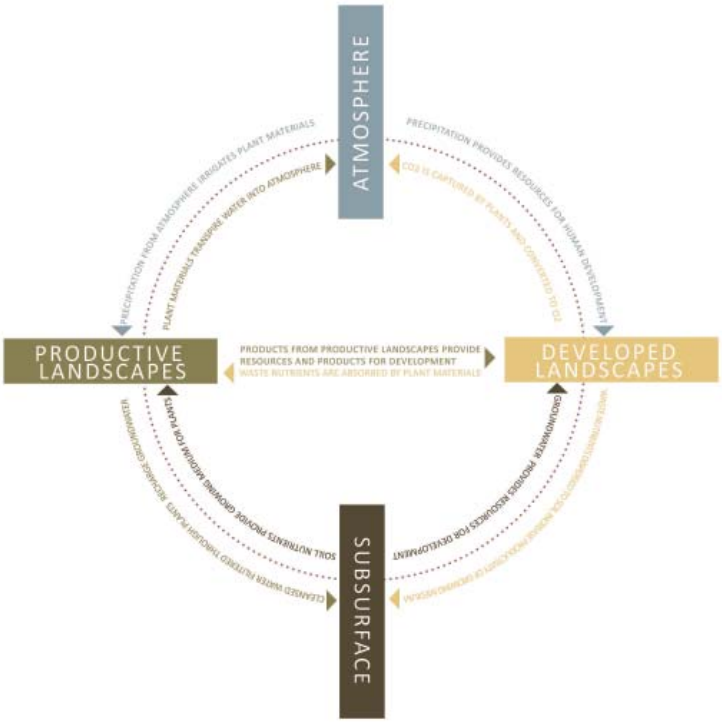
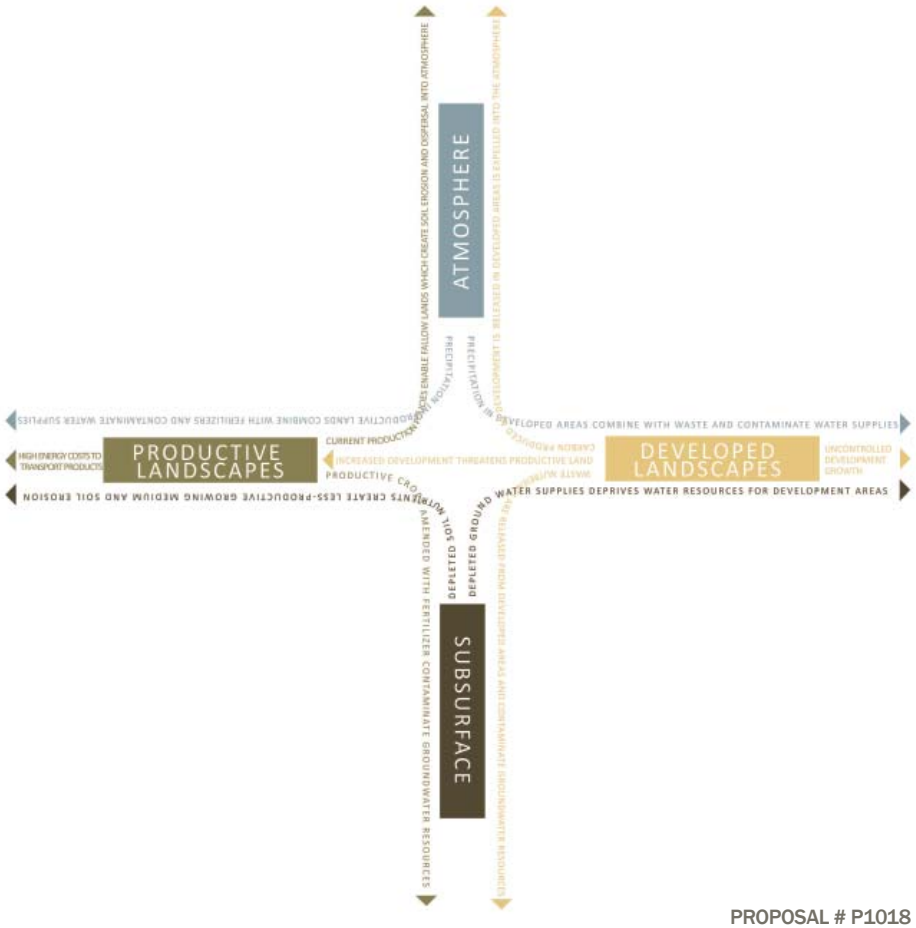
CYCLICAL RESOURCE FLOWS

Many of the current resource and waste management concerns in cities are recent. Before the industrial revolution, the lack of modern technology and its consumption of energy resources necessitated that cities be more integrated with the natural cycles of resource use and waste production.[1] The proximity of production and waste wielded advantages for layering multiple resource management systems into a cyclical solution. For example, the system of nutrients from food to waste were maintained symbiotically with produce feeding humans and waste returning to agricultural fields to provide fertilization.[2] This balanced system existed for other resources, such as water processes and the continuous cycle of O_2 and CO_2 between plants and animals. In a system where resources are managed cyclically, the need for infrastructure is minimized: Wetlands treat storm-water, agriculture utilizes waste nutrients, plant materials absorb carbon, and local product use minimizes long-distant transport.

