Environmental Protection

Belt Parkway Stormwater BMPs

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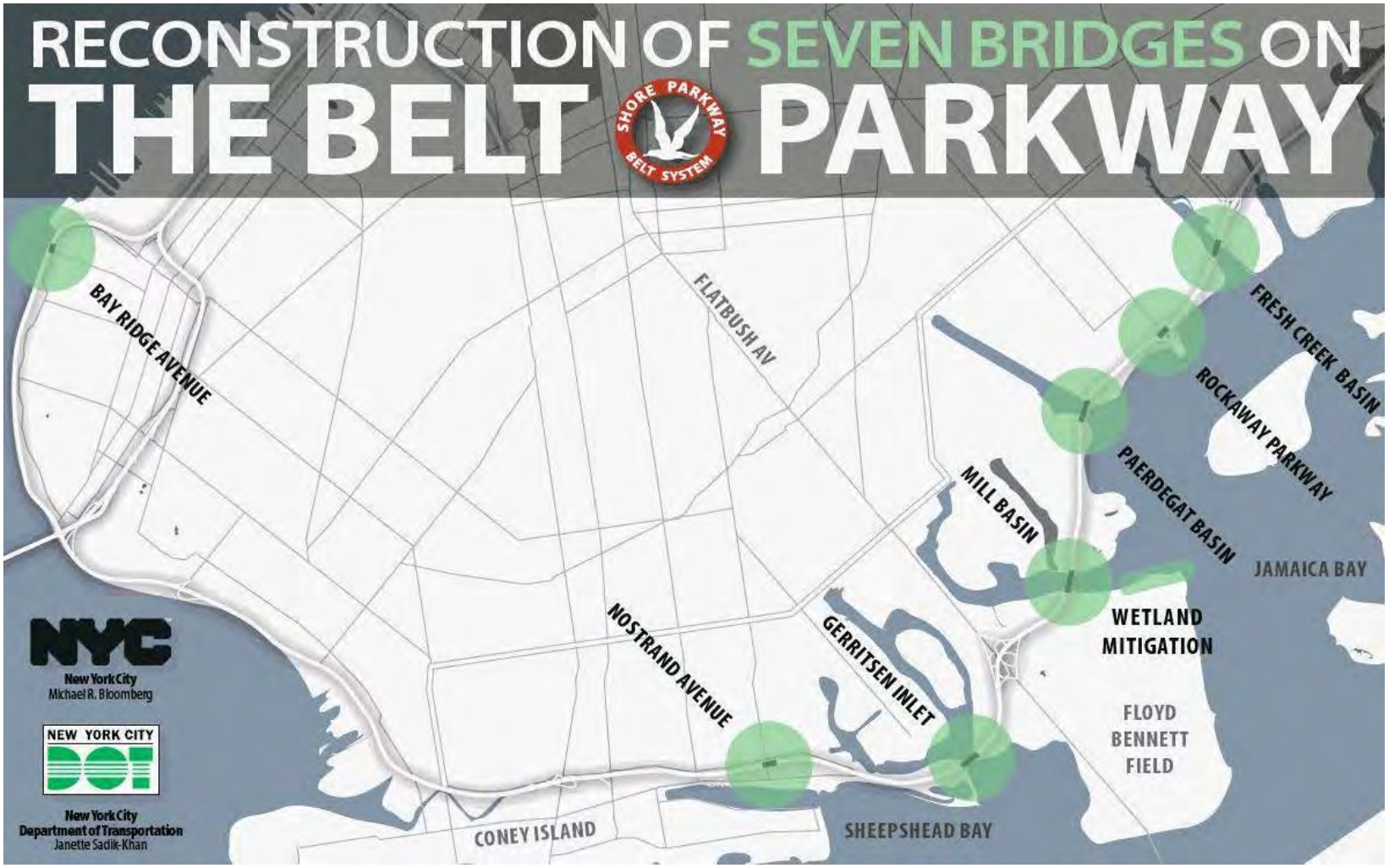
Biohabitats

