

The Restoration of Freshkills from Landfill to Park: Setting a Research Agenda

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FreshkillsPark 


Northern
RESEARCH STATION
USDA Forest Service



What does the NYC Urban Field Station do?

- Promotes natural resource stewardship and ecological literacy to advance human well being in the country's largest metropolitan area, New York City.
- Partners with municipal managers to create innovative "research in action" programs to support urban ecosystem management.
- Conducts comparative research and disseminates knowledge throughout other metropolitan regions in the United States and globally.
- Links to a growing network of U.S. Forest Service scientists and facilities and university cooperators focused on urban research.

How does the Field Station work?

- 3 FT NRS employees (social scientists)
- MOU with NYC Dept of Parks & Recreation
- New facility at Fort Totten in Queens, NY
- Four local research themes:
 - Urban Tree Canopy
 - Stewardship Mapping
 - Public health, Well-being and Urban Livability
 - Environmental literacy
- MillionTreesNYC Research and Evaluation Committee

Why is the Field Station interested in Freshkills Park?

- Adaptive reuse of a former waste management site
- Large investment in accessible open space creation and reforestation
- Size of the landscape could have citywide and regional impact (ecological, economic, social)
- Possibility of applying knowledge from other disturbed landscapes on this site
- Opportunity for secure, long-term research

FreshkillsPark

City of New York
Parks & Recreation
Michael R. Bloomberg, Mayor
Adrian Benepe, Commissioner



Freshkills Park Project Mission

- Transform the site into a public park that is safe, beautiful and accessible
- Promote responsible and innovative strategies for environmental sustainability through demonstration, instruction and collaborative investigation
- Provide amenities and attractions that both distinguish the park and draw local, regional and international visitors
- Reconnect the site to its natural history, local ecosystems and neighboring communities



GOALS

- Promote Freshkills Park as a locus for demonstration, instruction and collaborative investigation
- Develop a research agenda for Freshkills Park

OUTLINE

- Fresh Kills Past and Present
- Designing the Park
- Where We Are Now
- Potential for On-Site Research
- Brainstorm Research Questions/Agenda

PAST AND PRESENT

Freshkills Park in Regional Context



2,200 Acres
4 square miles
8% of Staten Island
2.5 times the size of Central Park