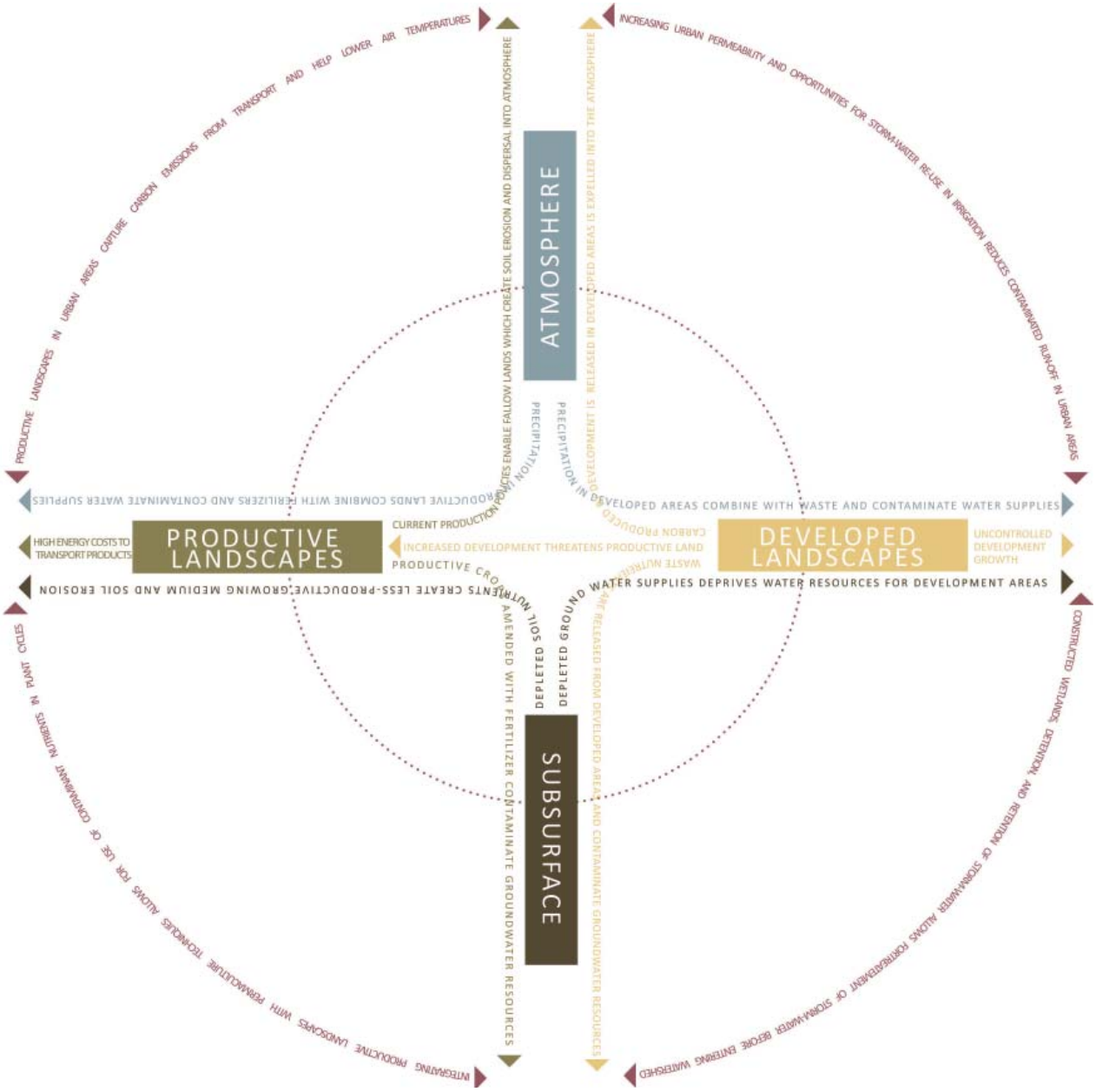


UNILATERAL RESOURCE FLOWS

The modern conception of cities, where technological advances privilege developed landscapes, necessitates elaborate infrastructural systems of finite life spans that are now coming to an end of their usefulness or are overtaxed and need to be replaced. These engineered solutions cause the demise of forest and wetland habitats, air quality, and water quality in both sub-grade and surface conditions. In separating resource cycles including water and nutrients, unilateral flows of energy and product pour into cities, but the waste is directed outward to watersheds and the atmosphere. This creates increased infrastructural demands on the modern city.[1] Transmitters include highways for transport of products, aquaducts for the supply of drinking water, sanitary lines to remove waste nutrients, processing plants to treat the waste, and a reliance on energy resources to fuel the incessant flows of product and waste, in and out of cities.

