RISE Work Unit 2.3- Phase I

Performance of selected sewage treatment plants in Nassau, Suffolk, and Westchester Counties with emphasis on the marine environmental impacts from flooding at the Bay Park facility

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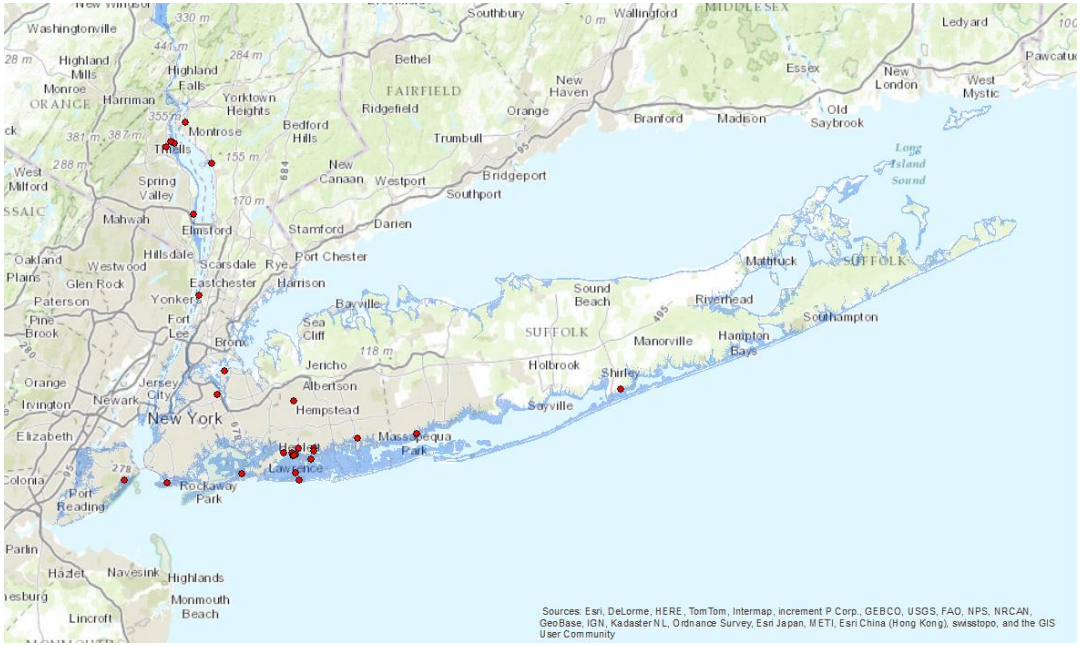
Background

- Examine causes of damage in wastewater treatment systems including the analysis of the design, operation, and capacity of the existing wastewater infrastructure system and its limitations.
- Assess performance of specific facilities during Superstorm Sandy including increases in loadings of chemical contaminants.

Photo Courtesy of Doug Kuntz
Taken from Department of Environmental Conservation

Project Scope

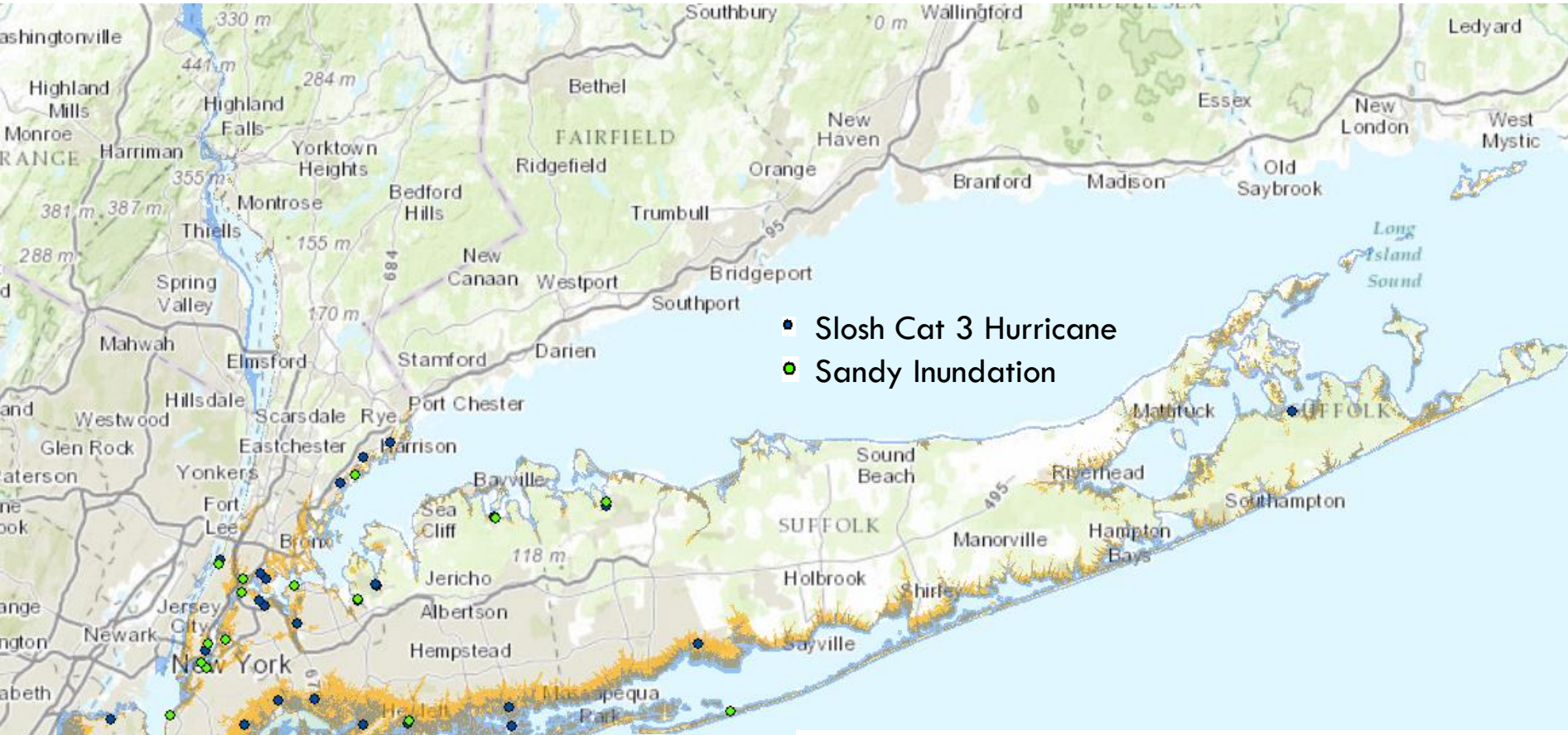
- Report on damage and vulnerability in wastewater treatment systems in the study region caused by Superstorm Sandy and other storms.
- Computer code for hydrodynamic modeling of dilution patterns from the outfall in Reynolds Channel and relief discharge in East Rockaway Channel associated with the flooding at the Bay Park Publicly Owned Treatment Works (POTW)
- A map and an interpretation of distribution of sewage tracers in sediments.



