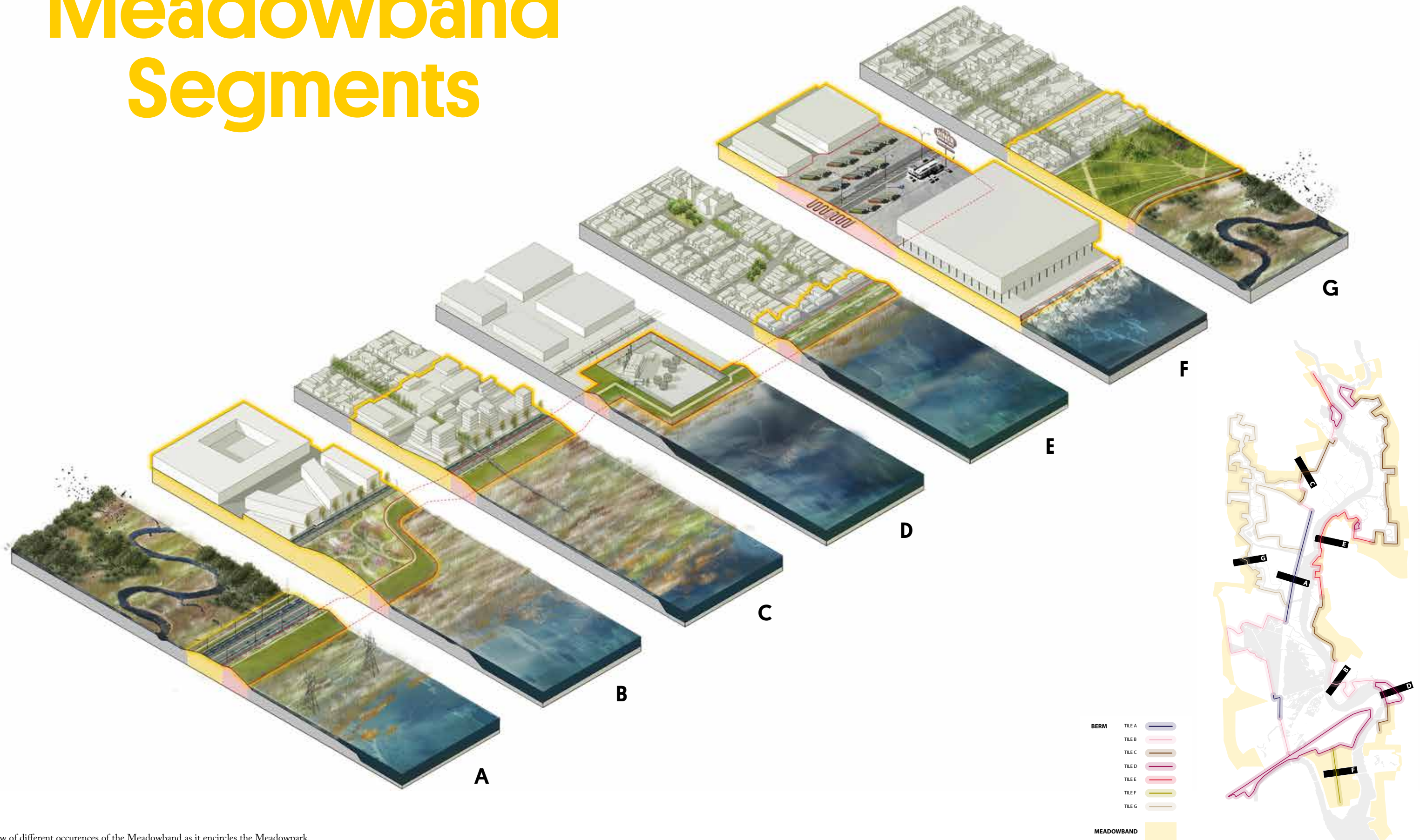
The Meadowband would provide a form of intermediate connectivity and act as a public space on the scale of the Meadowlands, an icon that generates park access, an understanding and legibility of the basin as a whole. It would allow for adjacent towns and neighborhoods to be connected

without the need to move to a higher-order transportation system; for cars, mass transit, bicycles and pedestrians.

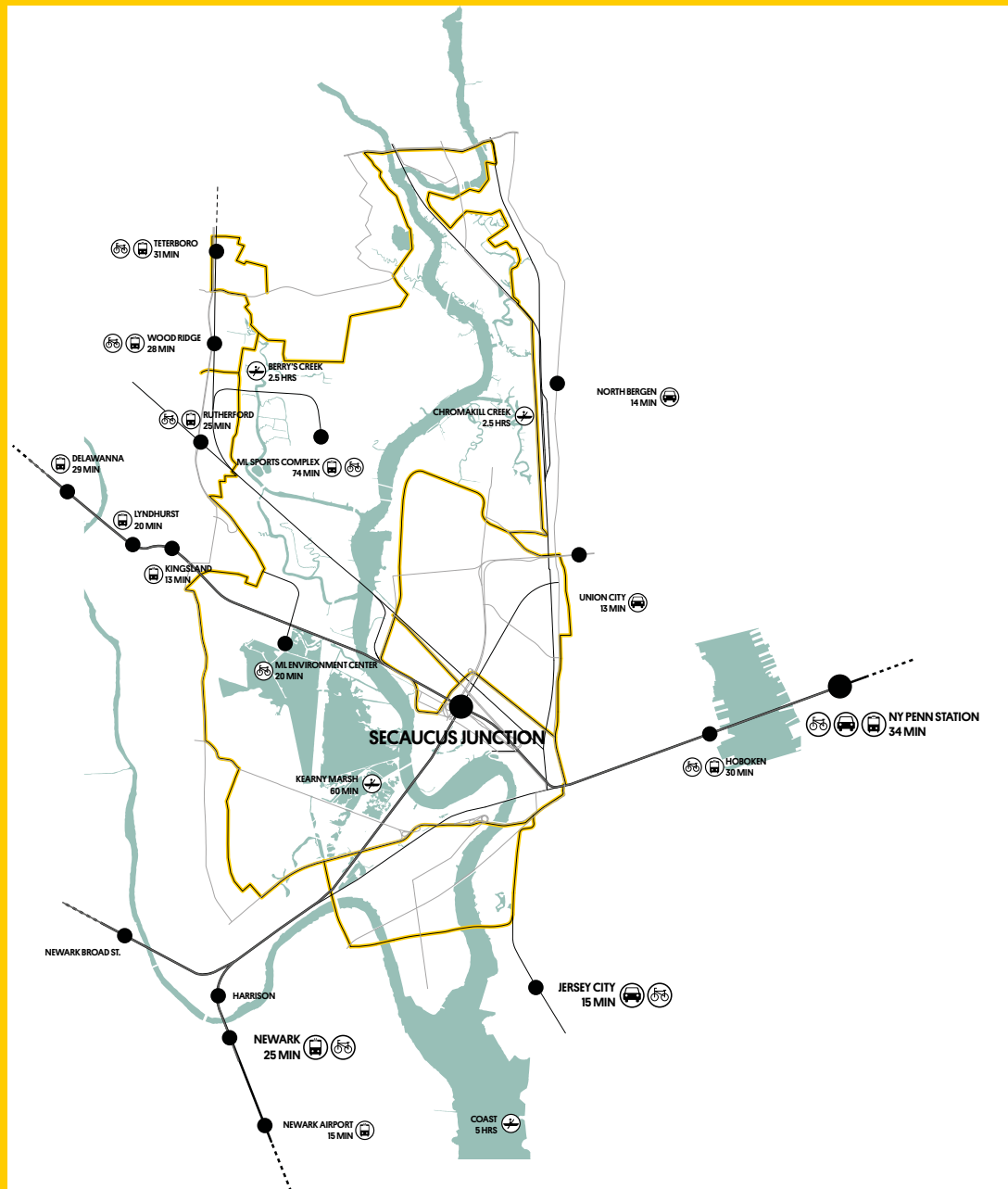
The proximate principle begins to work, and the various parts of the Meadowlands start adding value to each other: the park makes the neighborhoods more valuable; park access make the park more valued; some local circulation is taken off the major limited-access-highways. A new public boardwalk starts to draw both inhabitants and visitors.

Boardwalks fail when there is not sufficient human presence, leading to a sense of insecurity to the few visitors walking, running or cycling on it. The team wishes to underline that the provision of a local street along the boardwalk diminishes that risk, and increases passage, flow and visibility on the Meadowband. The street operates as a safety mechanism, guaranteeing public access and continuous visual supervision and escape routes.

Meadowband Segments



Overview of different occurrences of the Meadowband as it encircles the Meadowpark.



Above: Bus Rapid Transit lines use a dedicated lane and as a result have a high reliability but low capital costs. Below: the Meadowband would be accompanied by a BRT line, facilitating access across the basin, and connecting to existing mass transit stations (Path).

Functionalities of the Meadowband

The Meadowband is a street atop the outer berm connecting various park entrances with playgrounds, boardwalks, sports fields and a redeveloped urban edge. Where possible, the proposals accompanies it with a Bus Rapid Transit (BRT) line. It can be read as the urban extension and conclusion of the boardwalk systems prevalent at the Jersey Shore. Instead of ocean, there is a watery wildlife park; instead of entertainment, there is a more urban mix of uses. Nevertheless, as a figure, it completes the northern edge of Jersey's boardwalks and circles around itself. The Meadowband relates to the Meadowpark in the same way as 5th Avenue and 8th Avenue relate to Central park.

Various sections of the Meadowband may have different identities along different stretches of the outer berm protecting the Meadowlands municipalities. Recurring elements in every section would include a boardwalk / sidewalk; a bike path; and a local access street for emergency and access to newly emerging residential developments along its protected edge. The team aims to widen the local access street enough to have a dedicated line for a Bus Rapid Transit line. Along these linear systems, various accents would occasionally widen the boardwalk, allowing for the occasional playground, park entrance, sculpture, bike station, etc. These accents activate the boardwalk and will help draw an audience. The boardwalk itself will have enough room to host terraces and patios for adjacent restaurants. Widths can vary dependent on above-mentioned options to between 45 and 145 ft.

The BRT Line

The proposed BRT line will bring benefits to both local communities (cheaper and more reliable travel times), to the system at large (taking some vehicles off already congested roads), to visitors (circulate

Meadowlands fast and efficiently), and without requiring capital improvement costs usually associated with mass transit.

The following paragraphs contribute a few observations about the benefits and costs of a BRT line along the Meadowband, articulated in collaboration with the BRT center of excellent and by MIT Professor Christopher Zegras for this project:

Benefits are usually associated with performance measures such as vehicle miles traveled (VMT), vehicle hours of travel (VHT), or passenger-miles traveled (PMT). In this traditional framework, individual user benefits relate to reductions in generalized travel costs (travel times, monetary travel costs, or both). These reductions in travel cost increase total consumer surplus by (1) making it cheaper for existing transport infrastructure/system users to travel and (2) attracting new users otherwise "priced out" of the system. Additional societal benefits that factor into such analyses include potential safety benefits. Improved equity (e.g., distribution of benefits and costs) can also be considered. Other benefits to users of transport infrastructure or systems, such as quality of the trip, reliability, or accessibility are usually not directly included in cost-benefit analysis due to the difficulty to measuring them and/or concerns about double-counting.

Potentially longer term effects of public transportation investments relate to shifts in consumer behavior and business productivity, including vehicle ownership cost savings; business cost savings related to wages and labor productivity; productivity gains due to labor market access, economic spillovers, among others. Many of these effects are related to potential urban densification enabled by transit system investments and so-called "transit-oriented development" (TOD). Incorporating such

benefits into traditional project evaluation is more difficult, because they are difficult to quantify and predict.

Bus rapid transit (BRT) is undoubtedly "en vogue" at a global scale, with literally hundreds of projects developed across the world over the past decade. In theory, BRT has the advantage of bringing many of the benefits of "mass transit" at lower capital and operating costs than fixed-rail alternatives. Whether users view bus-based transit as comparable to rail-based transit and whether developers and others do as well remains a somewhat open question. Nonetheless, some evidence suggests that, controlling for other factors (levels of service), users are indifferent to bus versus rail modes; some evidence even suggests that developers are inclined to favor bus-based projects because such projects can be delivered more rapidly than rail. From a cost-benefit perspective, in the short-run, quicker project delivery speeds up the time when the benefit flows can be realized. In addition, since BRT tends to be more flexible than rail-based alternatives (for example, enabling smaller scale initial investments with the opportunity to expand the service as demand develops), supply can be more effectively calibrated to demand (especially as the latter evolves over time as the second-order, TOD-related effects of the transit investment begin to be realized), which improves project returns. BRT's flexibility may be particularly valuable in a world with greater climate risks, because the system can more easily respond to acute events (e.g., floods) and be re-structured for longer-term adaptation needs (such as re-aligning routes).



The Meadowband (red), separating redevelopment zones (orange) from a floodable watery park system (green)

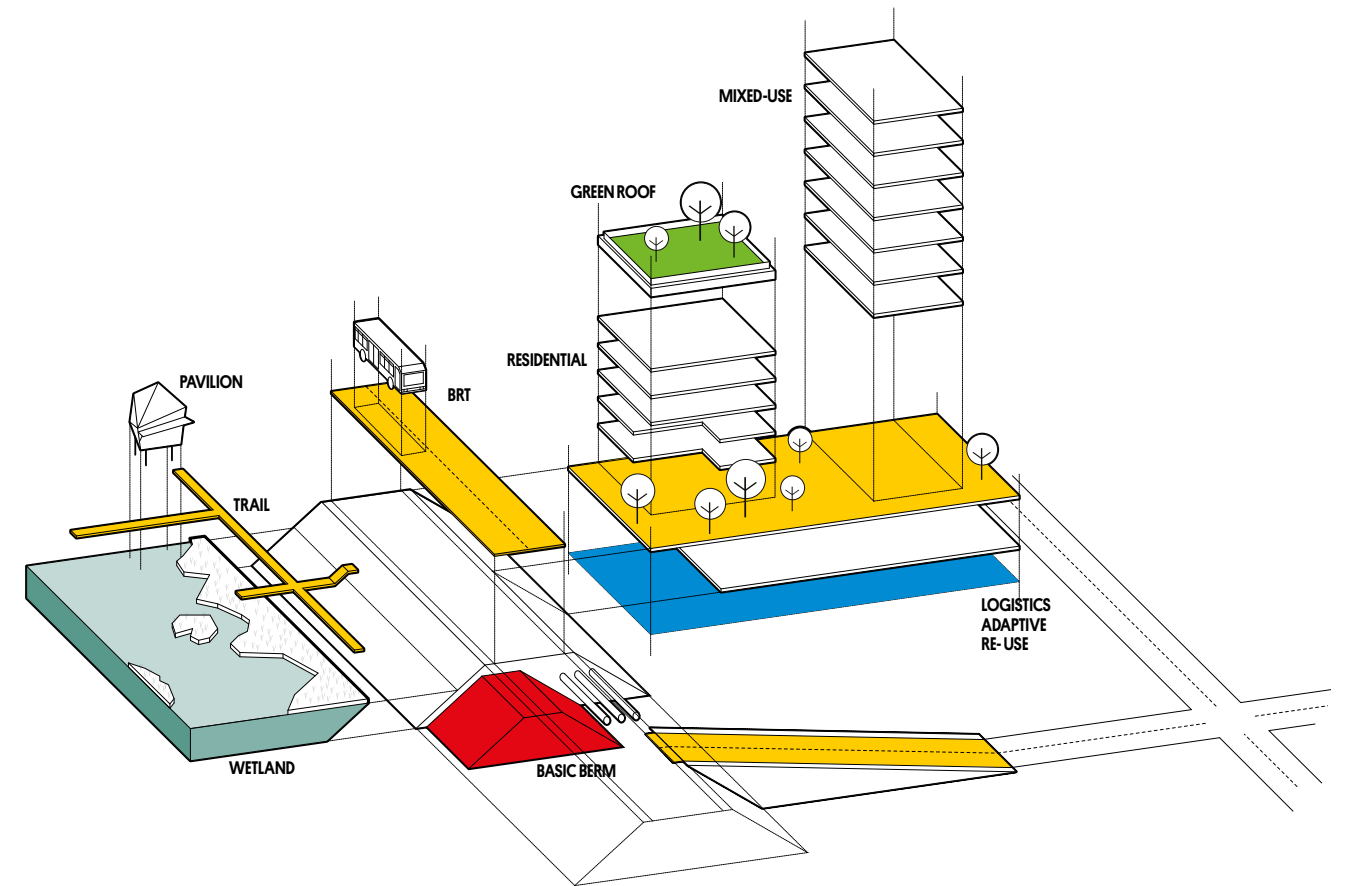
Relation with existing Infrastructure and Development

The Meadowband will connect to train transit stations currently in the area and may inspire the decision-making for future locations of new ones. Along any such intersection, FAR and density should increase to establish a pedestrian-based, transit-oriented development. Substantial residential development would deserve priority to capture a portion of the residential development pressure in the area. Current stations are mostly along the western edge (Kingsland, Wood Ridge, Harrison and Meadowlands Sports Copmle stations of Path), as well as West Side HBLR Station in Jersey City and Lautenberg Station in Secaucus.

Along the eastern edge, the Meadowband will occasionally run a few hundred feet west of train lines and spurs. These belong to the broad logistics and supply chain system flooding the Meadowlands. The masterplan proposal includes measure to strengthen this axis and develop the logistics and supply chain system more intensively along the eastern edge. Revisiting the New York New Jersey Port Authority study for a series of 'portways' – large distribution hubs – would be appropriate. At specific points, there is conflict in space use between supply chain functions (along rail and road) and residential needs (near mass transit stations). For these locations –e.g. Lautenberg station - a sectional solution should be investigated in which

the first 60 ft. (from the ground up) are reserved for supply chain functions, but a decking solution at that line, could provide for the insertion of residential development opportunities atop these locations.

The Meadowband will also allow for almost continuous and universal access to the regional Meadowpark and its bicycle and pedestrian trails.



section of typical elements in the meadowband.



GROW!

GROW!

Development Opportunities

The Meadowband as Opportunity Creator

The Meadowband connects disparate development fragments and allows multiplier effects between park, neighborhood, and intensified use of existing warehousing zones to become tangible. It is not only a civic amenity and a public space. It also acts as the opportunity creator for a series of (re-)developments. Residential projects along the Meadowband, with an address at and a view of the park, will be an attractive opportunity. Energy harvesting along the slopes of the berms along the Meadowband may be an attractive opportunity as well, deserving of further investigation in a next phase.



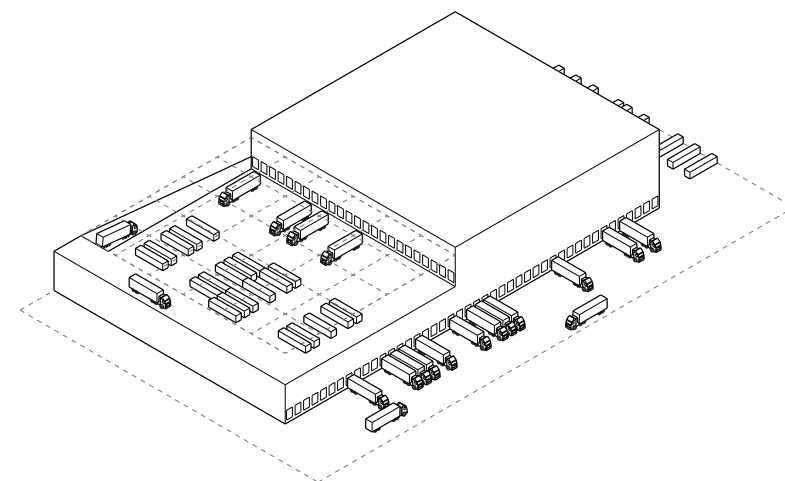
Suburban

Surface parking
Buffer zones between buildings and plots
Direct access to highway
Single use and type



Urban

Parking in buildings or underground
No buffer zones
Street access as a connective element
Mixed use and type



Multi story Warehouse

above: urban vs. suburban land use patterns.

below: diagram of a new generation of multi-story warehouses in the US context: two stacked single-story warehouses, with a ramp for truck access leading to the upper level.

Towards a more urban, durable Development Pattern

Development patterns for both offices, warehousing and more recently, multi-family residential complexes in the Meadowlands area have been largely of the suburban type: large lots, ground level parking surrounding buildings; buffer zones around the lots; direct access to limited-access highways. Any substantial federal investment in a complete and thorough protection system for these areas would need to make that investment worth it by transforming the development dynamic into a more dense, durable and multifunctional – urban – pattern. This implies allowing for smaller parcel sizes, eliminating buffer zones, parking inside structure basement, and connecting better to adjacent areas with the local street (Meadowband).

Zoning changes for residential in exchange for the federal investment package

Along the Meadowband, it makes sense to re-zone in order to allow for residential and retail uses to appear along the band, with primary address at the Meadowpark. Retail options at the level of the Meadowband (15 ft, sometimes 3-5ft) makes most sense. On top of these, the team advises for, on average, 4 stories of residential development, for different reasons. From a cost-benefit point of view, such density would materialize the benefits potentially offered by the Meadowband-and park. The

CBA (Cost-Benefit Analysis) has assumed and FAR 3 for the parcels immediately adjacent to the Meadowband. Second, such heights are not Manhattan-style, they imply only a relatively minor height upgrade compared to existing fabrics, and are comparable in height to other recent residential developments in the area. Third, current fire station equipment in the area can handle such building heights.

Around mass transit stations, the team advises to up the zoning to allow for more than 8 stories of residential development, maximizing the potential for sustainable, automobile-independent neighborhoods. The team also advises to develop a certain consistency in the application of a unified building height along stretches of the Meadowband, to be studied further in the next phase.

Zoning changes for logistics in exchange for the federal investment package

This pattern can be activated by an effective re-zoning and up-zoning strategy, which would have to be approved and engaged with by the Meadowlands Commission, the State of New Jersey, and local stakeholders.

The team proposes that warehousing districts behind the berm would be up-zoned to effectively allow for multi-story warehousing. Interviews with industry leaders of the industry, MIT-based work-

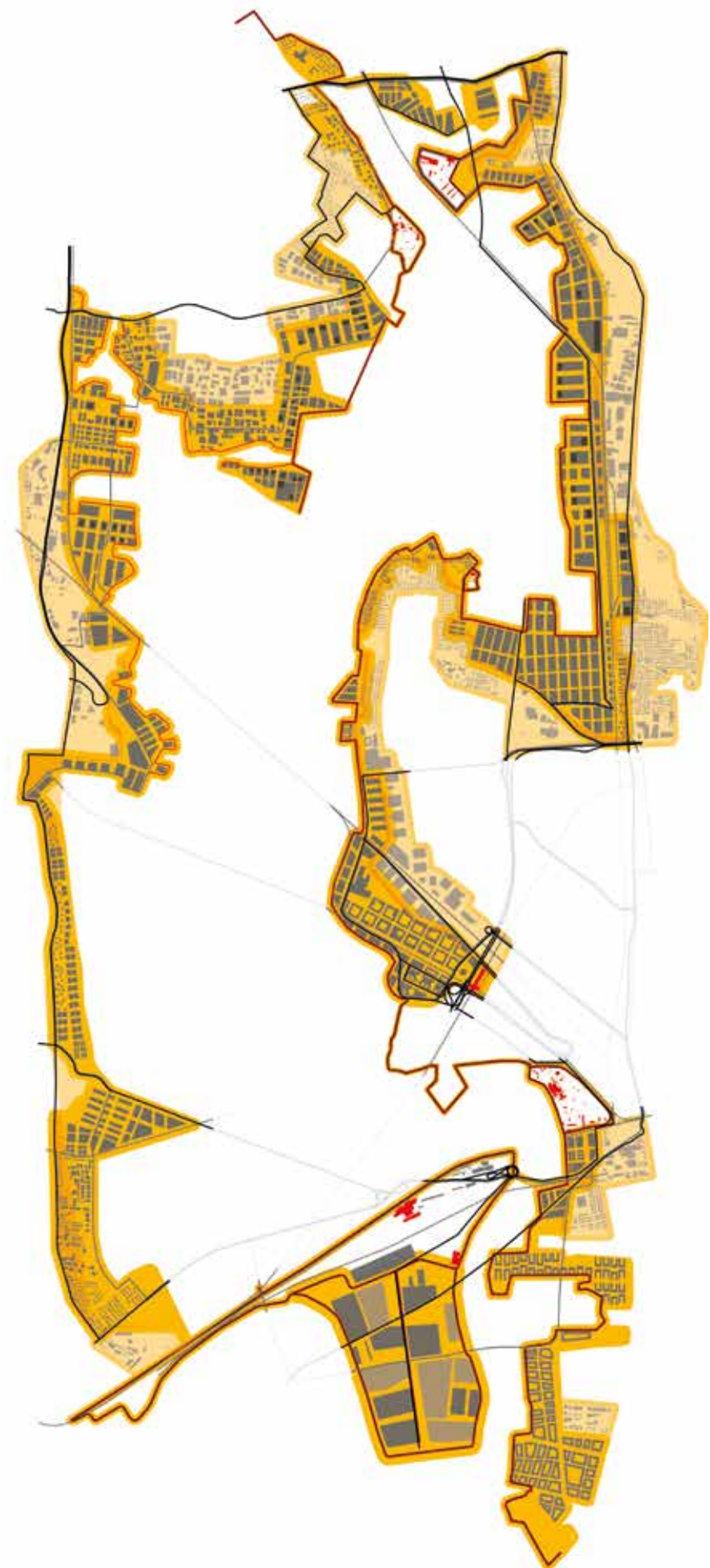
shops, as well as indigenous research by the industry indicate that the supply chain sector is almost ready for multi-story warehousing, and that this location, more than any other one in the United States, will likely be the first to adopt it. While rather common in overseas port areas such as Hamburg, Rotterdam, as well as supply chain districts in Japan, China and South-Korea, there is currently little precedent for multi-story warehousing.