Overview

- Setting
  - Gerritsen
  - Rockaway
  - Paerdegat
- Goals
- Site Challenges
- Basis of Design
- Site Designs
- Lessons learned

Source: www.ciesin.org

Overview



Source: New York City Department of Transportation

Setting

Source: www.marinas.com

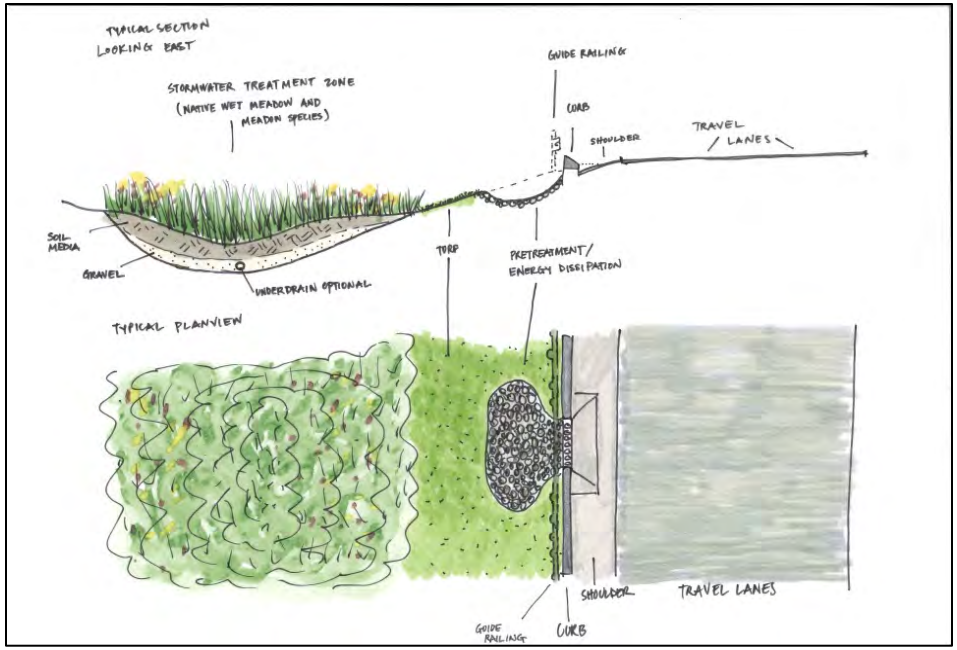
Above, the Gerritsen Inlet bridge.
At left, rough grading of the Rockaway and Paerdegat sites.

Goals

- Jamaica Bay Watershed Protection Plan (2005)
- Project Goals:
  - Provide water quality treatment (using the NY DEC criteria) for Parkway runoff using innovative approaches that include vegetative uptake and filtering, infiltration, and vegetated conveyance,
  - Provide habitat for native flora and fauna,
  - Serve as demonstration sites that highlight stormwater management approaches that reduce runoff volumes, reduce pollutant loads to Jamaica Bay, and limit the impacts associated with concentrating runoff, and
  - Provide safe and stable conveyance for larger frequency storm event criteria (i.e., 10-year peak discharge).

Site Challenges

- Road and drainage design already completed
- Tight spaces
- High groundwater and sea level rise
- Bridge approaches built in fill
- Maintenance



Concept plan and profile of curb cut to bioretention median

Basis of Design

- Water quality sizing
  - assumed a WQ rainfall depth of 1.3 inches (NYS Manual)
  - determined the anticipated WQv and 10-year discharge event
- Conveyance
  - Divert water quality runoff via catch basins or curb cuts
  - Larger flow bypass
- Modified bioretention design criteria (filter depth) to account for high groundwater and previously fixed elevation tie ins.
- Mixture of SI and English units