NYS DEC Reports of Raw Sewage Spills--14 out of 32 Located in Western Bays Watershed

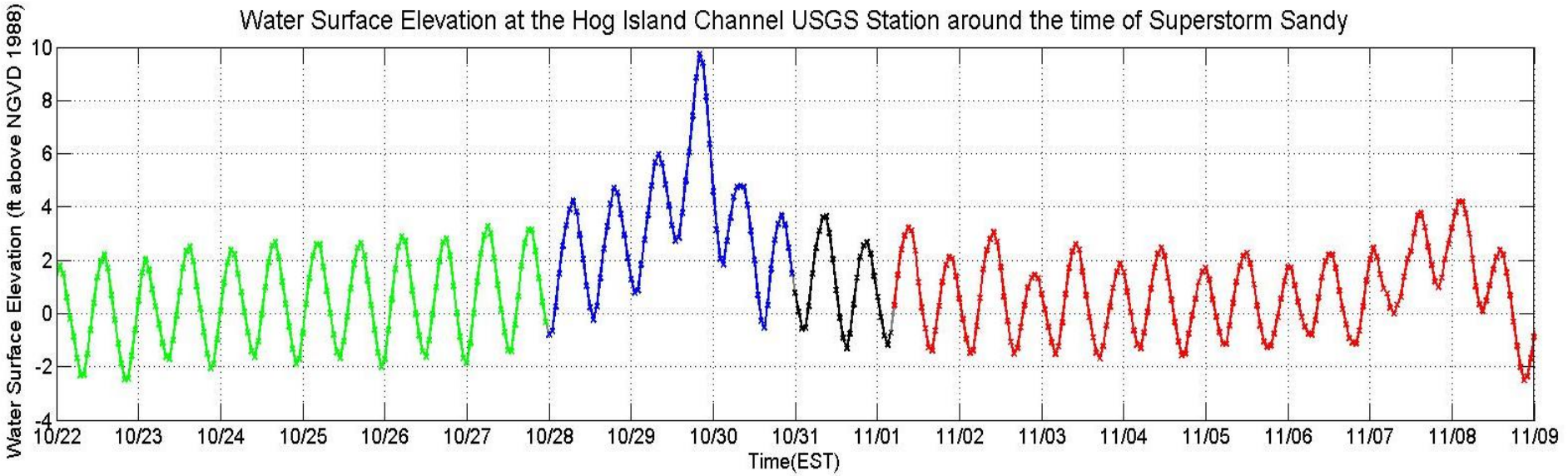
Wastewater Treatment Facilities Whose Addresses Lie Within Sandy (Blue) and SLOSH Model Category 3 (Orange) Inundation Zones

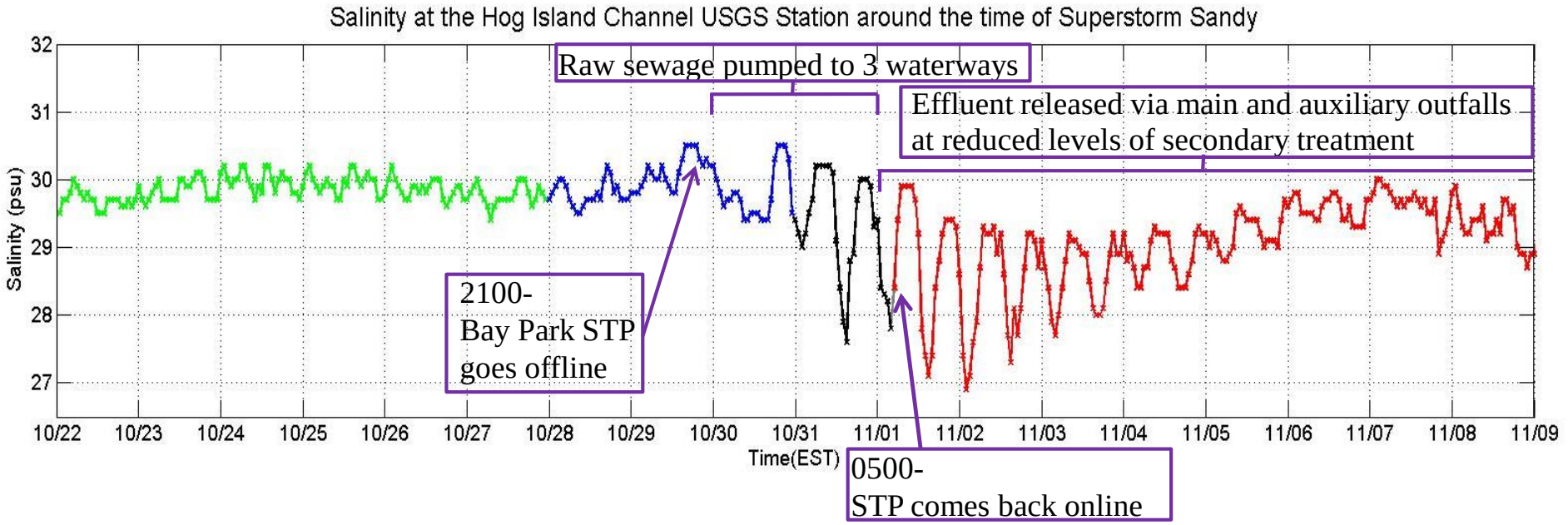
Nassau County More Susceptible



	# Facilities	Sandy	Category 3
Region-wide	161	27	54
Nassau	22	8	17
Suffolk	56	2	5
Westchester	10	1	4

Environmental Consequences of the Bay Park STP





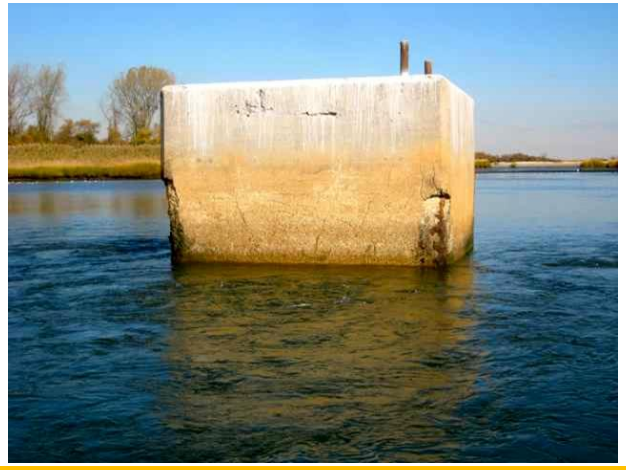
November 24, 2012 - Effluent no longer released via the auxiliary outfall in times of high tide and high volume flow.
December 13, 2012 - SPDES permit compliance achieved.