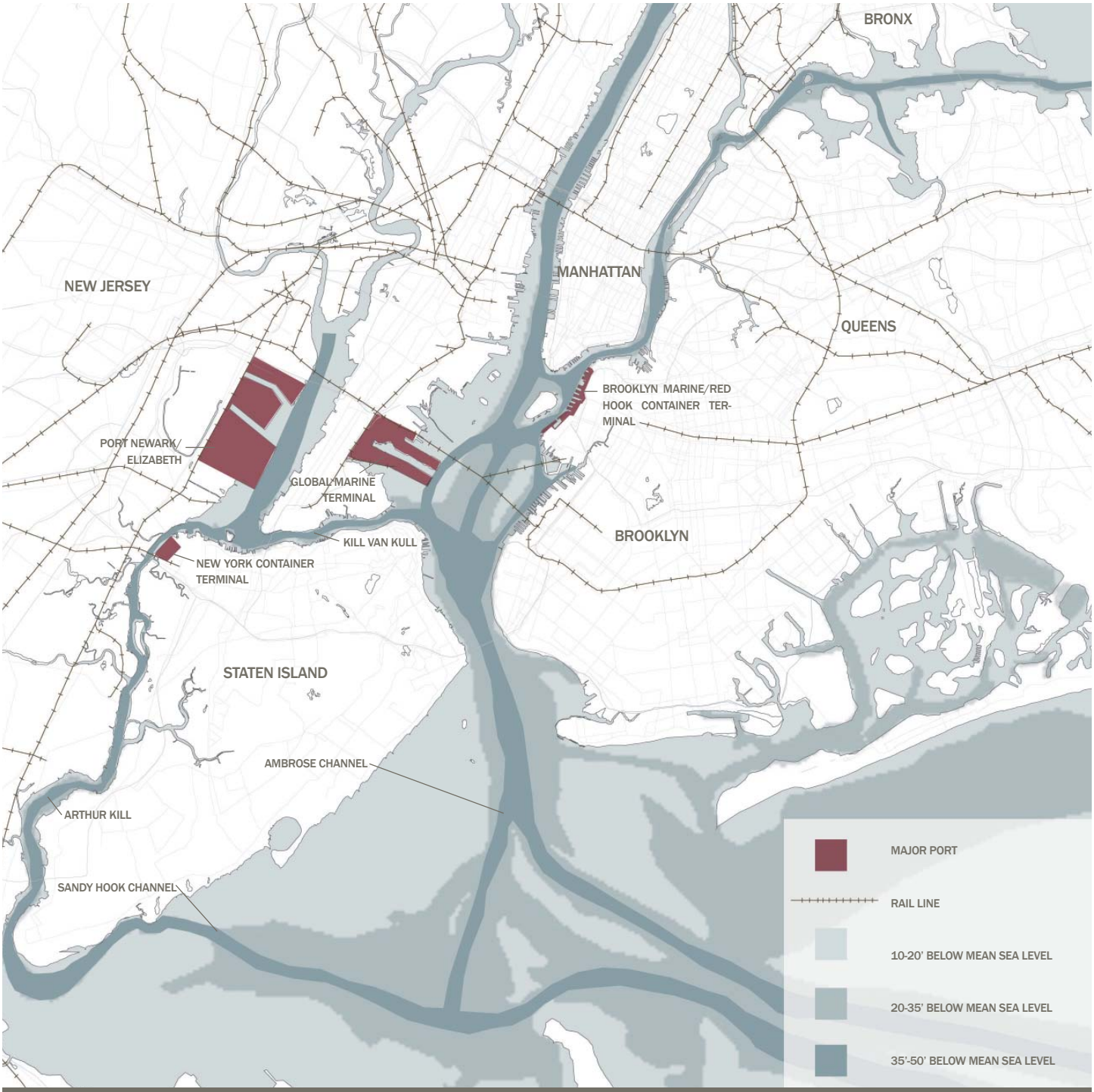


1. Viljoen, Andre (ed). *CPULs*. Elsevier Science & Technology Books. 2005.
2. Steel, Carolyn. *Hungry City*. Chatto & Windus. 2009



RECREATING THE CYCLE: REDEFINING INFRASTRUCTURE

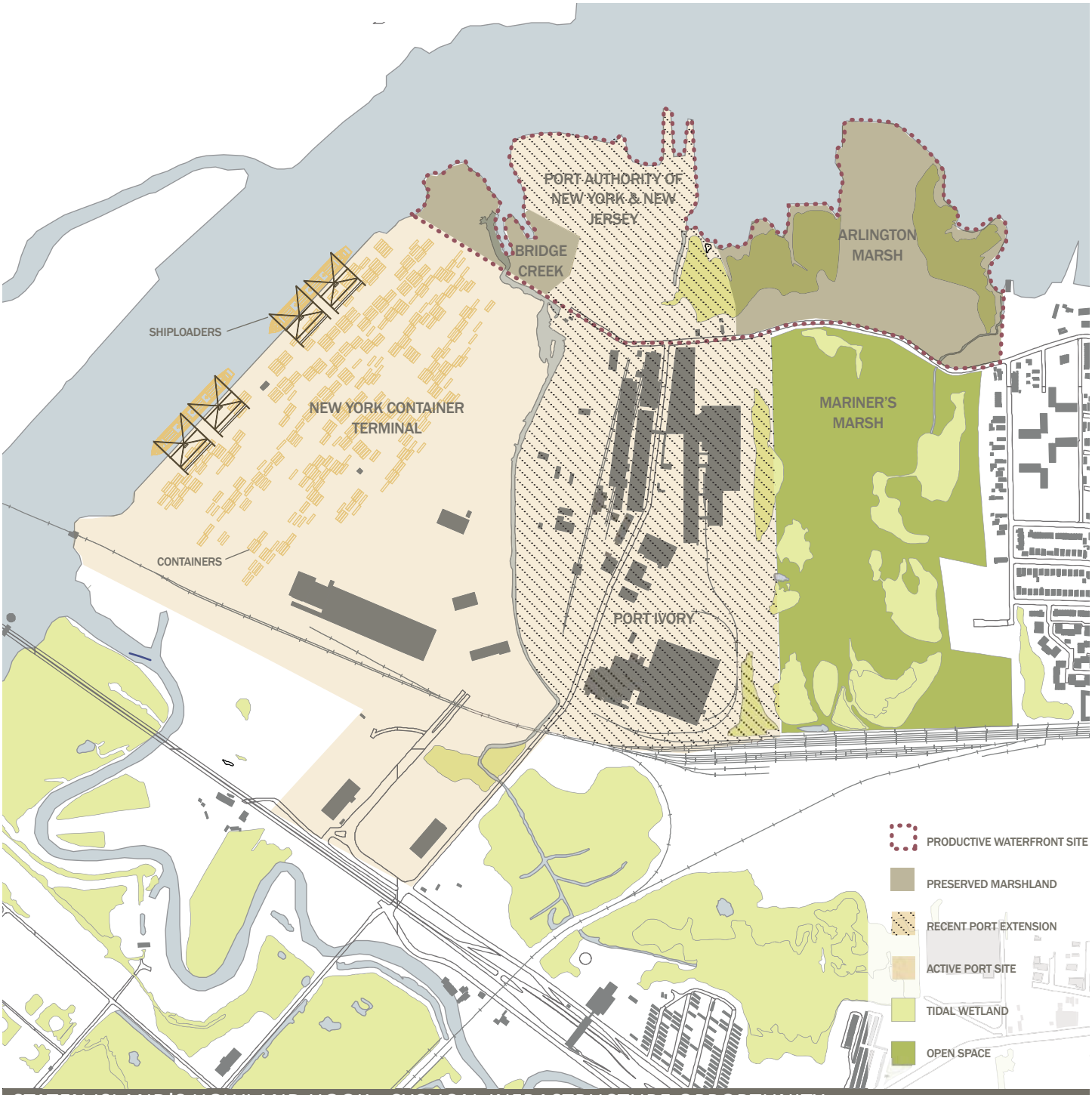
Considering past and present conditions of resource management, the creation of new urban infrastructure systems that function cyclically to manage resources is clearly needed. The term infrastructure itself, should be critically re-considered so that its connection with the concrete and steel entanglements of highways and sewer systems can be reduced, coordinated, or even eliminated. At a time when priorities are refocused on infrastructural investment, we must remind ourselves of the real meaning of the term: systems that manage resources within cities and for the people that inhabit them. Engagement of resource based strategic thinking beyond the limitations of current finite constructions can help facilitate design of alternate and sustainable overlapping urban systems that improve the quality of life within cities themselves. Design projects have the capacity to be economically, ecologically, and socially productive by actively engaging in addresssing current resource management issues. The following project represents a holistic approach to providing a productive landscape that serves as infrastructure by managing multiple resources. By recognizing opportunities for innovative infrastructural design, landsapes become the systems which complete the resource cycle.