Gerritsen

Site Design

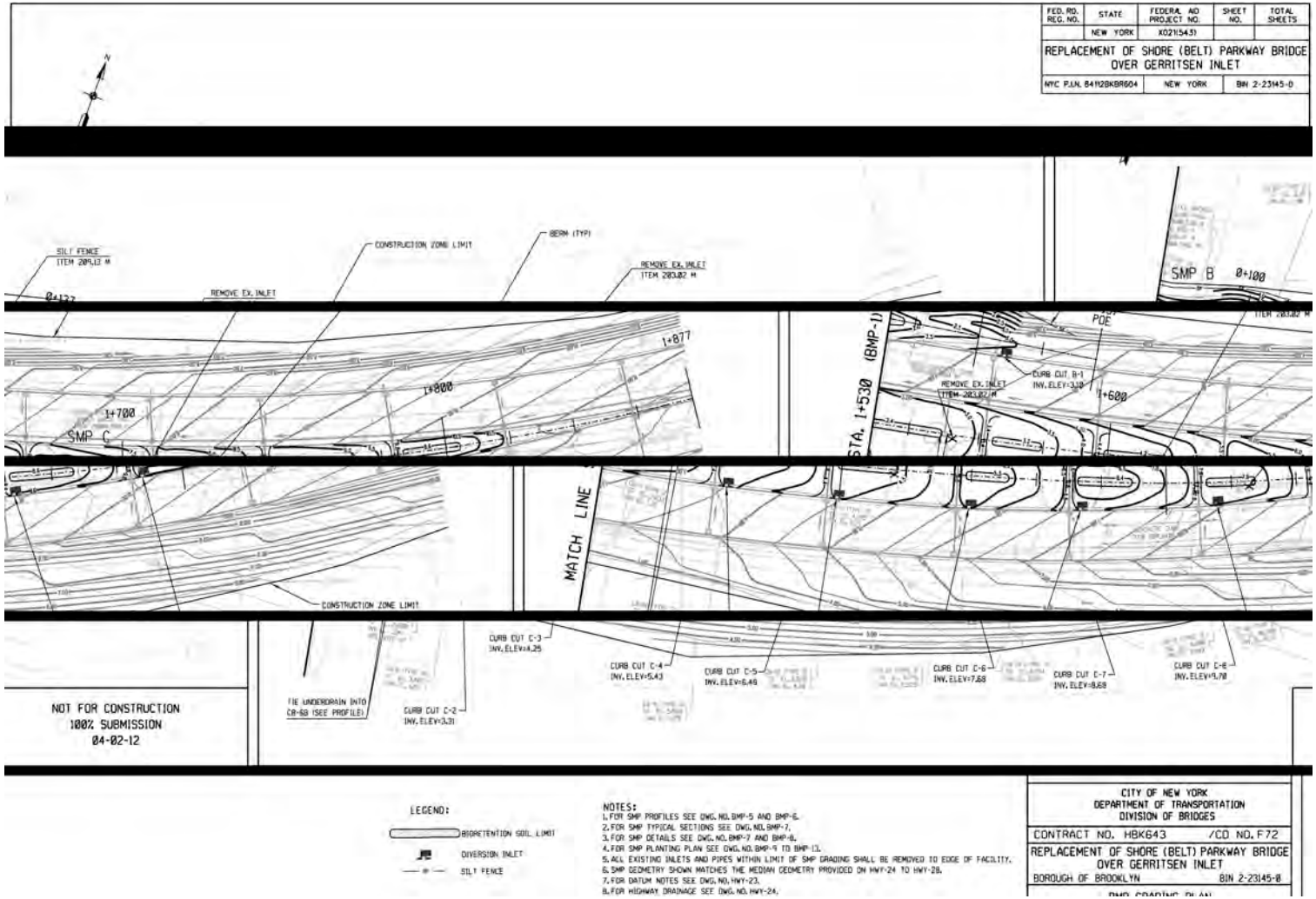
- In the design phase
- 740 meters (2430 ft) of bioretention
  - 4 SMP Areas
    - A, C, and D located within the median; B along the north shoulder
    - Receive runoff via sheetflow or curbcuts
      - Large volumes of stormwater bypass SMPs and enter Belt Parkway's stormwater conveyance system or system acts as a conveyance to route water to nearby outlet