Scale comparison: Manhattan



THE SITE TODAY



New Jersey

Travis

William T. Davis
Wildlife Refuge

New Springville

Staten
Island
Mall

Little Fresh Kill

Arthur Kill

Isle of
Meadows

Great Fresh Kills

Fresh Kills

Main Creek

Richmond Avenue

La Tourette Park

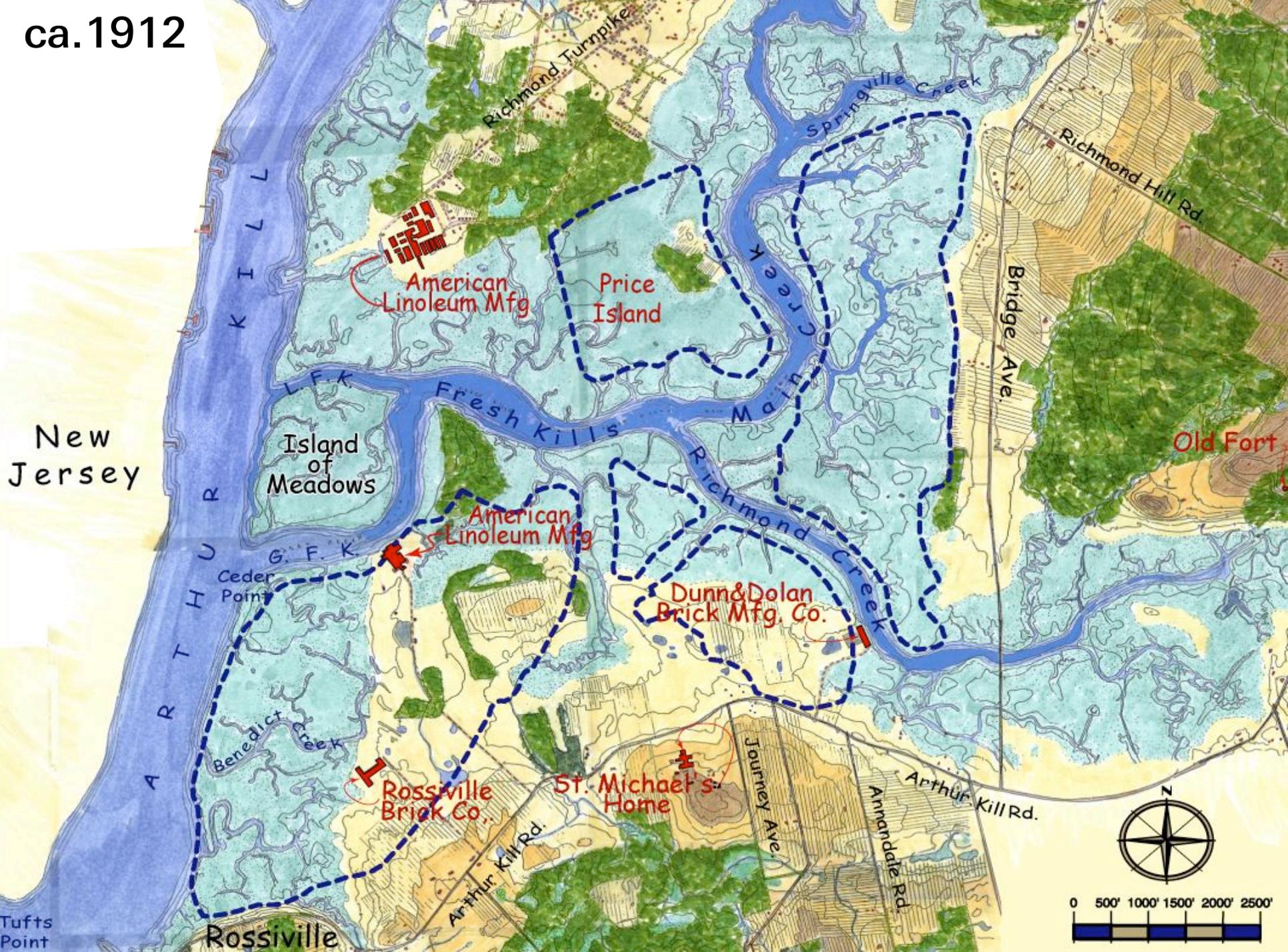
Richmond Creek

Arthur Kill Road

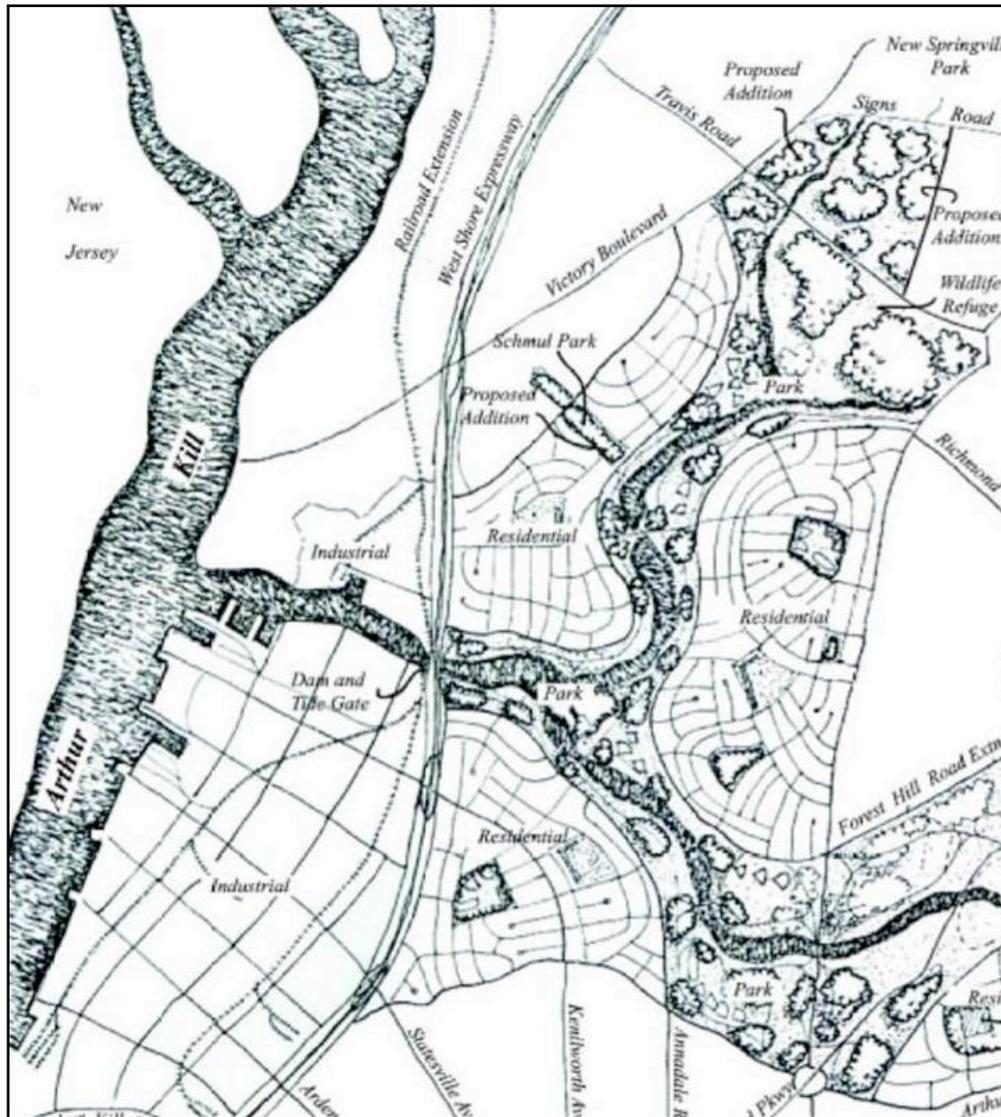
Arden Heights
Woods

Arden Heights

ca. 1912



Robert Moses' vision for Fresh Kills - 1948



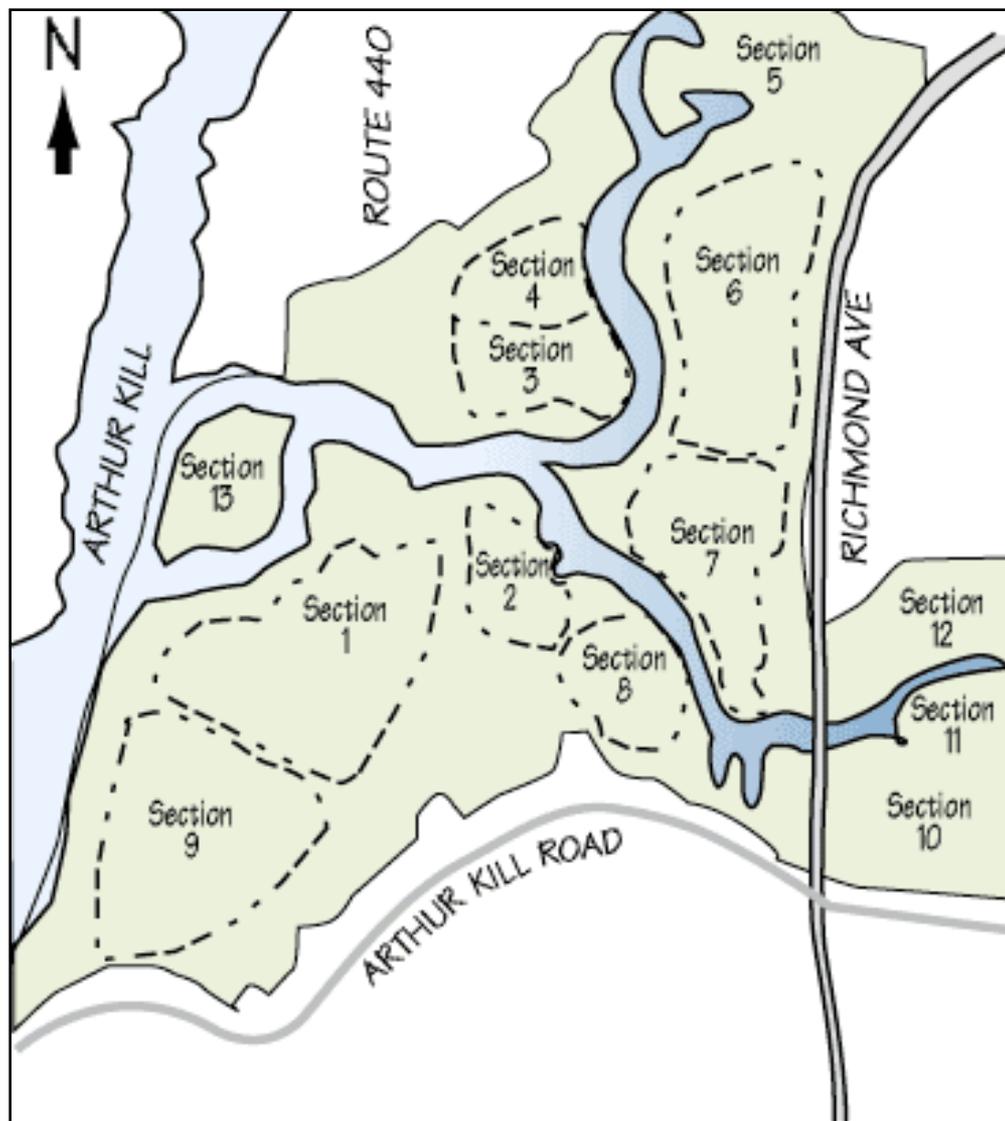
Goals:

- Recover “nuisance” marshlands for productive use
- Landfilling should be used to raise the land elevations for subsequent development

End Use Plan Included:

- Industrial development along the Arthur Kill
- Parkland along Richmond and Main Creeks
- Residential development North / South of park areas
- Circulation network

Landfill operations proceeded from 1948-2001



Landfill operations

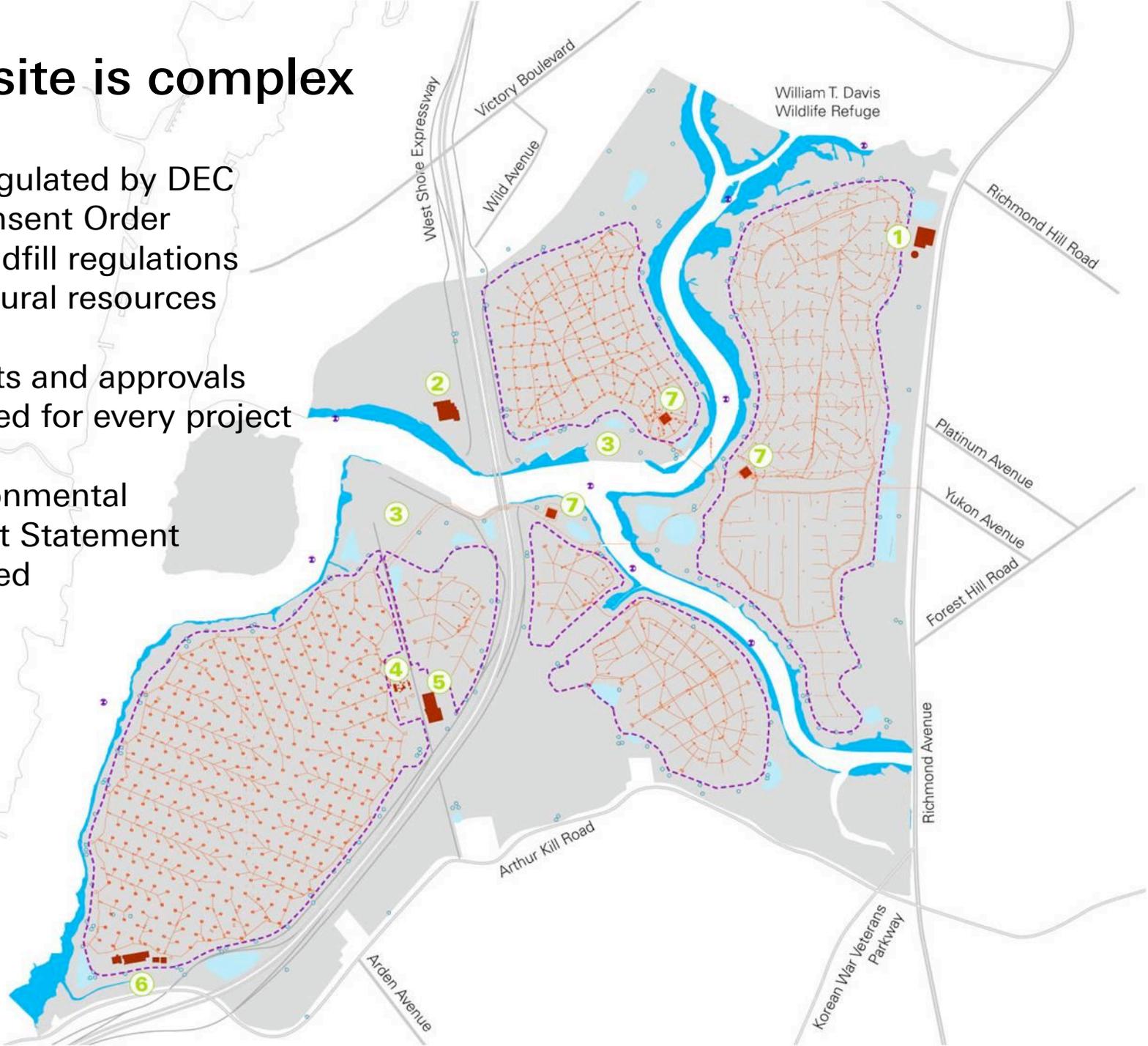




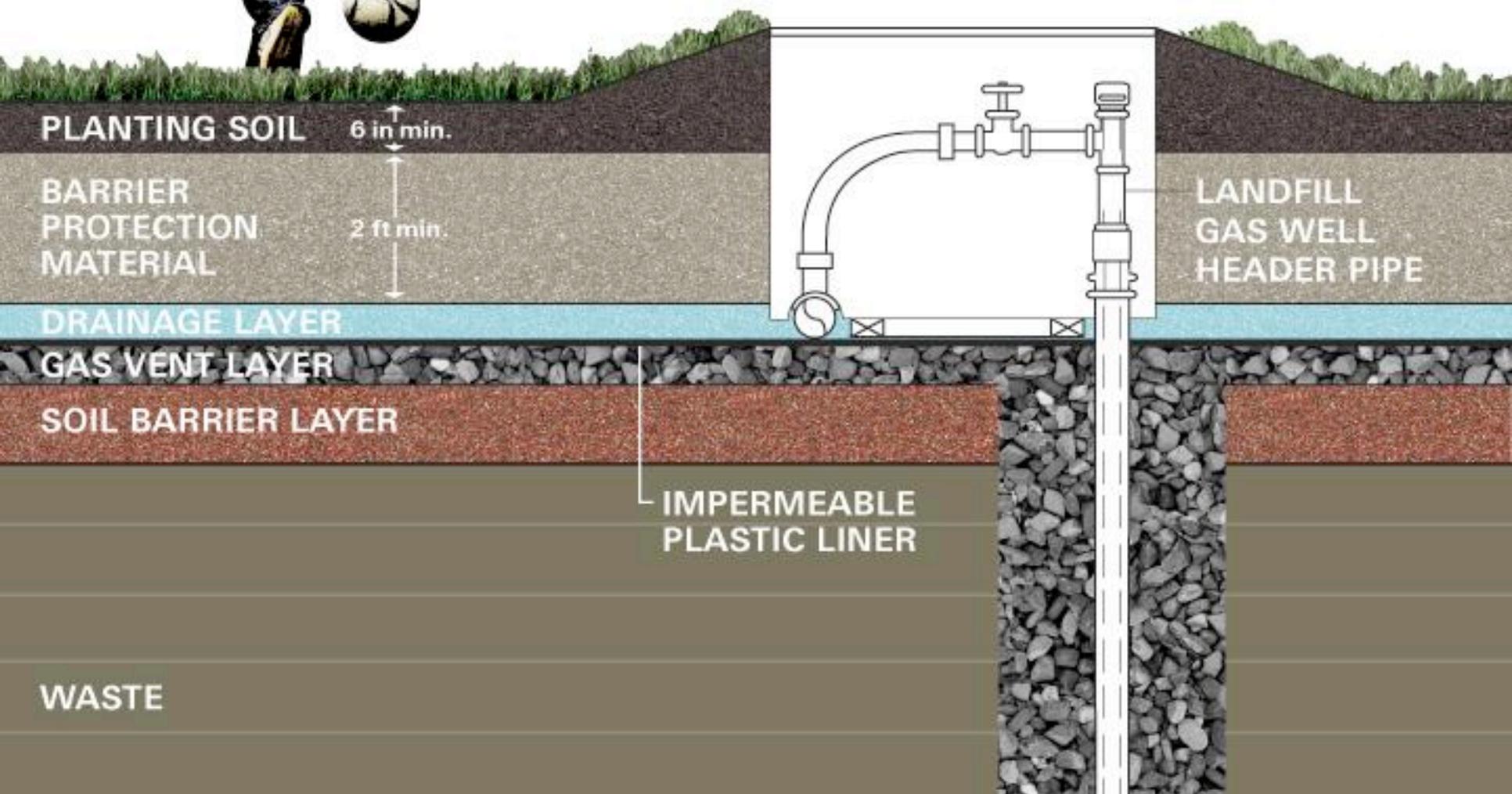
**ONLY 45% OF THE SITE IS LANDFILL.
THE OTHER 55% IS MADE UP OF CREEKS, WETLANDS, AND OPEN
FIELDS**