CONSIDERING CYCLICAL INFRASTRUCTURE WITHIN NEW YORK CITY'S SHORELINE

Consideration of integrated resources managed within an infrastructural landscape system is necessary when examining the waterway network surrounding New York City. The city owes its origins as a commercial center to it's advantageous location on maritime trade lines and extensive shoreline. Initially it was the docks and wharves of South Street that provided water-based mail transport and food products via the Erie Canal.[1] That waterfront industry later spread to Manhattan's west side, Brooklyn, Staten Island, and New Jersey waterfronts. Today's water-based transport supports international trade and requires signficant infrastructural management to dredge navigable canals and construct large-scale waterfront ports. Recently this work included the expansion and deepening of the Kill Van Kull and Arthur Kill channels to the north and west of Staten Island.[2] These systems are currently designed solely to maximize economic productivity. With hundreds of miles of shoreline, New York City's harbor resembles little of the native conditions that existed prior to human settlement of the city. As trade and commerce drive the development of waterfronts, the quality of natural tidal wetlands and salt marshes have shrunk. The design of integrated economic and productive waterfronts in underdeveloped within the New York City shoreline.

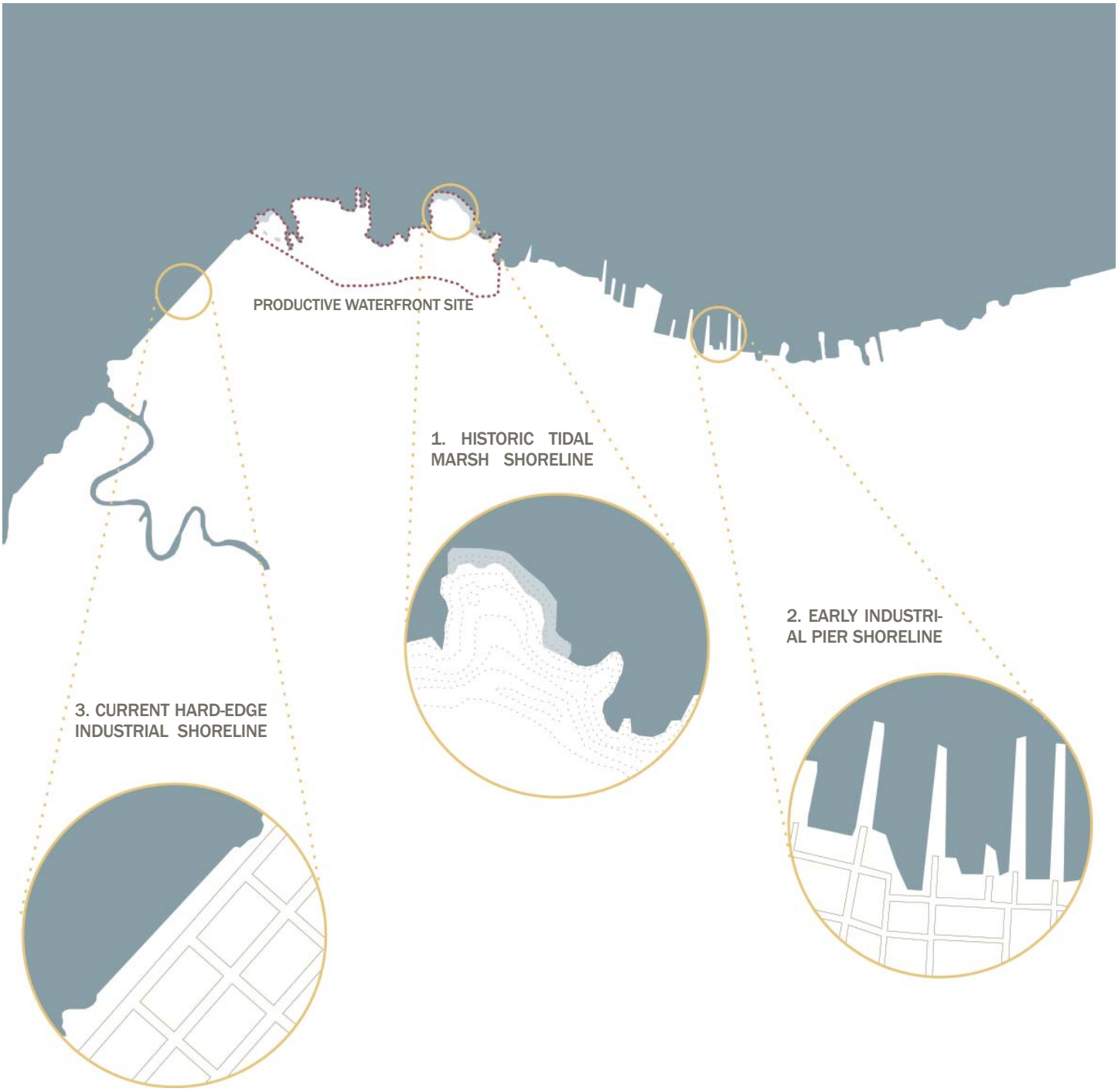
1. Ascher, Kate. *The Works: Anatomy of a City*. Penguin Books. 2005.
2. Lipton, Eric. "Beneath The Harbor, It's Dig or Else; Dredging Project Makes Way For Newer, Larger Ship." *The New York Times*. Nov. 23, 2004.



