Staten Island Living Breakwaters - Eelgrass Restoration Pilot

Interstate Environmental Commission

Jovan Snyder, Sarah Bolander, Isabelle Stinnette, Dr. Laura Logozzo, Dr. Bradley Peterson

Background

Eelgrass (*Zostera marina*) was once abundant within the NY/NJ Harbor Estuary. This eelgrass formed dense underwater meadows which served as habitat, prevented shoreline erosion, and improved water quality. A wasting disease outbreak in the 1930's along with poor water quality (i.e. excess nutrients and high turbidity) virtually eliminated all eelgrass habitat within the NY/NJ Harbor Estuary. Recent developments such as improved water quality and eelgrass's newfound resistance to the wasting disease suggests that restoration may be possible within the ecosystem. The Living Breakwaters site in Staten Island was selected for its cool, shallow waters, making it a potentially ideal eelgrass restoration site.

Goals:

- To observe and document the success of transplanted eelgrass at the site.
- To monitor environmental conditions that may contribute to successful eelgrass restoration.

Monitoring Parameters

WATER QUALITY:

From the HOBO MX801 Data Logger with D.O. Sensor and C.T.D Sensor:

- Temperature (°C)
- Depth (from Absolute Pressure, kPa)
- Conductivity and Specific Conductivity (µS/cm)
- Salinity (PSU)
- Total Dissolved Solids (mg/L)
- Dissolved Oxygen (mg/L)
- Salinity Adjusted D.O. (mg/L)

From the HOBO UA-002-64 Pendant Temperature/ Light 64K Data Logger:

- Temperature (°C)
- Light (illuminance in lux)

HABITAT SURVEY:

- Areal coverage
- Shoot density
- Canopy/shoot height
- Epiphytic load
- Grazing, flowers, and/or fruiting evident
- Areal coverage by other species

Installation

IEC partnered with the NY/NJ Harbor & Estuary Program and Dr. Bradley Peterson's Community Ecology Lab at Stony Brook University to conduct this project. Dr. Peterson's lab planted eelgrass in June of 2025 by transplanting adult eelgrass harvested in Shinnecock Bay, Long Island in a checkerboard pattern along a 20 m transect at the southern tip of Staten Island adjacent to the Living Breakwaters installation.

Figure 1. (Left) Eelgrass/shoots/sods ready for planting with the Living Breakwaters in the background. The inset map in the top-left corner shows the general location of the site. (Right) Helical anchor with HOBO MX801 Data Logger attached on the left, and two HOBO Pendant Temperature/Light Loggers attached on the right via a PVC structure that maintains a set distance between the two pendants.

Figure 2. (Left) The HOBO Pendant Temperature/Light Logger being attached to a PVC bracing structure with a zip tie. (Right) The HOBO MX801 Data Logger with D.O. and C.T.D. sensors attached.

Water quality monitoring sensors were deployed in August and September 2025, and multiple habitat surveys were conducted by IEC to determine the success of the transplanted eelgrass. All sensors were removed at the end of November 2025. Monitoring will recommence in the spring of 2026.

Observations

At the time of the first habitat survey on September 5th, 2025, less than 5% remained of the estimated 4000 eelgrass shoots that were originally transplanted in June 2025. By the second habitat survey on October 21st, 2025, several more of the eelgrass shoots had died, though canopy heights of the remaining shoots had increased. The habitat survey conducted November 4th, 2025, was conducted during a particularly low-tide. The entire transect was completely exposed and all eelgrass shoots gone, alongside Brant Geese (*Branta bernicla*) actively grazing on the eelgrass. Roots were untouched by the Brant Geese, and spring surveys will confirm if any viable eelgrass remains.

Throughout the series of habitat surveys, high levels of turbidity and the presence of competing algae (as can be seen in the top photo of Fig. 3) were observed as well. Epiphytic coverage of the eelgrass shoots was generally low.

Investigation into the initial die-off of the eelgrass transplants, as well as a search within the Breakwaters for a location with consistently lower turbidity and less chance of exposure (though there may be a trade-off between light penetration and depth), for future eelgrass transplants may be beneficial.

Figure 3. (Top) Vegetation identified during a habitat survey, including 1. *Zostera marina*, 2. *Ahnfeltia plicata,* 3. *Agardhiella subulata*, 4. *Ulva spp*. (Middle) Eelgrass identified during a habitat survey with epiphytic growth and high turbidity. (Bottom) Migrating Brants foraging next to Station A exposed sensors on 11/04/25 during a spring tide.

Results

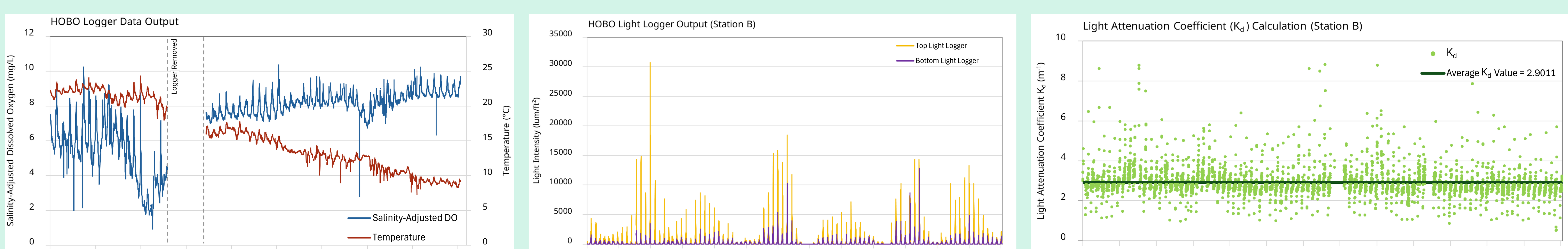


Figure 4. (Left) Graph showing temperature and DO readings from the HOBO MX801 Logger. (Middle) Graph showing light sensor readings from Station B. (Right) Light Attenuation Coefficient (K_d) calculations over the entire monitoring period, and average for Station B.

From the data collected during Fall 2025, wide fluctuations in DO were observed in the earlier months which decreases over time. This suggests excessive biological activity within the area. Light intensity readings were greater during spring tides, which was expected given the decreased low tide depths. The average K_d value for all the data collected from Station B is 2.9011 m^{-1} , and future monitoring will inform whether this value is accurate for the Living Breakwaters site.

IEC received financial support for this project from the U.S. Environmental Protection Agency through an assistance agreement.

Septic System Replacement Fund Program

Interstate Environmental Commission

Remy Freeman and Jovan Snyder

Background

The Septic System Replacement Fund Program provides a source of funding for the replacement of cesspools or septic systems for residents of Nassau and Suffolk County within the boundaries of the Long Island Sound (LIS) watershed. The program seeks to reduce the environmental and public health impacts associated with the discharge of effluent from cesspools and septic systems to groundwater. Innovative/alternative wastewater treatment systems (I/A OWTS) can fix and remove nitrogen, which has historically been a major pollutant in the Long Island Sound. Using new technology to reduce nitrogen input could significantly improve water quality in the Sound.