The typology most likely to succeed is that of 2 single-story warehouses stacked atop each other, with ramp allowing for truck access and a docking area on the second floor. Trailer parking areas on the second floor could take a portion of that floor; the remainder would be for a smaller-footprint warehouse. Possible Construction costs would obviously increase; land coverage could be higher as there are lower space requirements for trailer parking on the ground floor. Usable floor space would increase. Ratable tax income for the town would also increase, possible double. Overall warehousing capacity per district would also increase, possibly double.

The team suggests that the first such projects may require some external support to cover the risk engaged in introducing with the type. The Little Ferry/Moonachie warehousing district, or the Secaucus or Kearny districts provide immediate opportunities.

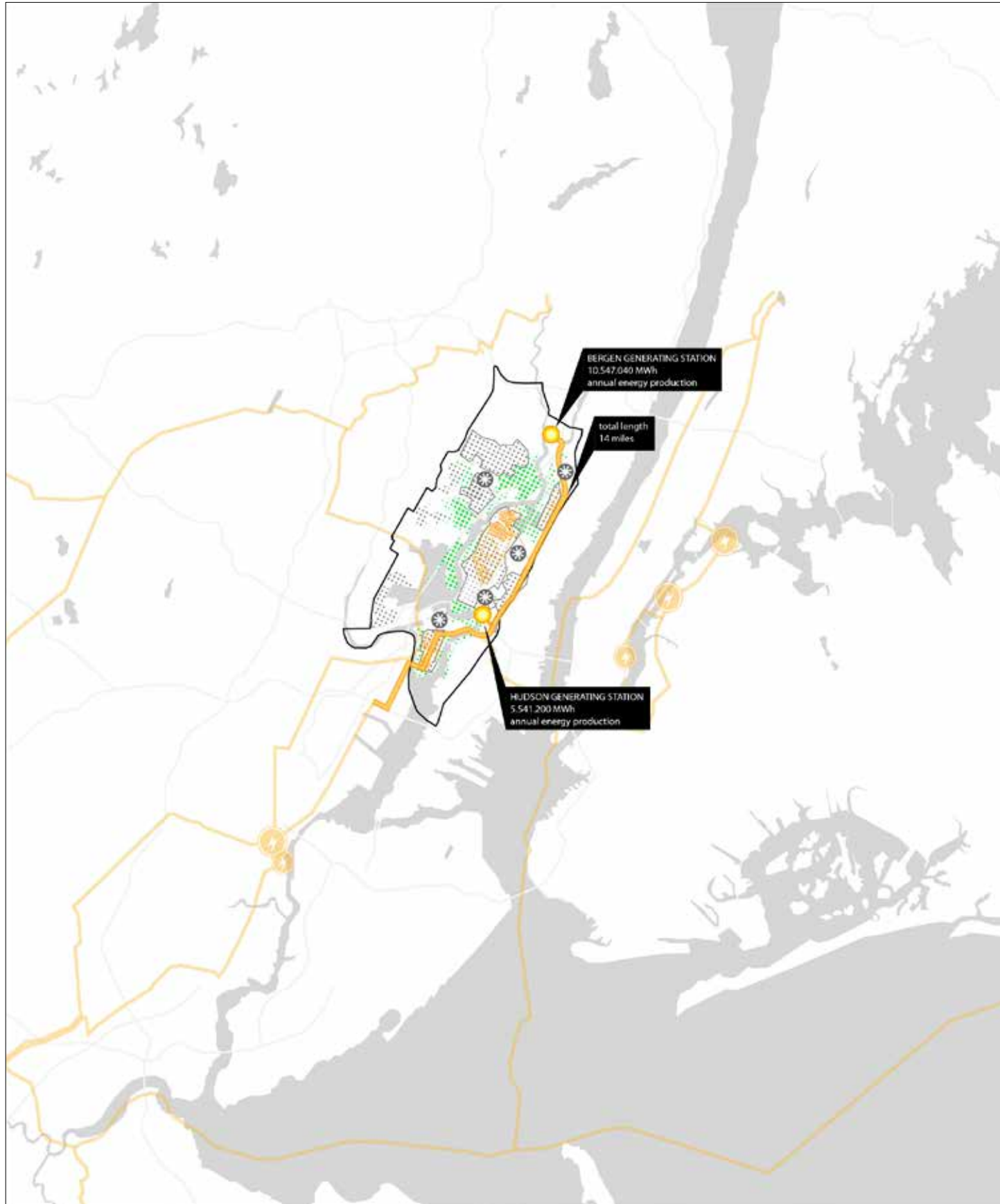


- first phase
- vital function
- primary berm / bike path
- secondary berm / bike path
- road
- BRT
- railway

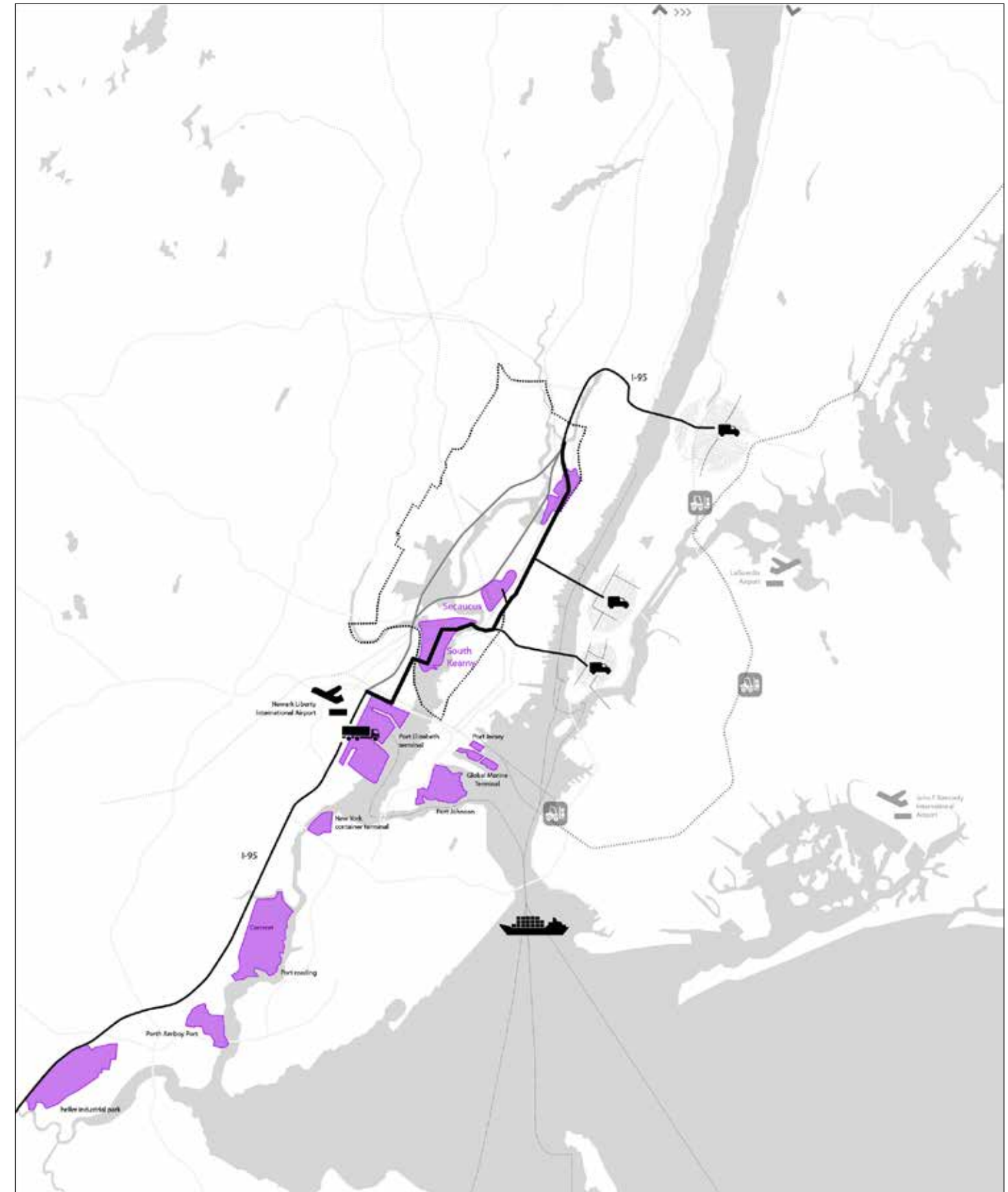


- second phase
- third phase
- vital function
- primary berm / bike path
- secondary berm / bike path
- road
- BRT
- railway

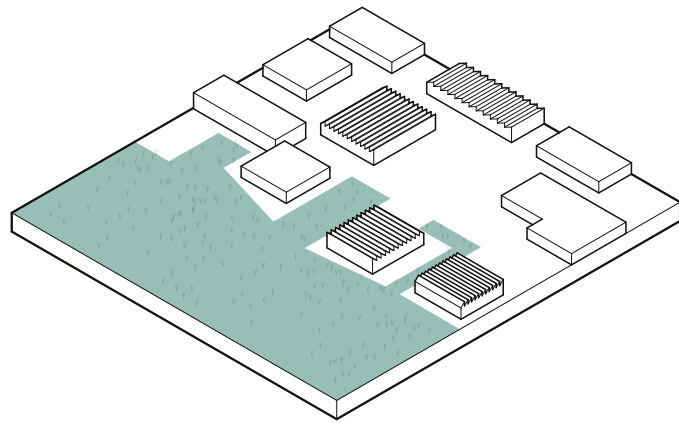
Energy Potential



Smart Distribution System

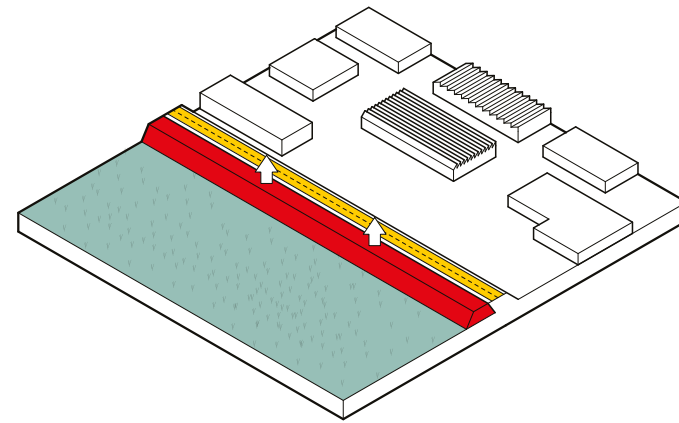


Meadowband Development Sequence



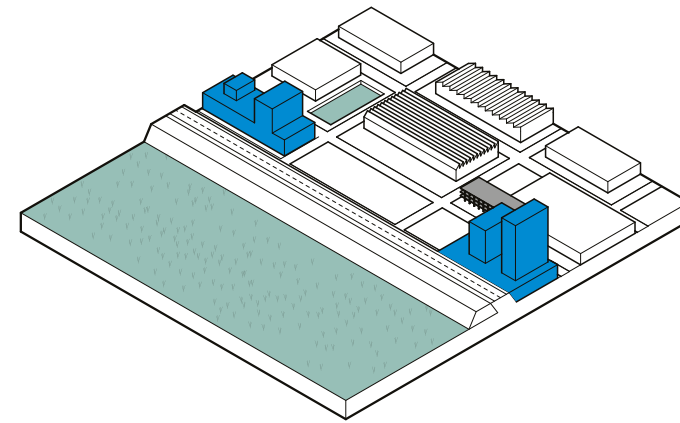
CURRENT CONDITION

The remaining watery open space in the Meadowlands ends along the back edges of mostly warehousing properties. High flood waters come in across this edge.



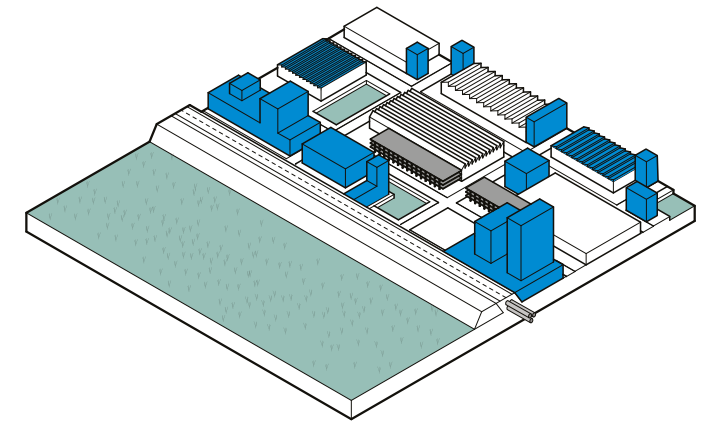
MEADOWBAND

Build a berm around this edge, and include a public path or street along that berm, turning the back-edge condition into a potential front-edge condition.



REDEVELOPMENT

Properties begin to transform, re-orienting and providing a front address along the Meadowband. Residential and retail programs are introduced on top of, and in combination with the warehousing.



CONSOLIDATION

A chain of urban development consolidates around the protected edge of the Meadowband and creates an iconic space for the entire basin.

IMPLEMENTATION STRATEGY

Dynamic strategy for 3 pilot areas	p.147
Project Implementation: Roles and Responsibilities	p.151
Timeline, Trends and Hurdles	p.153
Little Ferry / Moonachie / Carlstadt Pilot Area	p.157
Secaucus / Jersey City Pilot Area	p.173
Kearny / Jersey City Pilot Area	p.187
Costs and Benefits Analysis	p.198

Dynamic strategy for 3 pilot areas

Breaking down the Scale into single-stage pilot projects

This is a proposal of a regional magnitude, involving many stakeholders and parallel processes. Nevertheless, it is perfectly possible to organize an elegant way to implement such a proposal.

However, this does require innovation in the methods of project management, procurement, and overall organization. It will be crucial for any eventual grant application to develop a precise set of implementation devices. The team suggests following actions:

First, it is crucial to scale down the project into feasible parts. The team proposes to subdivide the Meadowlands basin into six areas, three of which are designated as *pilot areas*. At this point, it is important to distinguish pilot areas (3) from *pilot projects*, which are single-stage projects within the pilot area. The team envisages between 4-10 projects per pilot area. As a result, the overall amount of projects does amount to between 30 and 60.

Importantly, each of the pilots and even the projects, could start independently. There is no required linear succession. Experience with urban projects has taught the team that this pragmatic attitude greatly increases the chances for success of the proposal. Early-ready projects in the other areas than the pilot areas, could be undertaken parallel to the initiatives within the pilot areas. If future new opportunities and their realization occur in a coordinated way, each investment anywhere in the Meadowlands may help contribute a piece of the overall project. This will accelerate realization of substantial portions and the realization of the multiplier effects.

Dynamic Masterplan: continuous adjustments and integrations

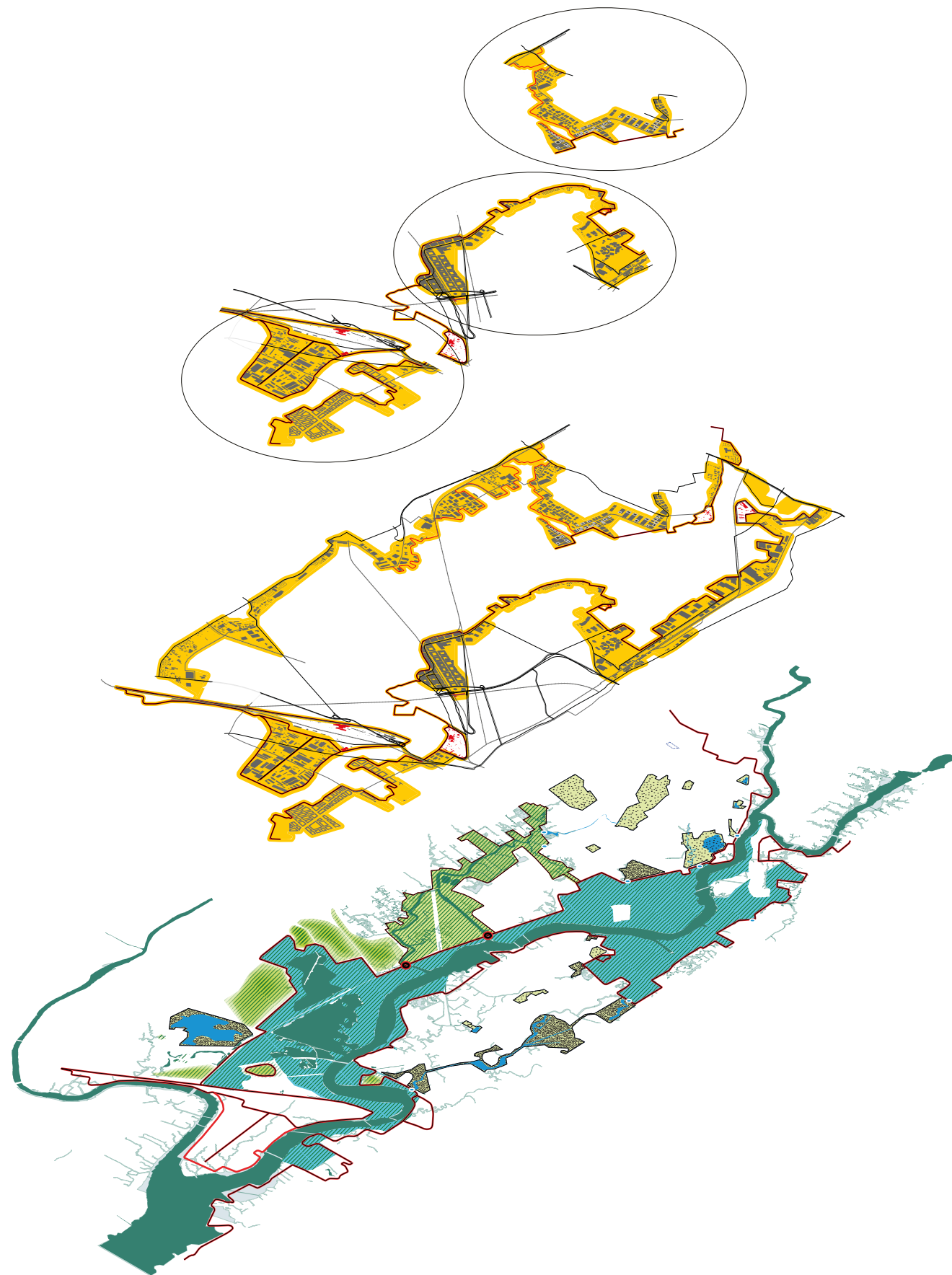
Second, Integrating designs and construction timelines of the various projects is of critical importance. Many actors will be engaged in different constellations per project. To guarantee overall consistency between these efforts, two actions are critical: (a) completion of the masterplan; and (b) continuous dynamic adjustment of the masterplan. If the Masterplan is a static document or report, it will become obsolete as soon as the first projects are underway. Active design and planning integration is crucial to realize the benefits and multiplier effects based on adjacency and proximate principle built into the proposal. In other words, the masterplan will need continuous adjustment, not of its main principles, but of its concrete elaboration. Berms need to align; residential fabrics need to connect; public spaces need to realize the missing link; parks need to be accessible; berms need to be closed, etc.

Implementation Push

Third, a continuous dynamic to search, identify, and marry partners for other parts and projects to be implemented needs to be in place. There are 3 parallel trajectories for the project coordinators to set up: (a) continued efforts for new grant applications for capital improvements (b) partnerships with private sector to realize supporting developments (c) implement re-zoning efforts and regulatory changes with local municipalities and the Meadowlands Commission.

The first trajectory creates deliverables in terms of further grant applications for and commitments from federal and state support for components of the projects. The second trajectory builds partnerships and alliances with private sector stakeholders to realize developments that strengthen other parts of the proposal. The third trajectory stewards the zoning changes required for this project.

exploded axonometric showing the masterplan area, the 6 areas for phasing, and the 3 pilot areas. Each contain the critical ingredients of the project.



Continue Fostering a broad Coalition of Support

The team has found evidence of broad support for the proposal. However, as the projects becomes more detailed and precise, it will be important to continue to build and maintain support at every step. For that reason, the outreach efforts should not stop but continue unabatedly by involving the communities during next phases, and brief them regularly about both opportunities for new pilot projects as well as about adjustments occurring in the dynamically evolving masterplan.

Land assembling

In order to realize the outer berms and the Meadowband, in some cases relatively small portions of private land will need to be acquired. Many other berms are within existing parcels owned by public entities. The pilot area studies demonstrate that the locations where berm overlaps with private property, do not concern residential parcels, but belong to warehousing properties. Initial conversations with land owners demonstrate a willingness and openness to participate in this process. A mechanism to manage and complete these conversations will need to be in place. The team proposes two possible mechanisms: A first mechanism entails the creation of a non-profit entity to purchase and acquire the land necessary for the construction of the (outer) berms and their associated gates and pumps.

A second mechanisms utilizes the 'Meadowlands Conservation Trust', a state land trusts that sits in but is not of the Meadowlands Commission. MC staff support the trust, whose mandate is *'acquiring or holding interest in land in order to permanently preserve and enhance environmentally sensitive lands located in the Hackensack Meadowlands or within the Hackensack River watershed'*. Berm construction is based on the mandate of protection; but given that the overall proposal as well as its berm locations, to a large degree confirm the above mandate, using the Trust is worth studying in more detail.

It is important to point out that the pilot area studies do not involve any substantial taking of existing marsh- and wetlands, but that they do require occasional modifications on these properties with green infrastructure.

Setting up an ownership structure for maintenance

Upon construction, the berms will need regular maintenance. The team recommends that such ownership and maintenance be the responsibility of a Meadowlands-wide agency or an even higher authority or level of government. A fragmented ownership structure (towns, or even private owners) delegates maintenance responsibilities illogically. Because both risks, costs, and benefits of the berm system operate on the scale of the Meadowlands area as a whole or beyond, the maintenance costs should be managed on that scale as well.

Permit preparations: per pilot area, with early on coordination

The proposal requires permits from State agencies (NJ DEP, NJ DOT) as well as federal ones (EPA, National Fish and Wildlife, and Army Corps of Engineers). Any permit application needs to be accompanied by an updated and more developed version of the dynamic masterplan for the entire area.

Nevertheless, the team has designed and isolated the pilot areas so that they can function independently, and that any trade-offs occur within a pilot area. In order to make the permitting process as smooth as possible, the team recommends that permit packages be prepared per pilot area. This will allow accelerating the process of building the permits, as well as having them reviewed. Review times of 1 year or more by federal agencies are not uncommon.

Building the required analyses, designs, and documents for a permit requires a

substantial effort. Besides the environmental, traffic, and protection analysis of the proposal, also commitment letters from land owners whose properties will be directly affected by berm construction need to be gathered.

As soon as one permit is entered for one pilot area, the writing and analysis for the second permit can begin. The review time is used to design, plan, analyze and quantify the next pilot area.

- a) consolidation of the overall masterplan in a separate report to demonstrate the overall intent and benefits of the project as a whole
- (b) early coordination with the MIMAC interagency team of the Meadowlands Commission or an equivalent.
- (c) separate submission of permits per pilot area.

Continuous Research and Analysis

It will also be important to have an outside institution critically evaluate the proposals and projects as they develop. Such a review mechanism, ideally by an academic institution, will provide quality checks and help keep the other consultants, players, and stakeholders on track to achieve a state of the art projects that will adhere to the highest standards and can become a shining example to the rest of the world. This evaluation should include not only Meadowband and meadowpark, but ideally also concern itself with the private and public-private partnerships that may emerge for some of the development opportunities.

PROJECT IMPLEMENTATION Roles and Responsibilities

The grantee for this proposal is the State of New Jersey.

The development and realization of a project of this scale and magnitude require an uncommon level of coordination of roles and responsibilities.

The team recommends the following: The team recommends that the interrelated responsibilities for the grantee to manage, include:

1

Support the completion of a masterplan, and give a central advisory role to this dynamic masterplan for the Meadowlands, without enshrining it into a legal document. The plan requires continuous adjustment, development, and integration of various projects and parts in the overall spatial framework so as to harvest the benefits promised by adjacency and connectivity that currently remain unrealized within the Meadowlands area. Coordinate this effort with existing projects and plans hosted by the Meadowlands Commission.

2

Support an external project development group to build partnerships and do funding applications for projects within the pilot area or in other locations in the Meadowlands. Measure its performance by (a) the amount of grants and private partnerships created for (b) construction of parts of the project related to the masterplan

3

Steward a process that leads to the approval of conditional zoning changes as described for, among others, the pilot projects described below. The conditionality connects the construction of the berm to the enacting of the zoning change.