STATEN ISLAND'S HOWLAND HOOK: CYCLICAL INFRASTRUCTURE OPPORTUNITY

The New York Container Terminal site at Howland Hook on the northwest shore of Staten Island provides an opportunity to layer economomic and ecologic approach to creating a productive waterfront. Formerly owned by U.S. Lines, this 187-acre port sat inactive for 10 years after bankrupcy in 1986.[1] It was reactivated in 1996 by the Port Authority of New York, with over $350 million invested in upgrading facilities.[1] In 2001 the Port Authority acquired Port Ivory (named for the site's production Ivory Soap), an additional 124 acres, from Proctor & Gamble. This included portions of the Arlington Marsh, one of the few remaining tidal wetlands in New York City's shoreline. In an attempt to protect a portion of this marsh, 70 acres of Port Ivory's salt marshes were transferred from the Port Authority to NYC Department of Parks and Recreation in 2007.[2] Remaining portions of Port Ivory are still slated for development, however the New York Container Terminal continues to thrive as an active port site. Conflicting adjacent ownership and layered resource needs of this waterfront site is typical of many cities throughout the United States. The competing need for both economically productive and ecologically productive shorelines exists simultaneously, and are currently acting as an impass in pursuing an approach to the site.

1. Ascher, Kate. *The Works: Anatomy of a City*. Penguin Books. 2005.
2. Newman, Andy. "Protecting a Wild Patch of City Marshland." *The New York Times*. Nov. 7, 2007.



HOWLAND HOOK'S SHORELINE CONDITIONS

Remnants of the historical progression of shoreline development exist near Howland Hook. Prior to settlement of New York City, wetlands and tidal marshes stretched along most of the harbor's shoreline. Early settlement began on the Southern tip of Manhattan and as the city and its trade grew, more constructed shoreline developed along its edge during the 18th century.[1] Narrow piers jutting into the harbor spread north along the western and eastern edges of Manhattan and later to the Brooklyn, New Jersey, and finally Staten Island shores by the 19th century. In the late 19th century the first dredging projects in New York Harbor occurred enabling larger ships to enter the harbors. Subsequently, larger docks and ports were necessary to handle the increased ship sizes and cargo loads. Currently, maritime container ships are as large as 1,043 ft long and 141 ft wide. In addition, the equipment necessary for loading and unloading ships requires extensive upland real estate.[2] As a result many modern active ports, such as the New York Container Port at Howland Hook, are highly constructed and massively scaled waterfronts with bulk-head edges and great swaths of impervious hardscaped upland.

1. Ascher, Kate. *The Works: Anatomy of a City*. Penguin Books. 2005.
2. U.S. Army Corps of Engineers, New York District

1891 USGS


ARLINGTON MARSH

1. HISTORIC TIDAL MARSH SHORELINE

Nearly 100 acres of tidal wetlands, including salt marshes, currently exist northeast of the Howland Hook site, a remnant of the original shoreline condi-ton of New York City's native waterfront. However up until the early 20th Century, three times that amount of wetlands covered the northwestern shores of the island, with tidal zones that stretched inland for hundreds of feet. A combination of fresh- and salt-water wetlands, supported by frequent tidal flooding and lowland gradual topography, provided habitat for young fish, birds, and bottom-dwelling aquatic animals.