This site is complex

- Site regulated by DEC
Consent Order
Landfill regulations
Natural resources
- Permits and approvals
required for every project
- Environmental
Impact Statement
required



What is a landfill cap?



Today

north mound
capped: early '90s

east mound
capping: 2007-2011

south mound
capped: early '90s

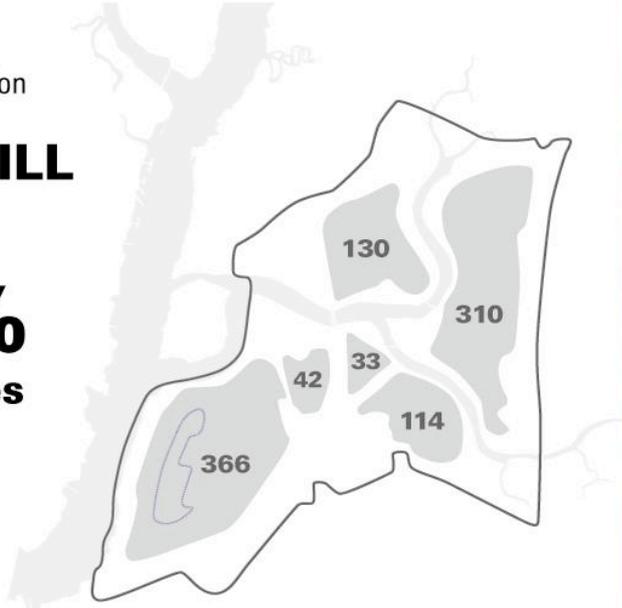
west mound
capping: 7-10 yrs



existing condition

LANDFILL

45%
995 acres



existing condition

CREEKS

6%
130 acres



existing condition

WETLAND

14%
315 acres



existing condition

DRY LOWLAND

35%
760 acres









Stormwater basin



Invasive species



DESIGNING THE PARK

International design competition



Field Operations

Conceptual Site Plan

2001-2002

Planning phase: 2003-2006



Three coordinated systems



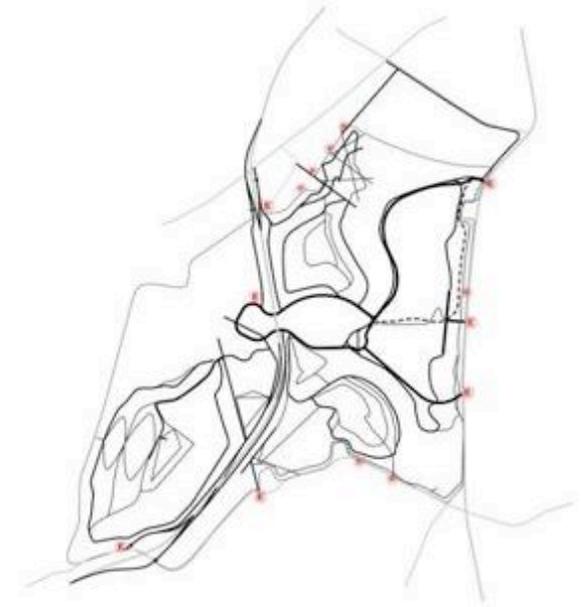
1. Habitat



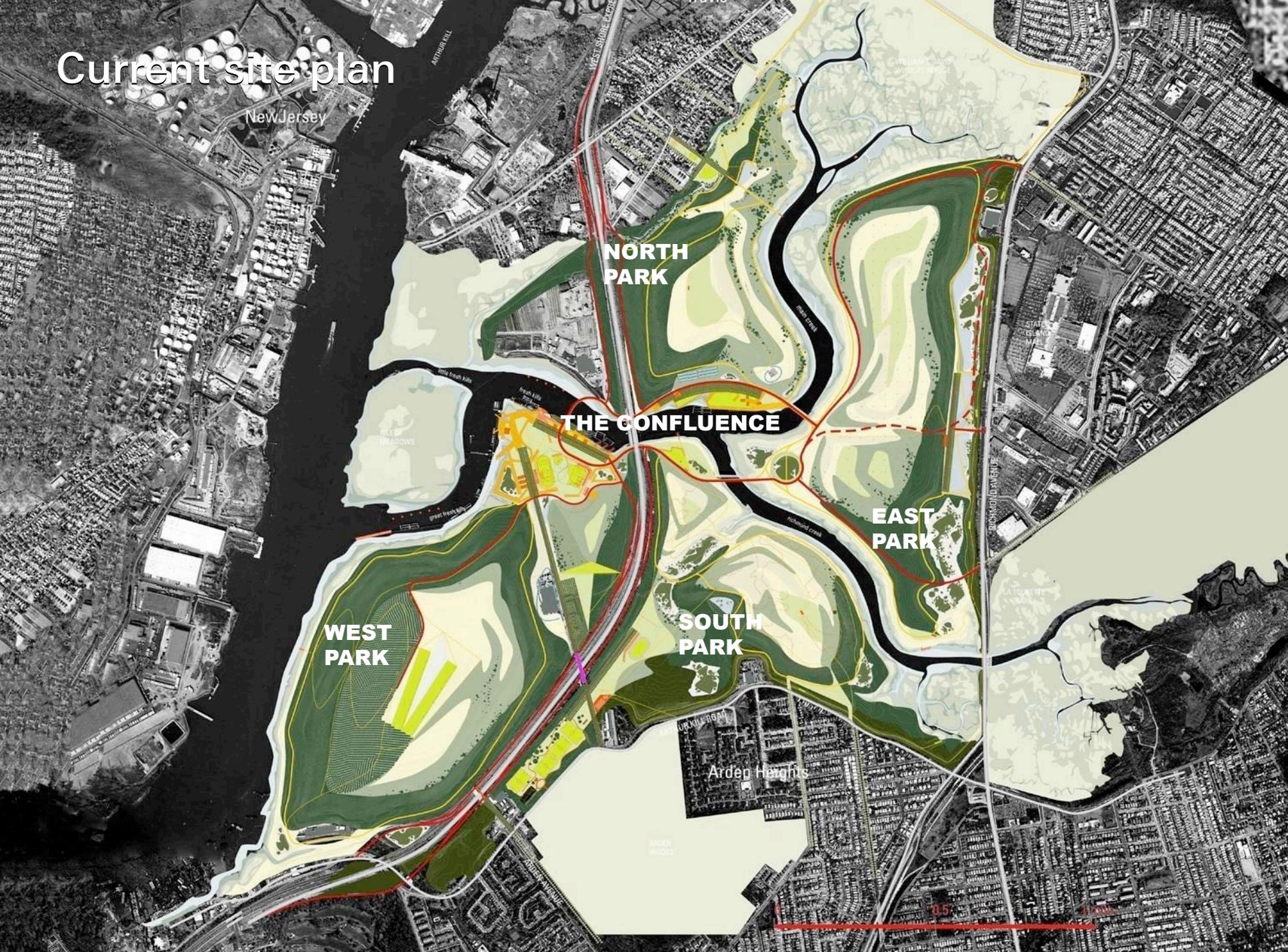
2. Program



3. Circulation



Current site plan



New Jersey

NORTH PARK

THE CONFLUENCE

EAST PARK

WEST PARK

SOUTH PARK

Arden Heights

ARTHUR KILL

EAST SHORE EXPRESSWAY

WIDE FRESH KILL

FRESH KILL

GRAND FRESH KILL

RICHARD CREEK

ROCKAWAY AVENUE

UR KILL ROAD

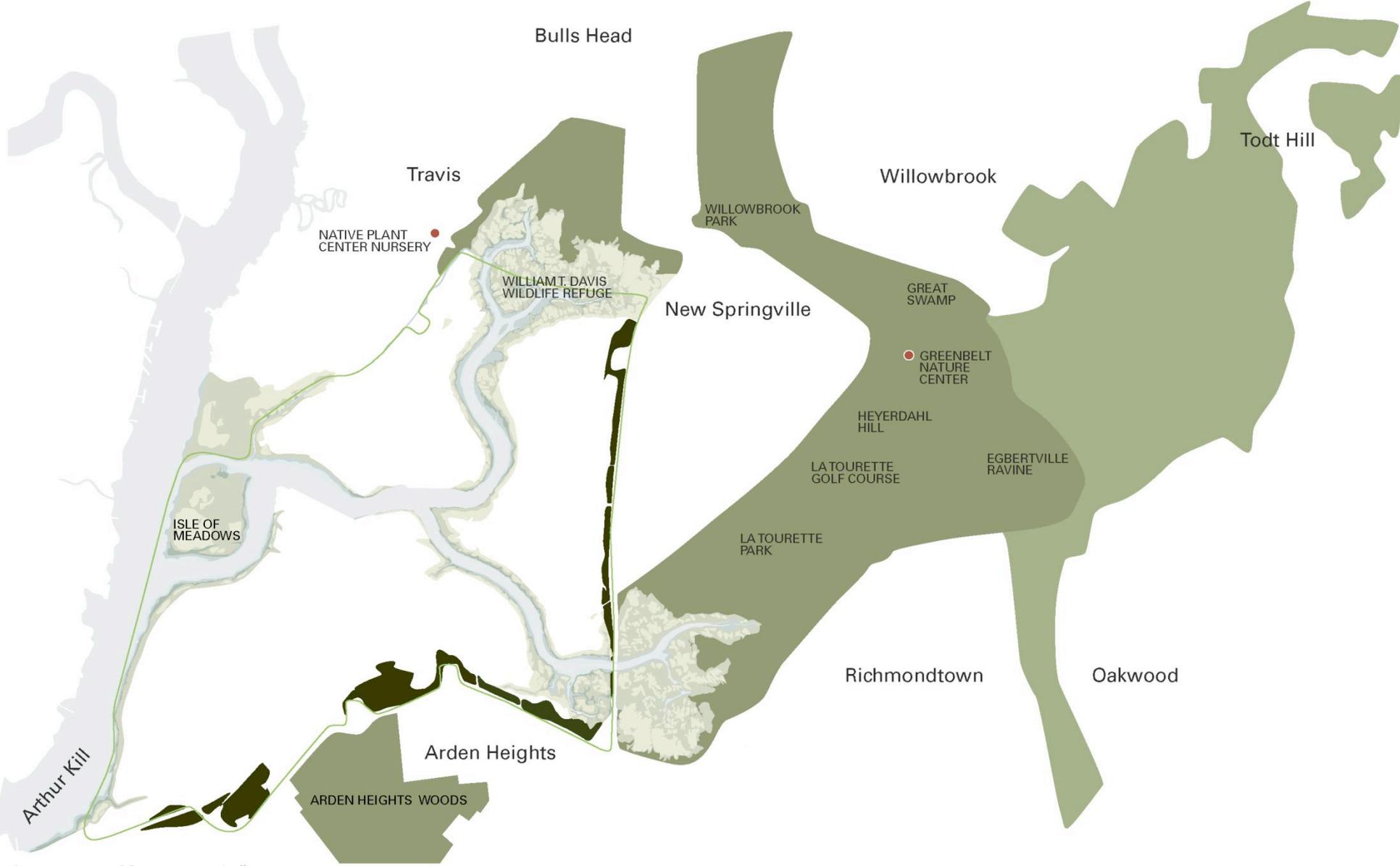
SOUTH WOODS

Borough-wide green space



- site boundary
- woodland/open space/recreation area
- open water

Ecological connectivity



0 0.5 1 mile

1" = 3200'

Potential ecotypes and plant species

WETLAND



LOW SALT MARSH

salt-marsh cordgrass



HIGH SALT MARSH

salt-meadow hay
spikegrass
sea lavender
pink gerardia
arrow grass