4

Task a non-profit land trust entity with the purchase of those slices of land, required for berm construction, that are currently in private hands. Engage this entity to achieve short-term results.

5

Procure teams to put together the permit applications for State and Federal entities, in consistency and collaboration with the dynamically changing masterplan and its team.

Timeline, Trends and Hurdles

The specific responsibilities described above do not all need to be taken up simultaneously. Attached timeline describes when which responsibility needs to be activated.

A primary task is for a task *a core group of planners and designers*, aided by a legal, economic and engineering expert to complete the masterplan. This process should take no more than 6-8 months. At that point, it transforms into the ‘dynamic masterplan’ process by which each successive transformation and opportunity can be integrated back in the overall spatial framework so that the principles of protection, connection, and growth can be effectively achieved.

This team should produce a masterplan report that can be included in the first wave of permit applications.

At the same time, *a core development group* should begin the process of finding private partners and potential state and federal funds to realize additional projects and components of the masterplan. The team recommends that the core development group work in close collaboration with the core planning design group.

Simultaneously, a *public bid for a design/engineering permit application consultant* should be organized so that a few months later, a consulting entity can begin prepare the reports and reviews required to file a permit application for the first pilot project.

Within a few months after the start of this completion process, the *land acquisition entity* should be activated. Here the deliverables include preliminary commitments or agreements by the various private parties, on a small portion of whose properties (partly) the berm/Meadowband will be constructed.

Also at about 3 months after the start of this process, the consultant tasked to prepare the permit application and prepare the design and engineering study, should be hired and start work immediately.

In about 1 year, the complete permit application for the first pilot should be ready. It will contain the complete masterplan, commitments and/or agreements by relevant land owners, a early engineering analysis of the project. This application will then be submitted to the Army Corps of Engineers, which will compile the reviews of other federal agencies.

The implementation for each of the pilots is similar. They can be initiated in a staggered way, so as to take advantage of the inherent delays during the permitting phase to accelerate the pilots. Concretely, at the end of year one, the bids for the second pilot can be organized.

Permitting Hurdles

The team estimates that the project will continue to receive significant support from ecological interest groups as well as federal and state agencies whose task is to uphold laws written to increase ecological protection. This optimism is grounded in the realization that the first pilots contain net increases of marshland and begin to clean up contaminated wetland. The creation of green infrastructure berms (and Meadowband) partially in wetland area may pose a challenge as there are diverging interpretations as to whether such a berm disrupts the wetland. However, the nature of the berms, and the overall offsets within each pilot area, are projected to make up for even the most conservative interpretation. Significant coastal earthmoving will require approval by the Corps of Engineers, and the project’s benefits may only outweigh the costs when looked at beyond the typical 10-year timeframe that the Corps uses to assess projects.

Market Trends

The team also estimates that the project will continue to receive significant support from the business community, because the development opportunities accumulate into a substantial package. In addition, land owners asked to deliver a slice of their property for berm construction, will independently see benefits accrue due to a re-zoning proposal. The real estate market in the Meadowlands has been pointing upward for both residential and supply chain programs. The proposed project relies on the assumption that the region is expected to gain an additional million residents and that some of this growth could be accommodated in the Meadowlands. Additionally, the proposal assumes that demand for logistics, storage, and warehousing will remain strong in the area, especially as these uses become harder to locate in the region due to development pressures. The proposal assumes no strong demand for office space in the area.

Public Opinion Trends

Communities that were flooded during Sandy, such as Little Ferry, are strongly in support of projects that protect them against flooding; however, this level of support could fade as Sandy recedes further in time.

Technical Hurdles

From a technical point of view, there are few major hurdles. The advanced berms discussed in this report have been built elsewhere as well as in the US before. The biggest innovation consists of the manner into which berms, street, recreation, and development are recombined.

Regulatory Hurdles

From a regulatory point of view, there are several aspects. Lower-level zoning changes are important to justify the berm protection investment and need to be subjected to a democratic discussion. The mandate of the Meadowlands Commission and the Trust may need to be examined in order to understand

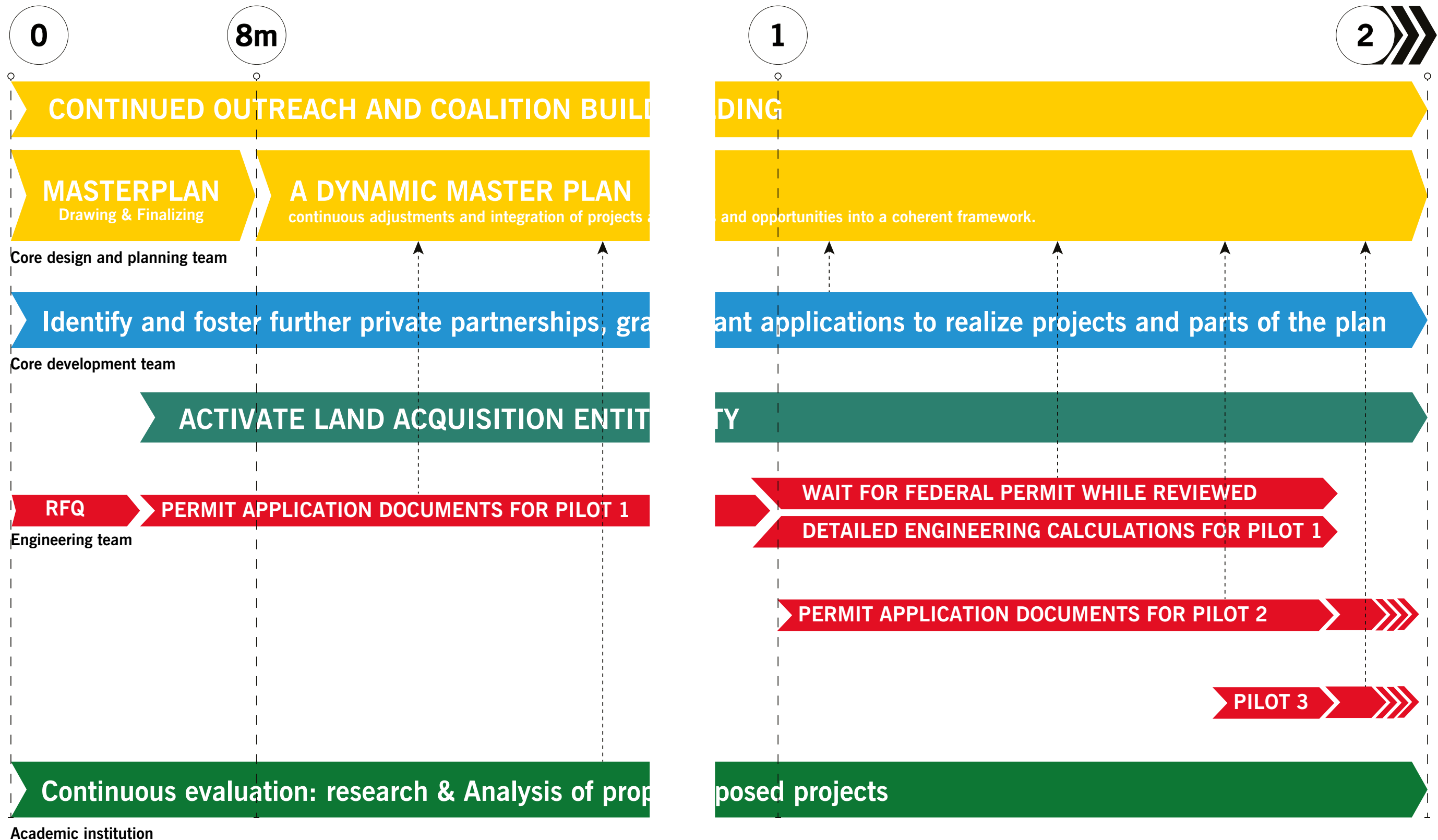
in how far the zoning changes or land acquisitions for the project can be realized within the powers entrusted to these entities. Overall, the proposal is geared to the construction and realization of projects, rather than towards institutional changes. The latter are not a goal. The team estimates that most of the projects can be implemented without great institutional reconfiguration. It does recommend that in parallel to the project dynamic, a conversation about the tax-sharing mechanisms be started.

Climate Change

Intensifying climate change increases the value of the project. For example, the 100-year flood frequency is expected to increase in probability from its current 1.5% chance of happening per year to a 3.2% chance of happening by the 2050s. Because the berm infrastructure takes into account rising sea levels, more intense climate-related events actually cause the project to help avoid further more intense losses.

2014

2016





Pilots

Pilot Area #1

Little Ferry / Moonachie / Carlstadt p.39

Proposal and primary benefits p.39
Rezoning proposal and Secondary benefits p.39
Internal Phasing and Stakeholders p.40

Pilot Area #2

Secaucus / Jersey City p.40

Proposal and primary benefits p.40
Rezoning proposal and Secondary benefits p.40
Internal Phasing and Stakeholders p.40

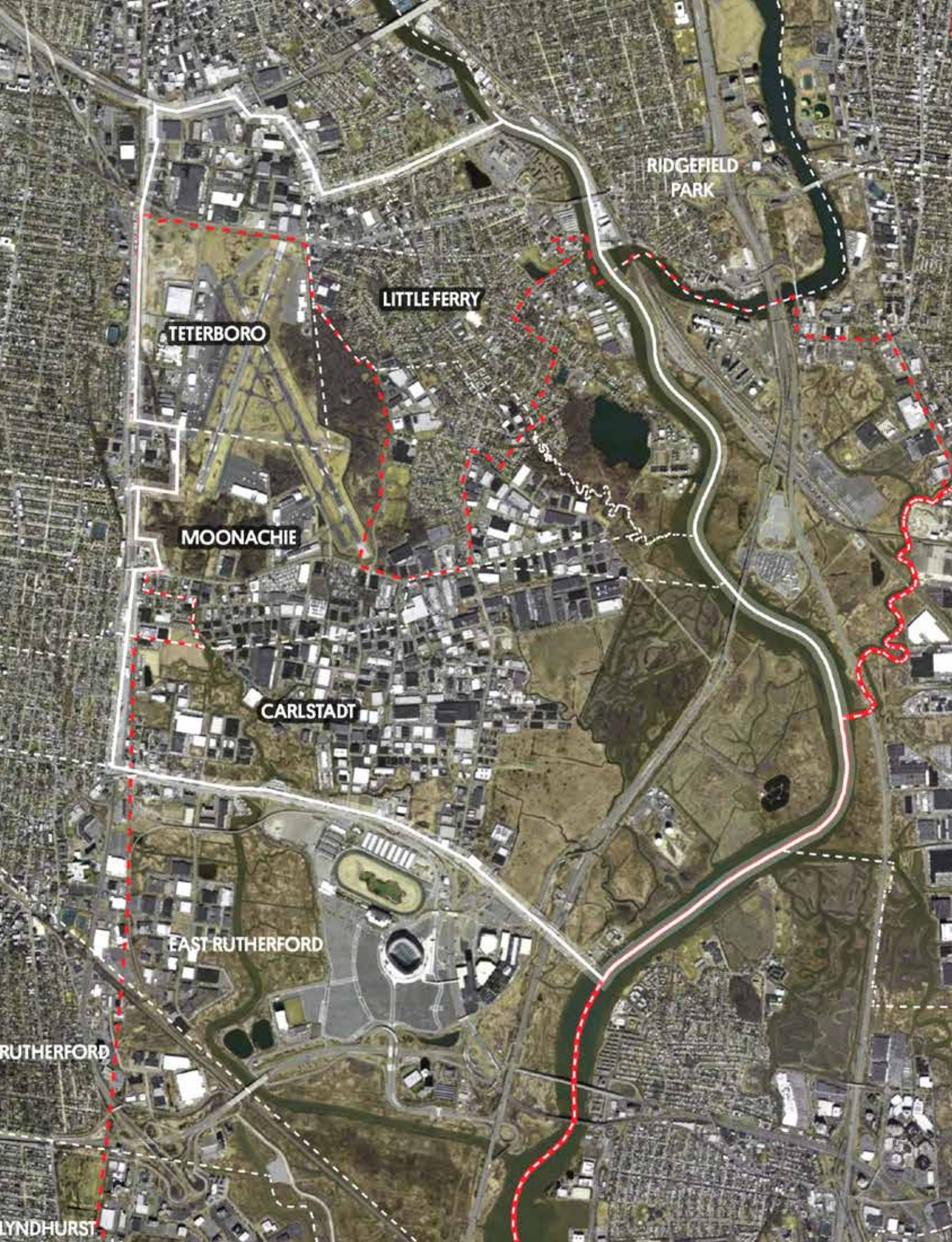
Pilot Area #3

Kearny / Jersey City p.41

Proposal and primary benefits p.41
Rezoning proposal and Secondary benefits p.41
Internal Phasing and Stakeholders p.41

Pilot Area #1

Little Ferry, Moonachie, Carlstadt, Teterboro



Local Risks and Vulnerabilities

The municipalities of Little Ferry, Moonachie, Carlstadt, Teterboro, and South Hackensack together compose the northern edge of the Meadowlands basin. They were severely inundated during Sandy. Even though their location is more than 10 miles from the coastline, they are in a low-lying area of between 3 and 5 feet above the water level, and therefore completely within the flood zone. Flooding affected both warehousing and residential areas equally. In addition, the towns suffer from regular flooding whenever intense precipitation occurs, since the rainwater runoff amounts cannot be handled by their sewer systems. Any future additional development or precipitation increase will increase this risk. The SIRR report foresees precipitation increases in the next decades of up to 11%, including more frequent extreme precipitation events. Finally, ocean flooding has and will continue to come in via among other Berrys Creek, adding a pollution risk. The sediments of the creek have substantial mercury levels, which, when uprooted, could be deposited in adjacent residential areas.

Proposal and primary benefits

The proposal is to build a berm system with associated gates in Little Ferry / Moonachie / Carlstadt (with a sliver of South Hackensack and Teterboro) that will extend ocean surge flooding protection to all five towns. The berm system will chamber off Berrys creek into sep-

arate parts that can be cleaned up successively. The proposal also includes the creation of new freshwater basins, and the expansion and sealing of existing basins (e.g. Sewage plant basin, Indian lake, Little Ferry) within the protected areas, to capture rainwater runoff before and hold it before it, if necessary, gets discharged into the Hackensack.

Executing the proposal in this pilot area will not only extend benefits to these five towns and their critical infrastructures (such as the Little Ferry sewage plant) but in addition also to the other communities in the basin. First of all, roadways through the protected 5 towns will be protected, making the east to west crossing through the Meadowlands possible during an emergency. Second, major precipitation will lead to lower water levels of the Hackensack, since the towns in the pilot area will no longer discharge their rainwater runoff immediately into the Meadowlands basin. Lower water levels benefit surrounding communities. As more pilot areas are realized, this effect will increase.

Rezoning proposal and Secondary benefits

The proposal envisages a rezoning of the warehousing district to actively allow and even encourage multi-story warehousing construction. The parcels immediately adjacent to the residential neighborhood should remain single story. This will enable the town to increase its taxable

income, and create a more dense and efficiently used warehousing district. Second, the proposal suggests to rezone the parcels and blocks immediately adjacent to the outer berm (edging the existing developments) in order to allow for and encourage residential uses and some retail. A string of such developments would connect along the Meadowband. They would be far enough removed from local neighborhoods to be welcome by the latter; and could connect to the main street of Little Ferry where it intersects with the berm.

Internal Phasing and Stakeholders

Planning for the Little Ferry area has included several work sessions with the town leadership and its inhabitants, with input from Meadowlands Commission experts, environmental experts, and local property owners. This effort is far from over, but the contours of the project are now visible.

The pilot area itself is composed of several parts, to be executed together or separately. The first project in the northern pilot area might be the construction of the high berm near the Hackensack, and the outer berm near a series of 6 private properties and the Bergen County Sewer Authority.

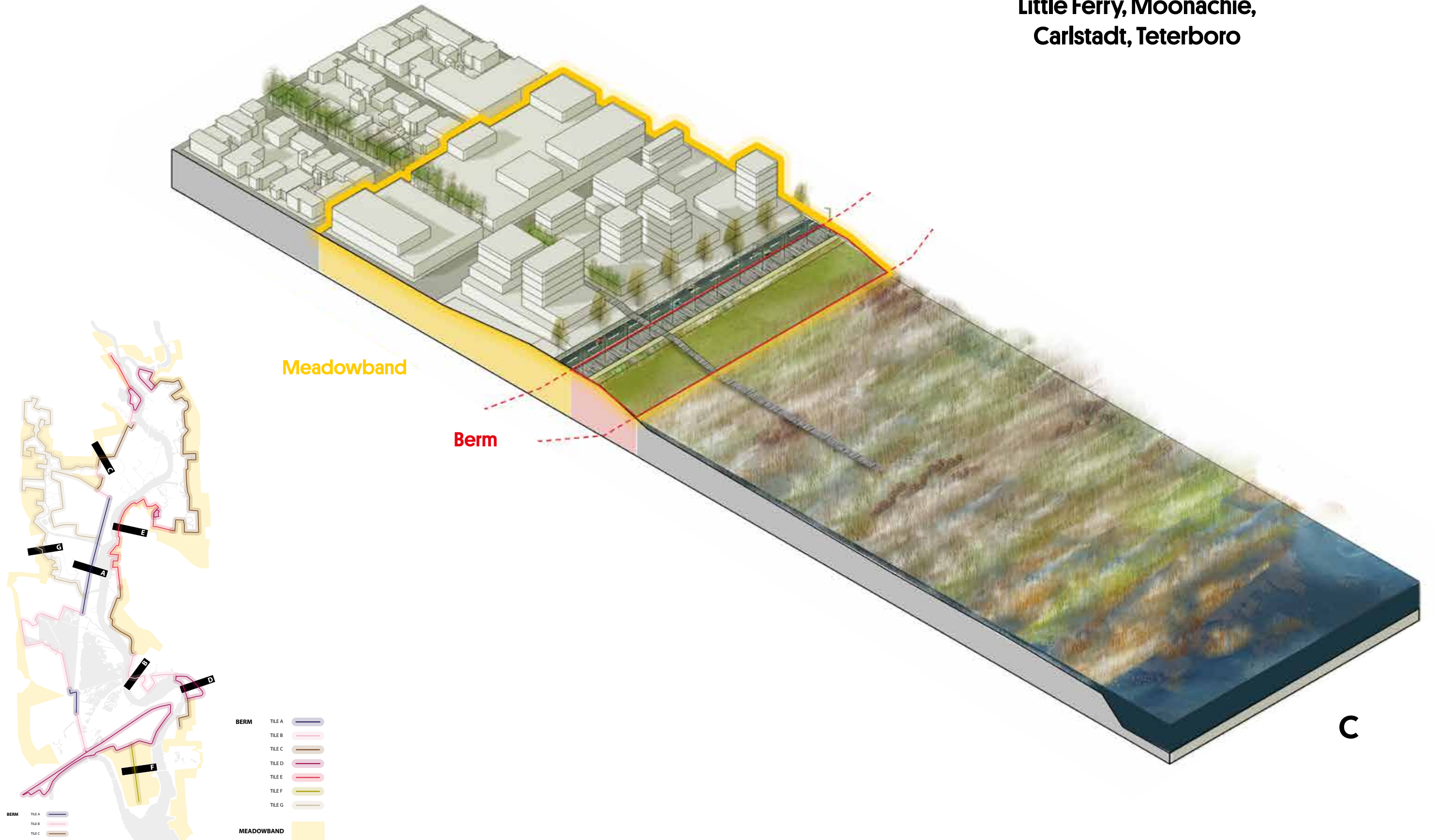
Further work sessions with other property owners, as well as with the Port Authority will be of critical importance in a next phase.

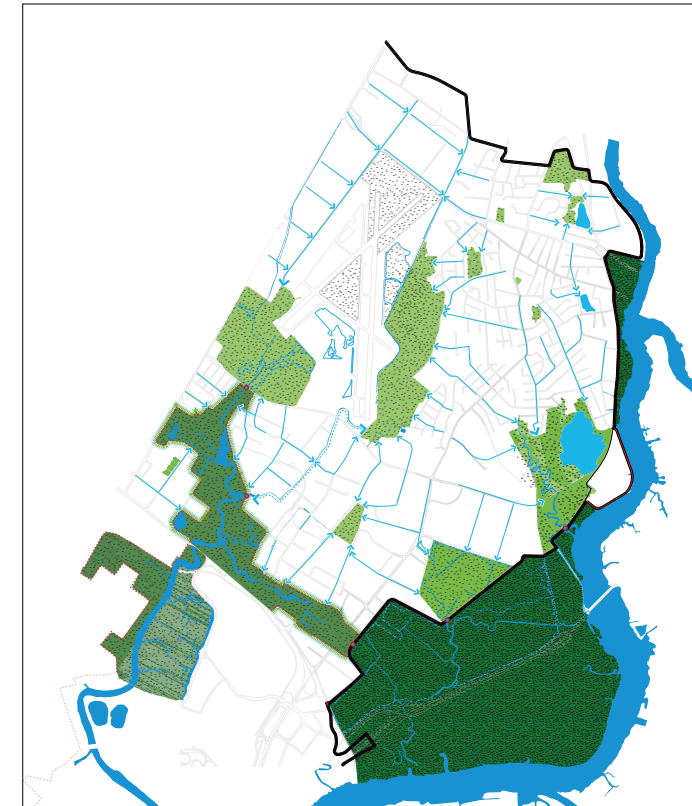
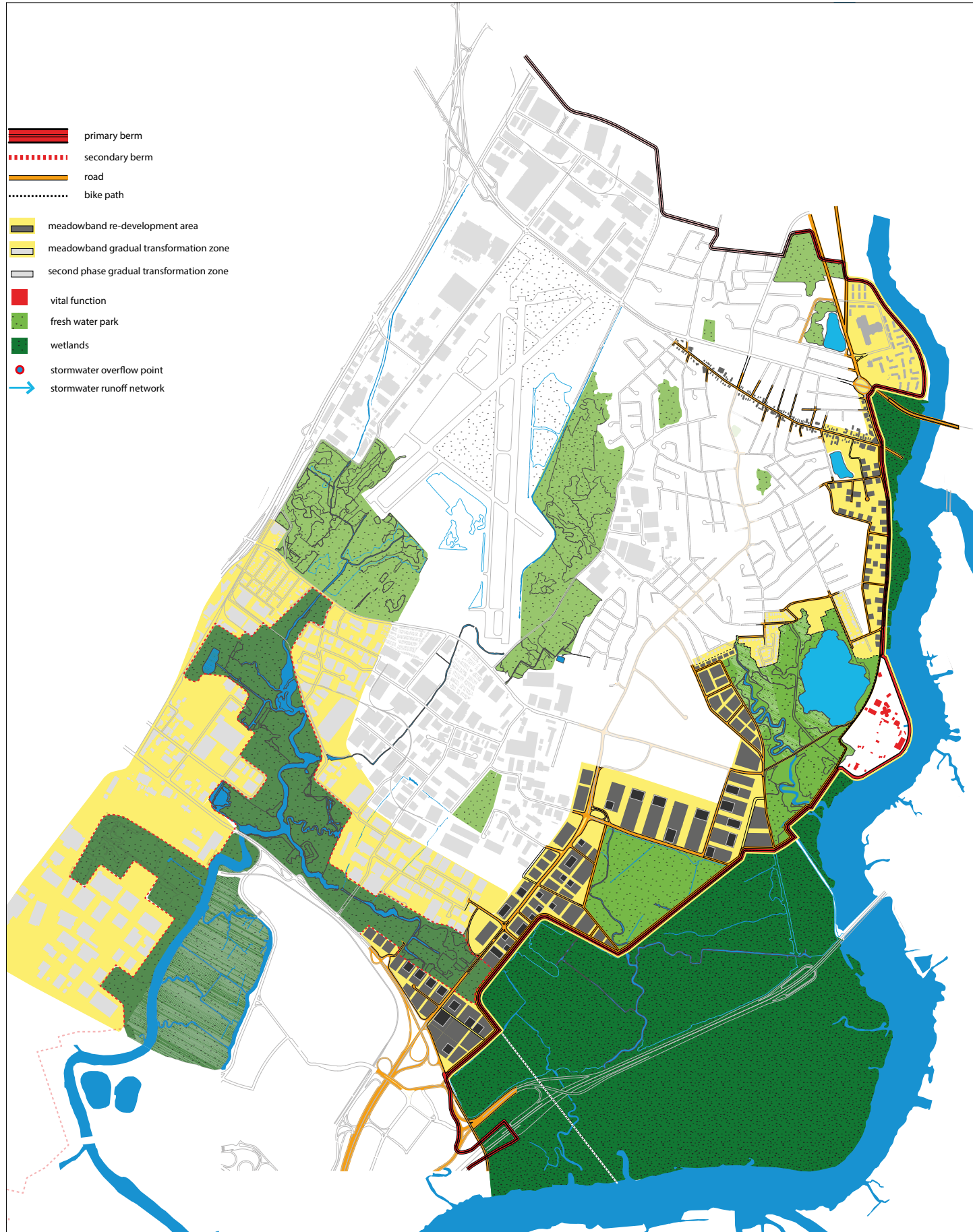
Flood Simulations Without Berm

Flood Simulations With Berm



Typical Section Little Ferry, Moonachie, Carlstadt, Teterboro





**Protect: Berm & Wetland
 and stormwater catchment**



Connect: Meadowband



The Hackensack in Little Ferry near the intersection with Rt. 46 today.