1984 USGS


PORT IVORY

2. EARLY INDUSTRIAL PIER SHORELINE

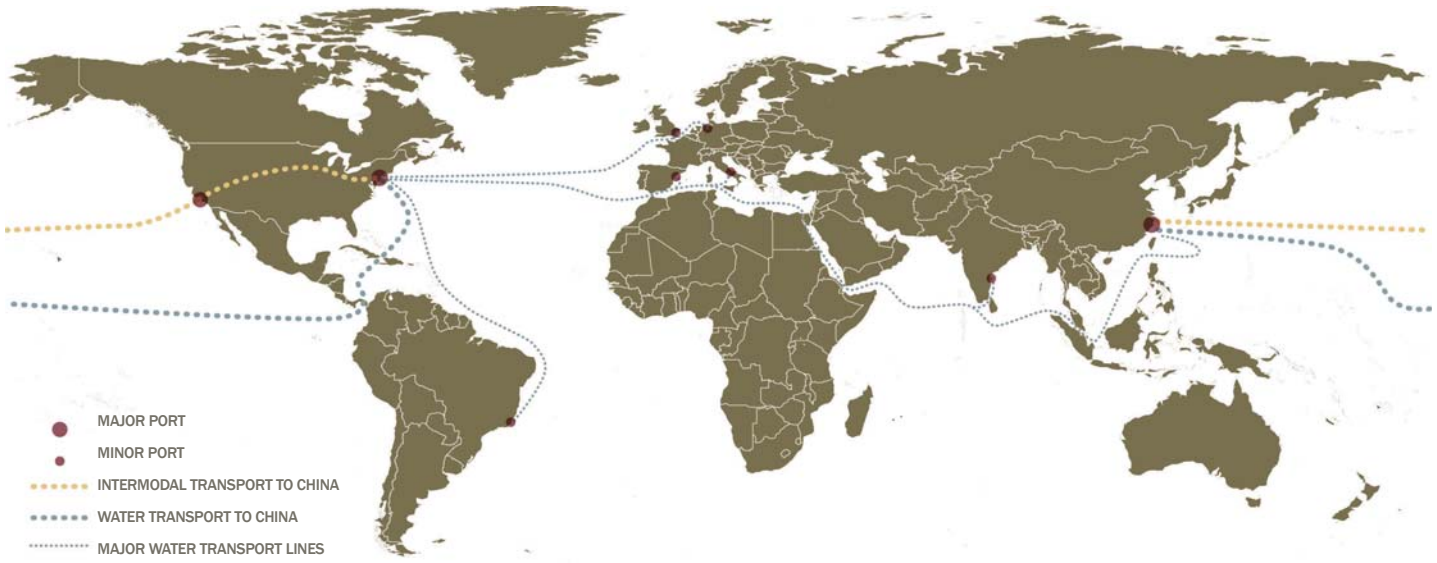
Shipping took off in the early part of the 20th century, following the Industrial Revolution, and waterfront trade came to Staten Island, centered to the east of Howland Hook and including portions of Arlington Marsh, where more navigable waters enabled easy ship docking. The tooth-like waterfront edge created by jutting piers not only reflected the scale of the ships utilized at the turn of the century, but also knitted into the scale of urban develop-ment that grew from a thriving commercial waterfront. Typical pier sizes were 50 ft wide and 400 ft long. By the mid-20th century, the increased scale of shipping could not be supported by the shores of Arlington Marsh, but rotting piers along Port Ivory's coast remain as a reminder its shipping past.


CURRENT


CONTAINER PORT

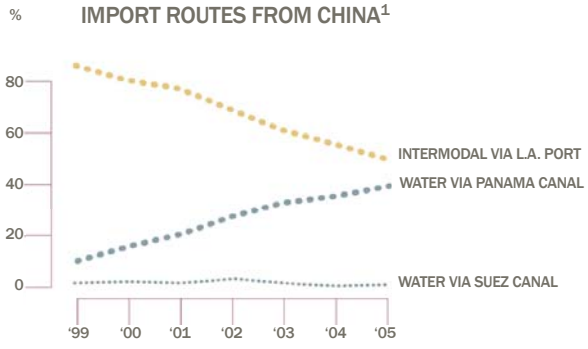
3. CURRENT HARD-EDGE INDUSTRIAL PIER SHORELINE

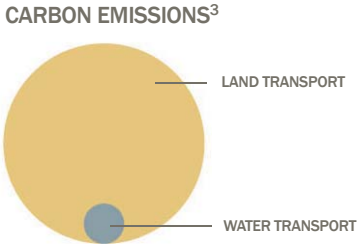
Dredged canals have allowed large ships to navigate the Arthur Kill channel but the products of this dredging have raised the topography of marshlands at Howland Hook, bringing large-scale commercial trade further west along Staten Island's shore. Currently the active port site at Howland Hook is over 2,500 ft long with over 200 acres of impervious surfaces. Urban form is re-scaled to match the increased infrastructural scale of transport and load-ing. With over 2 million containers handled on site within a year, the New York Container Terminal at Howland Hook becomes a formidable footprint on Staten Island's shore.