Gerritsen

Overview

Gerritsen

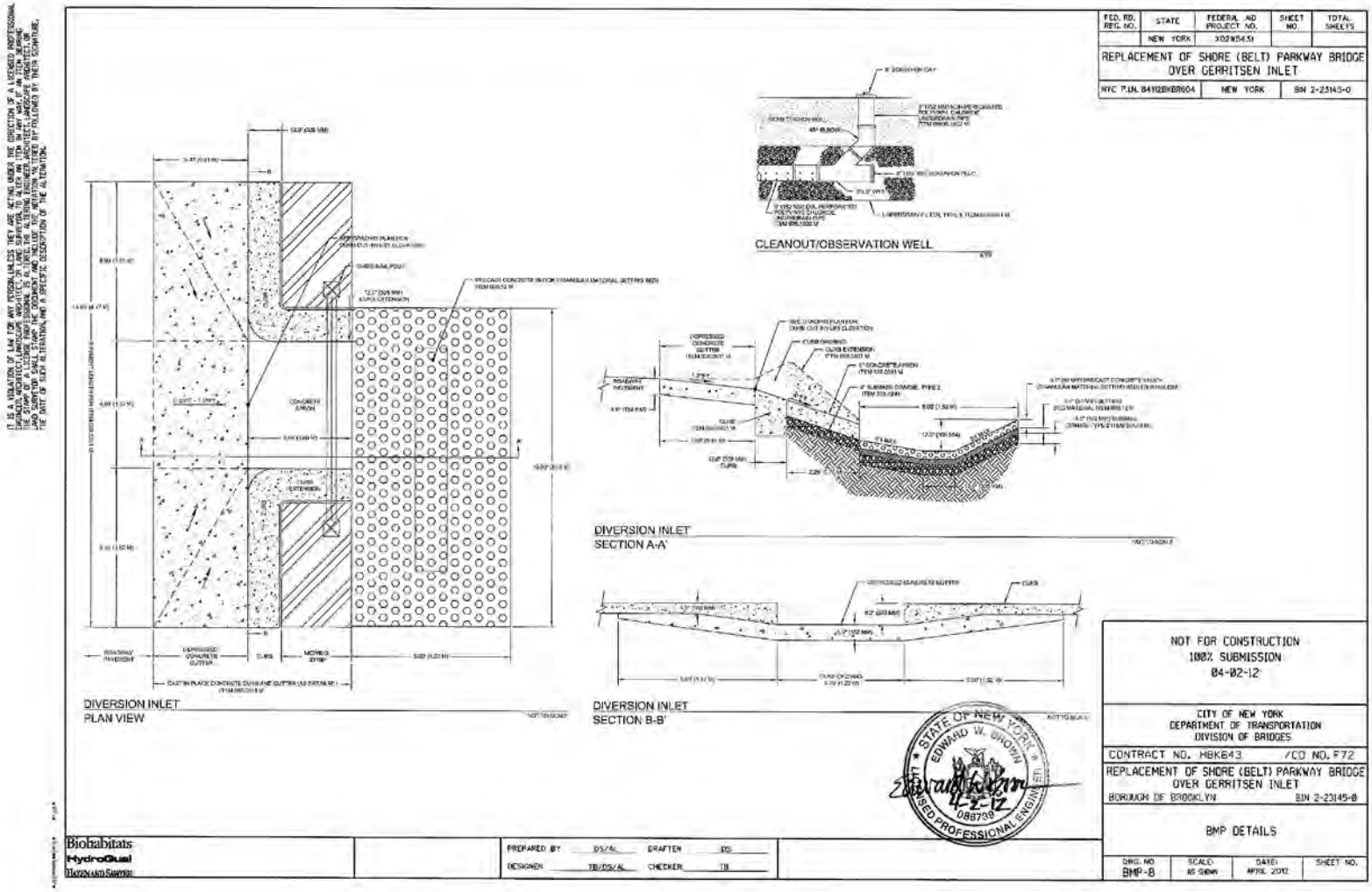
Stormwater Management Design



Gerritsen bioretention design

Gerritsen

Stormwater Management Design



Gerritsen

Planting Plan

- Zone 1a- Brackish Meadow Basin (SMP A/B)