From the Bay Park STP:

Normal and Post Sandy estimated sewage flows past Hog Island site and their impact on salinity

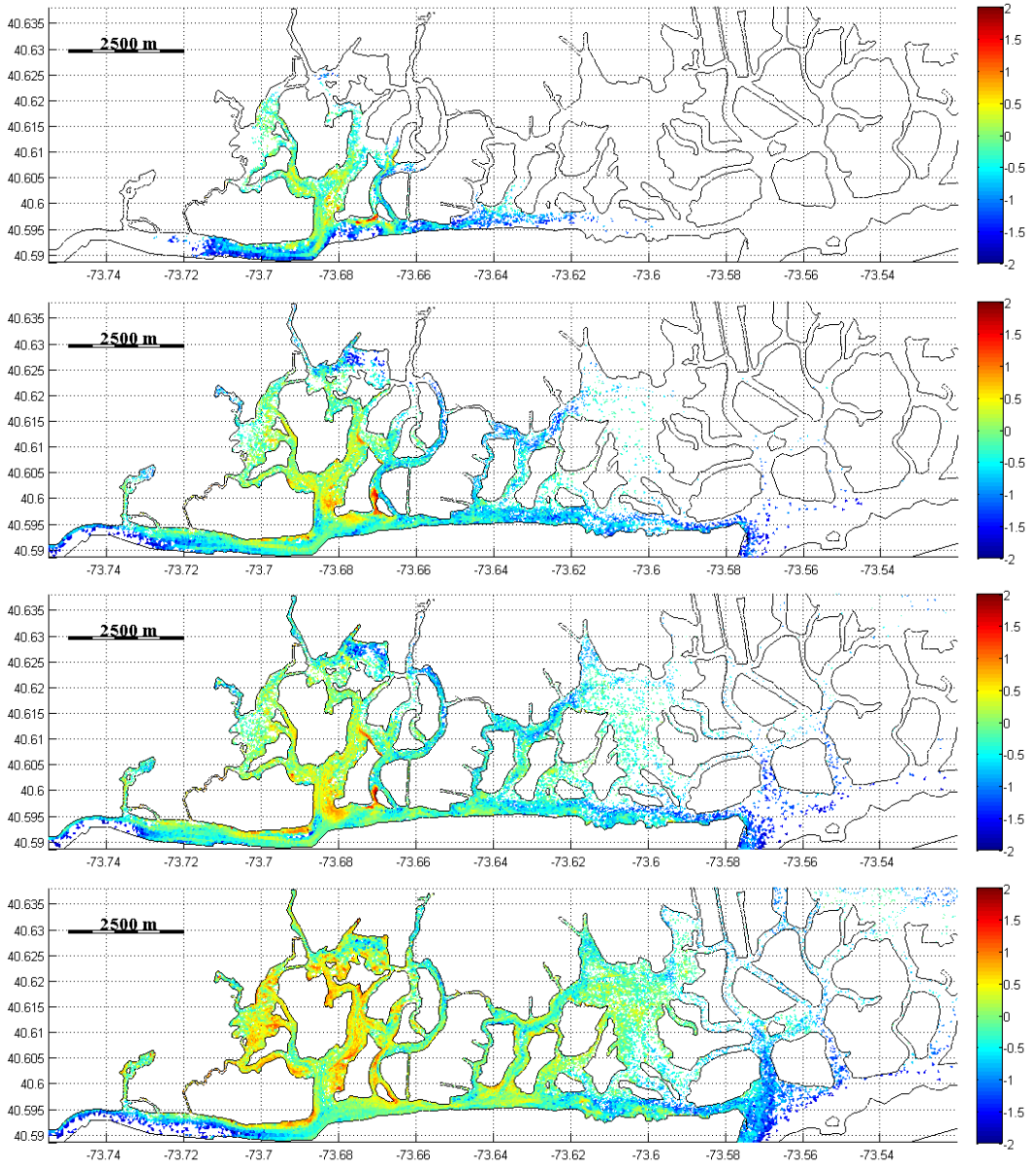
	Normal Discharge MG/tidal day	Normal Flow up Hog Island Channel MG/tidal day	Post Sandy Discharge MG/tidal day	Post Sandy Flow in Hog Island Channel MG/tidal day
The Block	51.7	21	70	56
Auxiliary Outfall	-	-	33	27
Total	51.7	21	103	83*

* Observed decline in salinity = 1.2
Estimated from dilution by increased sewage flow = 1.5