glasswort



FENS

cottonwood
red ash
green ash
sassafras
swamp rose



CAPE MAY LOWLAND SWAMP

sedge
cattail
burreed



GRASSLAND



TURF

nodding fescue
indian sweetgrass
poverty grass
red fescue



FLOWERING PRAIRIE

spiderwort
purple coneflower
pale purple coneflower
purple joe-pye weed



EASTERN PRAIRIE - MOIST

panic grass
big bluestem
indian nutgrass
switch grass
gamma grass



EASTERN PRAIRIE - DRY

panic grass
big bluestem
indian nutgrass



Potential ecotypes and plant species

WOODLAND



PINE OAK BARREN ISLANDS

scrub pine
blackjack oak
eastern redcedar
pitch pine
post oak



SWEET GUM / MAPLE SWAMP

sweet gum
red maple
black cherry
sweet pepper bush
pennsylvania sedge



MARITIME OAK FOREST

sweetgum
willow oak
scrub oak
scarlet oak
persimmon



PERSIMMON COPSES

persimmon
flowering dogwood
silky dogwood
red osier dogwood
hackberry
witch hazel



CAPE MAY LOWLAND SWAMP FOREST

swamp cottonwood
swamp white oak
sourgum
red maple
pin oak



SWEETBAY MAGNOLIA BOG

sweetbay magnolia
tussock sedges
red maple
sourgum
swamp cottonwood



BIRCH THICKET

grey birch
eastern redcedar
highbush blueberry
arrow wood
pinxsterbloom azalea



MORAINAL OAK/BEECH WOODLAND

american beech
northern red oak
pin oak
black oak
scarlet oak
white oak



Potential for habitat creation



Eleven natural areas on Staten Island were surveyed to develop a palette of plant communities that support native wildlife. Working from this palette, diverse habitats appropriate to Fresh Kills' topography and hydrology are proposed.