I/A OWTS Diagram

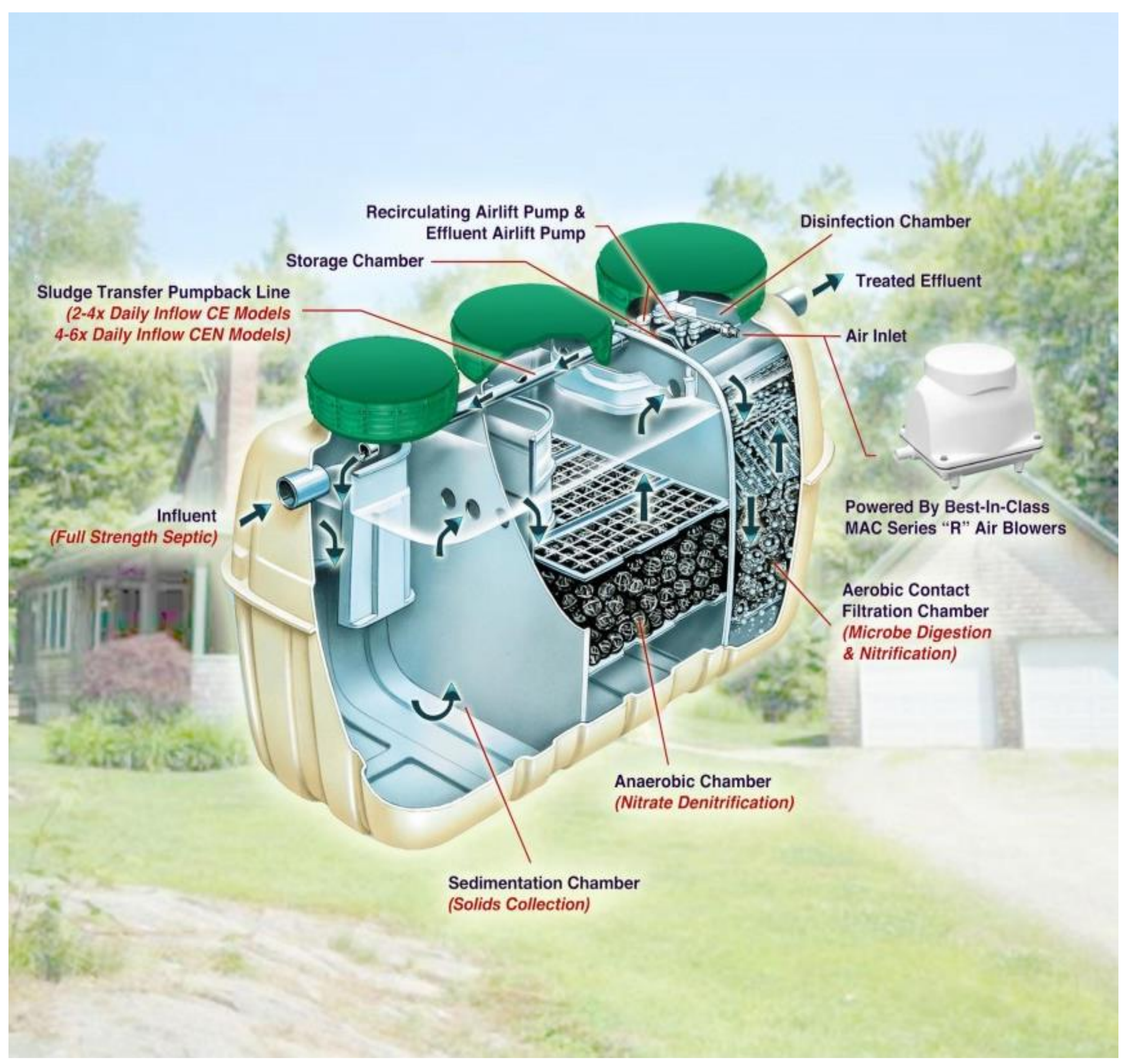


Figure 1. Example of how an I/A OWTS, or innovative/alternative onsite wastewater treatment system, treats influent.
http://floridaonsitesystemsanddesign.com/fujiclean-fujcileanusa-distributor-florida-springs-protection-nitrogen-reducing-septic/

Resident Eligibility

- To qualify, Suffolk or Nassau County residents must live within the LIS watershed (see map) and have septic systems or cesspools that are in failure or are reasonably likely to fail.
- Assistance will be based on the program criteria, the property's location in relation to a waterbody, the condition of the current cesspool or septic system, and the current system's impact on groundwater. Replacements must comply with the conditions of local permitting jurisdictions.

Septic System Installation Map

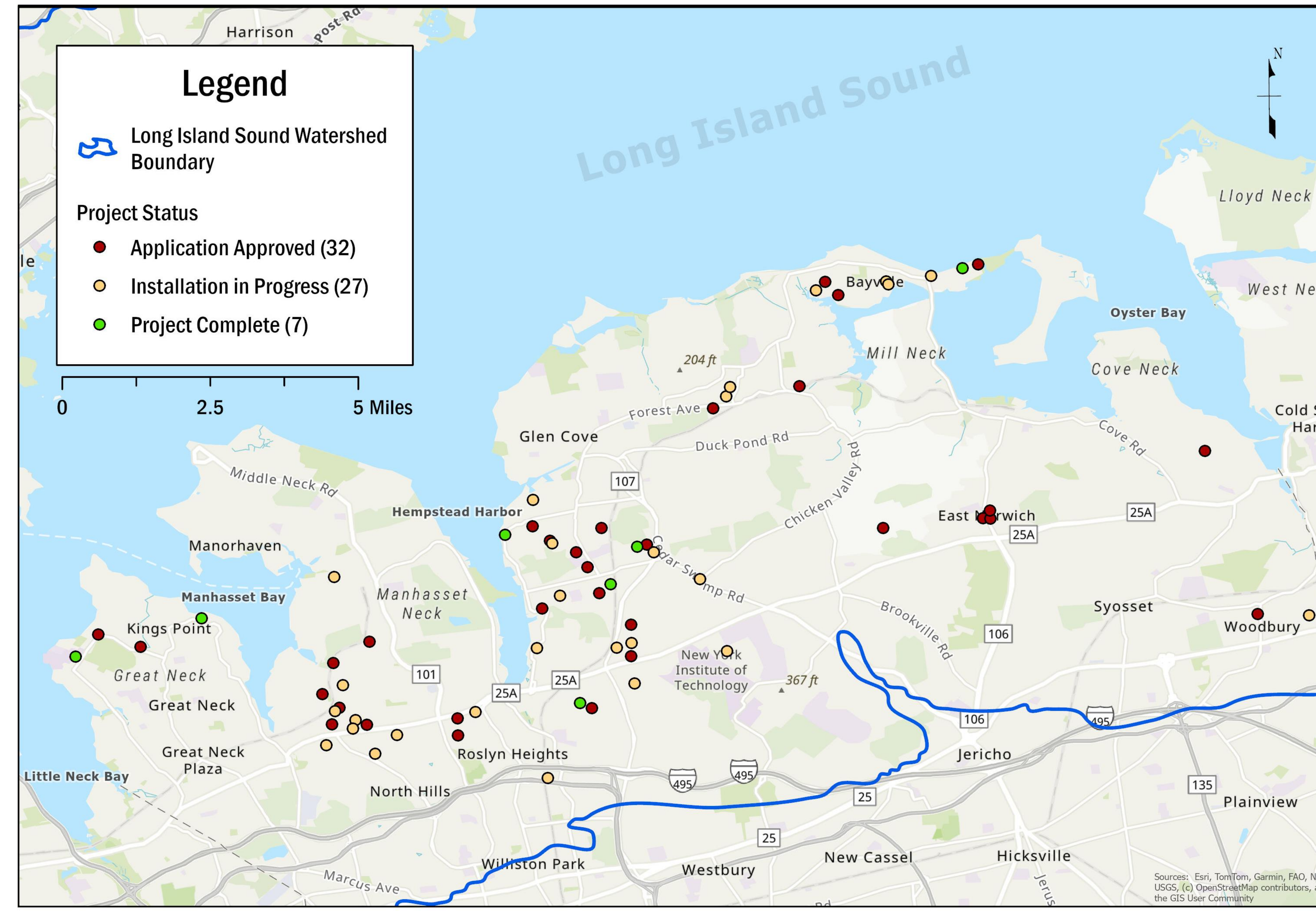


Figure 2. I/A OWTS that have been installed or are in the process of installation in Nassau County as of 11/4/2025.
Note: Information regarding Suffolk County installations was still pending at the time this map was created.

Funding

- The program is supported by EPA Bipartisan Infrastructure Law awarded by the Long Island Sound Partnership passed through the New York State Department of Environmental Conservation to IEC.
- The total funding available through this program is $7,560,016, or $3,780,000 per county, available until January 31st, 2028.
- Eligible homeowners and small business owners may be reimbursed up to $10,000 towards the installation of enhanced technologies. This program may be combined with existing programs, including county and town funding and the New York State Septic System Replacement Program, resulting in reimbursements totaling $20,000 or more.

Program Outcomes

Septic systems are the primary source of nitrogen pollution in the Long Island Sound. Conventional septic systems release an average of 40 pounds of nitrogen per household, per year into surface and groundwater in the LIS watershed. I/A OWTS can reduce the amount of nitrogen entering the watershed by up to 80%.

Excess nitrogen can cause hypoxia (low dissolved oxygen), coastal acidification (especially in embayments and near-shore waters), harmful algal blooms, eutrophication, and habitat degradation and loss. This has many ramifications for Long Island residents, including depleted drinking water quality, fish kills and reduced fishing, and diminished coastal resiliency. This program aims to mitigate these effects and improve water quality.

Unified Water Study: Water Quality Monitoring in Manhasset Bay, NY and Little Neck Bay, NY

Interstate Environmental Commission

Samantha Wilder | Environmental Analyst II | swilder@iec-nynjct.org

Background

The Unified Water Study (UWS), coordinated by Save the Sound, is a collaborative monitoring initiative aimed at addressing data gaps and evaluating the ecological health of Long Island Sound embayments. As of 2025, Save the Sound provides training, equipment, technical support, and standardized procedures to 29 groups monitoring approximately 50 embayments throughout Connecticut and New York (Map 1). The Interstate Environmental Commission began monitoring Little Neck Bay (Map 2) in 2017 during the inaugural UWS season and added Manhasset Bay (Map 3) in 2018.