  Examples: path rush (*Juncus tenuis*), seaside goldenrod (*Solidago sempervirens*), red fescue (*Festuca rubra),* salt marsh fleabane (*Pluchea odorata*)

- Zone 1b- Coastal Grassland (SMP C/D)

  Examples: little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), seaside goldenrod (*Solidago sempervirens*), narrow-leaved sundrops (*Oenothera fruticosa*)

- Zone 2- Fescue Mix Upland with tree plantings

  Examples: sweetgum (*Liquidambar styraciflua*), tupelo (*Nyssa sylvatica*), bald cypress (*Taxodium distichum*), honeylocust (*Gleditsia triacanthos*)

Rockaway

Stormwater Management Design

- 196 meter (640 ft) long bioinfiltration swale
  - main collection conveyance is located in the center median which receives runoff from both eastbound and westbound lane catch basins.
  - swale is able to pond 85% (110.5 m^3) of the total water quality volume
  - assuming infiltration rate is 0.5 in/hr, the projected infiltration volume over 776 m^2 (8359 ft^2) of surface area over a 24 hour period is 237 m^3 (8359 ft^3)
- 4 catch basins
  - cumulative water quality volume from all four catch basins is 130 m^3 (4613 ft^3)
  - diversion pipes to deliver runoff, particularly that of smaller storms
- 10-year storm
  - based on guidance provided by DEP, the 10-year flow elevation should have a 0.22 m (9 inch) freeboard
  - weir elevation is 0.7 m and the top of the berm is 1.0 m