before



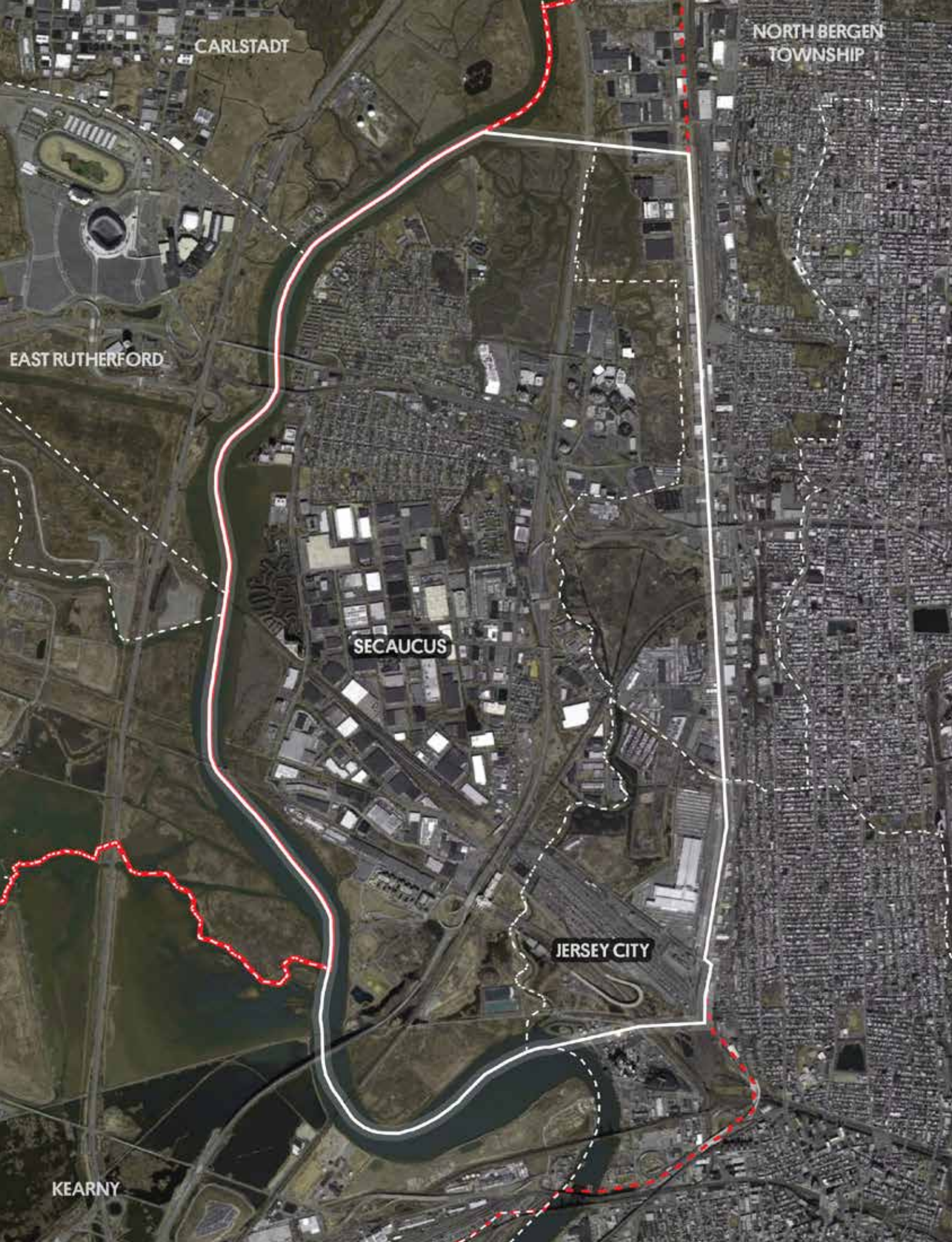
The Hackensack in Little Ferry near the intersection with Rt. 46 after the northern pilot is realized.

after



Pilot Area #2

Secaucus & Jersey City



Local Risks and Vulnerabilities

The towns municipalities of Secaucus and Jersey city together compose the mid-eastern edge of the Meadowlands basin. Although hit less hard by Sandy than some surrounding municipalities, there was still substantial flooding of the residential area along the northern edge, and the warehousing district in the south. There are also regular (springtide-related) ocean flooding, and rainwater flooding problems in Secaucus' warehousing district. Along the southern edge of town, a new residential development is being completed near Lautenberg Station. Although on higher ground, the team estimates that it too will be vulnerable to future ocean flooding events.

The mayor and municipality have been proactive in building out a berm along the northern and eastern edge of the town. This project is not complete.

Proposal and primary benefits

The proposal for this pilot area contains several components. The team proposes to complete and reinforce ongoing efforts to protect the north- and eastern edge. The berm, as well as the alignment of public spaces on top of it, deserves to be built out properly.

The team also proposes to construct and build the Meadowband also along the southern edge. This will be accompanied by an effort to build out further Laurel Hill park and the southern marshes into a watery park. Inside the southern berm/ band, the team strongly recommends the fast accumulation of high-density residential development with low parking ratios, to take advantage of the immediate vicinity of Lautenberg station.

Lautenberg station deserves, more than any other location in the Meadowlands, a high-density residential fabric, because it offers unparalleled mobility and access via mass transit, as no less than 7 lines intersect at the station. For that reason, the team recommends that a study begin about the expansion and reconfiguration of the CSX railroad yard, possibly coupled with an analysis of a deck over the railroad embankment in order to allow the build-out of a transit-oriented district.

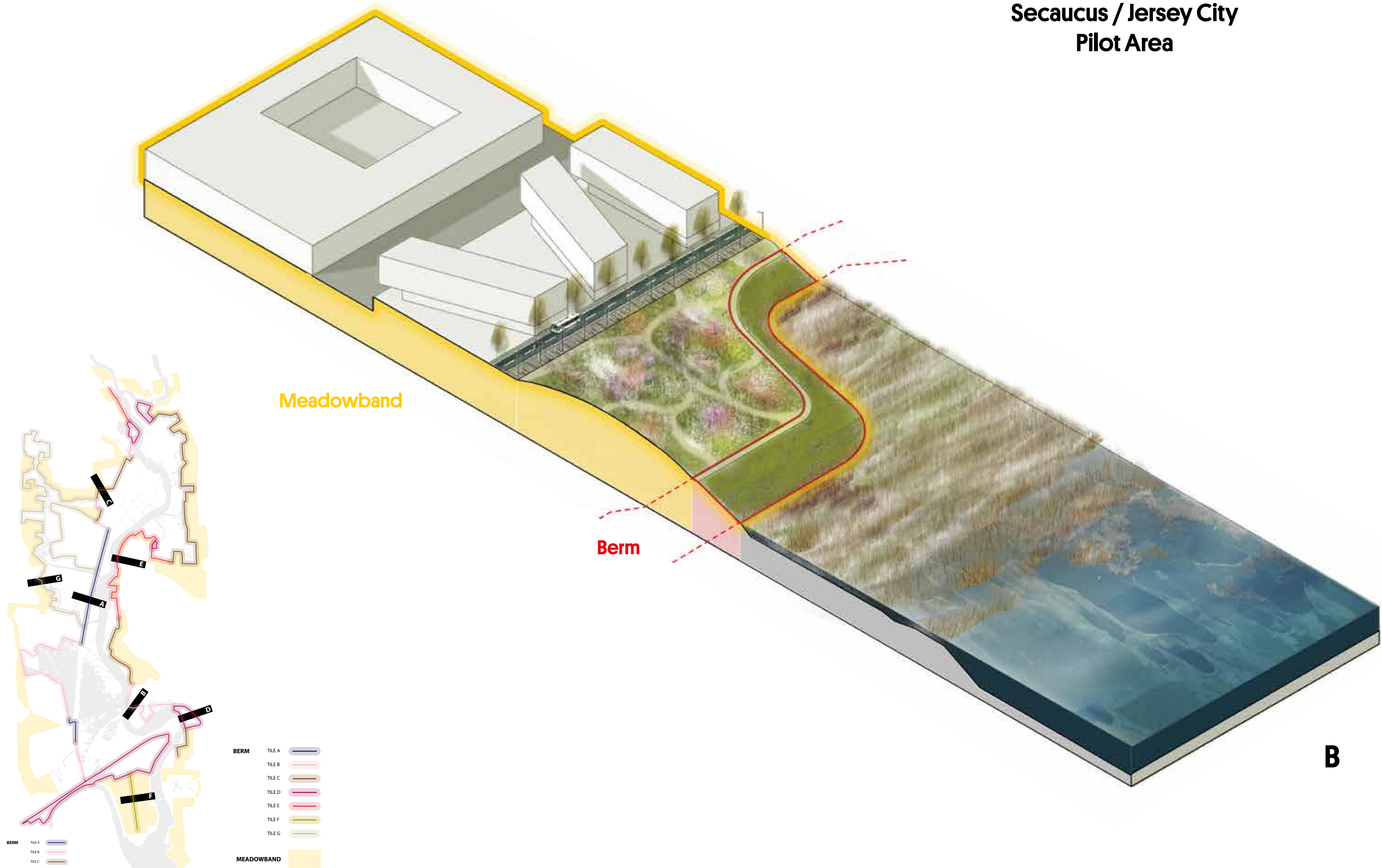
The basin eastward of the historical center of Secaucus and the ridges of Jersey city, currently hosts various small-scale industrial uses. In order to address the rainwater flooding issues, the team recommends the construction of a chain of fresh-water basins to capture runoff from both Jersey City and Secaucus. This would have to be

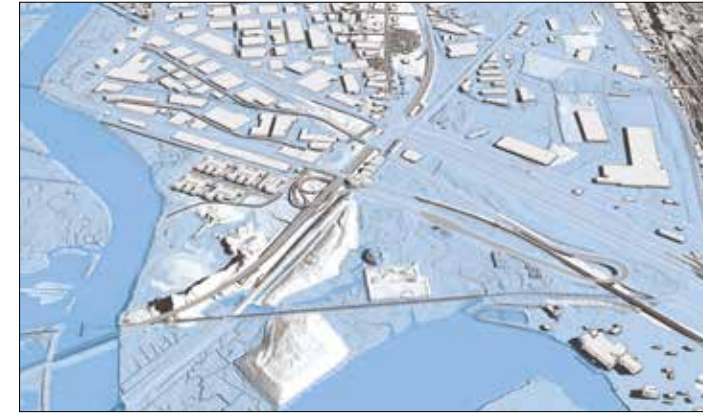
accompanied by an analysis of pollution in this area, and possibly a clean-up effort. Upon completion of the basins, the area will become attractive to residential uses and may witness further investment in neighborhood fabric expansion towards the basins.

Within the warehousing district, the team recommends to increase the zoning in order to allow for and stimulate multi-storey warehousing.

Executing the proposal in this pilot area will not only extend protection from both rainwater and ocean flooding to Secaucus; it will also reduce the water pressures in the Meadowlands basin as a whole, because the rainwater runoff of a substantial watershed will no longer be discharged directly into the basin during an intense precipitation event; but rather will be captured in local basins with substantial capacity. Intelligent gates can then discharge the water once the rain event is over, and overall levels in the basin have dropped.

Secaucus / Jersey City Pilot Area





**Protect: Berm & Wetland
and stormwater catchment**



Connect: Meadowband



safe!



safe again!





Pilot Area #3 Kearny & Jersey City



Local Risks and Vulnerabilities

The municipalities of Kearny and Jersey City have jurisdiction of the western Hackensack, where it is at its widest. The southern Kearny peninsula here is shaped by the confluence of the Hackensack and the Passaic river. This confluence is subject to high-energy water action. At this location, Sandy-type ocean surges enter the Meadowlands. Sandy inundated the South Kearny peninsula completely, while also flooding the low-lying western edges of Jersey City.

There are various projects underway on the Jersey City side, which are beginning to transform and clean up the industrial edge and begin to orient the city towards its western waterfront. The extension of Liberty Park with a wetland and a golf course; and the residential development on the former Honeywell site represent just two of these efforts.

The south-Kearny peninsula is primarily owned by two supply chain developers.

There are plans to raise the ground level of both properties. This will leave the street grid and the adjacent properties at least as vulnerable as today. These properties include a PS&G substation, a juvenile detention center, and a major CSX railroad facility.

Proposal and primary benefits

Efforts to absorb wave energy have positive effects upstream in the basin. For that reason, the team has proposed to avoid a hard edge, but rather install a broad, absorptive edge on both sides.

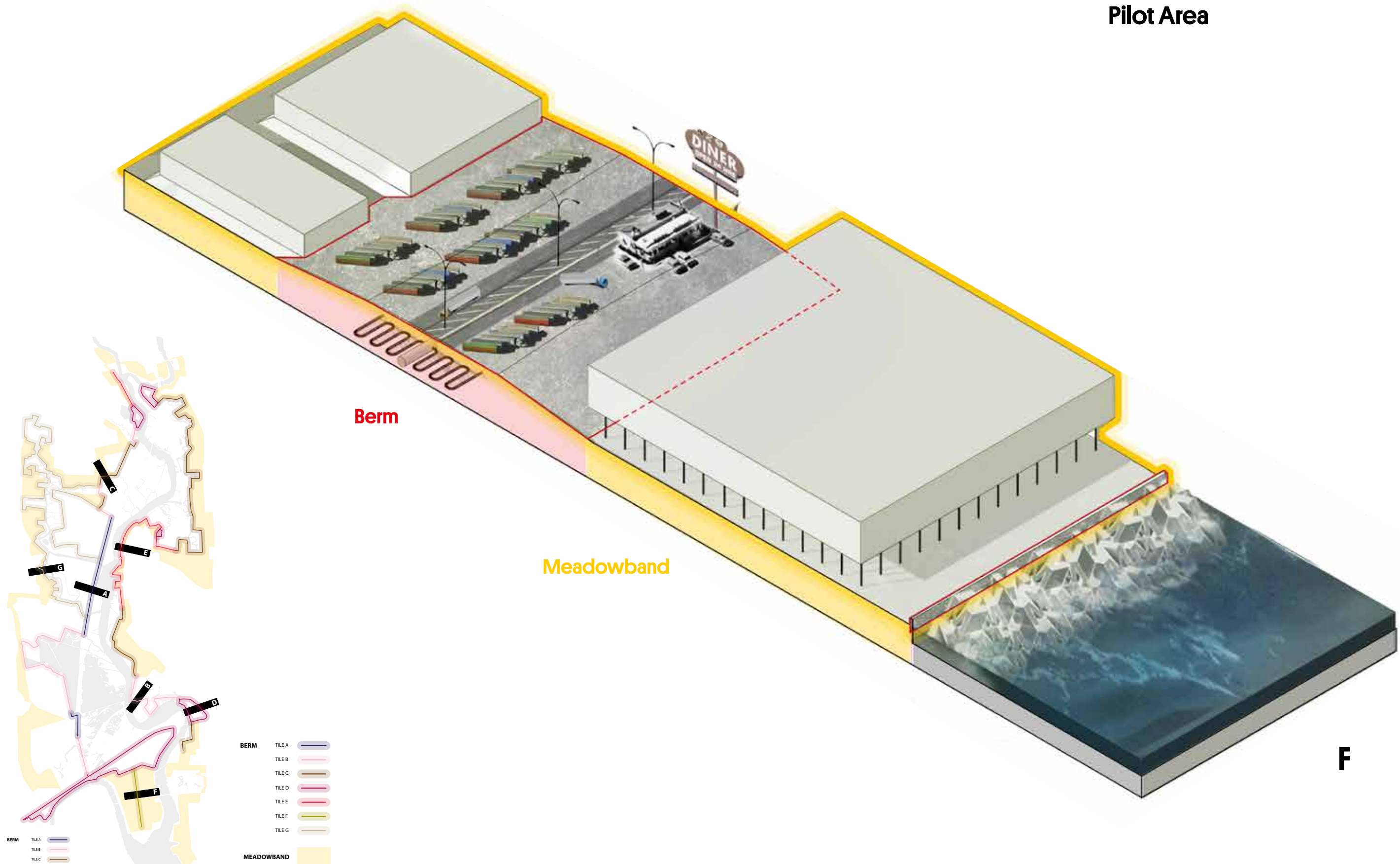
The team recommends that the aforementioned developments continue but be revisited to adjust the design to post-Sandy resiliency standards. This would include the creation of a continuous berm-band (Meadowband) along the waters' edge, ideally on both sides of the Hackensack. At the same time, the team recommends building out the supply chain facilities using 2-story buildings and a state-of-the-art distribution center (in South Kearny), and proposing a mix with new

residential (in Jersey City). Locations for the latter would include a local waterfront strip mall, and any areas around the Path station. Finally, the redesign of Route 4400 – the waterfront road in this area – would deserve to be revisited. High levels of truck traffic impede any future densification efforts, themselves a requirement to make berm and protection investment worth the cost.

Executing the proposal in this pilot area will not only extend benefits to the now protected land; but it will also reduce wave energy and pressure upstream.

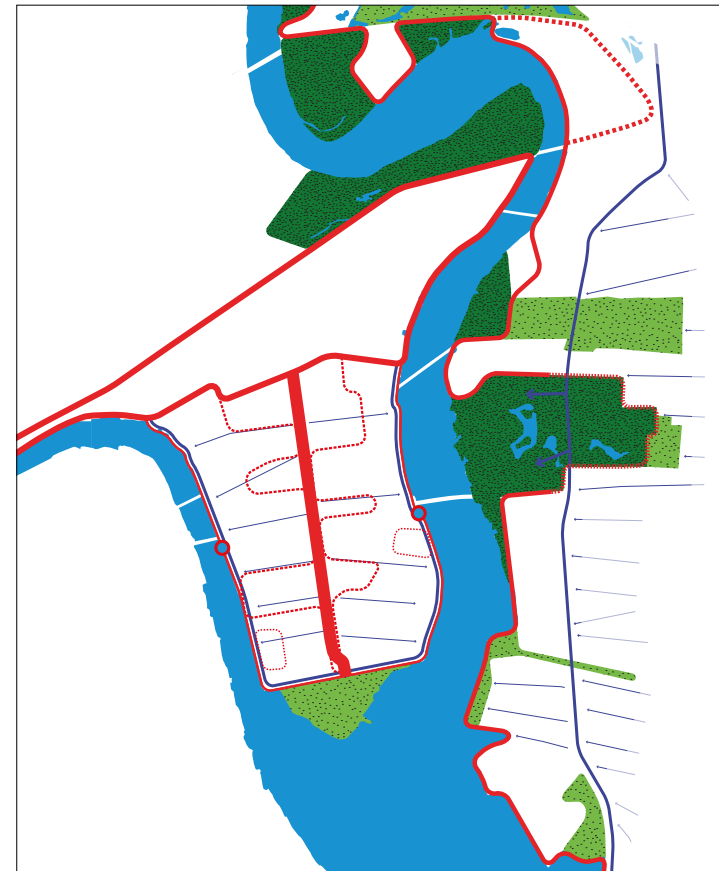
The team has discovered a willingness by private property owners to engage in the conversation; and a concern by the town about losing ratable tax property. We recommend a study early on in the next stage to confirm or deny our assessment that ratable income will in fact increase as a result of the protection project.

Kearny / Jersey City Pilot Area

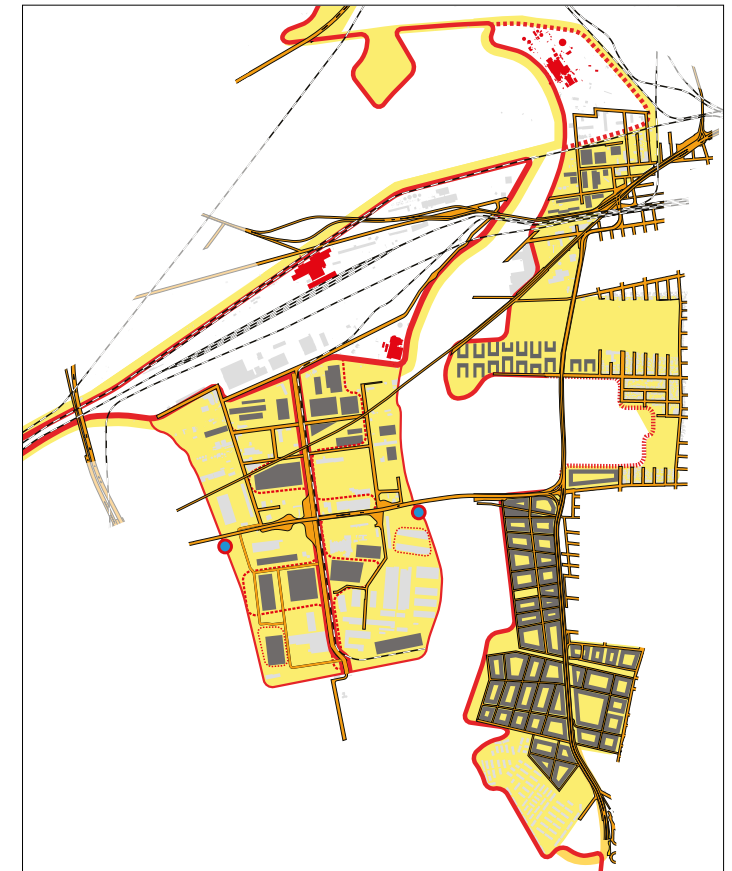




- primary berm
- secondary berm
- road
- bike path
- meadowband re-development area
- meadowband gradual transformation zone
- second phase gradual transformation zone
- vital function
- fresh water park
- wetlands
- stormwater overflow point
- stormwater runoff network

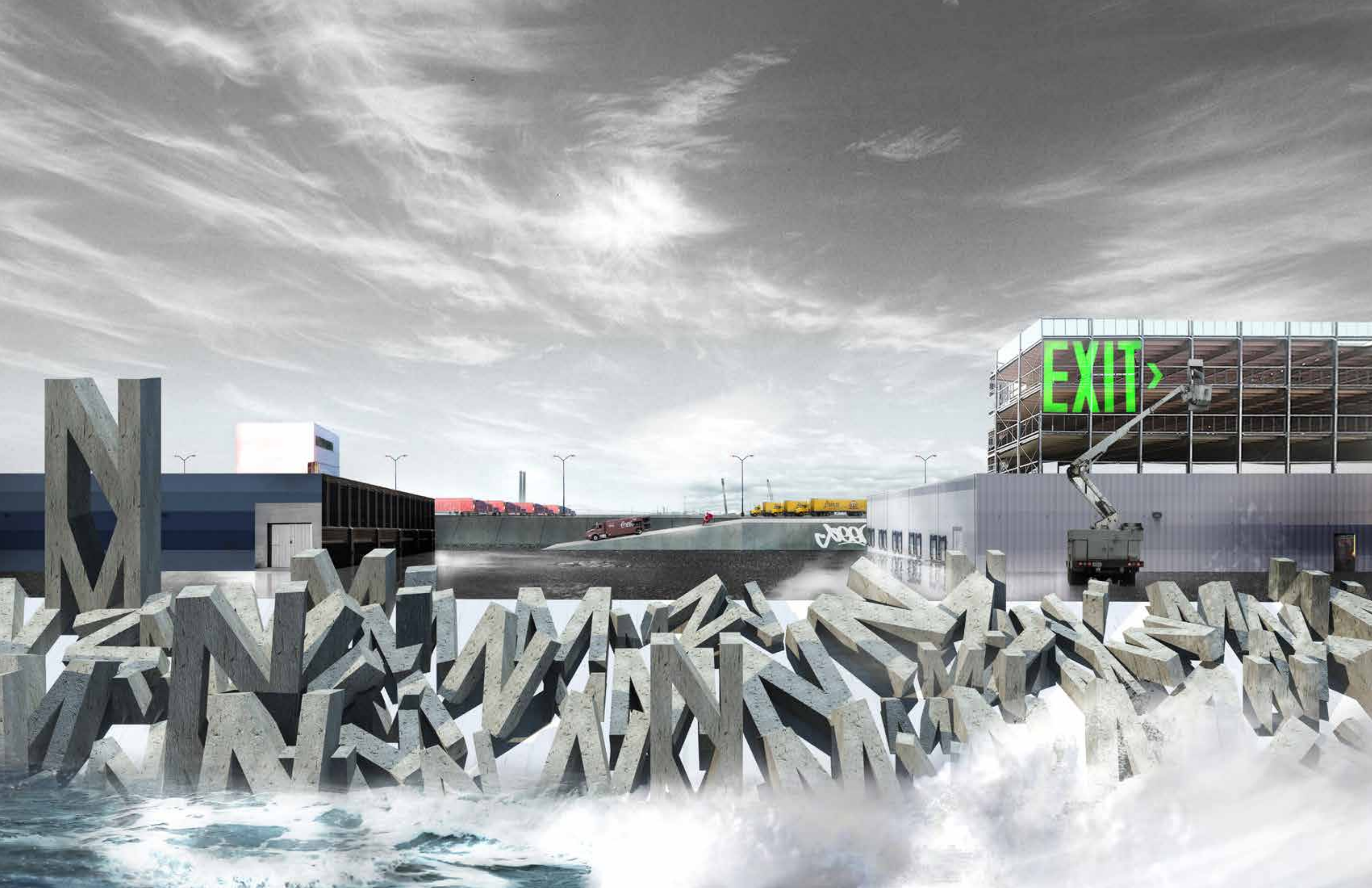


**Protect: Berm & Wetland
and stormwater catchment**



Connect: Meadowband







Costs and Benefits Analysis

Concepts

The team has built out a quantitative cost-benefit analysis (CBA). This analysis has extrapolated numbers for the complete Meadowlands basin proposal. These extrapolations are the result of a detailed study of costs and benefits performed by the team on the northern pilot area (Little Ferry/Moonachie/Carlstadt). The team assumes that CBA for Secaucus and Kearny will yield similar orders of magnitude, because the ingredients of the project – Meadowpark, Meadowband, berms, upzoning – are the same.