All monitoring groups follow a United States Environmental Protection Agency (U.S. EPA)-approved Quality Assurance Project Plan to generate high-quality data for submission to the U.S. EPA's Water Quality Portal.

Tier I Sampling

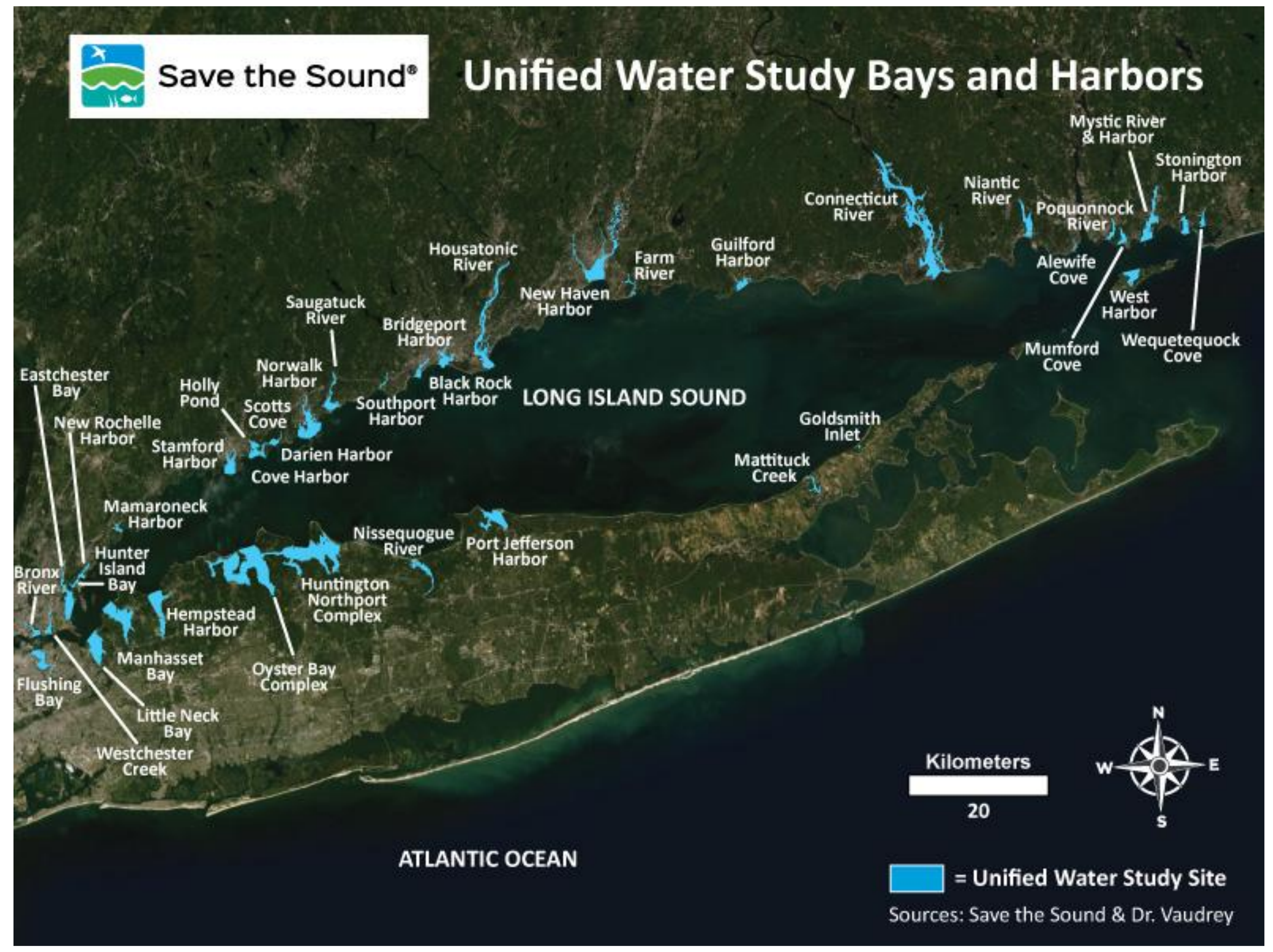
Sampling is conducted twice per month from May through October using a YSI EXO1 Multiparameter Sonde to collect *in situ* water quality data and grab samples for comparative chlorophyll-ɑ analyses. Measurements are taken in the early morning, within three hours of sunrise, when dissolved oxygen is typically low to track hypoxia trends. Additionally, three qualitative macrophyte assessments are performed from mid-July to early-August in both embayments, coinciding with expected peak growth and abundance during the summer.

Water Quality Parameters

- Temperature (°C)
- Salinity (ppt)
- Dissolved Oxygen (mg/L and % saturation)
- Turbidity (FNU)
- Chlorophyll-a (µg/L)

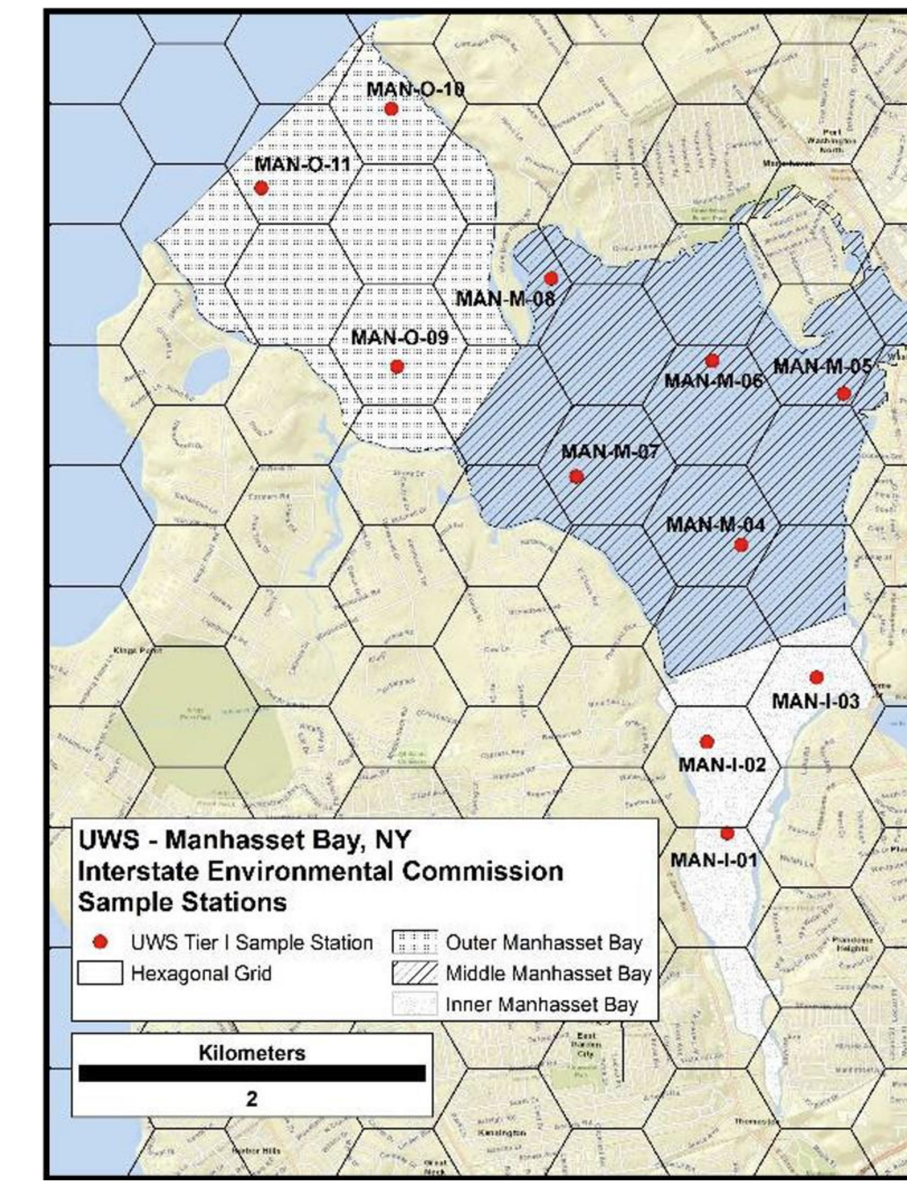
Figure 1. Seasonal intern Navairah Farooqi setting up a calibration check for a YSI EXO1 Multiparameter Sonde after sampling.