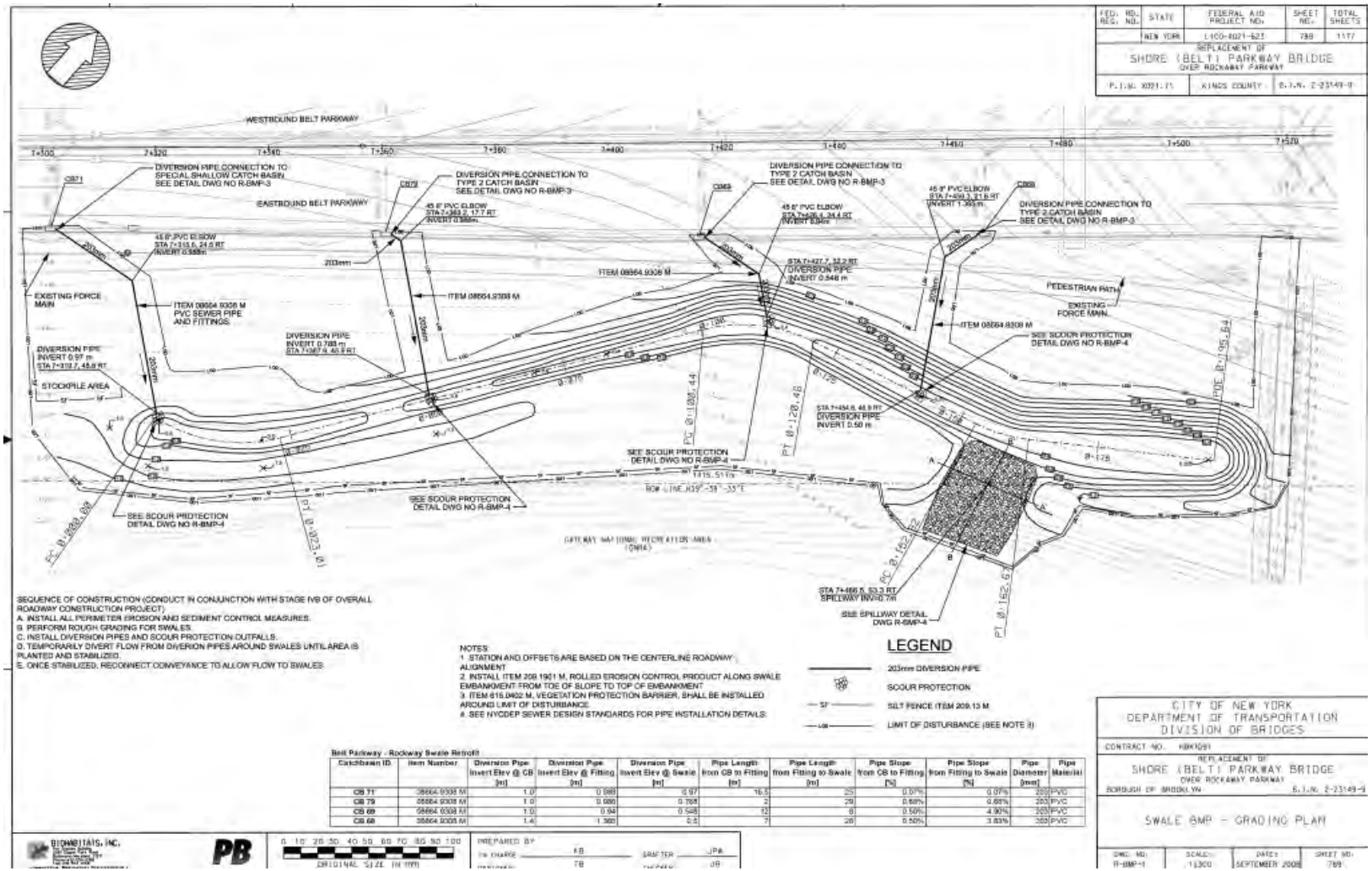
Rockaway

The Rockaway and Paerdegat sites with rough grading completed (2010)

View from seaward side of site, with Belt Parkway in the background (2013)