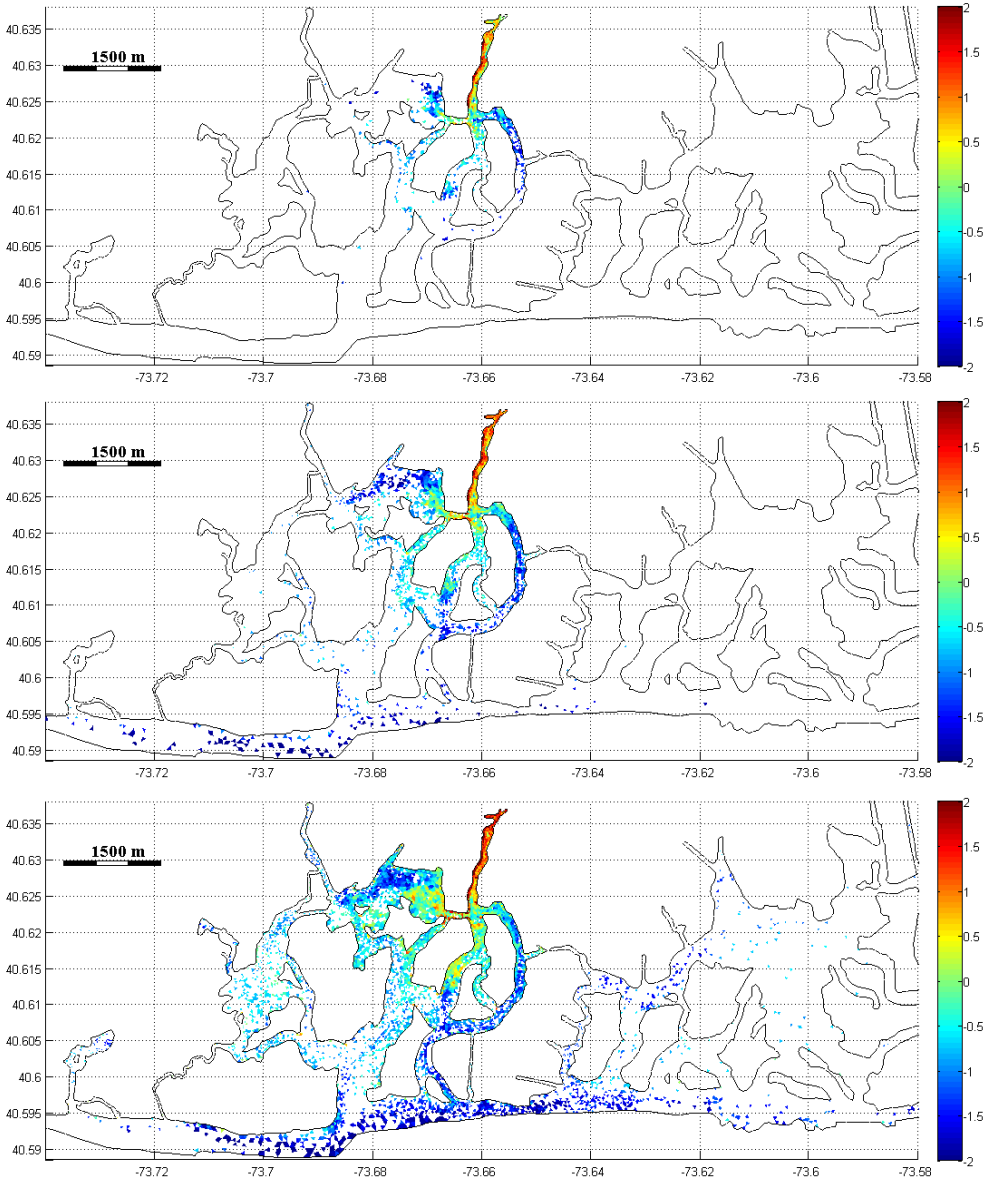
Dilution Patterns for the Block

Lagrangian simulations for sewage discharge through the Block in Reynolds Channel at 12, 50, 100 and 240 hours, following initiation of release presented as log to the base 10 of the percent dilution.



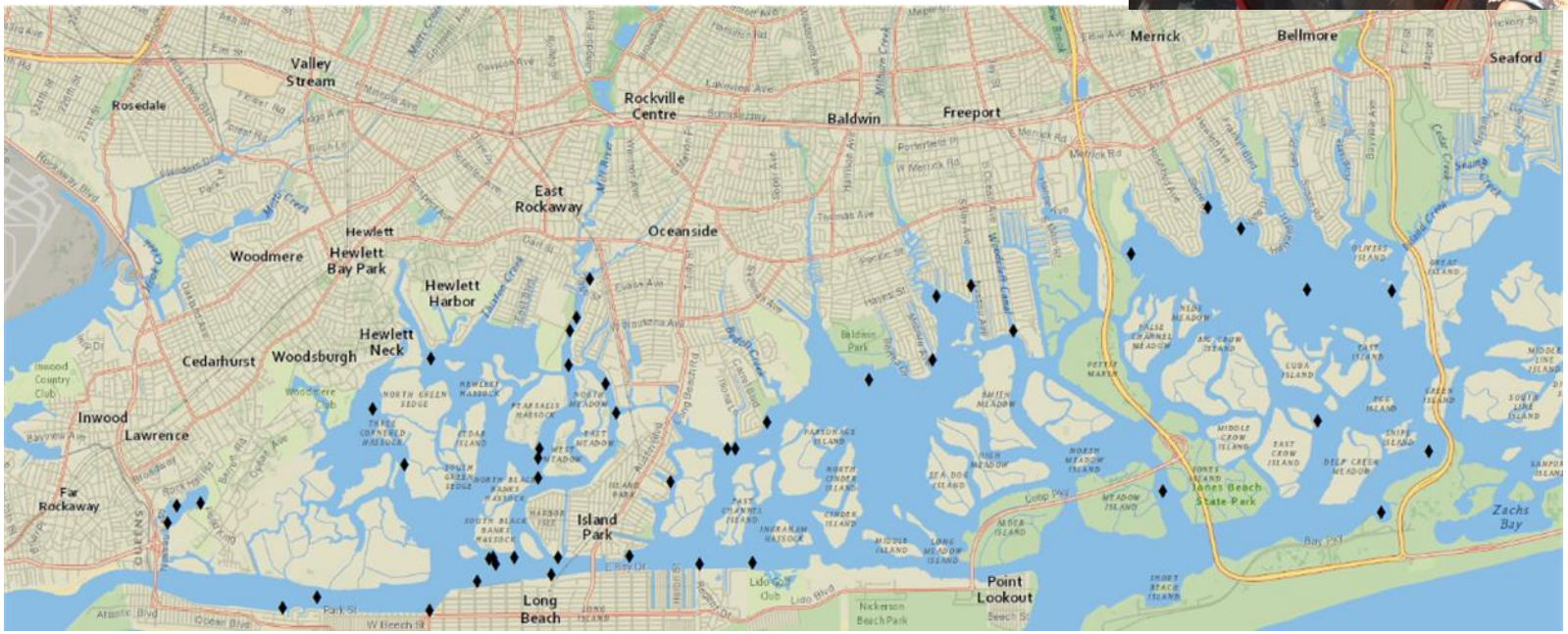
Dilution Patterns for the Auxiliary Outfall

Lagrangian simulations for sewage discharge through the emergency outfall in East Rockaway Channel at 50, 100 and 240 hours following initiation of release presented as log to the base 10 of the percent dilution.



Quaternary ammonium compound sewage tracers (QACs) in sediments of Hempstead Bay

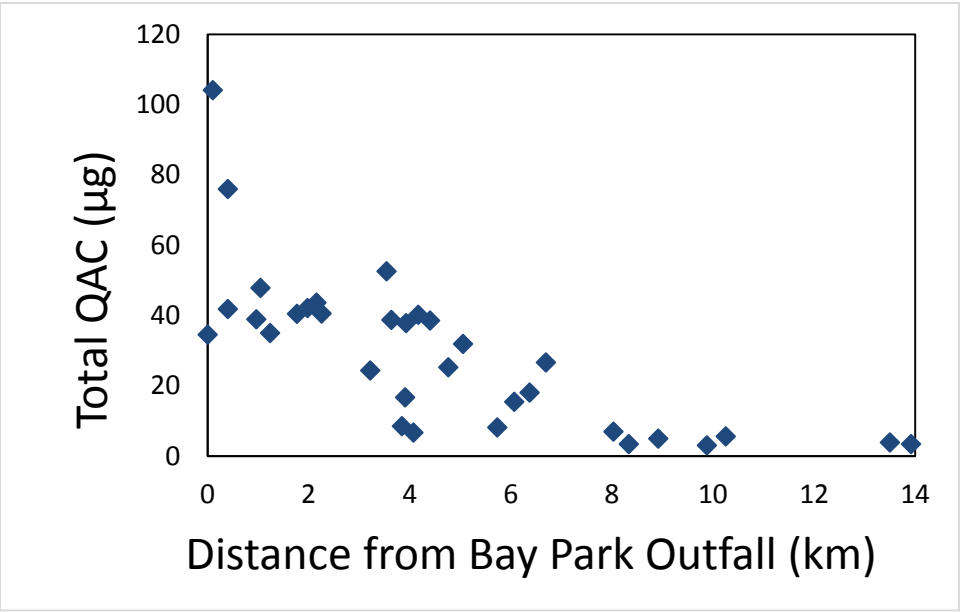
- All types of sediments were eroded
- A layer of fine grain sediment was deposited in most formerly muddy areas
- Grain size and organic matter changed at sites near Reynolds Channel