UWS Study Area



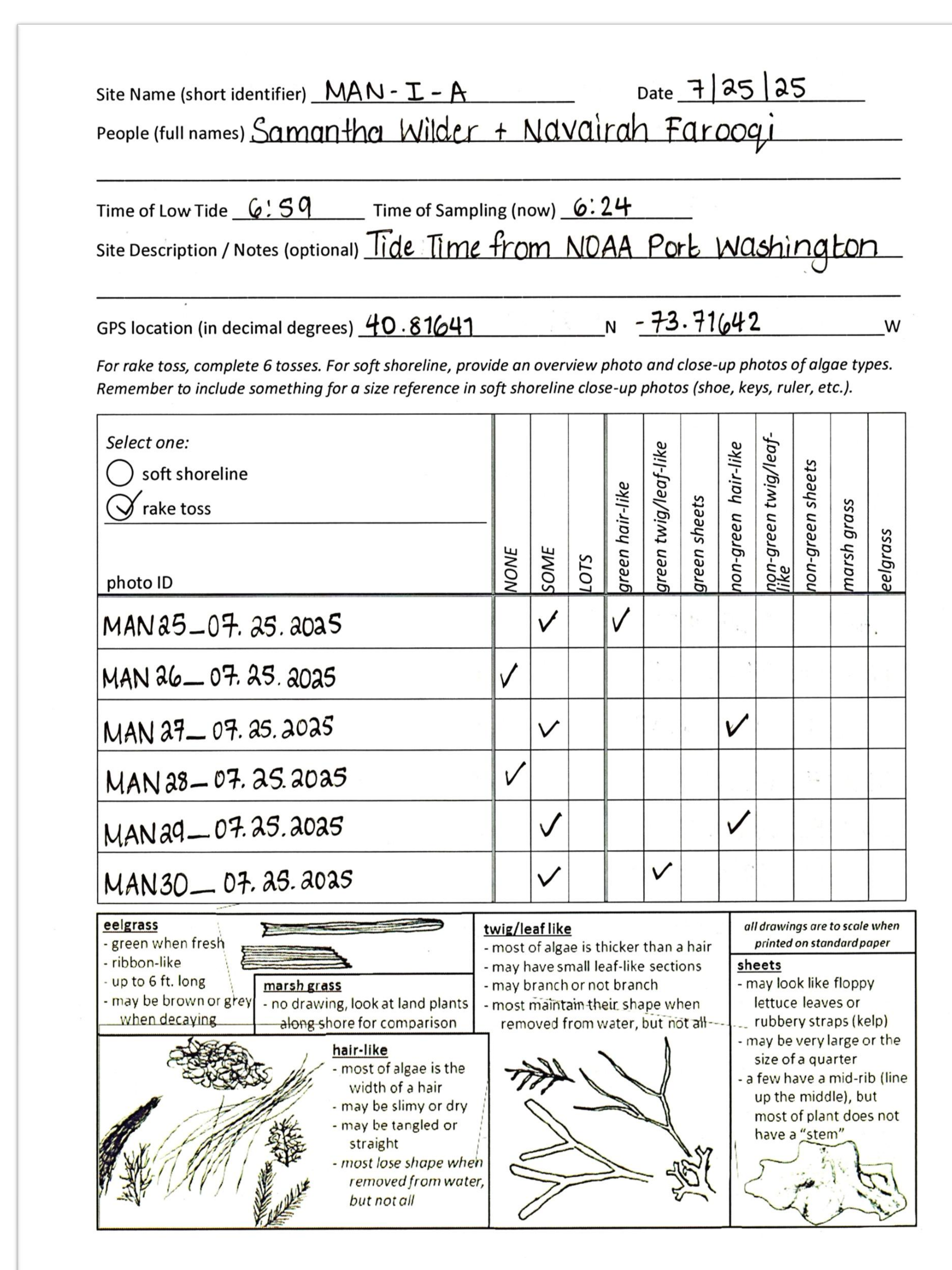
Map 1. Map of embayments monitored within the Long Island Sound watershed by participating groups.

Map 2. Map of Little Neck Bay sampling stations.



Map 3. Map of Manhasset Bay sampling stations.

Qualitative Macrophyte Assessment


Site Name (short identifier) MAN - I - A Date 7/25/25

People (full names) Samantha Wilder + Navairah Farooqi

Time of Low Tide 6:59 Time of Sampling (now) 6:24

Site Description / Notes (optional) Tide Time from NOAA Port Washington

GPS location (in decimal degrees) 40.81641 N -73.71642 W

For rake toss, complete 6 tosses. For soft shoreline, provide an overview photo and close-up photos of algae types. Remember to include something for a size reference in soft shoreline close-up photos (shoe, keys, ruler, etc.).

Select one: soft shoreline / ✓ rake toss

photo ID	NONE	SOME	LOTS	green hair-like	green twig/leaf-like	green sheets	non-green hair-like	non-green twig/leaf-like	non-green sheets	marsh grass	eelgrass
MAN25_07.25.2025		✓		✓							
MAN26_07.25.2025	✓										
MAN27_07.25.2025		✓					✓				
MAN28_07.25.2025	✓										
MAN29_07.25.2025		✓					✓				
MAN30_07.25.2025		✓			✓						

Figure 2. Field datasheet used for qualitative macrophyte assessments.

The purpose of the qualitative macrophyte assessments are to identify areas within each group's designated embayments that exhibit excessive macroalgae growth and/or the presence of eelgrass. Manhasset Bay, NY and Little Neck Bay, NY each have four macrophyte sampling stations. A weighted rake attached to a rope is tossed over the side of the boat twice in three different directions, for a total of six tosses at each sampling station. Each rake toss is photographed and assigned a value of "none", "some", or "lots" based on the amount of macroalgae covering the tines (Figures 2 and 3). General characteristics, such as color and thickness, are also recorded on field datasheets (Figure 2).

Results from Tier I macrophyte surveys are intended to complement recorded chlorophyll-ɑ data from routine water quality monitoring and are not intended to quantify the exact amount of macroalgae at each station.

"None" "Some" "Lots"

Figure 3. Photos taken during a qualitative macrophyte assessment. Tosses classified as "none" show no macroalgae on any tines (left). Tosses classified as "some" have macroalgae on some, but not all, of the tines (middle). Tosses classified as "lots" have macroalgae covering all tines (right).

IEC received financial support for this project from the U.S. EPA's Long Island Sound Partnership, distributed by Save the Sound, under Grant # LI 96269324.

Ambient Water Quality Monitoring in the Far Western Long Island Sound

Interstate Environmental Commission

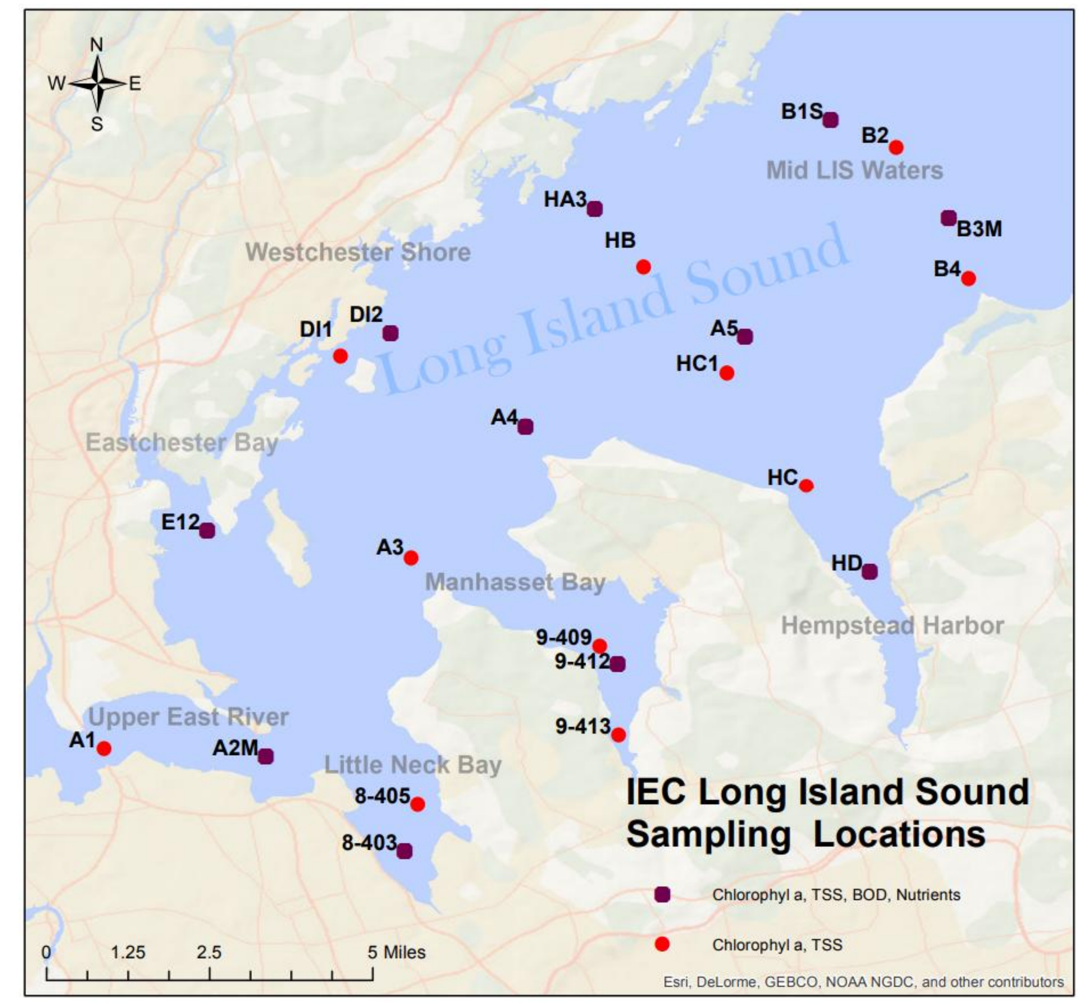
Samantha Wilder | Environmental Analyst II | swilder@iec-nynjct.org