The CBA ratio for the northern pilot area has an order of magnitude of 1.7. This is a strong number, and we suspect that as we extrapolate the benefits for the Meadowlands as a whole, this number should grow, because the multiplier effects continue to increase.

The CBA compares costs and benefits of the proposal to a base scenario that includes ongoing efforts at protection (without this proposal). It has assessed weighed risks from the 100- and 500-year flood, as well as from rainwater flooding. Below paragraphs have a breakdown of some of the assumptions built into the cost benefit analysis. In addition, attached sheets have a majority of assumptions sourced per line item. The analysis is built out over a 20-year period with increasing discounts per year into the future.

Base Reference Scenario

The base reference scenario includes all the existing assets, and it assumes that existing plans, such as the restoration of mosquito berms studied by the Army Corps of Engineers for Little Ferry, would be implemented.

This reference scenario has required the quantified build-out of vulnerabilities. These have already been described in chapter 2.1 ‘High-Risk Basin / Meadowlands-specific Risks and Vulnerabilities’, and include vulnerable developed areas, vulnerable natural areas, social vulnerability of neighborhoods, vulnerability of critical infrastructures, pollution points. Each of these have been quantified in terms of value, allowing to then estimate repair costs.

Our reference scenario is defined as a business-as-usual scenario in which long-deferred repairs are made to existing flood-protection infrastructure (ie: long inoperable floodgates within the northern sub-district are rehabilitated) and large environmental issues are cleaned up (ie: Berrys Creek in the northern sub-district is remediated). However, our reference scenario doesn’t foresee any new large-scale protection framework. Additionally, we don’t anticipate any other large-scale public projects that would provide any of the public transit or recreation components of our proposal. We also imagine limited investment in additional wetlands restoration.

As a result, our reference scenario accounts for increased frequency of flooding as a result of climate change and the impact that that flooding has on buildings, relocation needs, clean-up costs, and lost economic production. Because Teterboro Airport is within one of the sub-districts, the reference scenario also accounts for increased flooding and inoperability of the airport

in the days immediately following a flood event. Anticipating no further improvements to flood protection but strong demand for warehouse and residential uses, we anticipate occupancy and development (along with tax revenues) to be consistent with current development and additional projects already in the pipeline.

The reference scenario accounts for benefits that come from, for example, existing wetland habitats within the project area in much the same manner that the yearly habitat, open space, and water quality benefits are accounted for in the proposal scenario.

Detailed numbers for the northern sub-district can be found in the monetized CBA model, but a snapshot is included below:

1,472 acres of existing wetlands provide \$44 million of benefits per year
Berrys Creek cleanup cost is to be specified and is predicted to occur within the next 25 years.

Physical residential damage is expected to be about \$237 million per year for the next 25 years and \$299 million per year for the following 25 years when accounting for all types of rain and flood events as distributed on a yearly likelihood of occurrence and accounting for increased risk in the future
In 2040, industrial value in the sub-district is expected to be reduced by \$7 billion per year to account for relocation after a large flood event (this includes losses relating to wages, revenues, and value added to goods)
Debris removal is expected to cost \$59,000 per year as a result of flood events, with an increase to \$126,000 per year after the first 25 years

Property tax revenue for the five northern sub-district municipalities is expected to remain at a consistent \$71 million per year
Please see monetized CBA for more figures.

Assessment methods

for risks in the base scenario

Estimating the cost of future flood damage within the project area under the reference (business-as-usual) scenario required a calculation of both the likely cost per flood event (100-year, 500-year, rain) and the probability of those flood events occurring. Estimates from the City of New York’s Special Initiative for Rebuilding and Resiliency (SIRR) were used to predict both the height (8ft + 1 ft freeboard, 10 ft + 1 ft freeboard, and 5 ft) and likelihood of the events occurring within a single year (1.5%, 0.3%, 400%). Damage to structures, lost economic activity, and emergency response costs for each type of event were then calculated according to the relevant flood area and height, creating a per-event flood cost. To normalize these flood event costs over the next 50 years, these costs were multiplied by their likelihood of occurring in a single year and summed together. After 2040, higher frequencies (3.2%, 0.6%, 400%) were used to account for climate change’s effect in increasing the frequency and intensity of these events.

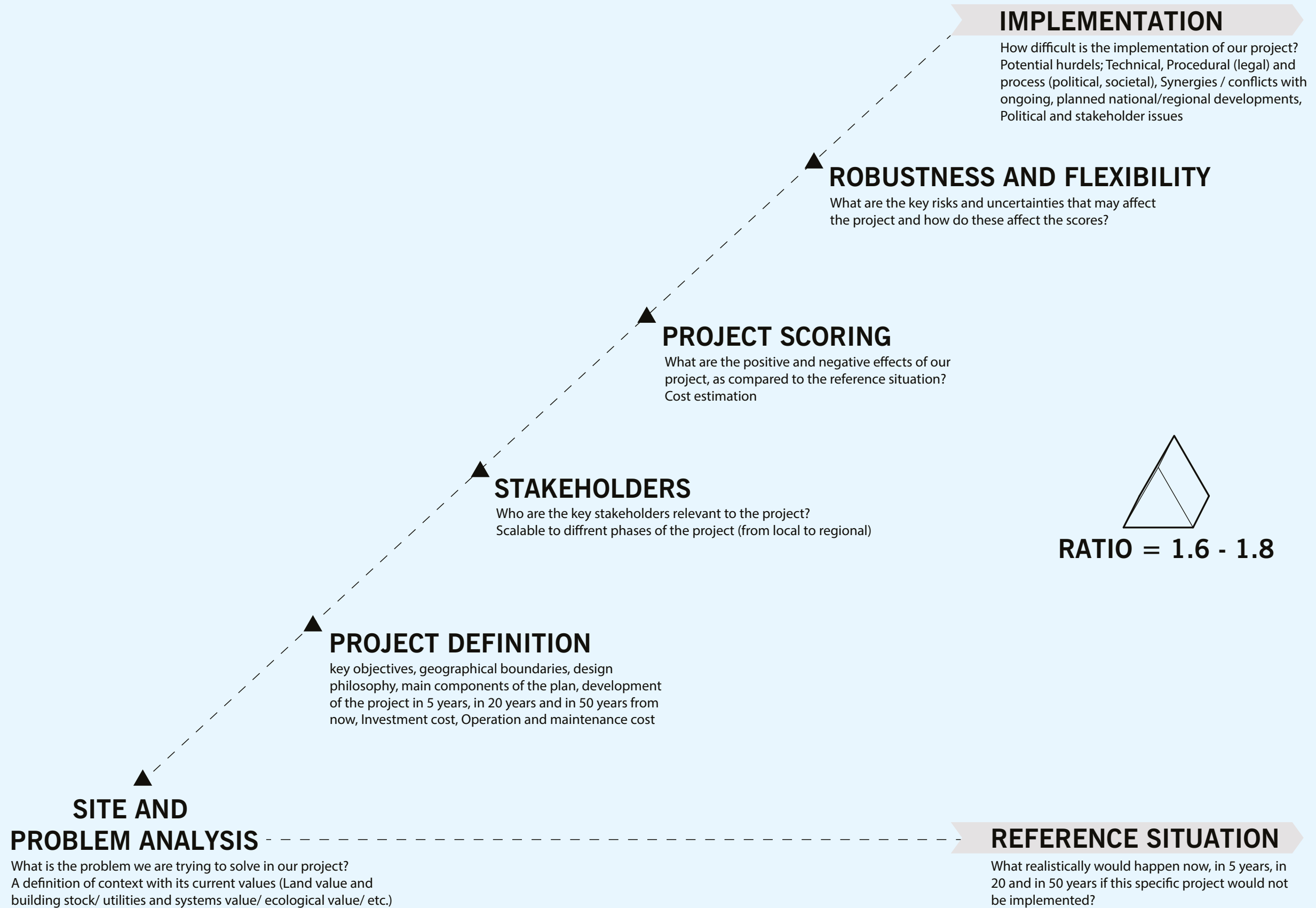
Costs of the proposal

Proposal costs for the northern pilot area are built out in full, and are used to extrapolate for cost estimates for the entire Meadowlands basin. The team estimates that the full cost of for the proposal is just below USD 3.5 billion. It estimates that complete costs over time for the northern pilot project are around USD 570 million. However, but it is important to realize that a number of cost items only kick in during a later phase – e.g. the costs to operate the BRT line. In the first phase, these costs are not in place yet. With such trimming, the cost of the northern pilot is USD 400 million.
Attached is a breakdown of the cost.

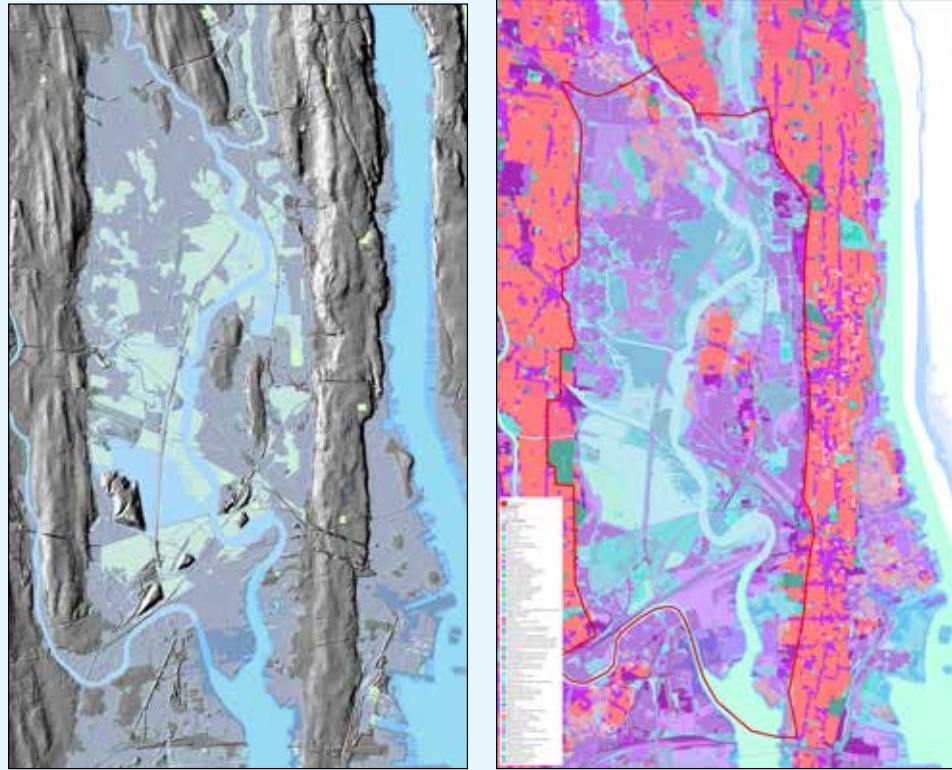
Benefits of the proposal

In the calculation of quantifiable benefits of the proposal, the team has included, among others
Flooding protection: reduces substantially the costs to the landowners over time.
Arrival of new residents: spend locally and grow the local economy.
Increase in Tax Revenue: because the remaining development areas will see increased growth because of increased protection and rezoning.
Property Value Increase: because the realization of the Meadowpark adds value to all adjacent properties
Ecological value: due to the realization of a contiguous natural and recreational reserve, which increases the overall health of the area.
Jobs: not just for construction, but also in building out a broader and more diverse economic basis for the area.

CBA Methodology



OVERALL SCALE Base scenario – CBA / Vulnerabilities



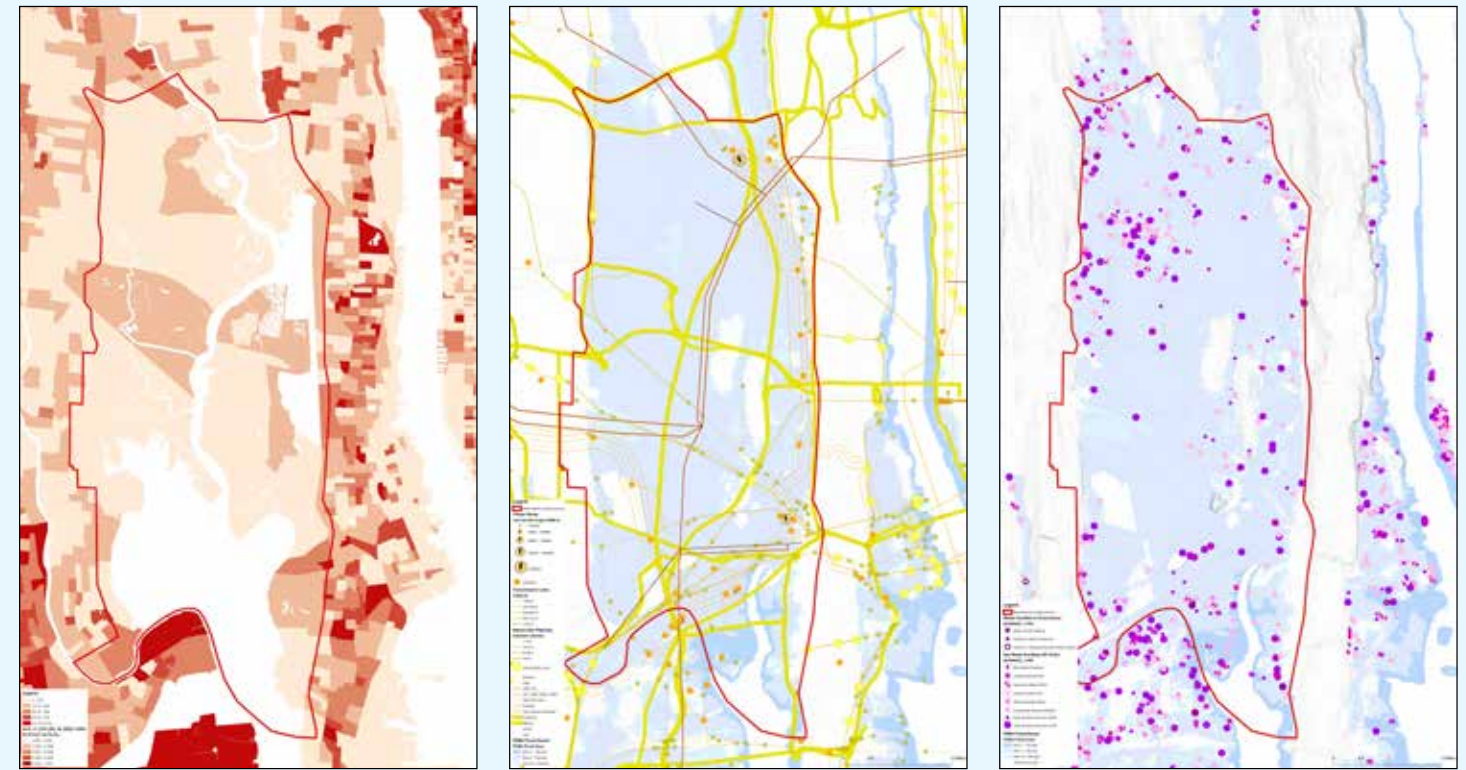
WETLANDS (NJ Land Use 2007)

Overall area = 28,450 acres
 Dryland area = 5214 acres
 Wetland area = 8400 acres (2004 plan);
 4,131.77 acres (GIS category of wetlands
 in Land Use file)
 Downgraded wetland area = 3298 acra
 Historical area of wetland = 20000 acres
 Wetlands lost over the years - In the
 NJMC masterplan they calculate 20,000
 acres (30 square miles) at the end of the
 19th century and 8400 acres (13 square
 miles) today.

LAND USE (NJ Land Use 2007)

Data: NJ Land Use 2007
 Commercial, Industrial and
 Transportation Land:
 10,927.69 acres (38.33% of total area)
 Residential: 1978.84 acres
 (6.94% of total area)
 Wetlands: 4,131.77 acres
 (14.49% of total area)

OVERALL SCALE Base scenario – CBA / Vulnerabilities



SOCIAL VULNERABILITIES (ACS 5 year estimates 2008-2012)

66 Census Block Groups
 85,769 people
 11,294 households with a mortgage (ACS
 5 year estimates 2007-2011)
 Poverty = 9030 people in poverty (10.5%
 of the total population)
 People in the flood zone = 47916
 1.79 mean SOVI
 59 out of 66 block groups have positive
 SOVI values (18 above 3.0)
 Jobs in the study area = The Meadow-
 lands region is a major center of economic
 activity in New Jersey. It is home to 9,322
 business establishments that employed
 over 154,000 workers in 2005. 93% of
 these businesses employ fewer than 50
 workers, and 56% employ fewer than 5.

INFRASTRUCTURE (PLAtts 2008)

3 power plants
 PSEG Hudson Generating Station
 (fuel: bituminous coal, 2.127 million
 megawatt hours of energy)
 Bergen Generating Station
 (fuel: natural gas, 4.947 million
 megawatthours of energy)
 PSEG Kearny Generating Station
 (fuel: natural gas, 0.21 million
 megawatthours of energy)
 21 substations
 49 transmission lines
 17 natural gas pipe lines
 5 metro nodes
 (NJ Transit and PATH Trains)
 Rail yards (2661 acres of logistics – trans-
 portation/communications + railroads)
 Airport: Teterboro (197.25 acres)
 108.23 miles of rail lines
 107.6 miles of highways
 257.7 miles of roadway

POLLUTION (EPA Interests 2013)

110 brownfield locations (US EPA)
 87 Large Quantity Generators
 Landfills: 1392 acres
 (2 open and 13 closed)
 7 Superfund sites on the National
 Priority List (NPL)

OVERALL SCALE Key Qualitative Assumptions

Property value

Properties directly adjacent to park space increase in value by 5%
Properties within ¼ mile of BRT increase in value by 5%

New Residents

1 school-aged child per 10 unit (multi-family)
1.8 residents per unit (vs. current size of 2.6)

Density

FAR 3 for new residential areas
FAR 1 for redeveloped and new commercial development.

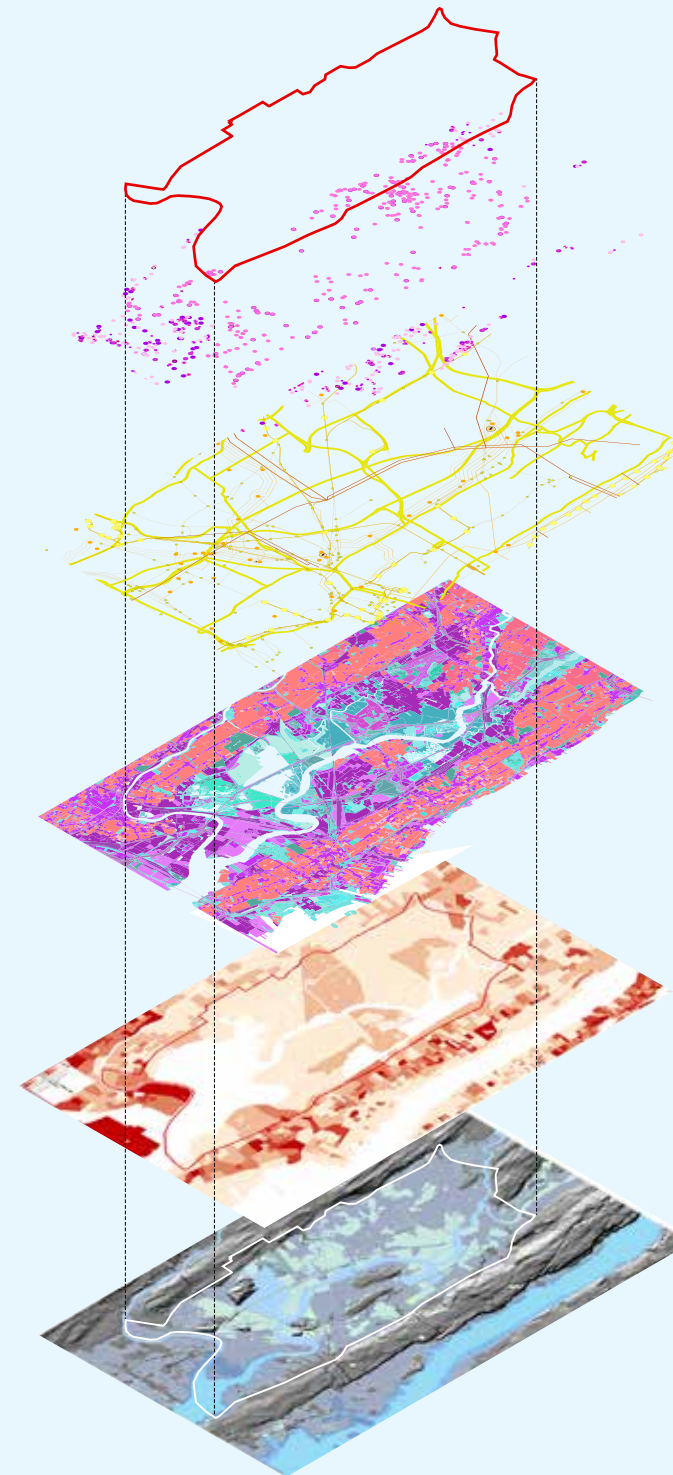
Jobs

1 job per 4,000 sq ft of new commercial development

Flood probabilities and intensities

TODAY: 100-year flood | 1.5% likelihood per year | 8' above sea level + 1' freeboard
TODAY: 500-year flood | 0.3% likelihood per year | 10' above sea level + 1' freeboard
TODAY: "Intense Precipitation" event | 20% - 400% likelihood per year | 4'
Today's probabilities would double towards the year 2050 (taking into account SLR)

OVERALL SCALE Base scenario – CBA / Costs & Losses



Public health

Polluted sediment disturbance is a regional health hazard.

Transport

Movement of goods are at constant risk of being cut off from the region.

Energy

3 power plants and 21 substations remain at risk of flood-related damage and interruption.

Land Use

\$2 billion of physical damage will occur from inundation of the district's residential, commercial, and industrial structures every year.

Social Vulnerability

\$1 billion worth of salaries from commercial and industrial jobs within the district are likely to be lost in the long term as a result of flooding vulnerability.

OVERALL SCALE
New Meadowlands – CBA / Benefits

FLOOD PROTECTION

Physical damage to structures avoided per year: \$124 million

HEALTH

Health value of recreation space for the current population of residents: \$13.5 million per year

WETLANDS

Value of new wetlands: \$31,086,380 per year

ACCESS

Value of new recreation space in proximity to current residents: \$165,000 per year

OVERALL SCALE
New Meadowlands – CBA / Benefits

NEW RESIDENTS

Overall proposed 60,000 new residential units = 117,000 new residents

JOBS

Overall proposed 39,000,000 new commercial and Industrial sqft. = 10,000 new jobs

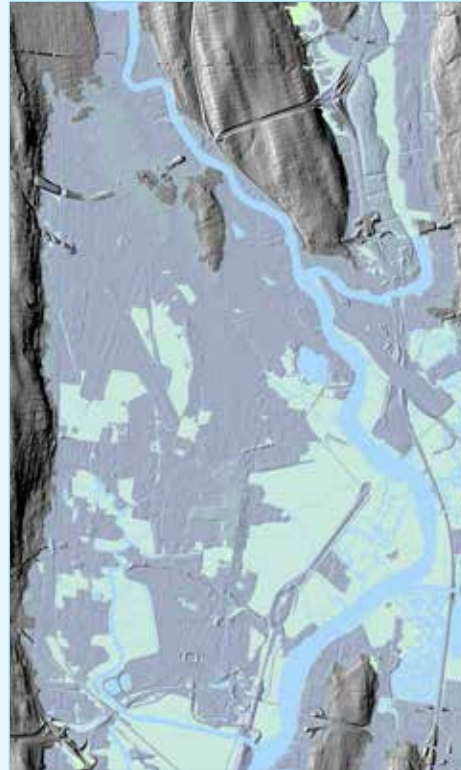
NEW DEVELOPMENT

Net value for new construction of residential and commercial development amounts to \$75 billion.