Varied woodland landscape can resist upland, in wet and dry marginal zones. These diverse communities will provide habitat for such species as white-footed mice, deer mice, beaver, meadow, osprey, goldeneyes, pine siskins, and non-shouldered hawks.

WOODLAND

MESIC GRASSLAND

WET GRASSLAND

DRY GRASSLAND

SWAMP FOREST

HIGH MARSH

LOW MARSH

MUD FLATS

SHALLOW OPEN WATER

In the wet grassland, a seasonal high water table is important as foraging ground for diverse bird communities, including Killdeer, Blackbird, Parula, and warblers. Wooded fox, cottontail, and dragonflies are also found here.

Mesic grassland (between wet and dry) will support small tree species, important for dragonflies, songbirds and birds of prey. The meadow hawks, and the mesic grassland for breeding and foraging small mammals—mice, voles, rabbit, fox, and opossum live there, in the transition between grassland and forest edge.

Initially moist in early spring, exposed, wet, mesic grasslands dry quickly, and support such soil change of those which emerge over time. The number of species of birds here is relatively small, but it includes sparrows. Many mammals, such as rabbit, skunk, weasel, and fox will feed and forage here.

The fresh water means birds sensitive to species able to survive in generally wet, acidic soils. High in nutrients. Connected to the Esplanade, the sediment, deposited during flooding, adds nutrients to the rich biological community.

A great number of fish, birds, amphibians and reptiles can be found in this area, such as the green fish, the bankside warbler, the eastern blue bird, and meadow lark.

Low marsh and tidal mud flats are characterized by daily tidal fluctuations. Many birds use the habitat for feeding, moulting and brooding fish, crabs and others use the dead and muddy water zones.

Typical species include killifish, mud crab, muskrat, Goldeneye, heron and other wading birds, duck-birds and gulls, Goldeneye muskrat, and a few crustaceans.

Particularly submerged, this area is predominantly of importance to fish, aquatic insects, and birds and other wildlife that eat aquatic vegetation.

Species include killifish, bluefish, muskrat, and mink, shad, and American lobster, among others.

Rarely inundated marsh is populated by meadow and wet birds, marsh fox, and even has importance to birds like the egret, or great blue heron.

High marsh provides habitat for herons, rose and waterlilies, muskrat, such as muskrat and muskrat and smaller crustaceans like marsh snails, scudbugs and waterfleas.