Background

- Far Western Long Island Sound (WLIS)
    - Highly susceptible to degradation
    - High population density, extensive coastal development, insufficient tidal flushing
    - Excessive nutrient inputs from stormwater runoff, combined sewage overflows, leaking septic systems
    - The Western Narrows, west of Manhasset Bay, received an **F** in Save the Sound's 2024 Long Island Sound Report Card
- Since 1991 – IEC monitors LIS and embayments for hypoxic conditions (dissolved oxygen < 3.0 mg/L) and water quality
- 12 weekly surveys in the summer (Late June – Mid September)
- Monthly surveys in fall, winter, spring (October – May)

WLIS Stations

Figure 1. IEC WLIS sampling locations were chosen by IEC and the New York State Department of Environmental Conservation to fill a monitoring gap in the Western LIS. Sampling locations that are additionally analyzed for BOD and nutrients are included in the Coastal Acidification program.



Parameters

YSI Sonde – *in situ* water quality measurements with probes
- Temperature, Salinity, Dissolved Oxygen, pH, Turbidity

Field Observations/Measurements
- % Cloud Cover, Sea State, Secchi Disk Depth

Sample Collection
- Chlorophyll-*a,* Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD)
- Ammonia, Nitrite+Nitrate, Total Dissolved Nitrogen, Particulate Nitrogen
- Orthophosphate, Total Dissolved Phosphorus, Particulate Phosphorus
- Dissolved Organic Carbon, Particulate Carbon
- Dissolved Silica, Biogenic Silica

Coastal Acidification Program
- Dissolved Inorganic Carbon, Total Alkalinity

Out in the Field

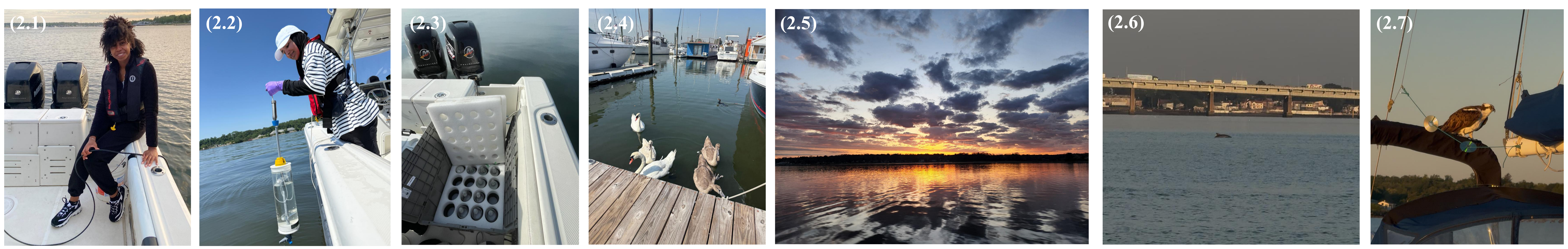


Figure 2.
2.1 Environmental Analyst Samantha Wilder taking YSI readings
2.2 Seasonal Intern Navairah Farooqi collecting samples for total alkalinity and dissolved inorganic carbon
2.3 Total alkalinity and dissolved inorganic carbon samples
2.4 Bevy of swans in Manhasset Bay Marina
2.5 Sunrise in Manhasset Bay
2.6 Pod of dolphins outside of Little Neck Bay
2.7 Osprey perched on a boat in Manhasset Bay

2025 Hypoxia Maps

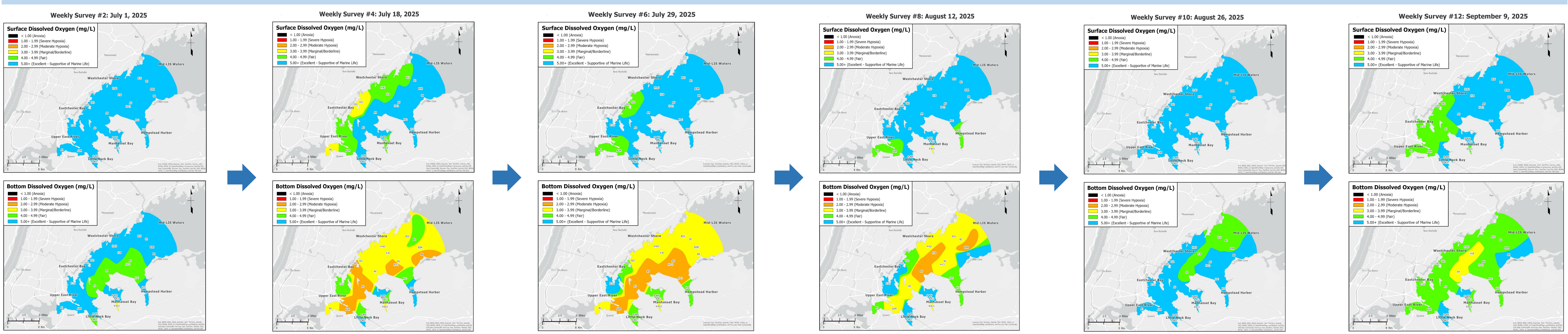


Figure 3. GIS maps demonstrating the extent of hypoxia across WLIS stations during the 2025 weekly sampling season. Shown are interpolations of surface and bottom dissolved oxygen measurements during weekly surveys #2, 4, 6, 8, 10, and 12 (shown from left to right).

IEC received financial support for this project from the EPA's Long Island Sound Partnership under Assistance Agreement LI-96244221.

Coordinated Volunteer Water Quality Monitoring Program

Interstate Environmental Commission

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Background

Volunteer monitoring, also referred to as *citizen science* or *participatory science*, is an opportunity for local communities to participate in ambient water quality monitoring in publicly accessible recreational waters or waterfront areas. Some of these areas may not be routinely monitored by regulatory agencies or established monitoring programs.

In 2025, the Interstate Environmental Commission (IEC) worked with eight groups to sample from a total of 29 sites throughout the New York - New Jersey Harbor. Each group participated in 10-20 weekly sampling events. IEC provides volunteers with hands-on training, quality assurance/quality control oversight, sample bottles, and field equipment, including a handheld YSI multiparameter water quality meter. All monitoring groups adhere to an EPA-approved Quality Assurance Project Plan. Data was disseminated weekly to monitoring groups, and will be submitted to the U.S. EPA's Water Quality Portal.

Parameters

Water quality measurements:

- Temperature (°C)
- Conductivity/Salinity (ppt)
- Dissolved Oxygen (mg/L and % saturation)
- Turbidity (FNU and NTU)
- Chlorophyll-a (µg/L, RFU)
- pH

Fecal Indicator Bacteria (FIB):

- Enterococci (MPN/100mL and CFU/100mL)
- Fecal coliform (CFU/100mL)
- E.coli (MPN/100mL)
- Total coliform (MPN/100mL)

Figure 1. YSI ProDSS Multiparameter Digital Water Quality Meter

Method & Water Quality Standards for Fecal Indicator Bacteria

IDEXX (SM9230D-2013)