Rockaway

Stormwater Management Design



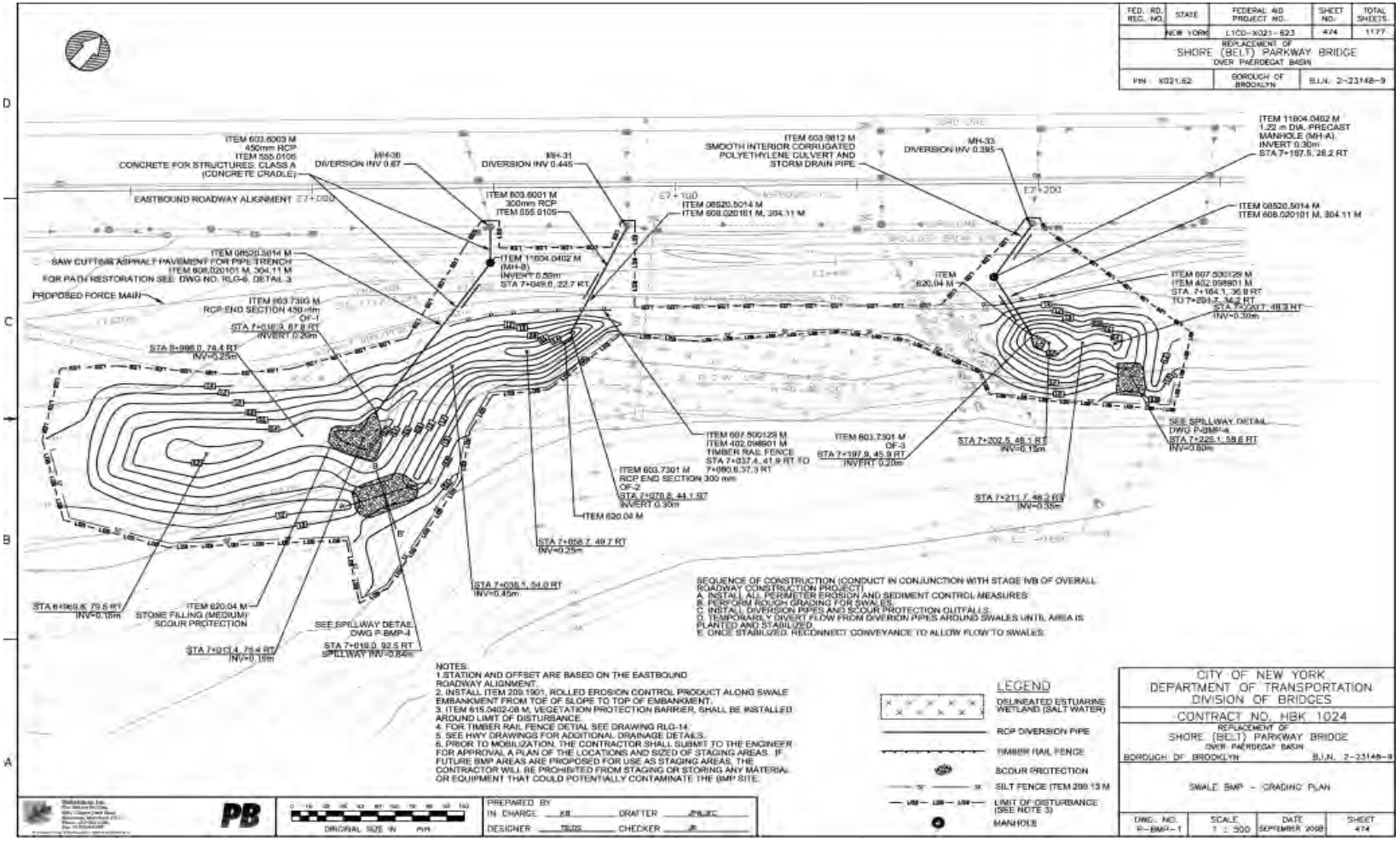
Paerdegat

Stormwater Management Design

- 2 bioinfiltration swales
  - receive runoff diverted from the main roadway conveyance system
  - locations determined by identifying the available areas that limit disturbance to existing trees, shrubs, wetlands and paths
- Conveyance
  - main collection conveyance is located in the shoulder of the eastbound lanes
  - westbound lane runoff is conveyed to the main collection system through a series of catch basins and cross connections.
  - Rock scour protection sized to resist maximum velocities from the diversion pipes
- 10-year storm
  - overflow spillway at the end of the west swale was sized to safely convey 31 cubic feet per second flows
  - west swale weir elevation is 0.84 m and the top of berm is 1.2 m
  - east swale weir elevation is 0.80 m and the top of berm is 1.2 m

Paerdegat

Stormwater Management Design



Rockaway & Paerdegat

Planting Plans

- Zone 1 – Brackish Meadow

  Examples: saltmeadow cordgrass (*Spartina patens*), saltmeadow rush (*Juncus gerardii*), switchgrass (*Panicum virgatum*), seashore saltgrass (*Distichlis spicata*)

- Zone 2 – Temporarily Inundated Coastal Shrub

  Examples: eastern baccharis (*Baccharis halimifolia*), bayberry (*Morella pensylvanica*), smooth alder (*Alnus serrulata*), marsh elder (*Iva frutescens*)

- Zone 3 – Dry Coastal Shrub

  Examples: beach plum (*Prunus maritima*), eastern baccharis (*Baccharis halimifolia*), silky dogwood (*Cornus amomum*), bayberry (*Morella pensylvanica*)

Rockaway & Paerdegat

Planting Plans

- Rockaway and Paerdegat were planted in June 2013
  - Total planted: 19,074 herbaceous plants; 2,189 deciduous shrubs
  - Plant quantities determined to help ensure establishment despite presence of invasives such as *Phragmites australis*

Rockaway & Paerdegat

Current Status

Rockaway & Paerdegat

Current Status

Lessons Learned

- Water quality treatment should be integrated into linear roadway projects
- Early stormwater design integration yields best project outcomes and is cost-effective
- Vegetative practices are best planted in spring
- Maintenance practices need to shift to accommodate more effective designs
- Co-benefits to treatment systems can be abundant