SWAMP

LABORERS AND EXHIBITION POND

Two feet of clean soil



Native plantings



WHERE WE ARE NOW

Near-term construction projects

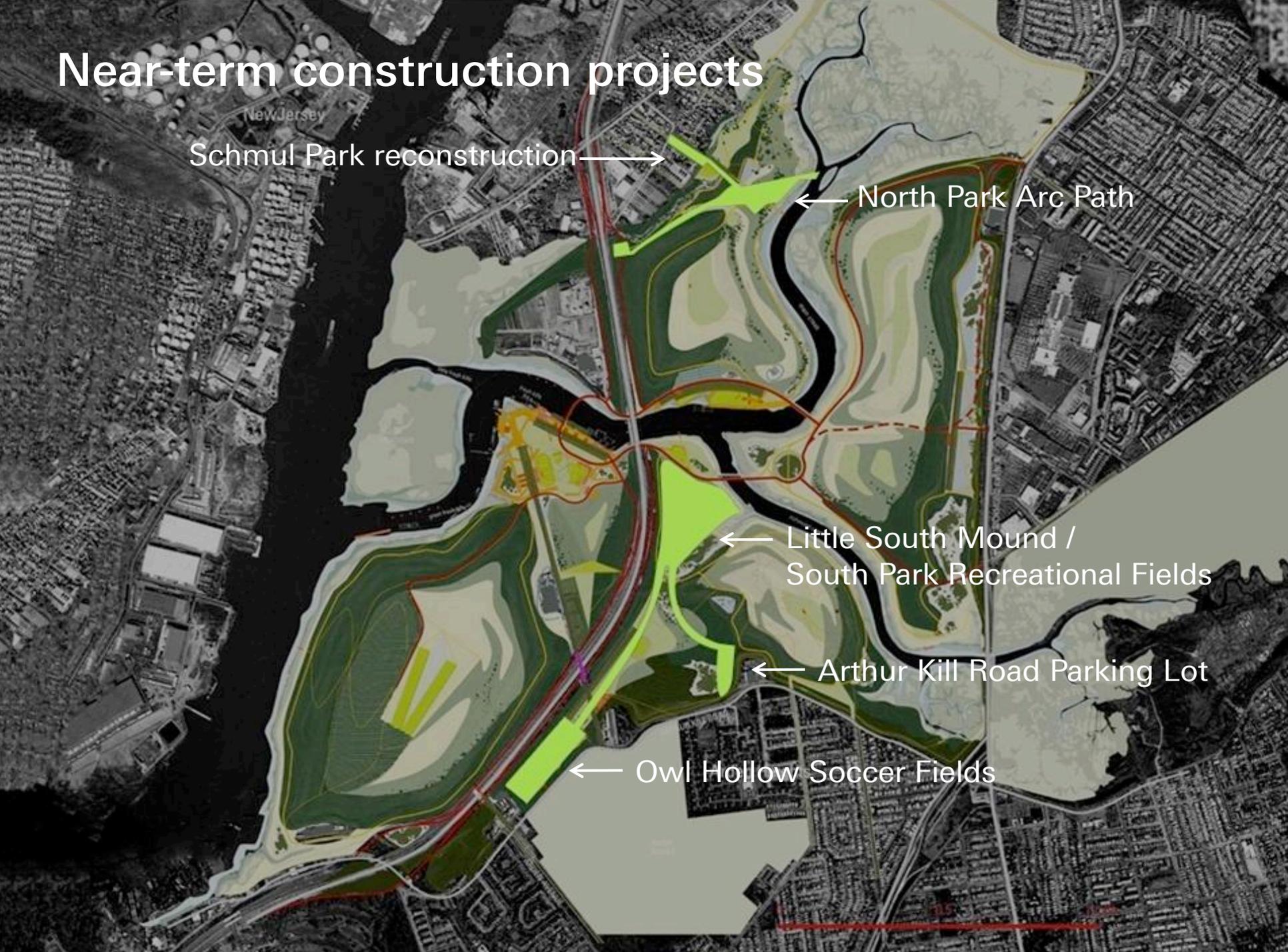
Schmul Park reconstruction →

← North Park Arc Path

← Little South Mound /
South Park Recreational Fields

← Arthur Kill Road Parking Lot

← Owl Hollow Soccer Fields



Schmul Park Entrance



Owl Hollow Soccer Fields and Comfort Station



NORTH PARK



1 mile

North Park Parking Lot & PV Panel



North Park Arc Path



Composting Toilet Comfort Station at Forested Plateau



Pot-in-pot Tree Nursery



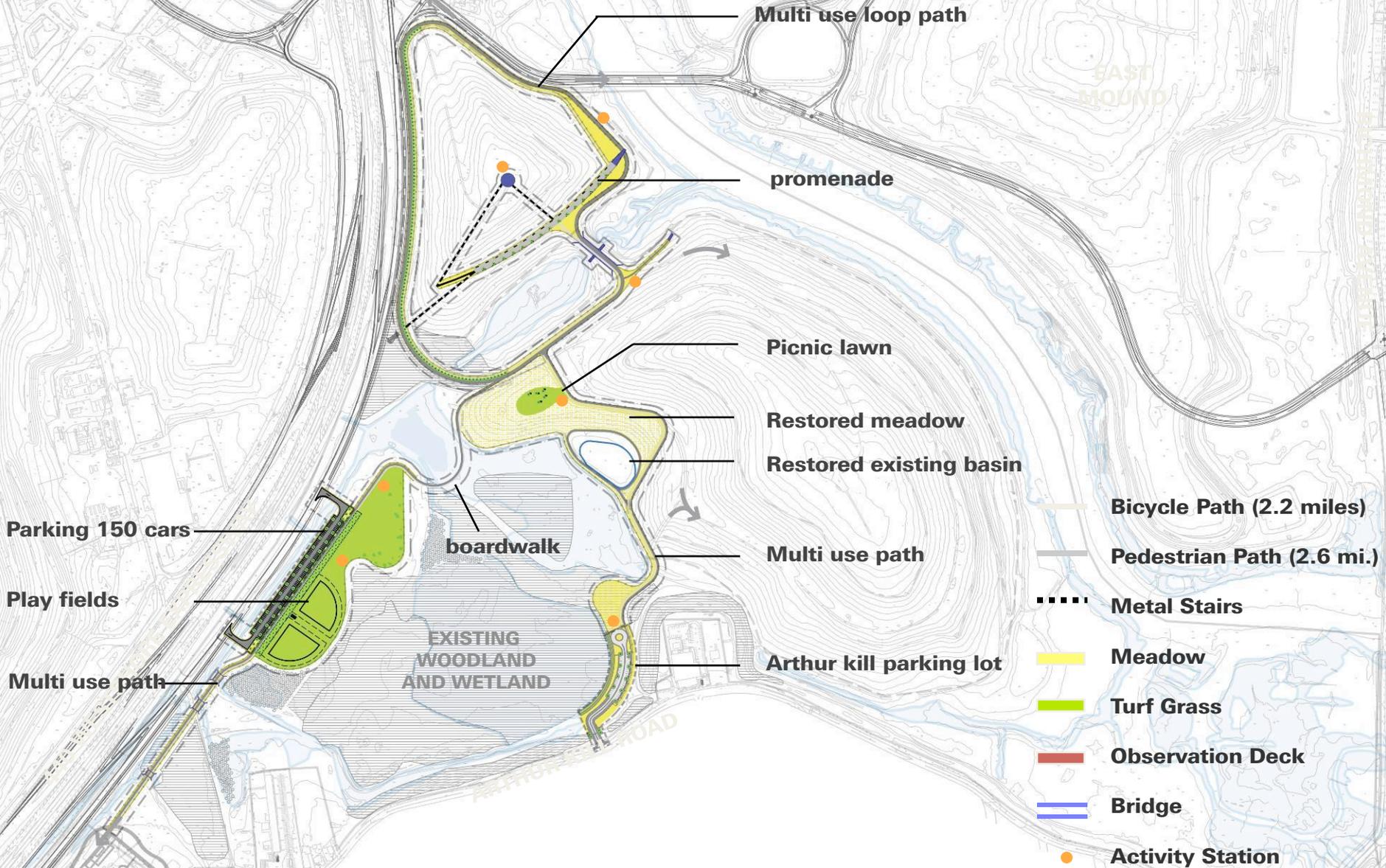
North Park Picnic Lawn and Seed Farm



Bird Observation Tower looking northeast



South Park Phase One Conceptual Plan



Designated cycling paths



South Park hilltop overlooks



Environmental education



Renewable energy projects

The Parks Department fully supports pursuing renewable energy projects including wind, solar, co-generation and other renewable energy technologies at Freshkills Park.

Wind

- Commercial-scale wind turbines
- Small-to-medium scale wind turbines incorporated into individual capital projects *eg. Owl Hollow comfort station*



Solar

- Large-scale solar arrays
- Smaller solar arrays incorporated into the design of individual capital projects *eg. North Park*



Other

- Co-generation, creating energy from the landfill gas generated at the site
- Renewable energy research and development, offering a site for the piloting of sustainable technologies as advancements are made in the field

POTENTIAL FOR ON-SITE RESEARCH

Why do research at Freshkills Park?

- Interested and invested project team
- Access to a secure site that is closed to public access
- City partner for joint funding applications
- Unique site with varied landscape (creeks, wetlands, woodlands, meadows, capped landfill mounds, active recreation areas, etc.)
- Assistance in navigating the regulatory requirements of the site
- Restoration site with national and international significance
- Publicity/exposure
- Access to baseline data already collected