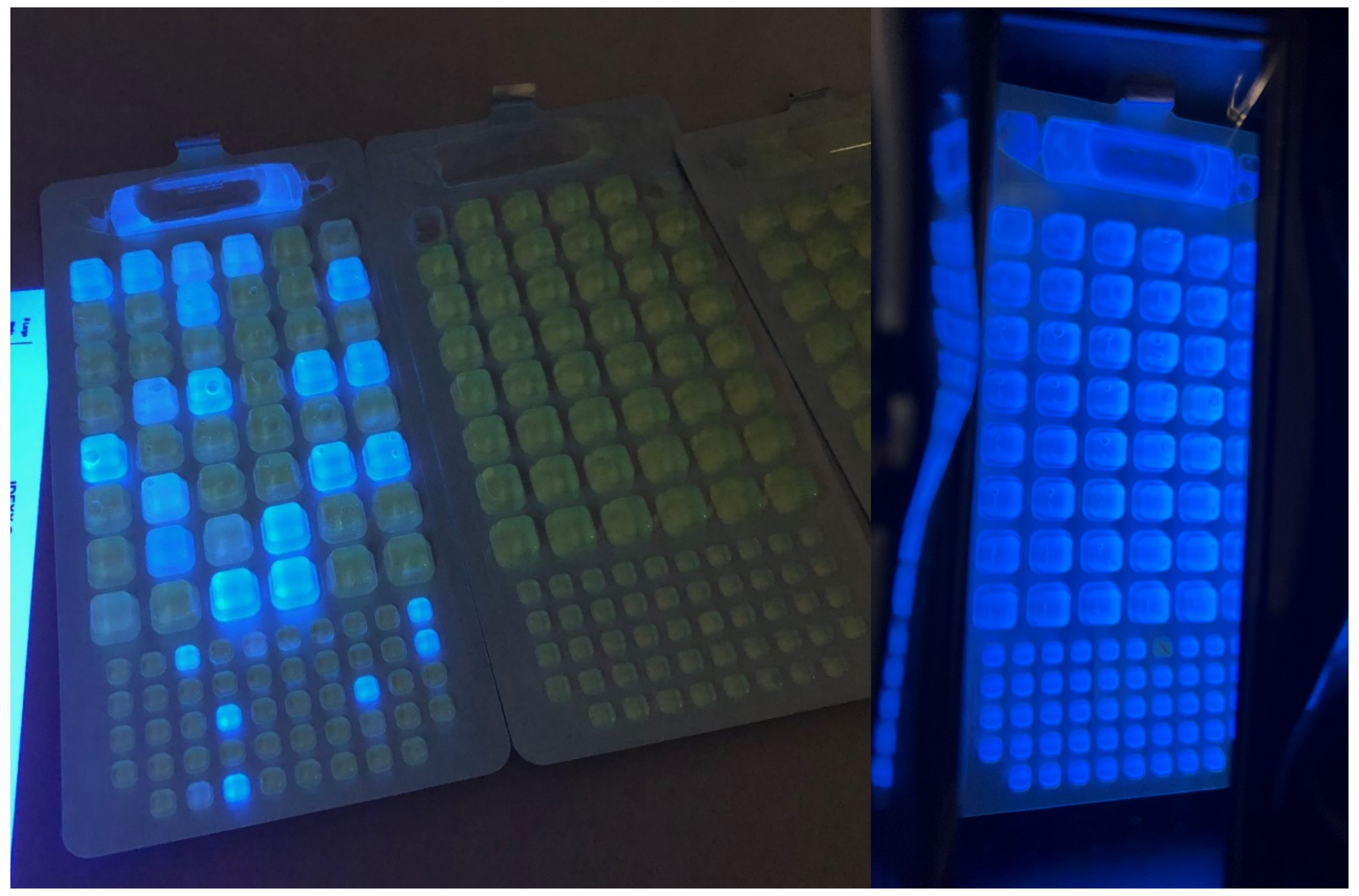


Figure 2. Enterococci analysis via IDEXX methods

Membrane Filtration (EPA 1600 & SM9222D-2015)

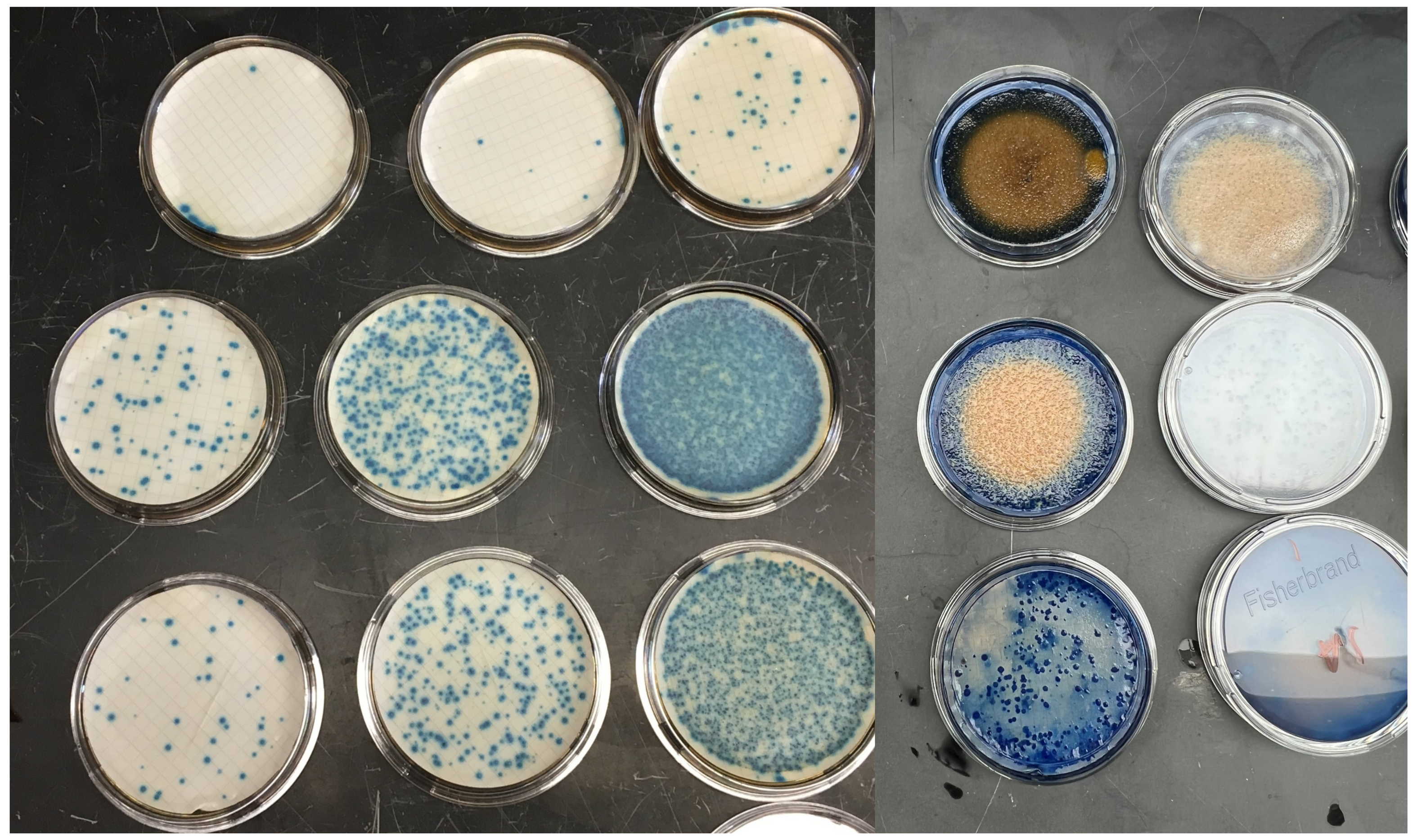


Figure 3. Fecal coliform analysis via membrane filtration

<u>New York State Department of Environmental Conservation Standards and Criteria</u>

- Enterococci: the geometric mean over a 30-day period shall not exceed 35/100mL and no more than 10 percent of the samples collected in the same 30-day period shall exceed 130/100mL (Class SA and SB)
- Fecal Coliform: the monthly geometric mean (five sample minimum) shall not exceed 200/100mL (Class SB, SD, and I)

<u>New Jersey Department of Environmental Protection Standards and Criteria</u>

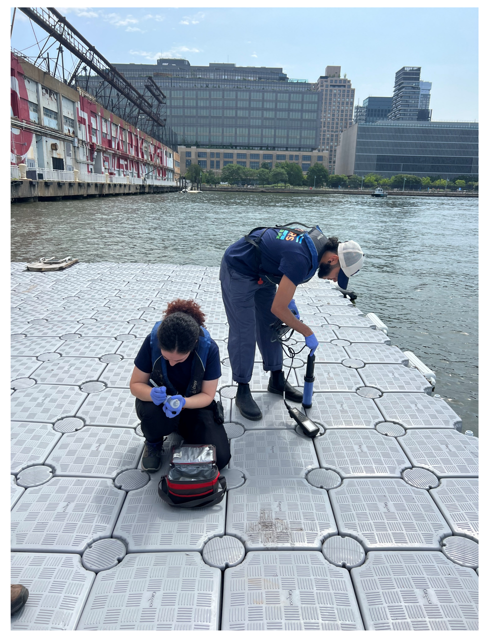
- Enterococci (primary contact recreation): the geometric mean over a 90-day period shall not exceed 30/100 mL and no more than 10 percent of samples collected shall exceed 110/100mL over a 90-day period (Class SE1)
- Fecal Coliform (secondary contact recreation): the geometric mean shall not exceed 770/100mL for waters classified as SE2, and 1500/100mL for waters classified as SE3