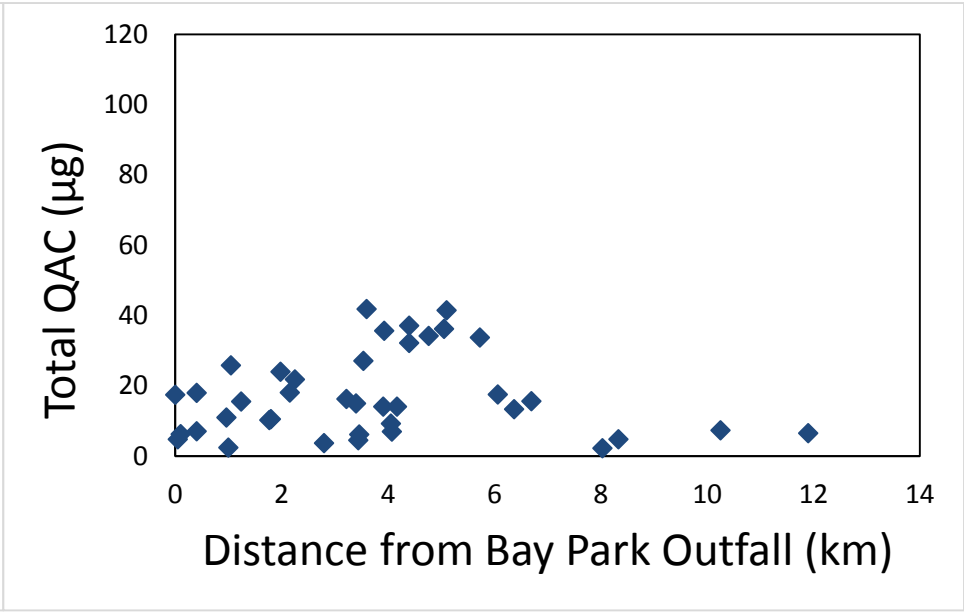


Changes in ΣQAC After Sandy

ΣQAC are reduced in concentration in areas near the outfall (dilution with a source of cleaner fine grain sediment) but are much more similar in areas away from Reynolds Channel

Pre-Sandy (2011/12) → **Post-Sandy (2013)**



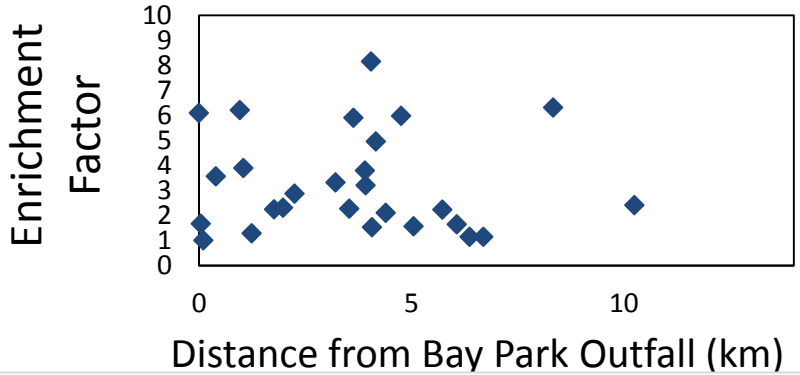


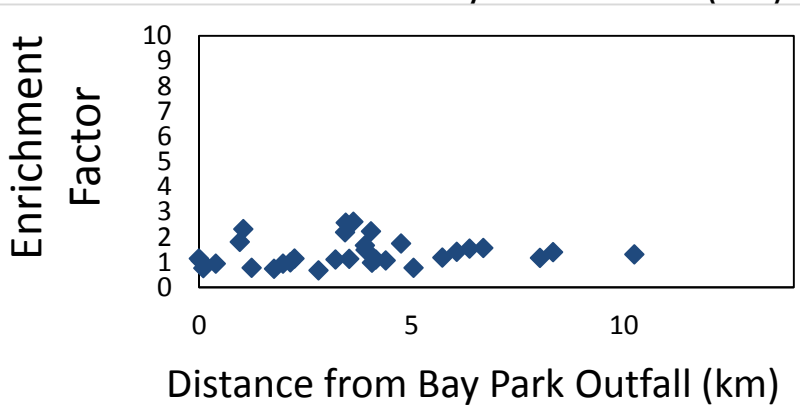
QAC specific variations suggest Reduced Levels of Sewage Treatment

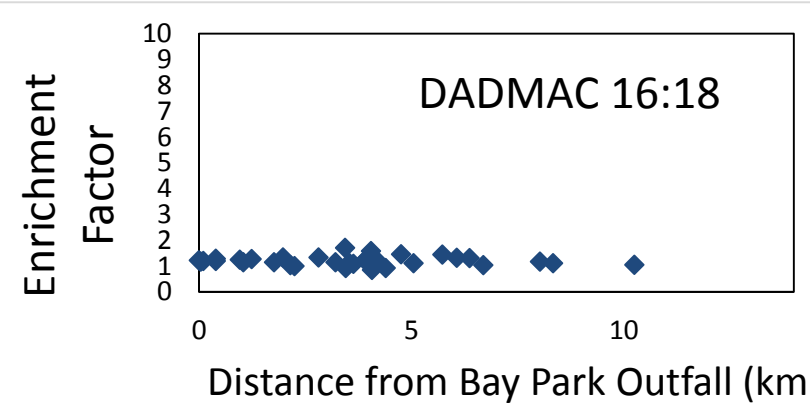
QAC specific variations in degree of average enrichment (Post/Pre levels at same Stations) match expectations for **increased inputs during period of less effective sewage treatment** (e.g., same order near CSOs (Li and Brownawell, 2010)

Less treated sewage will lead to greatest enrichment of wastewater contaminants normally well removed by treatment (e.g., consider pathogens without disinfections)