TAX REVENUE

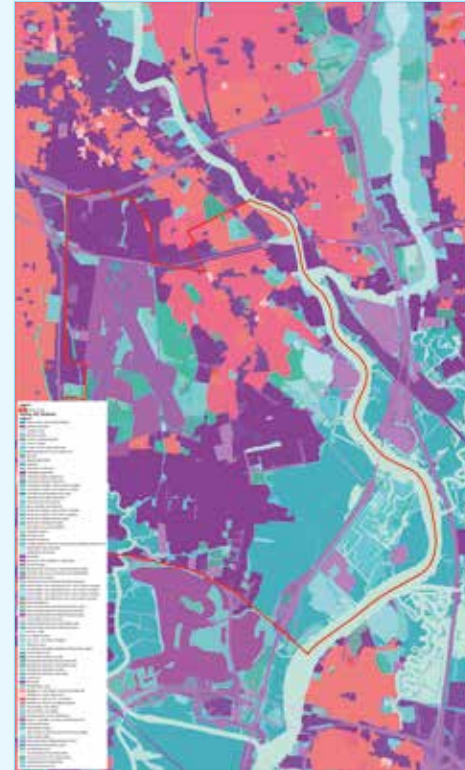
The area could expect an increase in tax revenue totaled at \$2.25 billion

NORTHERN PILOT SCALE – CBA Bese scenario - Vulnerabilities



HS_WETLANDS
(NJ Land Use 2007)

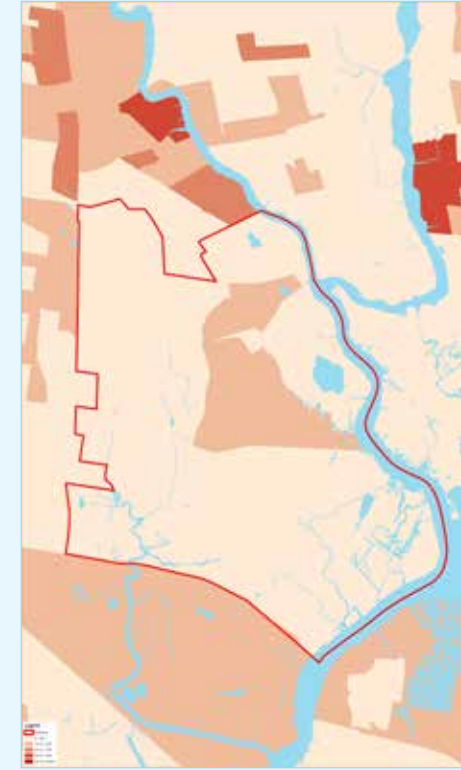
Overall area = 5198.65 acres
 Dryland area = 2139 acres
 Wetland area = 1404.3 acres
 Downgraded wetland area = 865 acres



LAND USE
(NJ Land Use 2007)

Commercial, Industrial and Transportation
 Land: 1857.51 acres (35.73% of total area)
 Residential: 253.08 acres (4.8% of total area)
 Wetlands: 1404.3 acres (27.01% of total area)

NORTHERN PILOT SCALE – CBA Bese scenario - Vulnerabilities



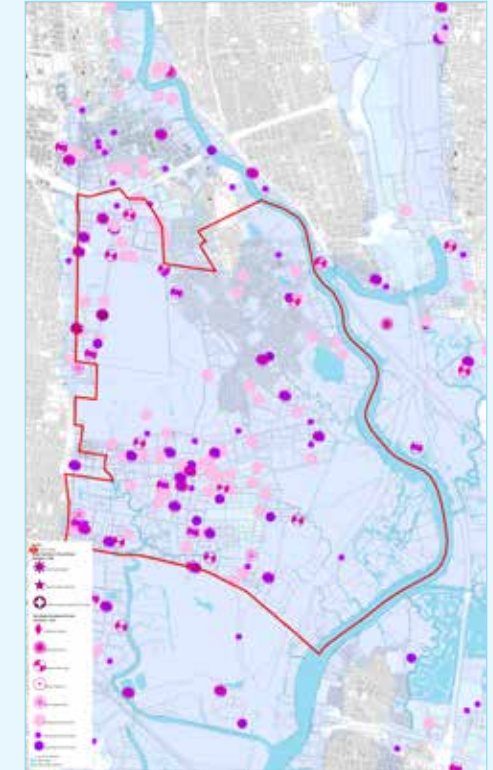
HS DEMOGRAPHIC
(ACS 5 year estimates 2008-2012)

10 Census Block Groups
 10,944 people
 2285 households with a mortgage
 (code: B25081e1)
 Poverty = 688 people in poverty
 (6.4% of the total population)
 (code: B17021e2)
 People in the flood zone = ?
 0.828 mean SOVI
 9 out of 10 block groups have positive
 SOVI values (though 0 above 3.0)



HS INFRASTRUCTURE
(PLAtts 2008)

0 power plants
 0 substations
 3 transmission lines
 6 natural gas pipe lines
 Logistics not including Teterboro
 (145 acres of logistics – transportation/
 communications + railroads)
 Airport: Teterboro (197.25 acres)
 3 miles of rail lines
 9.2 miles of highways
 56.15 miles of roadway



HS POLLUTION
(EPA Interests 2013)

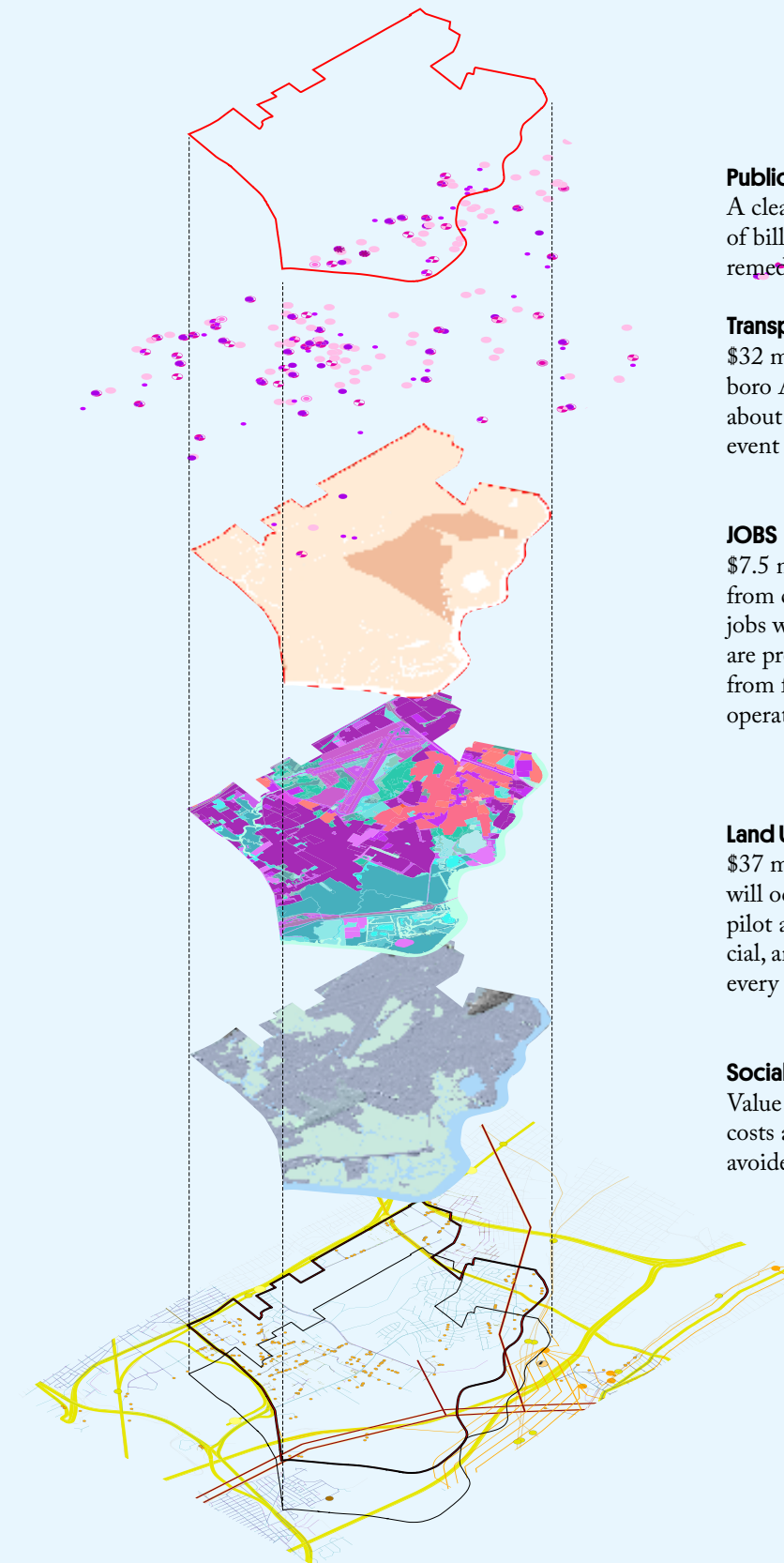
43 Locations on the Toxic Release
 Inventory (TRI)
 29 Large Quantity Generators
 3 Superfund sites but not on the National
 Priority List (NPL)

NORTHERN PILOT SCALE – CBA

Base scenario - The cost of being at risk

Cost of Flooding // TODAY	100-Year Flood Event	500-Year Flood Event	Rain Event	Per Year (by probability)
Physical Residential Building Damage	\$ 141,371,612	\$ 168,275,814	\$ 48,298,910	\$ 12,285,184
Residential Relocation Costs	\$ 5,978,711	\$ 5,978,711	\$ 2,663,747	\$ 640,366
Physical Commercial/Industrial Building Damage	\$ 163,220,698	\$ 244,831,047	\$ 107,340,706	\$ 24,650,945
Commercial Revenue Lost	\$ 22,958,650	\$ 22,958,650	\$ 22,158,298	\$ 4,844,915
Total Salaries Lost	\$ 1,949,913	\$ 1,949,913	\$ 1,881,938	\$ 411,486
Lost Airport Economic Value (jobs, revenue, etc)	\$ 31,964,382	\$ 31,964,382	\$ -	\$ 575,359
Debris Removal Costs	\$ 3,295,259	\$ 3,295,259	\$ -	\$ 59,315
TOTAL	\$ 370,739,226	\$ 479,253,776	\$ 182,343,598	\$ 43,467,569

Cost of Flooding // 2050s	100-Year Flood Event	500-Year Flood Event	Rain Event	Per Year (by probability)
Physical Residential Building Damage	\$ 154,823,713	\$ 179,112,228	\$ 58,158,473	\$ 17,732,372
Residential Relocation Costs	\$ 5,978,711	\$ 5,978,711	\$ 2,663,747	\$ 762,332
Physical Commercial/Industrial Building Damage	\$ 203,076,915	\$ 257,357,287	\$ 143,609,408	\$ 36,867,430
Commercial Revenue Lost	\$ 22,958,650	\$ 22,958,650	\$ 22,158,298	\$ 5,313,272
Total Salaries Lost	\$ 1,949,913	\$ 1,949,913	\$ 1,881,938	\$ 451,264
Lost Airport Economic Value (jobs, revenue, etc)	\$ 31,964,382	\$ 31,964,382	\$ -	\$ 1,227,432
Debris Removal Costs	\$ 3,295,259	\$ 3,295,259	\$ -	\$ 126,538
TOTAL	\$ 424,047,544	\$ 502,616,430	\$ 228,471,864	\$ 62,480,639



Public health
A cleanup cost in the magnitude of billions will need to be spent to remediate Berrys Creek

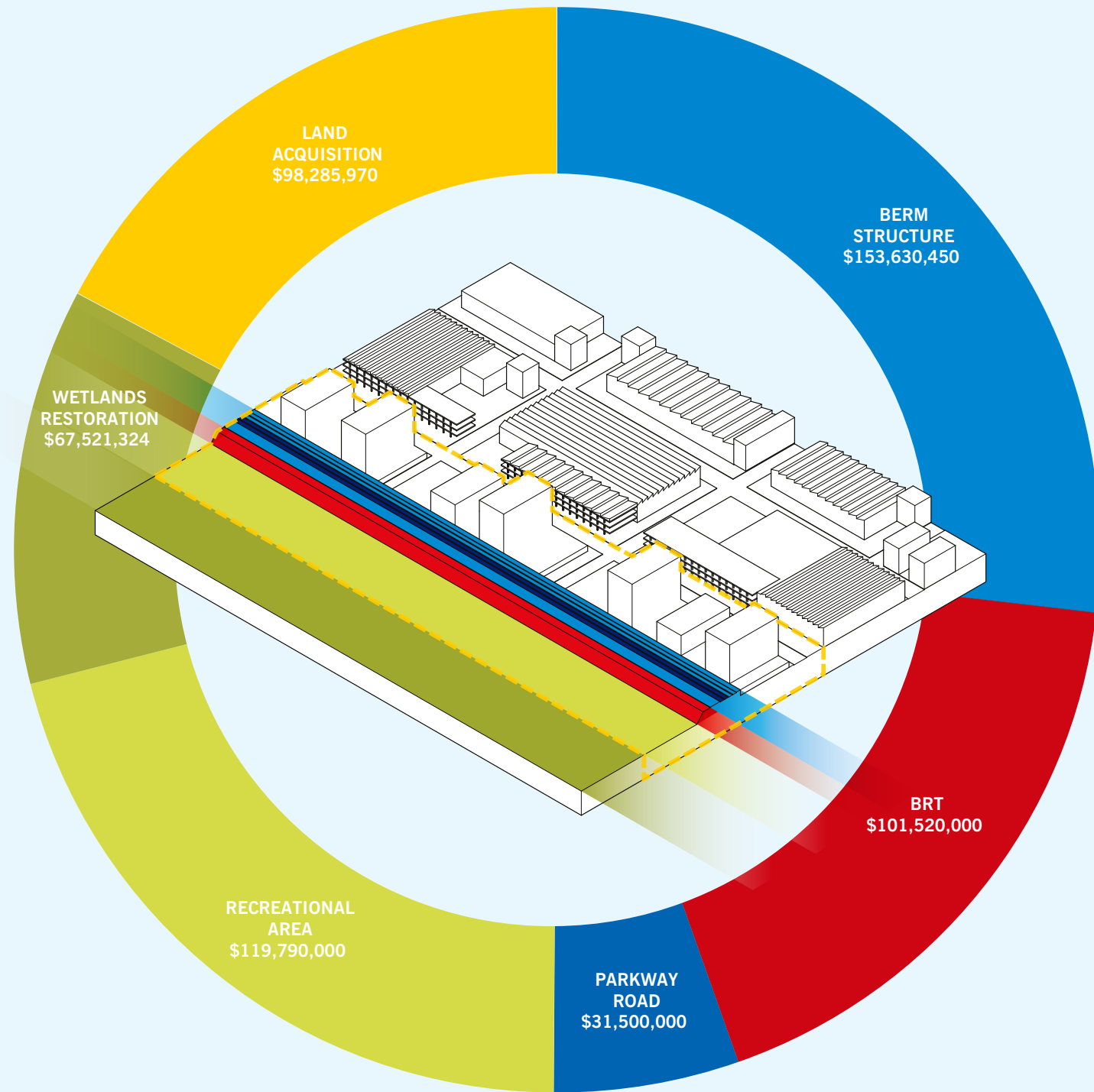
Transportation
\$32 million is lost when Teterboro Airport ceases operation for about 3 days per 100-year flood event

JOBS
\$7.5 million worth of salaries from commercial and industrial jobs within the pilot project area are predicted to be lost every year from flood-related days out of operation.

Land Use
\$37 million of physical damage will occur from inundation of the pilot area's residential, commercial, and industrial structures every year

Social Vulnerability
Value of economic loss, relocation costs and cleanup expenditures avoided per year: \$5,956,082

NORTHERN PILOT SCALE – CBA / COST



COSTS

	Miles/Acres	Cost per mi/per acre	Cost	Maintenance per year
Berm structure	9	\$ 17,070,050	\$ 153,630,450	\$ 325,891
BRT	9	\$ 11,280,000	\$ 101,520,000	\$ 720,000
Parkway Road	9	\$ 3,500,000	\$ 31,500,000	\$ 94,500
Recreational Area	55	\$ 2,178,000	\$ 119,790,000	\$ 359,370
Wetlands Restoration	717	\$ 94,172	\$ 67,521,324	\$ -
Land Acquisition			\$ 98,285,970	\$ -
Total			\$ 572,247,744	\$ 1,499,761

Northern Pilot scale CBA - Benefits

FLOOD PROTECTION

Physical damage to structures avoided per year: \$37 million

HEALTH

Health value of recreation space for the current population of residents: \$3.3 million per year.

WETLANDS

Value of new wetlands: \$5,290,928 per year

ACCESS

Value of new recreation space in proximity to current residents: \$41,175 per year

Northern Pilot scale CBA - Benefits

NEW RESIDENTS

Overall proposed 14,414 new residential units = 25,674 new residents

JOBS

Overall proposed 9,716,455 new commercial and Industrial sqft. = 2429 new jobs

NEW DEVELOPMENT

Net value for new construction of residential and commercial development amounts to \$19 billion.

TAX REVENUE

The area could expect an increase in tax revenue totaled at \$561,760,390 Million

Implementation – Permitting & Approval Process

1. Project Definition

A key decision in regards to the scale of the projects would have a significant impact over the approval schedule and the time frame for implementation.

2. Approving Agencies

Identify the full range of agencies that will need to issue approvals:

- HUD and other federal sponsors
- State and local sponsors
- US Army Corps of Engineers
- US Fish & Wildlife Service
- NOAA
- EPA
- NJ Dept of Env Protection
- NJ Meadowlands Commission
- Local agencies

In consultation with AKRF

3. Environmental Review

The project must meet the requirements of the various approving agencies.

Review may be lengthy - but should be accelerated where urgency is found. Agency policies with respect to environmental issues may be in conflict. Potential for public opposition needs to demonstrate resiliency effectiveness through comprehensive modeling and testing. Need to develop mitigation: consensus on form and function of offsets impacts. Consensus on mitigation ratios (NJDEP, USACE, USFWS, USEPA, NJ Meadowlands Commission, NMFS, and other stakeholders).

4. Permitting

Need for specific project details. Shift in regulatory paradigm might be necessary in order to allow a project of this magnitude and scale of impacts. Consensus on phased permitting of large-scale changes in landscape - USACE, NJDEP, NJ Meadowlands Commission.

Master plans comparison

Hackensack Meadowlands Comprehensive Land Use Plan



1970

- District is 20 times as large as Central Park
- 1000 acres of public park and 500 acres of commercial recreation space
- build new residential islands in wetlands area
- 1,500 acres of marshland conservation, 4300 acres of commercial development
- proposes various flood control mechanisms, such as levees and tidal gates
- recommended elevation of new land 10 feet above mean sea level
- 70,000 units of residential development
- 23 million sq ft of commercial/office space
- 90 million sq ft of industrial/warehouse space

Special Area Management Plan (SAMP)



1995

- Summary of growth needs (p. 1-21)
- Residential: 14,000 housing units
 - Primary Office: 18.0 million square feet
 - Secondary Office: 6.3 million square feet
 - Warehouse/Distribution: 9.0 million square feet
 - Commercial: 2.5 million square feet
- less than one page devoted to flood control issues and management
 - core goal to preserve, restore and enhance natural resources
 - 749.8 acres of wetland fill
 - 1688.9 acres of total development proposed in planning and satellite areas
 - 17.75 million sq ft of offices, 2.7 million sq ft of commercial and 13.9 million sq ft of residential
 - 40 dwelling units per acre proposed in Carlstadt

New Jersey Meadowlands Commission Master Plan



2004

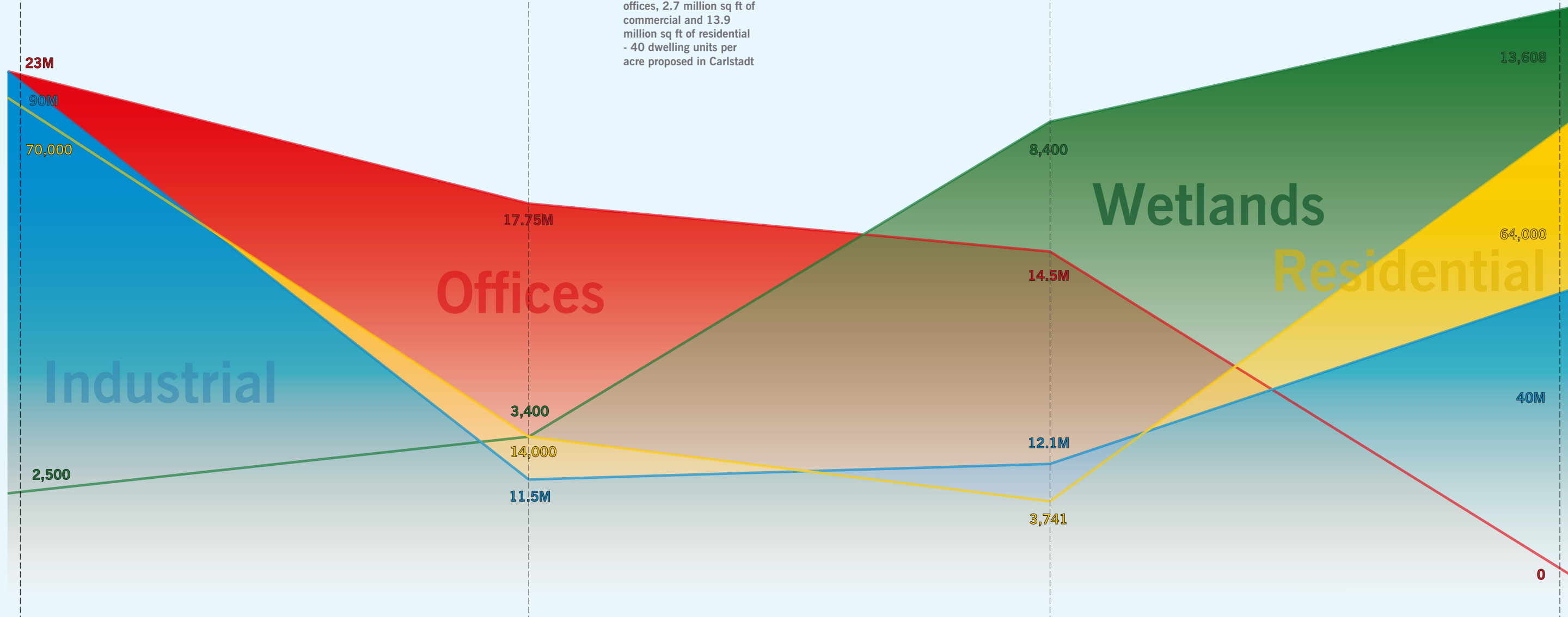
- protection, enhancement and preservation of 8400 acres of wetlands
- removal of 3.5 million sq ft of existing structures for redevelopment
- 3741 new units of residential development
- 14.5 million sq ft of new commercial/office development
- 12.1 sq ft of new industrial development

New Meadowlands



2014

- Meadowband – A 63 miles berm (Primary berm: 47 miles)
(Secondary berms: 16 miles) + Road + BRT
- Recreational area proposed: 400 Acres
 - Wetland restoration area proposed: 3895 acres
 - Residential Units proposed: 96,700
 - Office area proposed: 0
 - Industrial / Commercial proposed: 43,141,060 sqft
 - New Jobs: 10,784





Building Strong Businesses That Build Strong Communities

March 24, 2014

Mr. Alexander D'Hooghe
Director, Center for Advanced Urbanism, MIT
77 Massachusetts Avenue, E14-140
Cambridge, MA 02139-4307

Dear Alexander,

Please accept this letter of continued support on behalf of me personally and the entire Board of Directors of the Meadowlands Regional Chamber. Over recent months I have been incredibly impressed with the level of intellectual thought and understanding your team has of this unique geography we call the Meadowlands. You have moved the project so far in such a short time that it provides me with great confidence that we can achieve what this project is aimed at.

I hope the interaction with our organization has contributed to your research and please know you will have our full support to advance this project if you are successful in gaining the release of capital improvement funding for the pilot areas.

I am convinced that the implementation of funding for the pilot areas will produce a great ripple effect that will not only remedy the flood prospects of the future but produce new areas of development opportunity that can create jobs and help sustain a vibrant economy here in the Meadowlands.

Please stay in touch and communicate your next steps as we are ready to assist you further.

Respectfully,

James Kirkos
CEO

JK/lt

Meadows Office Complex | 201 Route 17 N., 2nd Floor | Rutherford NJ 07070
Phone: (201) 939-0707 | Fax: (201) 939-0522 | www.meadowlands.org



9 BASIN DRIVE
SUITE 120
KEARNY, NJ 07032
973.842.2600
KEARNYPOINT.COM

March 21, 2014

Built By Design Jury

Dear Rebuild By Design jury,

In my capacity as President of RTL Services, Inc., dba Kearny Point Industrial Park, I wish to offer my support of the 'New Meadowlands' project. Currently, this project is being submitted as an entry in the Rebuild By Design' (RBD) competition, for federal funding and support. RBD is an initiative of the Hurricane Sandy Rebuilding Task Force and the US Department of Housing and Development. Throughout the third phase of the Rebuild by Design competition, the MIT CAU +ZUS+Urbanisten team has been in close contact with us. During this period we had many interactions, and have been able to communicate our own needs for the future and find potential for those in the proposal.

We also appreciate the important of working on the Meadowlands area as an entire region, while using several pilot projects, one of which covers our area.

Since Hurricane Sandy hit the region in October 2012, we have worked hard not only to recover and rebuild, but also to prepare for other future calamities. We are deeply concerned about the continuing vulnerabilities and risks for our area. The well-being of our ecosystem, stability of our social fabric, and our economic growth needs reinforcement. The New Meadowlands project provides this reinforcement and we hope that federal assistance will make our area and region more resilient.