2025 Volunteer Monitoring Groups

Hackensack Riverkeeper (6 sites)

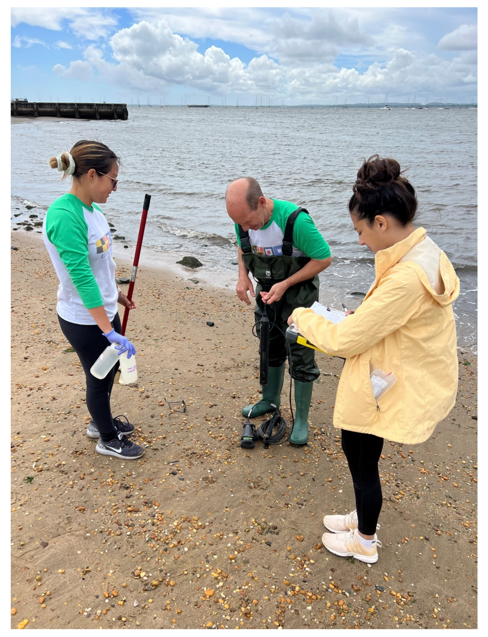
Hugh Carola and William Getreuer taking a YSI reading at Rutkowski Park in New Jersey.

Hudson River Park (2 sites)



Training session with seasonal staff at Hudson River Park at Pier 40 in Manhattan, NY.

Lower Raritan Watershed Partnership (6 sites)



Jocelyn Palomino leading volunteers at the final site in Perth Amboy, NJ.

Rahway River Watershed Association (3 sites)

Clea Carchia and Robert Berns sampling near the Rahway Valley Sewerage Authority.

Freshkills Park Alliance (2 sites)

Shannon Curley and José Ramírez-Garofalo taking a FIB sample from kayaks in Richmond Creek.

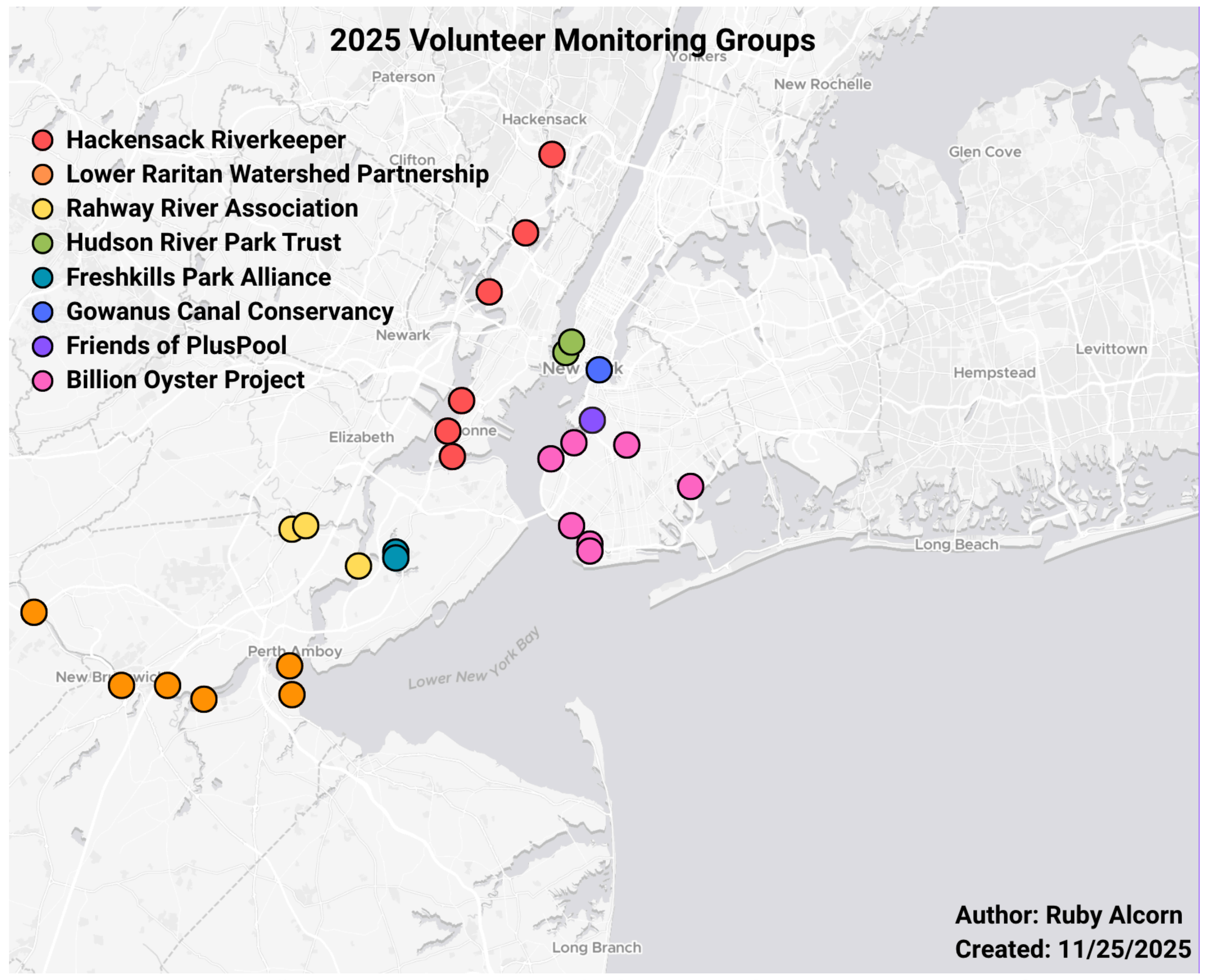
Gowanus Canal Conservancy (1 site)

Jennifer Kepler and Aurelia Casey learning how to calibrate the YSI ProDSS multiparameter water quality meter.

Figure 4. Participating monitoring groups in 2025; organizations not shown above: Friends of +POOL (1 site) and Billion Oyster Project (6 sites)

IEC received financial support from EPA under an assistance agreement to support this project.

Site Map



Map 1. Map of sites monitored during the 2025 sampling season

IEC – NJDEP NY/NJ Harbor Discrete Monitoring Network

Interstate Environmental Commission

Coordinated by Stephen Biazo, Environmental Analyst II

Background

- New Jersey Department of Environmental Protection partnered with IEC to develop the NY/NJ Harbor Estuary program in 2021
  - Water quality classifications in New Jersey were downgraded in 1985. NJDEP's Division of Water Monitoring and Standards would like to assess if certain segments can be upgraded.
  - Ongoing monitoring began in 2021 and NJDEP and IEC are continuing to implement the monitoring network annually going forward, with additional parameters phased in.
- One goal for this project is to investigate the current conditions of waters currently classified as Saline Estuary 2 (SE2) and Saline Estuary 3 (SE3).
  - SE2 & SE3 are considered to have less protective designated uses and do not support primary contact recreation (i.e. swimming) or the full life cycle of fish.
- Fate and transport model development:
  - NJDEP is developing a calibrated and validated Harbor Eutrophication Model potentially using the Long Island Sound Model funded by USEPA and NYCDEP or utilizing another appropriate modeling tool.
  - Validate the Pathogen Model developed by the Passaic Valley Sewerage Commission that can be utilized to assess the bacterial responses to rainfall and attainment of designated uses of the water.
- Since its inception in 2021, additional locations have been incorporated, and the list of parameters has expanded to include Dissolved Organic Carbon (DOC) and a suite of metals that were both added in 2024.

New Jersey Surface Water Designated Uses

Saline Estuary 1(SE1) designated uses:
1. Shellfish harvesting in accordance with N.J.A.C. 7:12;
2. Maintenance, migration and propagation of the natural and established biota;
3. Primary contact recreation; and
4. Any other reasonable uses.

Saline Estuary 2(SE2) designated uses:
1. Maintenance, migration and propagation of the natural and established biota
2. Migration of diadromous fish
3. Maintenance of wildlife
4. Secondary contact recreation
5. Any other reasonable uses.

Saline Estuary 3(SE3) designated uses:
1. Secondary contact recreation
2 Maintenance and migration of fish populations
3 Migration of diadromous fish
4. Maintenance of wildlife
5. Any other reasonable uses.

Fresh Water 2 (FW2) designated uses:
1. Maintenance, migration and propagation of the natural and established biota;
2. Primary contact recreation;
3. Industrial and agricultural water supply;
4. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and
5. Any other reasonable uses.