Increasing Removal by Secondary Treatment







Bay Park STP Impacts in West Bay following Sandy

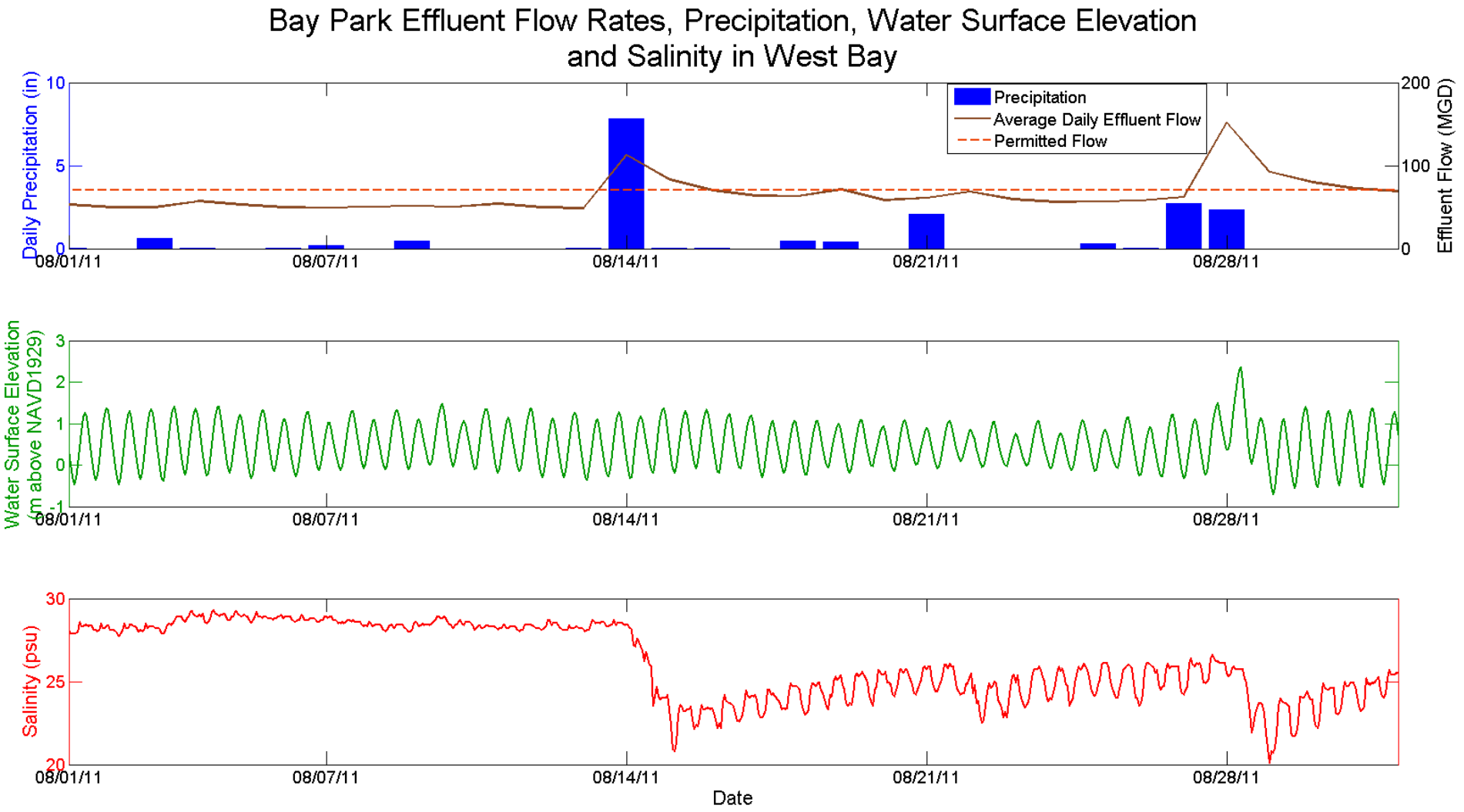
- Short Term- Water Column
  - Decreased salinity
  - Increased BOD
  - Decreased DO
  - Increased Nitrate
  - Decreased pH
- Long Term- Water Column and Sediments
  - Redistributed sewage contaminated sediments
  - Contributed to impaired status

Bay Park STP Remediation

- Constructing an 18ft berm around the facility
- Elevating electrical supply
- Installing check valves and slide gates on two stormwater outfalls
- Eliminating need for auxiliary outfall
- Implementing seasonal dissolved nitrogen removal*

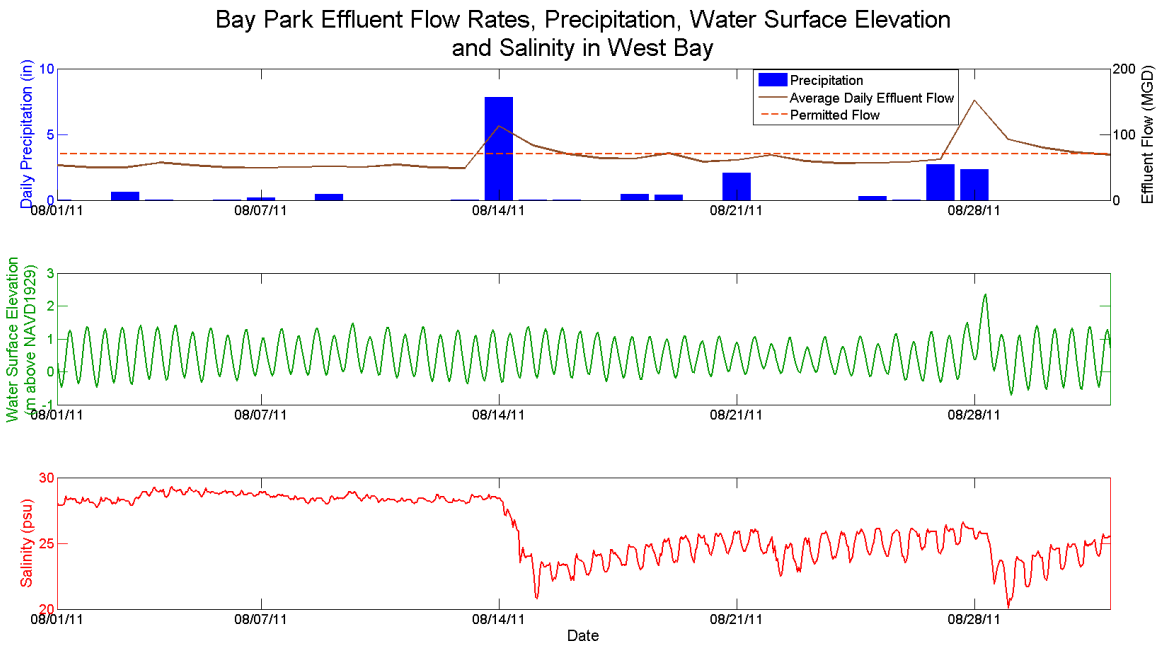
* Part of the debate over the ocean outfall

Remediation will not keep West Bay safe



Data retrieved from the USGS (Water Surface Elevation and Salinity), NOAA (Precipitation), and Nassau County Department of Public Works (Average effluent flow).