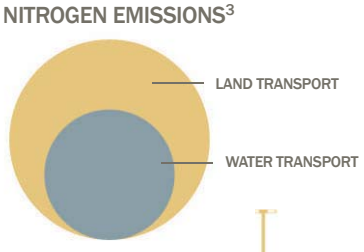


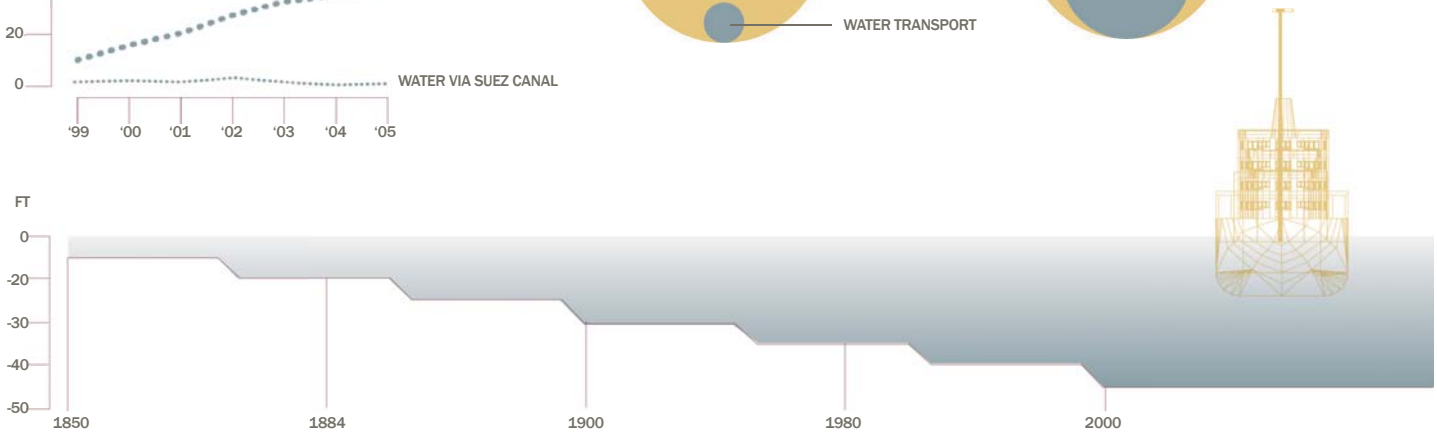
ECONOMIC BENEFIT OF PRODUCTIVE PORT ACTIVITY

Chinese imports currently account for 20% of all foreign trade in the United States, representing the largest contributor to transport resource use and necessitating complex infrastructural systems. Prior to the dredging of navigable canals which deepened waterways up to 45 ft, most Chinese imports travelled intermodally via ports in L.A.[1] Recognizing that 28.5% of the total energy consumption in US is used for transport, which is equivalent to 28.95 quadrillion BTus and accounts for 97.48% of total petroleum consumption,[2] reconsideration of transport systems becomes critical in dealing with today's global energy and environment concerns. Due to the economies of scale, lower speeds, less air resistance and friction, and lack of topography,[3] water-based transport emits 80% less carbon 35% less nitrogen into the atmosphere than land-based transport.[4] Additional resources are also needed for construction and maintenance roadways for land transport. It is therefore critical to understand the important role these navigable waters, including dredged canals and ports suitable to handle the modern container ships, play in efficient and economically competitive international trade. With rising fuel costs and the increased navigability of channels surrounding New York City, water-based transport of international goods has steadily increased over the past 10 years while intermodal transport has declined.[1] The $300 million investment in New York City's maritime infrastructure has contributed to $20 billion in economic benefit to the region and provided roughly 25,000 jobs.[5]









1. Lipton, Eric. "New York Port Hums Again, with Asian Tade." *The New York Times*. Nov. 21, 2004.
2. U.S. Bureau of Transportation Statistics
3. Green House Gas Protocal
4. Non-profic organization, *Freight by Water*
5. Jones, Richard Lezin. "To Bolster Competitiveness, Dredging is Planned in Bay," *The New York Times*. May 29, 2004.

BLACKGRASS
ALOPECURUS MYOSUROIDES

GLASSWORT
SALICORNIA SP.