We are impressed by the extent to which the team has developed a knowledge and understanding of the area. Using state-of-the-art design, planning and engineering, we feel that the 'New Meadowlands' project is incredibly timely for the area. In particular we value the fact that the project does not minimize its scope to issues of flood protection, but makes a considerable effort to multiply the effects of resiliency measures by addressing issues of economic development and growth, infrastructural and utilities improvement, as well as ecological and recreational aspects of the area.

We look forward to collaborating with the MIT CAU+ZUS+Urbanisten team in the implementation of the 'New Meadowlands' project in which our town hopes to play a significant role as a pilot area. We hope this project will allow the Meadowlands to serve as a model of resiliency for the region.


Yours sincerely,
Kearny Point Industrial Park

Jay A. Zimmern

Mauro D. Raguseo
Mayor

Michael Capabianco
Borough Administrator

Barbara Maldonado
Borough Clerk



Borough of Little Ferry
215-217 LIBERTY STREET • LITTLE FERRY, NJ 07643
201-641-9234 201-641-1957 FAX
www.littleferrynj.org

Ronald Anzalone, *Council President*
Roberta Henriquez, *Councilwoman*
Stephen Lanum, *Councilman*
George Muller, *Councilman*
Thomas Sarfo, *Councilman*
Peggy Steinbilber, *Councilwoman*

March 24, 2014

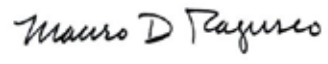
RBD Jury

To whom it may concern:


The Borough of Little Ferry offers its support for continued funding for the proposed Rebuild By Design project of "The New Meadowlands." The proposed projects is an intriguing option to protect our community from flood events. We respectfully ask that additional funding be provided to continue the exploration of this design project to ensure that all variables are discussed and brought forth to provide that the best information is available to decision makers across all levels of government and the private sector.

Please do not hesitate to contact me at 201-641-9234 or via email at mayor@littleferrynj.org if you require additional information.

Sincerely,



Mauro D. Raguseo



Michael J. Gonnelli
Mayor

Municipal Government Center
Secaucus, N.J. 07094

Tel: 201-330-2005
Fax: 201-330-8352
Cell: 201-376-3576
Town Web: www.secaucusnj.org

March 20, 2014

Dear Rebuild By Design Jury,

In my capacity as Mayor of the Town of Secaucus, I wish to offer my support of the 'New Meadowlands' project. Currently, this project is being submitted as an entry in the 'Rebuild By Design' (RBD) competition, for federal funding and support. RBD is an initiative of the Hurricane Sandy Rebuilding Task Force and the US Department of Housing and Development. Throughout the third phase of the Rebuild by Design competition, the MIT CAU+ZUS+Urbanisten team has been in close contact with us. During this period we had many interactions, and have been able to communicate our own needs for the future and find potential for those in the proposal. In fact, the workshop that we hosted with the design team to get community input was so well attended that the parking lot at the venue was filled to capacity and participants were forced to find additional parking on the street.

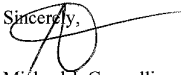
We also appreciate the importance of working on the Meadowlands area as an entire region, while using several pilot projects, one of which covers our area.

Since Hurricane Sandy hit the region in October 2012, we have worked hard not only to recover and rebuild, but also to prepare for other future calamities. We have taken on several projects, from rebuilding and reinforcing a berm at one of the lower elevations in Town to adding and updated several pump stations in other areas. We are deeply concerned about the continuing vulnerabilities and risks for our area. The well-being of our ecosystem, stability of our social fabric, and our economic growth needs reinforcement. The New Meadowlands project provides this reinforcement and we hope that federal assistance will make our area and region more resilient.

We are impressed by the extent to which the team has developed a knowledge and understanding of the area. Using state-of-the-art design, planning and engineering, we feel that the 'New Meadowlands' project is incredibly timely for the area. In particular we value the fact that the project does not limit its scope to issues of flood protection, but makes a considerable effort to multiply the effects of resiliency measures by addressing issues of economic development and growth, infrastructural and utilities improvement, as well as ecological and recreational aspects of the area.

We look forward to collaborating with the MIT CAU+ZUS+Urbanisten team in the implementation of the 'New Meadowlands' project in which our town hopes to play a significant role as a pilot area. We hope this project will allow the Meadowlands to serve as a model of resiliency for the region.

Sincerely,



Michael J. Gonnelli



Hackensack RIVERKEEPER[®], Inc.
Captain Bill Sheehan
Riverkeeper & Executive Director
231 Main Street
Hackensack, NJ 07601

Phone: 201-968-0808
Fax: 201-968-0336
info@HackensackRiverkeeper.org
www.HackensackRiverkeeper.org

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Chris Marinello	Watershed Ambassador



Printed on Recycled Paper

March 24, 2014

Dear Rebuild By Design jury:

Please accept this letter of support of the "New Meadowlands" project being submitted as an entry in the *Rebuild By Design* (RBD) competition for federal funding and support. RBD is an initiative of the Hurricane Sandy Rebuilding Task Force and the US Department of Housing and Urban Development. Throughout the third phase of the competition, the MIT CAU+ZUS+Urbanisten project team has been in close contact with our organization. During this time we communicated to them our own concerns – which they met – such that the wetlands in the Meadowlands District remain unaffected.

We also appreciate that the "New Meadowlands" team recognizes that the NJ Meadowlands District is an important region, and should be dealt with as such. Since Hurricane Sandy impacted, the communities within the Meadowlands and along the Hackensack River we have worked hard not only to recover and rebuild, but also to prepare for other future storms. We are deeply concerned about the continuing vulnerabilities and risks for our area, especially factoring climate change and sea level rise into the equation. The well-being of our ecosystem, stability of our communities and their economies need support. The New Meadowlands project provides this support; and we hope that federal assistance will make the populated portions of the Meadowlands District more resilient.

We are impressed by the extent to which the team developed a knowledge and understanding of the Meadowlands. Using state-of-the-art design, planning and engineering, we feel that the New Meadowlands project is incredibly timely for the area. In particular we value the fact that the project does not speak only to flood protection, but makes a major effort to increase resiliency measures by addressing issues of economics, infrastructural and utilities improvement, as well as ecological and recreational aspects of the area – the last two being of paramount importance to Hackensack Riverkeeper.

We look forward to continued collaboration with the team in the implementation of the New Meadowlands project, and to playing a significant role therein. We hope this project will allow the Meadowlands District to serve as a model of resiliency in our region – and as an example for others.

Yours in conservation,

Captain Bill Sheehan



FORSGATE INDUSTRIAL PARTNERS
400 Hollister Road, Teletoro, New Jersey 07608 Tel 201 393 4300 Fax 201 393 4301

24 March 2014

To the Rebuild By Design Jury:

I am writing in support of the proposal conceived of by MIT CAU + ZUS + URBANISTEN in conjunction with the Rebuild By Design program.

Forsgate Industrial Partners has been creating warehouse/distribution/logistics facilities in the Meadowlands for over forty years. Long ago, we realized the importance of the area as a support system for the goods and services provided to the regional economy, particularly the dense populations of Northern New Jersey and New York City. The region has become dependent on the Meadowlands as its staging facility for many essential components of local commerce. Thus, we wholeheartedly support the comprehensive proposal of MIT CAU + ZUS + URBANISTEN.

Superstorm Sandy has put an unfortunate, but inevitable, spotlight on the vulnerability of the entire area to flooding. The exposure is not just in capital, but in human safety, public health and environmental degradation. The MIT CAU + ZUS + URBANISTEN team has developed an exquisite plan that protects the Meadowlands from future storm-surge, while enhancing its predominant uses. Their plan creates public outdoor space, protects critical infrastructure, improves what is already a vibrant wildlife habitat, enhances the water quality system and makes available additional areas for the creation of much-needed housing and future commercial facilities.

We particularly support their proposition to allow the existing New Jersey Meadowlands Commission (NJMC) to be the administrative entity that will guide implementation of the project. The NJMC, from its inception, has been a forward-thinking regional governance platform that has successfully brought together disparate interests in to a vibrant environmental and economic ecosystem. NJMC's local experience and existing reputation makes them the best entity to oversee the proposed plan.

We hope that the RBD Jury will engage the MIT CAU + ZUS + URBANISTEN team's proposal with the same exuberance that the rest of the Meadowlands community has shown. At many of the public presentations, the participants have been enthusiastic about and very interested to see the project started, and soon completed.

Great communities are based on great planning. With the MIT CAU + ZUS + URBANISTEN proposal the Meadowlands can continue to be a model for the coexistence of a vital natural resource, and vibrant commercial activities.

Sincerely,

Alex Klatskin, FAIA
General Partner
NJ Registered Architect - 21A101210600
NJ Professional Planner - 33LI00524100

**TOWN OF SECAUCUS
COUNTY OF HUDSON**

**RESOLUTION IN SUPPORT OF MIT CAU+ZUS+URBANISTEN TEAM
SUBMISSION OF THE 'NEW MEADOWLANDS' PROJECT IN THE
REBUILD BY DESIGN COMPETITION**

WHEREAS, Hurricane Sandy hit Secaucus and the Meadowlands region in October 2012 and created considerable damage; and

WHEREAS, the Town of Secaucus has taken on several projects from rebuilding and reinforcing the berm to adding and updating several pump stations; and

WHEREAS, the Town of Secaucus continues to be deeply concerned about the continuing vulnerabilities and risks for our area; and

WHEREAS, the well-being of our ecosystem, stability of our social fabric and our economic growth are dependent upon these vulnerabilities being addressed; and

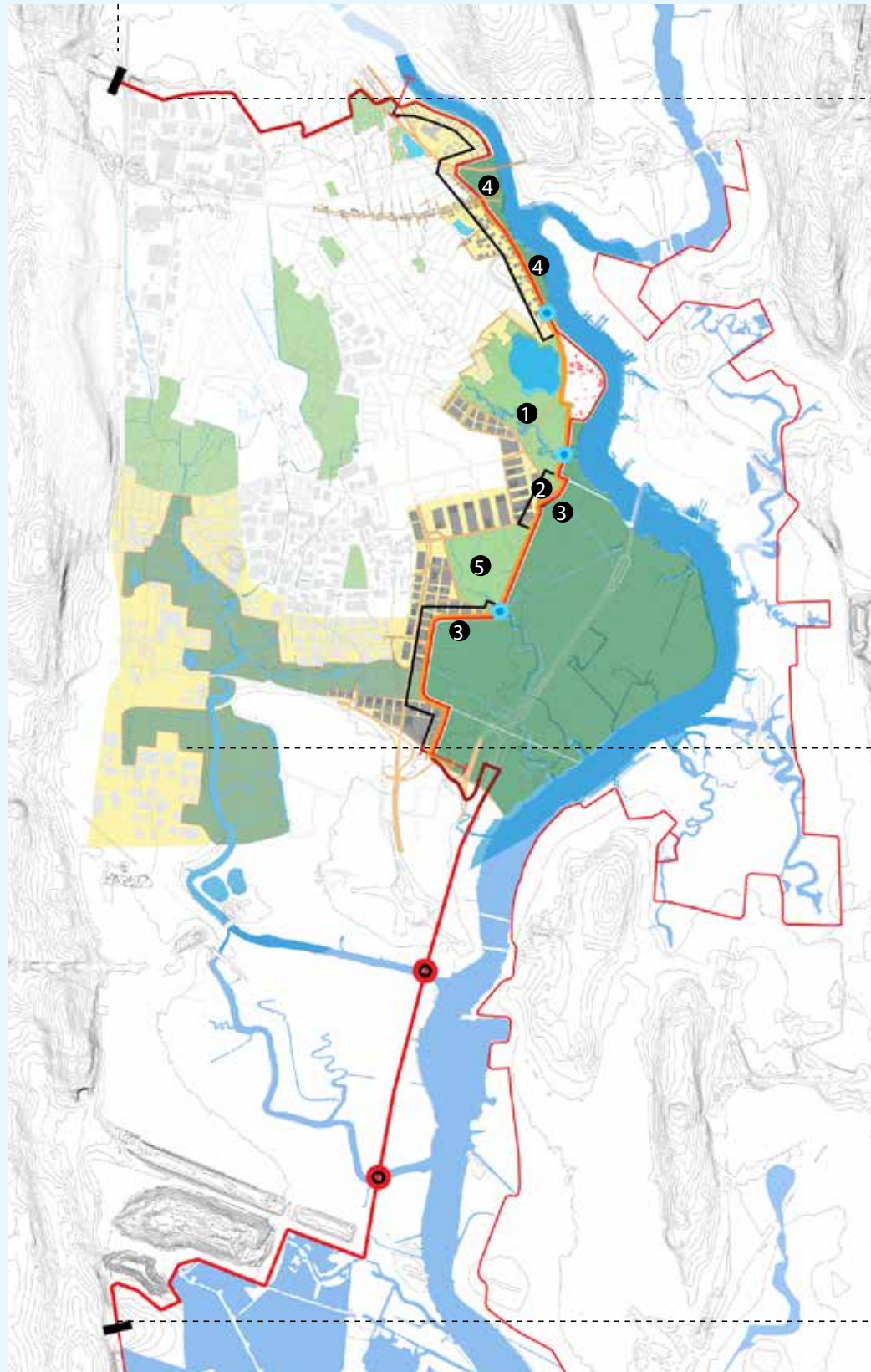
WHEREAS, the 'New Meadowlands' Project addresses these issues but does not limit its scope to flood protection; as it also makes a considerable effort to multiply the effects of resiliency measures by addressing issues of economic development and growth, infrastructure and utility improvement, as well as ecological and recreational aspects of the area; and

WHEREAS, the Town of Secaucus and the Rebuild by Design team hosted a workshop at the Secaucus Public Library that included participation by more than 140 residents and stakeholders; and

WHEREAS, the Mayor and Town Council wholeheartedly support the 'New Meadowlands' Project which is being submitted as an entry in the Rebuild By Design competition;

NOW, THEREFORE, BE IT RESOLVED, that a copy of this Resolution be submitted to the Rebuild By Design jury in an effort to further advance the Rebuild By Design submission of the MIT CAU + ZUS +Urbanisten team for the Meadowlands basin, including its pilot projects such as the one in Secaucus, for federal funding and support.

ADAPTED PROPOSAL NORTHERN PILOT



BERM

MEADOWBAND

1.8 MILES

SMALL BERM connected to topography.
3.5 million / mile

4.8 MILES

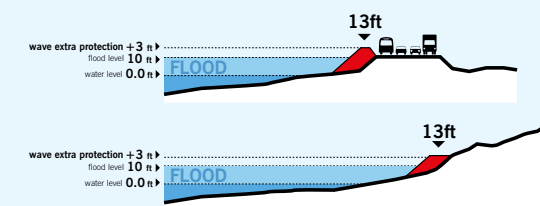
INTEGRAL BERM
7 million / mile

- ← + STREET SCAPE _ 4.8 miles
- ← + ROAD _ 3.7 miles
- ← + LAND ACQUISITION _ 3.3 miles
- + 3 PUMPS

- ① Losen Slote Park
- ② Visitor center / Park ride station / Emergency storage facility
- ③ 0.5 mile Linear Park
- ④ Brackish wetland restored (Gates property) = 30 acres
- ⑤ Fresh water wetland restoration = 92.5 acre

4.9 MILES

HALF BERM connected to existing highway and landfills
3.5 million / mile
+ 2 FLOOD GATES



PILOT AREA - ADAPTED COST ESTIMATE

1. Berm	
- 11.5 mile Berm:	= \$ 57 million
6.7 miles (1.8 miles of small berm + 4.9 miles of half berm) x \$3.5 (million per mile) + 4.8 miles of integral berm x \$7 (million per mile)	
- 3 new pumps = 2 million per piece	= \$ 6 million
- 2 new flood gates 90 feet wide + 180 feet wide	= \$ 40 million
Total Berm Cost	= \$ 103 million
2. Meadowband	
- Streetscape in relation to integral berm in Little Ferry: 4.8 miles (40ft wide Streetscape, \$35 per sqft):	= \$ 35.5 million
- 3.7 mile Road (\$3.5 million per mile) along the integral berm	= \$ 13 million
- Land Acquisition: 98 million x 15% Total Net value for private plots which intersect the integral berm	= \$ 31.695 million
1. Losen Sloom park = 1.35 mile long pedestrian trail	= \$ 2.5 million
2. Visitor center / Park and Ride station / Emergency public facility	= \$ 20 million
3. 0.5 mile linear park = 100 ft wide, 35\$ per sqft	= \$ 9.5 million
4. Brackish wetland restored (demolition \$5 per sqft) = 30 acres	= \$ 6.6 million
5. Fresh water wetland restoration = 92.5 acre	= \$ 9 million
Total wetlands and park areas cost	= \$ 127.795 million
3. Scientific research, design and engineering cost	= \$ 25 Million
Overall cost for Pilot area north eastern edge	= \$ 255.795 million

HOW AMBITIOUS IS THE WETLANDS GROWTH?

The proposal is not converting any natural areas into development areas, quite to the contrary. Currently 60% of the overall Meadowlands basin study area is dry; 40% is wetland or water. The proposal converts 9% of the overall Meadowlands basin study area into wetland. This changes the balance from 60-40 to 51-49. This also adds 2348.3 acres of wet land. The 49% are integrated in the regional landscape park. Development areas retreat inversely. The land acquisition cost of 700 million dollars represent the current development value of properties that will convert.

COULD THE WETLAND HAVE BEEN EXPANDED MORE?

Yes, but only at a massive cost of anything upward of 5 billions of dollars in eliminating residential and industrial development. We advise against this because:

- This is a primary location for logistics because it connects the harbor to Manhattan.
 - None of the 14 municipalities with some land in the basin are wealthy. Their financial survival depends on the tax income from the warehousing functions in the basin. The basin creates wealth for towns with perimeters far outside of it.
 - The surrounding residents' economic well-being depends on the jobs these warehouses offer (typically between 40-200 job without college requirement per warehouse).
- CONCLUSION: an aggressive further expansion of the wetland will destroy the economic basis of the region.

DOES A WETLAND STOP FLOODING INTO ADJACENT AREAS?

A tidal wetland is unable to stop ocean-surge flooding. It absorbs wave energy and contributes to berm stability. Even if the entire Meadowlands basin would be a wetland, it would not stop the flood waters. A wetland does not mind flooding, whereas property does. That is the main difference.

A freshwater wetland is able to stop extreme precipitation from overflowing rain sewer lines, because the rain water would not enter the sewer system to begin with, but instead be diverted into aforementioned freshwater wetland. That is why the proposal includes large new freshwater wetlands and basins, amounting to insertions worth 10% of the surface of the watershed they protect.

IS THE PRIMARY FLOOD PROTECTION BERM PERIMETER RELATED TO THE EXTENTS OF THE WETLAND SYSTEM?

It is not. The surface area of existing and newly created wetlands inside the berm is about the same as that outside of it. Wetlands outside the berm are always tidal and brackish. Those inside the berm are a combination of freshwater marshes, tidal marshes, and marshes with pollution problems which needs to be separated from the system at large and treated locally (Berrys creek); each separated from each other with secondary berms.

DOES THE LOCATION OF THE PRIMARY FLOOD PROTECTION BERM MATTER TO THE SIZE OF THE PARK AND WATER SYSTEM?

Not as long as its perimeter is continuous and no human activity has settled outside of it. The primary flood protection berm has 1 function: to protect against extreme ocean surge flooding. An ocean surge means an infinite supply of water, and only a high berm will provide protection against it. Water will go wherever it can. This primary berm does not 'divert' water volume, since the volume coming in is infinite.

During daily tidal regimes and even springtides, the primary berm is not important. Several floodgates allow tidal regimes to extend behind the primary berm, contributing to the creation and growth of tidal wetlands behind the primary flood protection berm. These gates only close for extreme weather events. A secondary berm system outlines the edges of these inner wetlands and acts as a second, lower protection line.

For that reason, the effective and economic choice for the primary flood protection berm location is to take a route that is short embedded in existing structures where possible. This route was most obviously taken when the berm aligns with I-95. The secondary berms define the real extent of the watery natural system and often have a more complex geometry. The 'Meadowband' aligns with those except when there is only a primary flood protection berm. That is the case along the eastern edge of Little Ferry and Moonachie; along the western edge of Secaucus; and the southern edge of Kearny.

AS SEA LEVEL RISES, HOW DO WETLANDS ADAPT?

Tidal wetlands grow in height with every tidal cycle. This occurs due to a soil and sediment accretion process. Tidal water contains small sediments, which are during every tidal cycle. Furthermore, organic decay on the wetlands adds to soil accretion. Over time, these processes increase the elevation of the wetland. The soil accretion measured in the Meadowlands shows considerable growth that can match with moderate sea level rise scenarios. Currently, wetlands are growing in elevation too fast and they become dry. Sea level rise will eliminate this problem.

SHOULD LOGISTICS AND SUPPLY CHAIN FUNCTIONS NOT GO ELSEWHERE?

The proposal ends for once and for all the historical pattern of expanding development at the cost of nature. The berm systems are more effective than any zoning rule. No one will build in the park because it is not safe. However, to remove most logistics and supply chain functions currently in this location is another matter. The Meadowlands basin is strategically positioned between the harbor and Manhattan. Relocating supply chain functions elsewhere means to move them at least 15-20 miles away. It requires new railroad and highway infrastructure to handle the resulting flows; and substantially increases the CO2 emissions resulting from truck traffic.

SHOULD THE NEW RESIDENTS IN THE METRO AREA LOCATE HERE?

There is substantial pressure for residential, which is currently developing in the floodplain. The proposal ends this, and instead directs this pressure to the immediate area behind the outer berms, along the very edge of the regional park, facing the park.

As long as Manhattan stays the powerhouse, the following argument is valid.