Bay Park Phase II



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OBJECTIVES

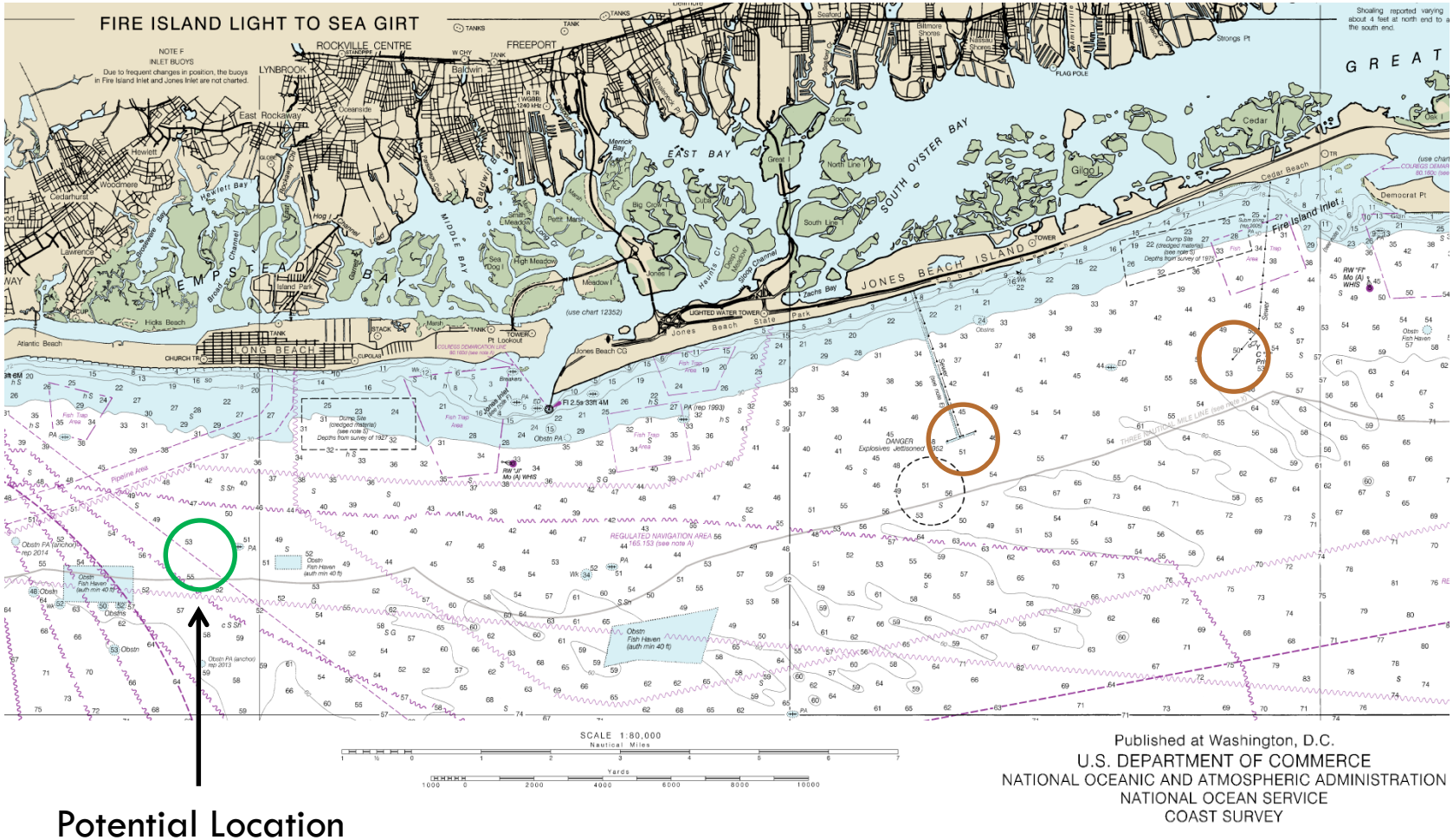
In West Bay

- Assess likely damage to the physical site of the Bay Park STP considering resiliency measures
- Determine frequency and probability of flow exceedances related to precipitation and storm surge
- Assess potential environmental impacts to Reynolds Channel

Ocean Outfall

- Assess oceanic environmental impacts
- Assess economic impacts due to impairments suffered by the beach community.