SEA CUCUMBER
HOLOTHURIA FLORIDANA

COMMON PHRAGMITES
PHRAGMITES AUSTRALIS

SEA LAVENDER
LIMONIUM LATIFOLIUM

SEASIDE PLANTAIN
PLANTAGO MARITIMA

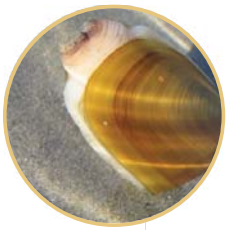
AMERICAN PLOVER
PLUVIALIS DOMINICA

ROCKWEED
PELETIA FASTIGIATA

MARSH ELDER
IVA FRUTESCENS

BLUE HERON
ARDEA HERODIAS

CORDGRASS
SPARTINA ALTERNIFOLIA



RAZOR CLAMS
SILIQUA PATULA

SALT MARSH ASTER
ASTER TENUIFOLIUS

WIDGEON GRASS
RUPPIA MARITIMA

SALT MEADOW HAY
SPARTINA PATENS

MARSH BORDER:
INFREQUENT OR NO TIDAL FLOODING, LOWER SALINITY, DRYER SOIL

HIGH MARSH:
LESS FREQUENT TIDAL FLOODING, MODERATE SALINITY, WET SOIL

POOL

PANNE

LOW MARSH:
FREQUENT TIDAL FLOODING, HIGH SALINITY, WETTEST SOIL

TIDAL FLAT:
CONSTANT INUNDATION OF SEAWATER

EXTREME SPRING HIGH TIDE

MEAN HIGH TIDE

MEAN SEA LEVEL

PRODUCTIVE TIDAL SALT MARSH

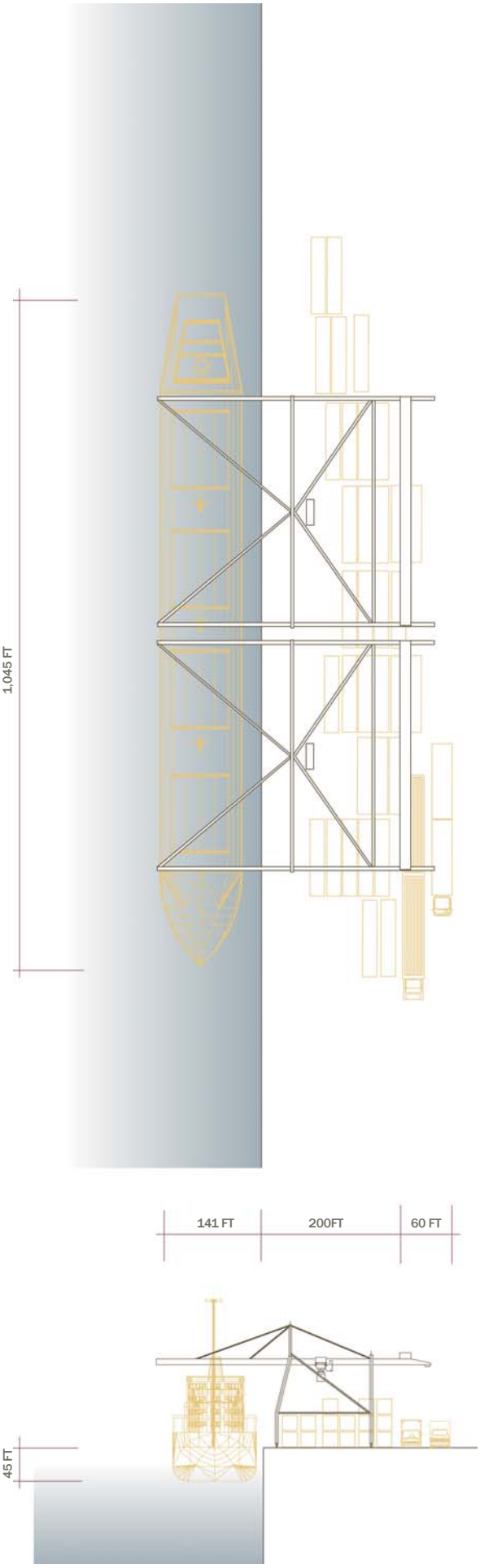
Although Howland Hook has been the site of heavy industry both in its past and present, a lull in maritime industries in the mid-20th century allowed wetland grasses, shellfish, and birds to reclaim the Arlington Marsh, northeast of the terminal site. Spartina alternifolia, an indicator species for one of the most productive natural habitats, is present in abundance. It provides shelter for juvenile fish and nutritious seed for birds; over 100 species of birds nest and feed in the marshland.[1] Other important aquatic life, such as clams, oysters, snails, crabs, and sea cucumbers thrive in the shallow tidal water, providing an integral link within the food-chain. Additionally it is these tidal marshlands that become the sponges which absorb excess water in floods and high tides, filtering nutrients and transpiring water, and helping to manage watersheds.[2] Currently 70 acres of the Arlington Marsh are protected, but due to industrial adjacencies that continue to expand the health of the marsh rests in a sensitivity within the design of that port development.

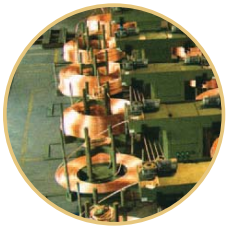
1. Newman, Andy. "Protecting a Wild Patch of City Marshland." *The New York Times*. Nov. 7, 2007.
2. France, Robert L. Wetland Design. W.W. Norton. 2003.

PRODUCTIVE PORT FACILITY

Designing productive port facilities requires an understanding of the modern machinery and vessels utilized for water-based transport. Hundreds of years ago, sailboats could easily manuever the 12-15 ft channels to reach ports in Manhattan. Presently more than 12,000 ships travel New York Harbor, 40% of which are tankers carrying petroleum products, 45% are container ships, and the remaining are bulk vessels carrying single cargoes. Associated industry at New York City port facilities include producing copper wire, stockpiling scrap metal, manufacturing gypsum board, processing of orange juice, edible oil facilities, and processing dredged material from navigation canal maintenance.[1] The New York Container site on Howland Hook, Staten Island handles only containers. The majority of the property is characterized by thousands of containers, 8 ft wide x 8.5 ft tall x 20 ft to 40 ft long, stacked and sprawled throughout the 287 acres.[2] Container contents vary widely and can include automobiles, toys, electronics, clothing, footware, ceramics, and many other internationally imported products. At the water's edge large-scale ship-loaders, steel cranes that pull containers off ships and onto the port, line the hard-edged bulk head. These shiploaders operate on tracks that slide along the water's edge, and with rail or truck transport, arrange containers for distribution.[3] Shiploaders can stack containers into rows of 20 units up to 8 containers high. The container ships require a minimum 45-ft canal depth and 141-ft ship width. They vary in length from 330 ft to 1,043 ft long. The shiploaders require minimally 200 ft to provide adequate off-loading and stockpiling capability. An additional 60-ft lane for land-based transport provides the means of distributing the containers throughout the region, state, and country.

1. Ascher, Kate. *The Works: Anatomy of a City*. Penguin Books. 2005.
2. Jones, Richard Lezin. "To Bolster Competitiveness, Dredging is Planned in Bay," *The New York Times*. May 29, 2004.
3. Ascher, Kate. *The Works: Anatomy of a City*. Penguin Books. 2005.




COPPER WIRE PRODUCTION


AUTOMOBILES & CARGO


SCRAP METAL


GYPSUM BAORD MANUFACTURING


EDIBLE OIL FACILITY


DREDGED MATERIAL PROCESSING

PRODUCTIVE WATERFRONT PROPOSAL FOR HOWLAND'S HOOK

Our approach to the watefront at Howland Hook seeks to integrate the infrastructural, economic, and ecologic needs of the site by providing a balanced landscape that allows for a productive port facility and marshland ecologies. By orienting the proposed piers perpendicular to the waterfront, similar to historic precedents, the waterfront edge is maximized but scaled for the operational needs of large-scale port infrastructure. The constructed piers will utilize the already abundant dredged canal material to provide fill. By double-loading the piers with a spine of rail and road land-transport which pulls the storage of the containers into the interior of the site, ecological waterfront is maximized and former connections between disparate portions of wetlands become re-connected, with transport lines bridged over the moments of connection. The extension of existing peninsulas and contstructed piers will protect marshes against wake from ship traffic in the channel. Additionally, diversion of storm-water runoff into fresh-water wetlands and the use of pervious paving with the capacity to infiltrate runoff will protect the more sensitive salt marshes from contamination. Extension of Mariner's Marsh as open space adajcent to existing residential neighborhoods allows people to enjoy wetlands, shoreline, and harbor views via boardwalk trails. Although the proposal will not ameliorate all issues on site for any singular concern, it does begin to create hybridized solutions that give multiple resource concerns equal priority in development of a multi-productive waterfront.