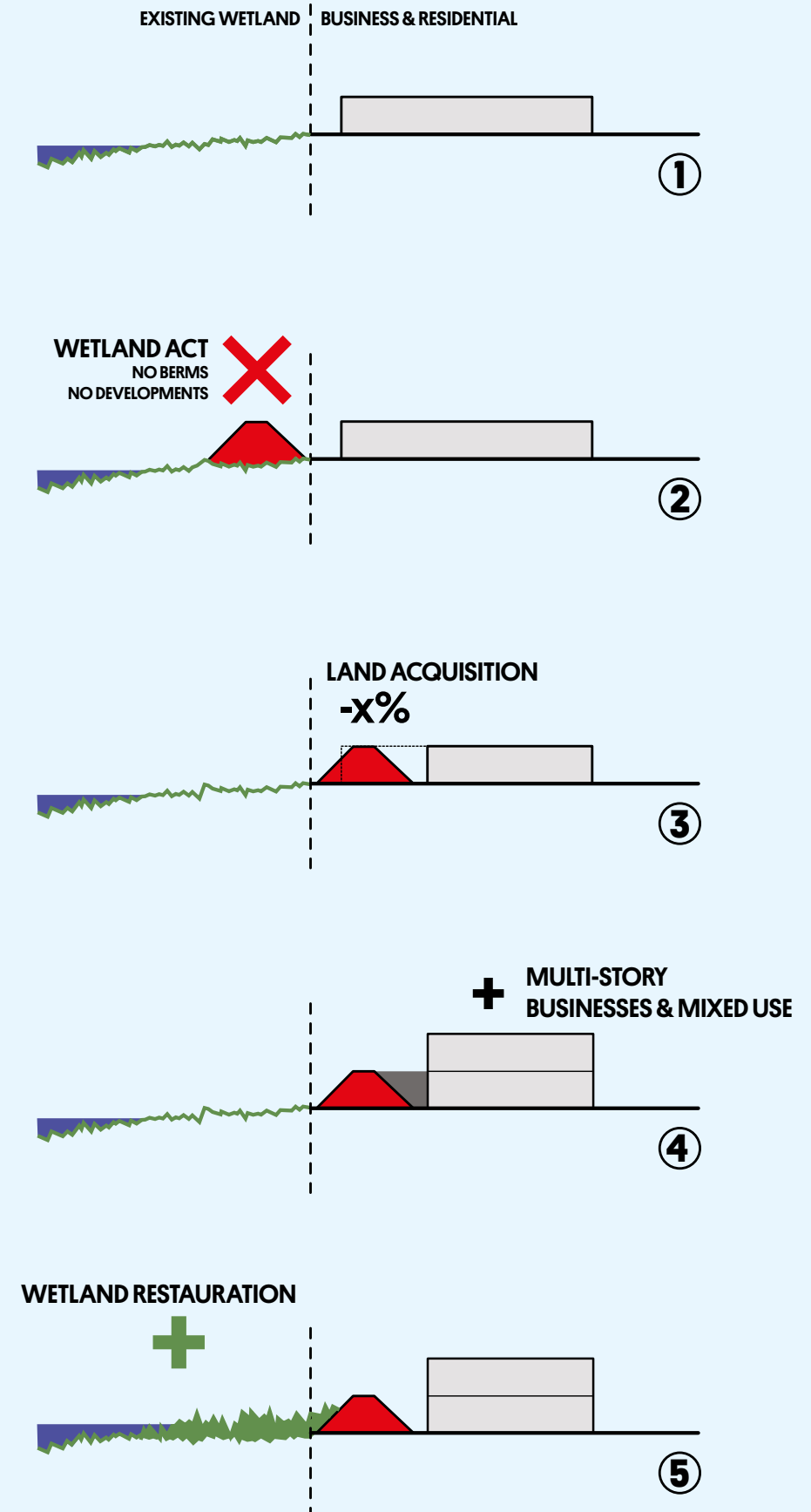
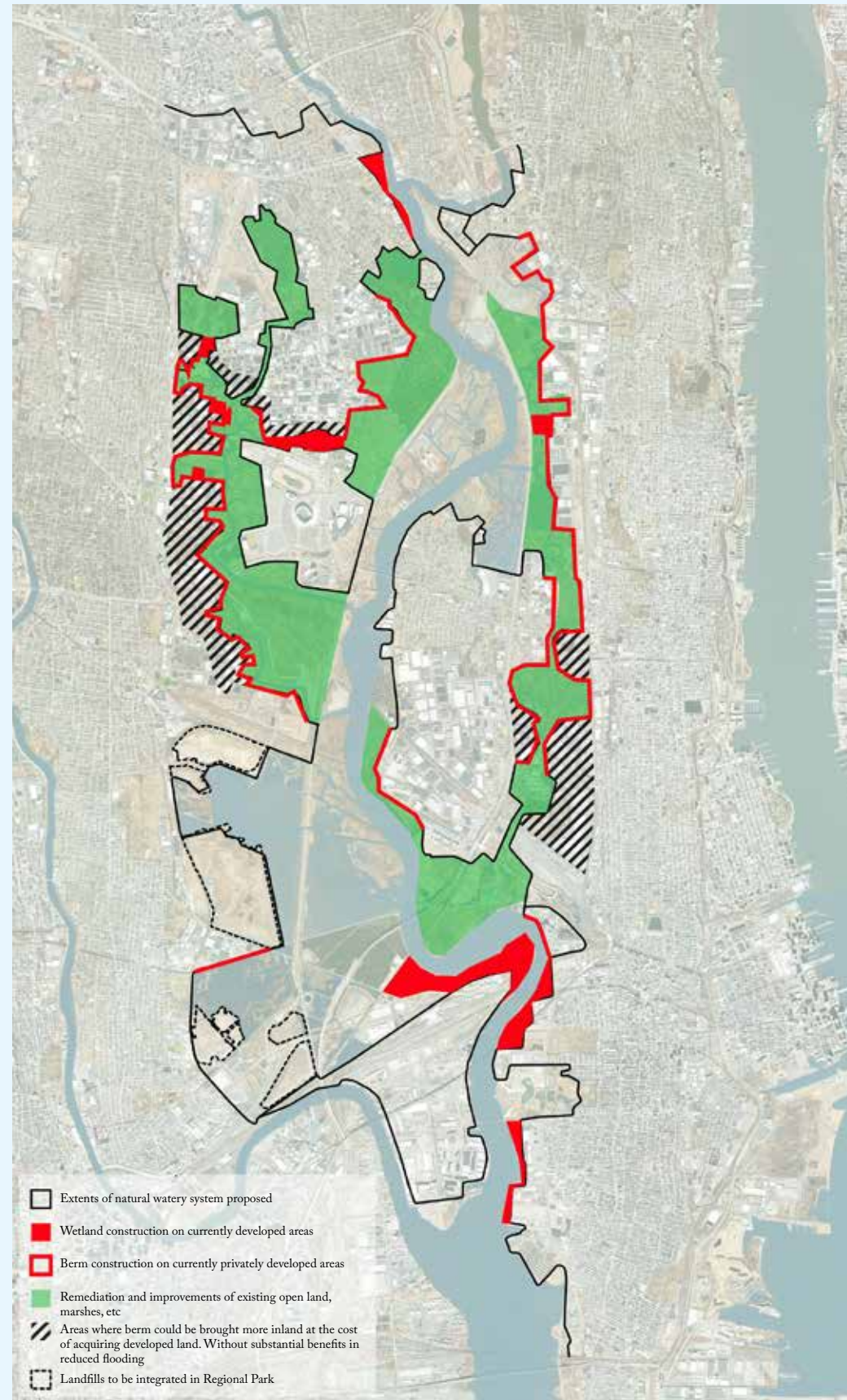
1. To reduce CO2 emissions, we advise to keep populations and jobs in proximity to each other and to Manhattan.
2. To maintain economic opportunity and exchange, we advise against isolated new satellite towns in remote locations (e.g. Trenton, upstate Connecticut). The history of urbanization shows that their isolation reduces opportunity and choice for residents; and it increases dependency on 1 or 2 mobility options or employers. Being part of an integrated network makes for a measurable difference in opportunity.
3. Density should be sufficient to allow and encourage mass transit use without eliminating access to automobiles
4. Not in coastal areas subjected to violent wave action.
5. Urban health metrics must be positive.

Surveying the metro area immediately shows the lack of available locations.

The Meadowlands basin is the only area near Manhattan which survives above criteria. It is extremely close, well connected, developed in a suburban fashion [which means it can be redeveloped by internal densification]. More than 3/4 of the basin does not suffer from violent wave action. A great large regional park increases health far beyond that of residents in Newark or other places in the metro system.

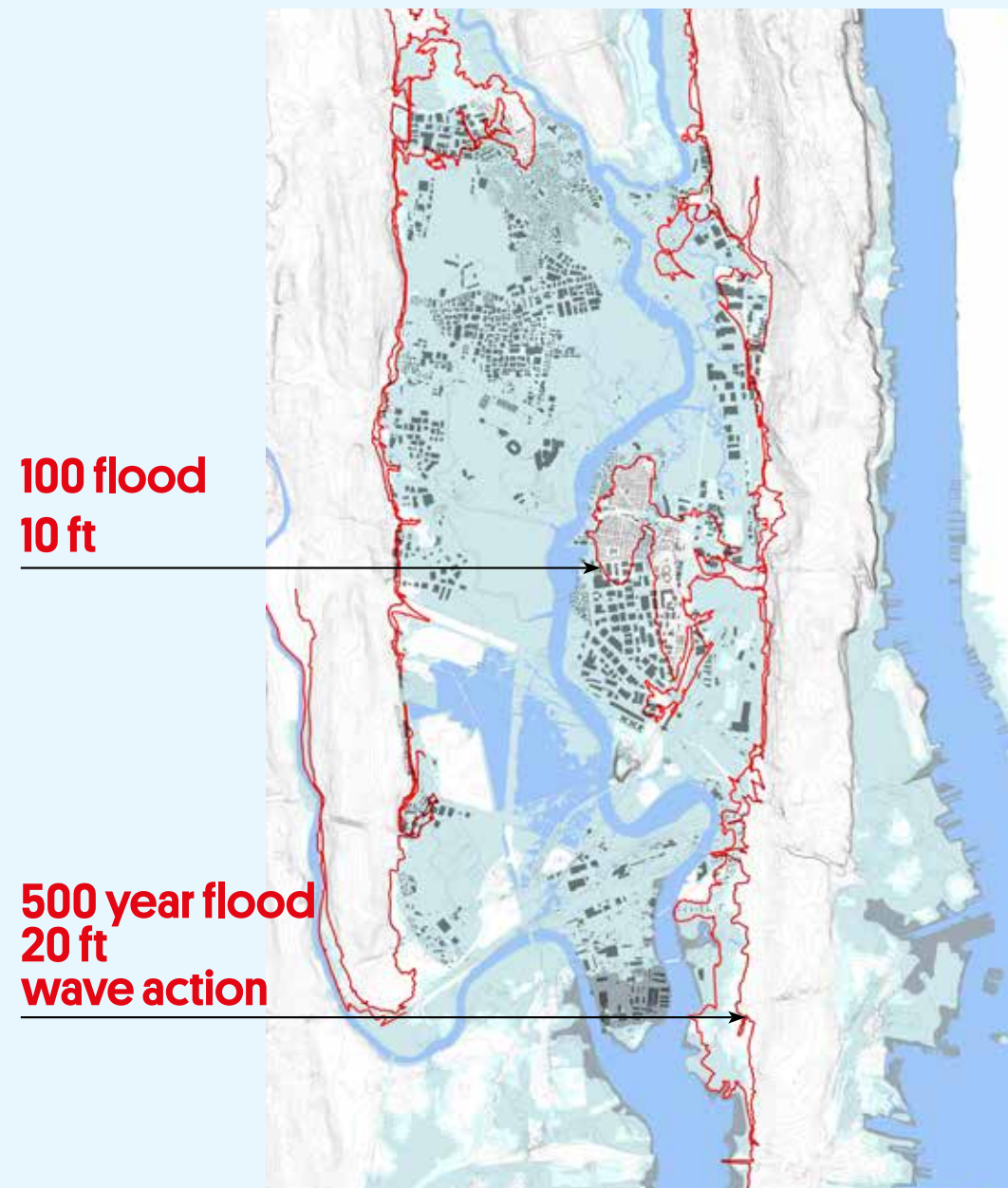
Additional densification along high grounds within the metro area is a great idea. Capacity is limited and political opposition will be substantial. Relocating to wealthy outer suburbs is a good idea as well, but faces similar problems. We think it is not or – or, but and – and. Meadowlands residential capacity, should park and berms be realized, is about 117,000 residents or 8% of the estimated population increase.

Berm Protection, Wetland Expansion, Vertical Growth



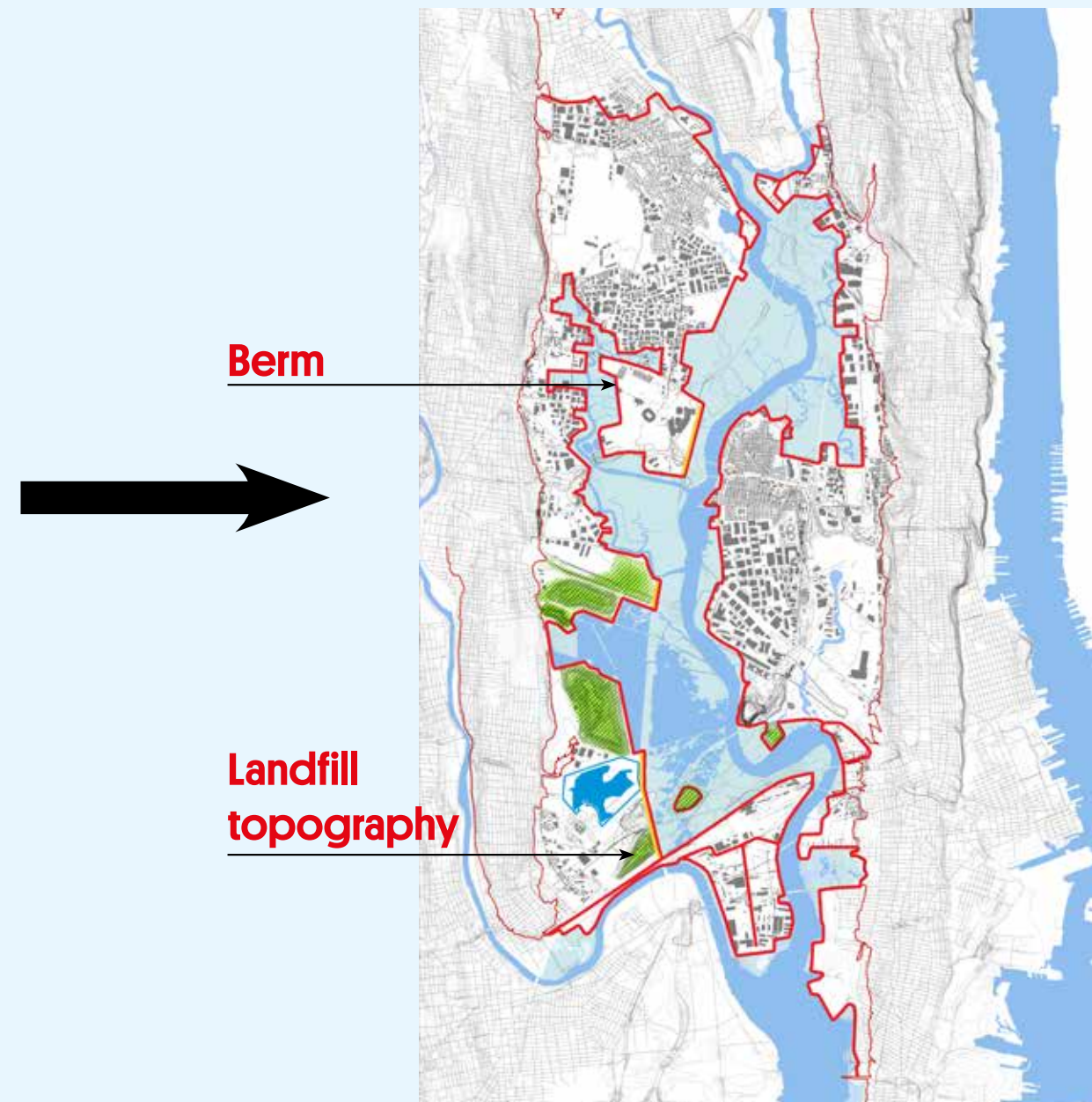
1. FLOOD RISK AREA

The area that can flood during a 1: 500 storm event (FEMA data) stretches out along the entire Meadowlands on both sides of the Hackensack, between two high ridges.



2. PROTECTIVE BERM

We propose a berm around the existing urban fabric. All of the towns will be safe from future flooding. Only wetland remains to be flooded, this ecology can handle temporal flooding.



Protected:

- 154,000 workers
- 9,322 businesses
- 47,916 residents
- 11,294 households with a mortgage
- 3 power plants
- 21 substations
- 2,261 acres of rail yards (Logistics and transportation)
- 2 sewage plants
- 5 metro stations
- 1 airport
- 7 superfund sites on the National priority list (Heavy pollution)

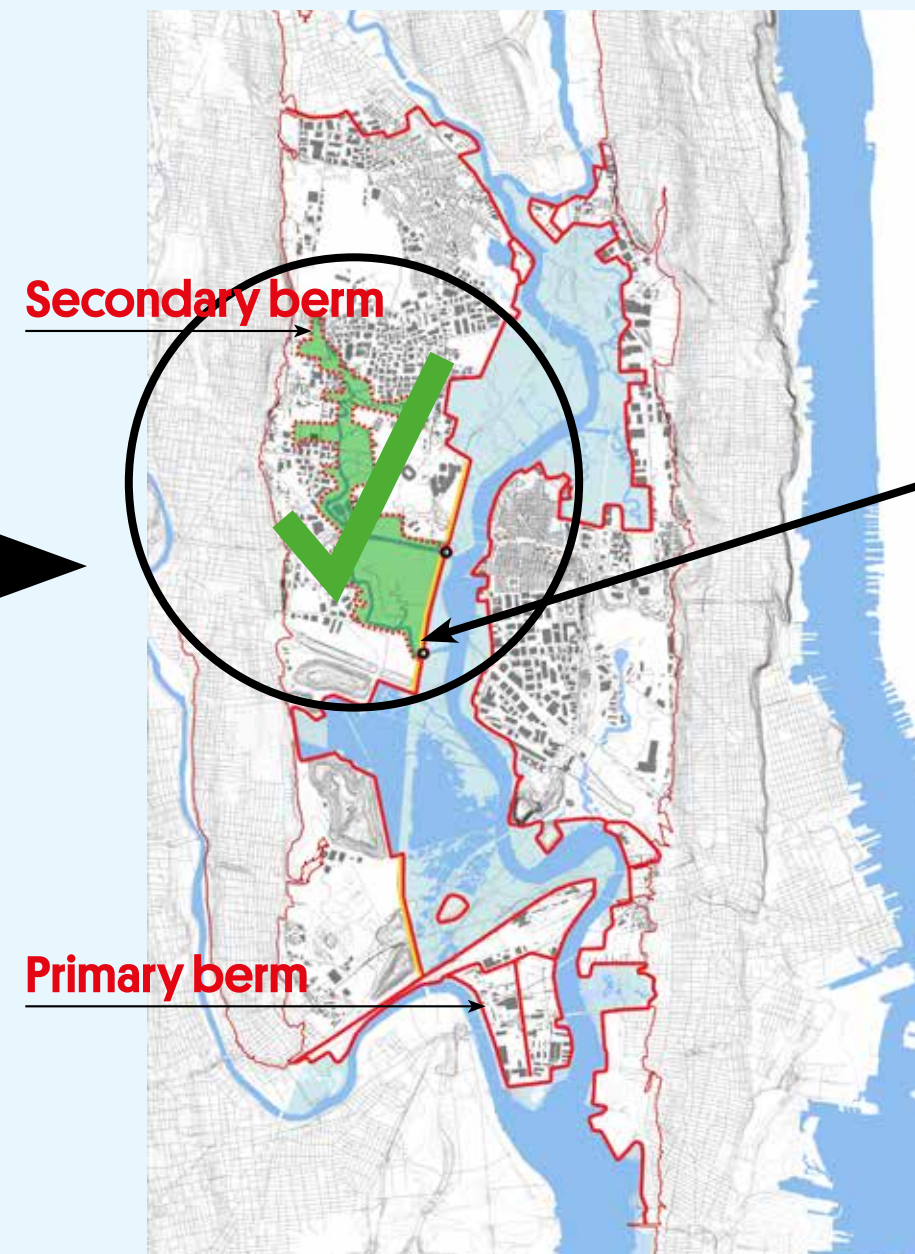
3. POLLUTION SPILL RISK

A part of the eastern wetland is heavily contaminated, in this part temporal flooding is undesirable, because then contamination will spread downstream when the surge retreats towards sea.



4. CHAMBERING POLLUTION

Therefore we realign the berm in front of this contaminated wetland, which is along the turnpike. This berm is special, because it has two openings where the creeks are connected to the Hackensack. This ensures that the tidal connection remains.



The openings are already there right now, they are gates under the turnpike. When we add the berm next to the turnpike, floodgates are added in these openings. Only when a flood is predicted, we will have to close the gates to prevent the area behind the berm to be flooded. This includes the contaminated wetland as well as the urban fabric next to it.



There are some advantages to placing the berm next to the I-95:
The highway is higher than its surroundings and therefore can add to berm stability. Its volume and mass will help to make sure that the chance of a berm breach will be minimized. The same counts for the places where we place the berm next to the landfills.
The necessary length of the berm is reduced with 8 miles, which is almost 15% of the total length of berm needed for the Meadowlands. This saves cost. These savings can be used for two tidal gates.
Around the contaminated wetland a berm is no longer needed on the short term. Because the wetland is lower than its surrounding urbanized land, the contaminants will not be spread. The tidal effect will ensure that sediments will accumulate and cover this area up over time. This will capture the contamination and will level out sea level rise to a certain extent. Here extra data research is needed but in the next 20 years the proposed situation will be effective. In this time detailed calculations can be made, soil accretion and sea level rise can be monitored. In the future it can still be decided to erect a secondary berm to prevent the daily tide to flood urban fabric if the sea level rises more than expected. This berm can be very modest in size: an average of approximately 3 feet high in relation to the existing topographical situation (which leads to 6 to 7 feet above mean sea level).

EXISTING WETLAND

The existing wetland is brackish and is being actively reconstructed by the Meadowlands commission. This is a good thing, the reconstruction ensure a wetland that has high and low marsh. This increases biodiversity and allows sediment to accumulate. This soil accretion adds to the safety of the berm structure: it breaks waves and increases berm stability because it functions as a long slope in front of the berm. Where there is more than 150 feet of wetland in front of the berm, a change of a breach is reduced to an absolute minimum.



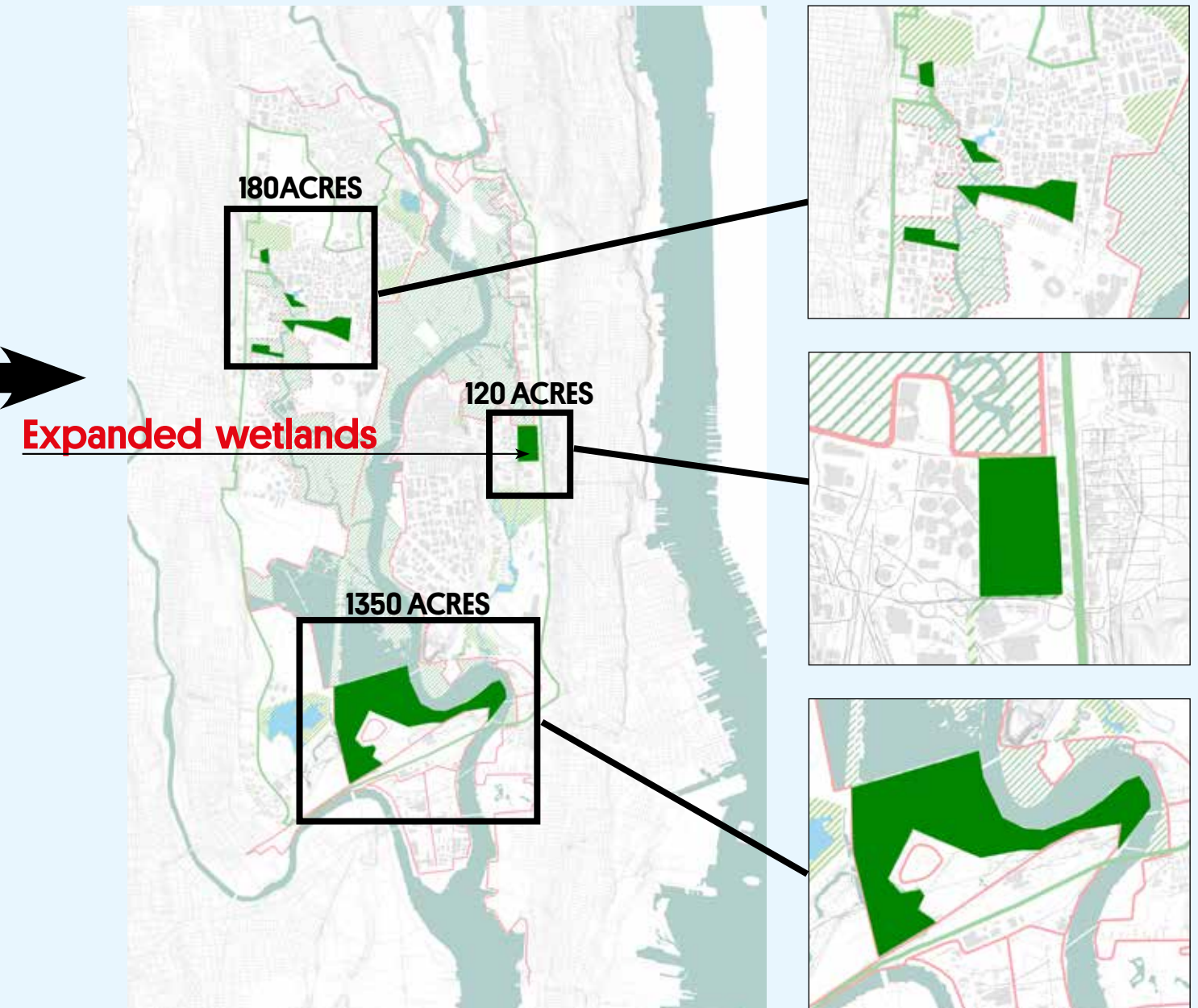
EXPANDED WETLAND

Current Land Use	Acres	% of Total
Dry Land	17023.34485	60%
Water / Wetland	11489.6026	40%
Total study area	28512.94745	100%

Proposed Land Use	Acres	% of Total
Dry Land	14675.02111	51%
Water / Wetland	13837.92634	49%

Total study area	28512.94745	100%
------------------	-------------	------

We propose to enlarge this safe situation by adding approximately 10% of extra wetland. The combination of the berm and wetland will make the New Meadowlands a safe place. On the safe side of the berm there are more wetlands. These are semi fresh right now and can become genuinely fresh in the future because of the berm separating brackish and fresh waters. The fresh wetland can function as local rain water buffers for extreme rain events. In the entire Meadowlands we propose 10 to 15% of buffer surface within the urban fabric. The majority of this area is already there, we expand the existing situation with 10% smartly located enlargements.



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COLOPHON

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This project transforms the Meadowlands basin to address a wide spectrum of risks, while providing civic amenities and creating opportunities for redevelopment:

PROTECT, CONNECT, GROW

A large natural reserve made accessible to the public will offer flood protection. Called 'the Meadowpark', it connects and expands marshland restoration efforts by the New Jersey Meadowlands Commission, and makes them accessible. Around and across the Meadowpark the team proposes an intricate system of berms and marshes. These protect against ocean surges, and collect rainfall, reducing sewer overflows in adjacent towns. The Meadowpark adds value to surrounding development through its views and recreational offerings.

The Meadowband defines the edge of the Meadowpark. A civic amenity, it consists of a street, Bus Rapid Transit line, a series of public spaces, recreation zones, and access points to Meadowpark. The Meadowband brings together different systems (such as transport, ecology, and development) and different scales (from local to regional). Local residents and visitors from further afield will meet here to enjoy parks and recreation.

The park and the band protect existing development areas. In order to be worthy of federal investment, it is imperative to use land more intensively. We propose shifting from suburban-style development to more urban typologies. New residential development could occur along the Meadowband overlooking the park.

Within the larger project, we have identified three pilot areas to host the first projects. The northern edge includes sections of Little Ferry, Moonachie, Carlstadt, Teterboro, and South Hackensack. The eastern edge contains Secaucus and a portion of Jersey City. Finally, the southern tip consists of South Kearny and the western waterfront of Jersey City.