Near-term construction projects

— less than 100 of the full 2,220 acres

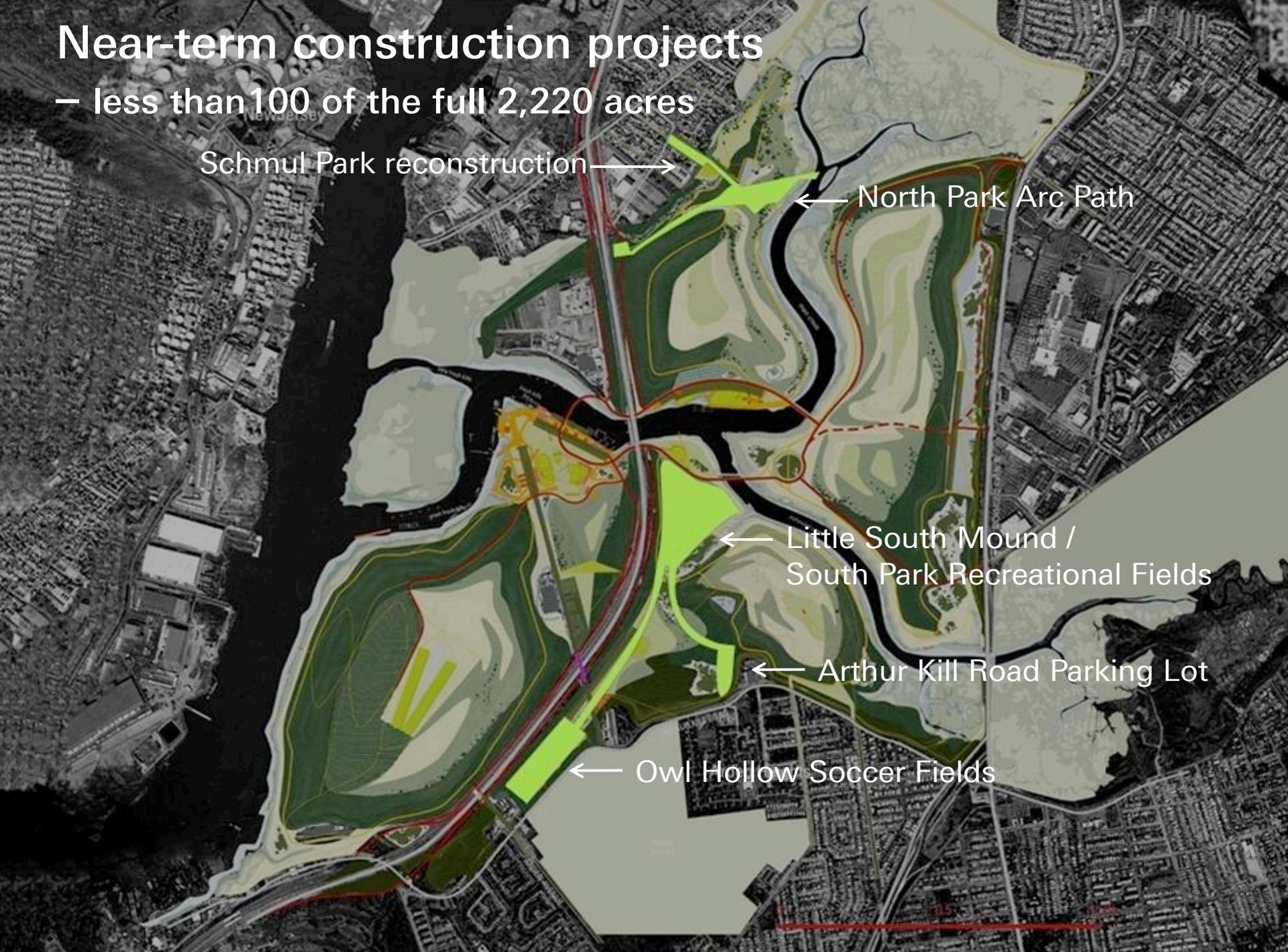
Schmul Park reconstruction →

← North Park Arc Path

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Research Opportunities

Site-specific research that:

- addresses particular problems at Freshkills Park
- advances questions around urban ecology and restoration
- is applicable to urban parks city-wide and/or at larger scales
- is applicable to other landfill-to-park conversion sites

Potential research topic areas:

- Climate
- Plant survival / recruitment / diversity / productivity
- Soil
- Air
- Water
- Biodiversity (wildlife)
- Human Health
- Economic Impact
- Citizen Engagement
- Recreation
- Alternative Energy

Research Conducted (*example*)

Steven Handel, Rutgers University - Center for Urban Restoration Ecology

- Tree root penetration studies
- Seed dispersal and growth pattern studies
- Procedures for restoring native habitats to highly degraded lands

Restoring Urban Ecology

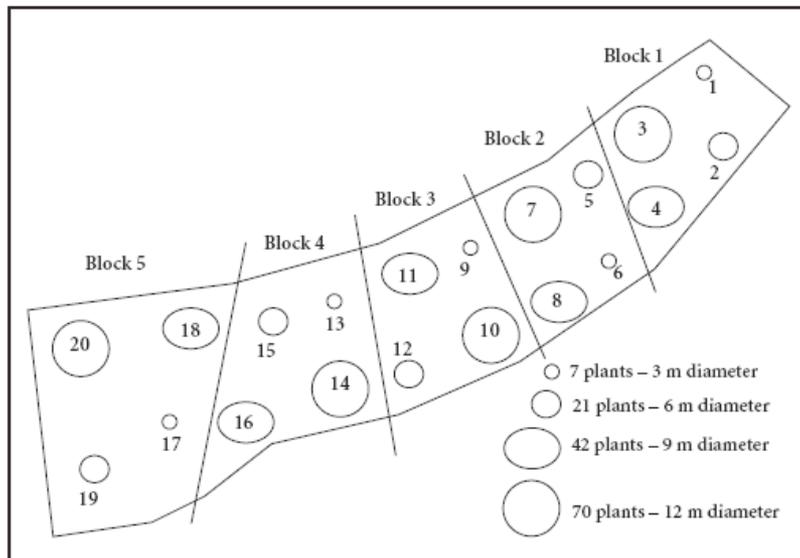


Figure 1 Arrangement of experimental patches of woody plants at Fresh Kills landfill, Staten Island, New York. Twenty patches of seven species vary in size, containing seven, twenty-one, forty-two, or seventy plants. These patches test how scale of restoration planting may change ecological functioning.

How can the study of Freshkills inform the research questions of your disciplines?

examples:

- What can be learned from the ecological systems at Freshkills that would further an understanding of the dynamics of disturbed landscapes?
- What is the value of Freshkills to the bird migration corridor along the Arthur Kill? If it was enhanced as a stopover point, what would be the effect on birds flying over?
- How do you direct plant succession on a highly engineered and managed site?
- How do various planting strategies affect on-site water quality?
- How do the conditions at the toe of the mounds affect plant and animal life? How is this different from what happens in on-mound or off-mound areas?
- How do ecological enhancements at Freshkills contribute to climate change mitigation? How are microclimates affected?
- How and in what cases should phytoremediation be utilized in brownfields mitigation? How should these sites be monitored in the long term?
- How and by what factors will perceptions of the site's safety and desirability change, both on Staten Island and in the region as a whole?

Next steps

- Brainstorm research projects/questions at Freshkills Park
- Identify research partner(s) – both individuals and institutions
- Identify potential funding sources and partners for proposal development

Can you help? Let's talk.

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An aerial rendering of the Freshkills Park development. The image shows a large, winding river or canal system cutting through a landscape of green fields, trees, and various structures. In the upper left, there are several wind turbines. A bridge crosses the river in the upper right. The foreground shows a large, curved green field with a path, and a body of water with several kayakers. The overall scene is a mix of natural and developed areas.

www.nyc.gov/parks/freshkillspark

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PROJECT OF NEW YORK CITY DEPARTMENT OF PARKS & RECREATION

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