Existing Outfalls and Possible Bay Park Outfall



Potential Location for the Bay Park Ocean Outfall

Sturgeon in Potential Outfall Area

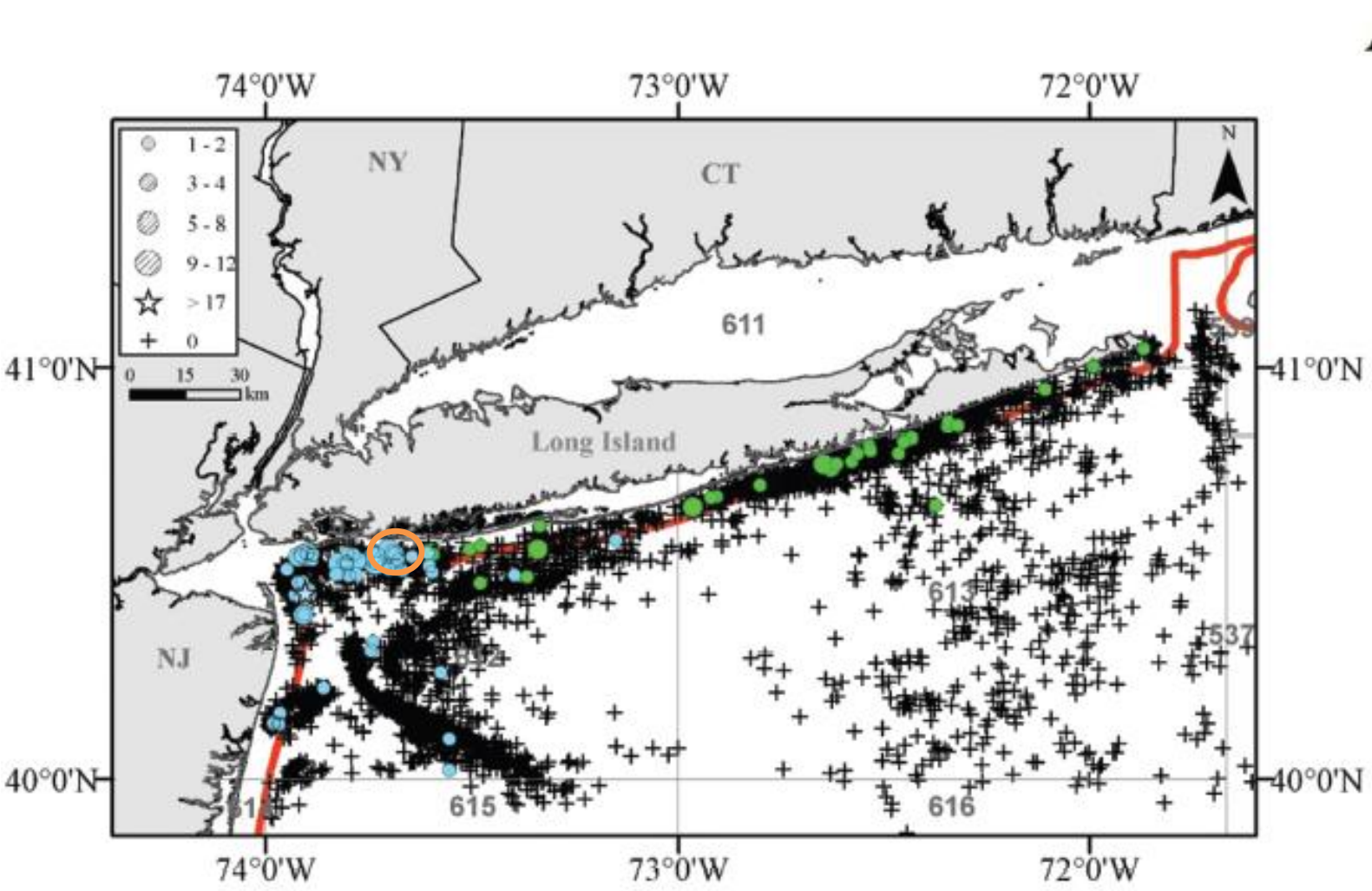
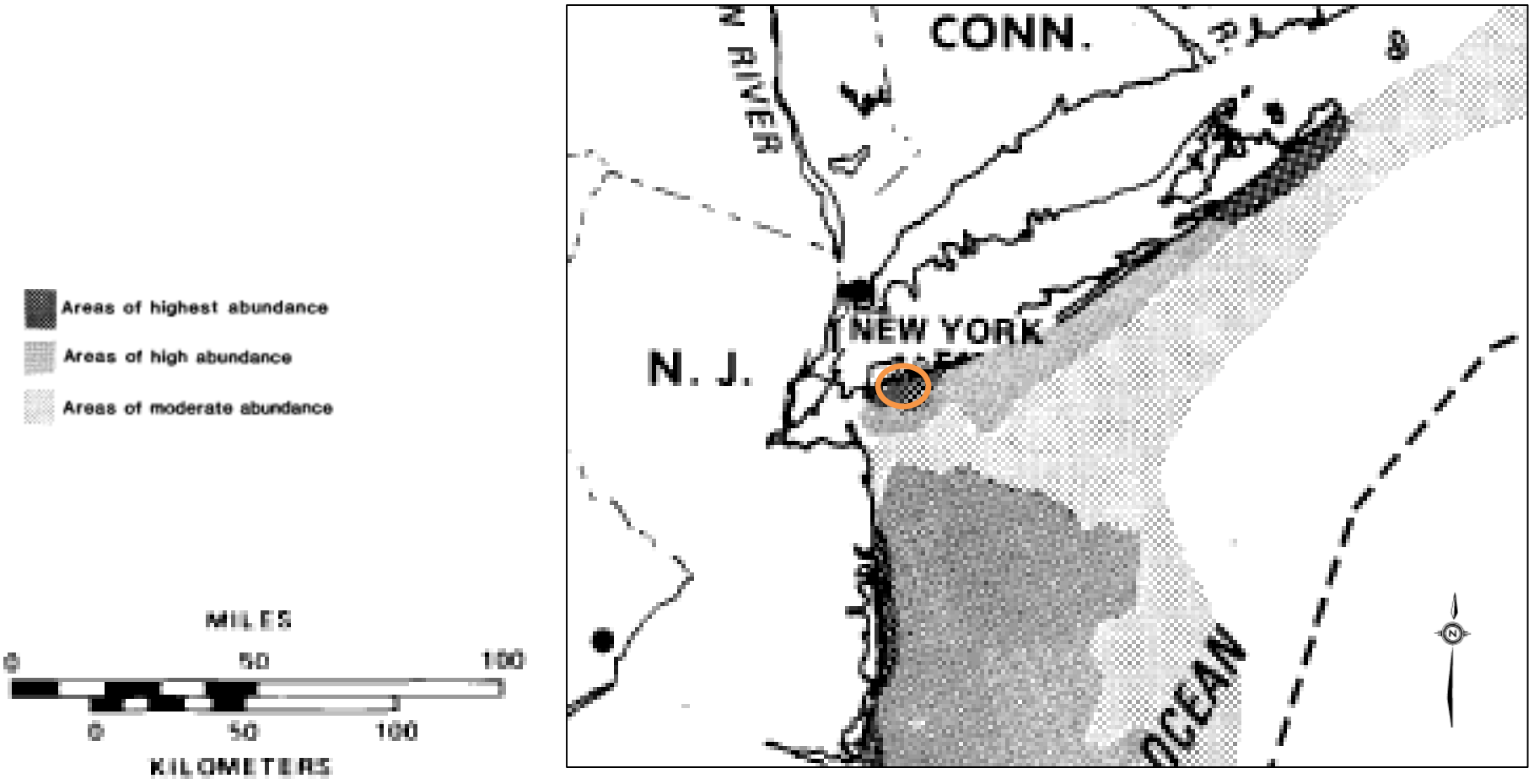


FIGURE 4. Atlantic Sturgeon bycatch observed by the Northeast Fisheries Observer Program from **(A)** bottom otter trawls (fish and twin) and **(B)** gill nets (floating sink-drift and sink fixed-anchored combined). Green circles represent bycatch from vessels that landed within New York ports and blue circles are from vessels that landed in New Jersey ports within statistical areas 611 (modified, only tows south of Long Island and Block Island are included), 612, and 613 (gray numbers and gray lines). The Federal–State boundary (3 mi) is indicated by the red line.

Dunton, K.J., A. Jordaan, D.O. Conover, K.A. McKown, L.A. Bonacci and M.G. Frisk (In Press). Marine distribution and habitat use of Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus) in New York leads to fisheries interactions and bycatch. Marine and Coastal Fisheries.

Surf Clam Distribution



Fay, C. W., Neves, R. J., and Pardue, G. B., 1983. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic) Surf Clam. Department of Fisheries and Wildlife Sciences. Virginia Polytechnic Institute and State University Blacksburg, VA. FWS/OBS-82/11.13.