*Category 1(C1): those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (i), for purposes of implementing the antidegradation policies set forth at N.J.A.C. 7:9B-1.5(d), for protection from measurable changes in water quality based on exceptional ecological significance, exceptional recreational significance, exceptional water supply significance or exceptional fisheries resource(s) to protect their aesthetic value (color, clarity, scenic setting) and ecological integrity (habitat, water quality and biological functions).

New Jersey Surface Water Classifications

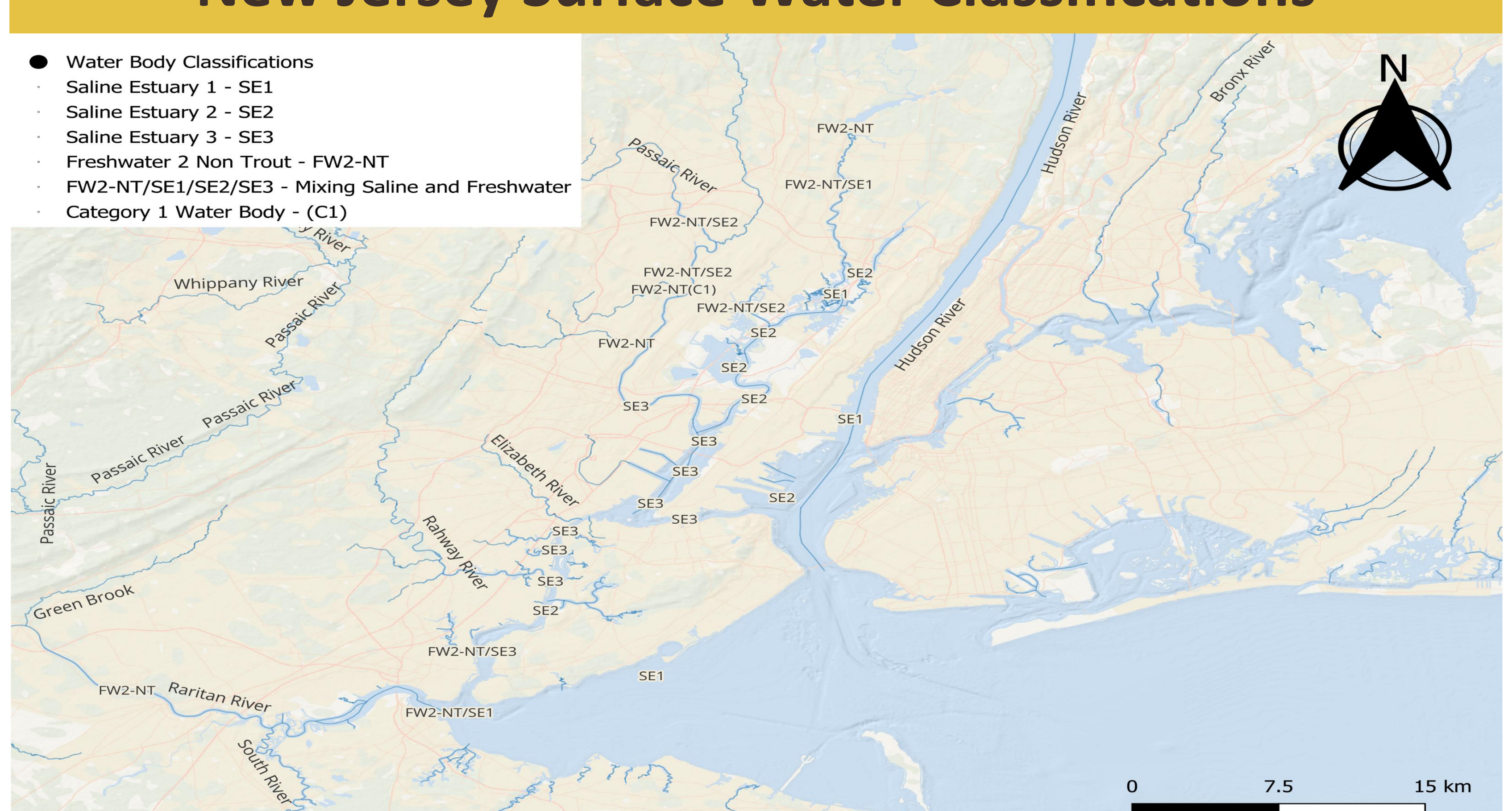


Figure 1: Map generated using QGIS 3.44 Software. New Jersey Waterbody Classifications. Coordinate Reference System: EPSG 4326, WGS 84.

Discrete Monitoring Locations

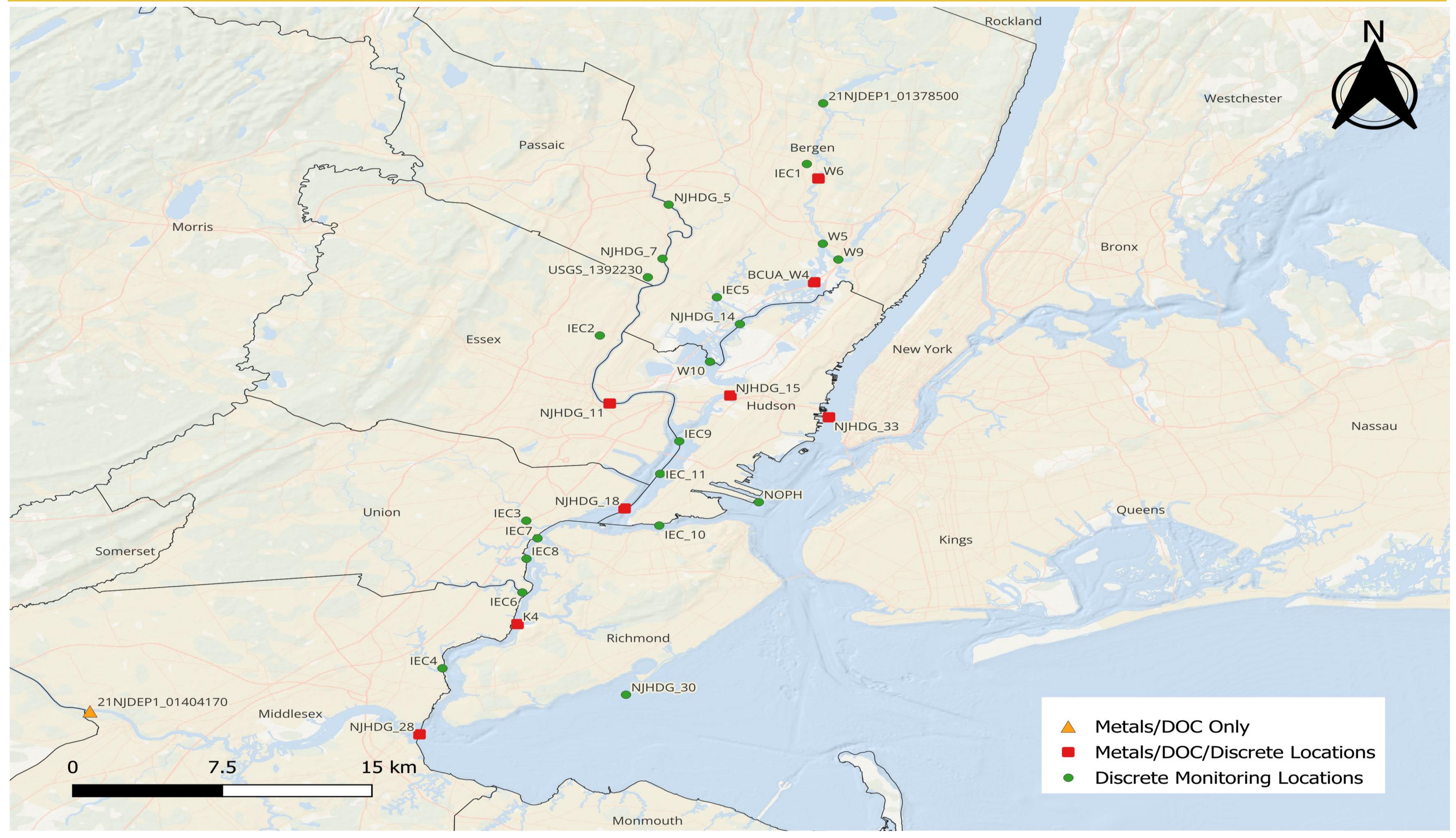


Figure 2: Discrete monitoring locations where readings are recorded using a YSI Multi-Parameter SONDE. Included are locations designated by NJDEP for a suite of Metals as well as Dissolved Organic Carbon samples. Parameters listed under discrete monitoring parameters and discrete field sampling are taken at every location shown above with one exception (21NJDEP1_01404170). Map generated in QGIS 3.44, Coordinate Reference System: EPSG 4326, WGS84

Dissolved Oxygen Interpolation Maps

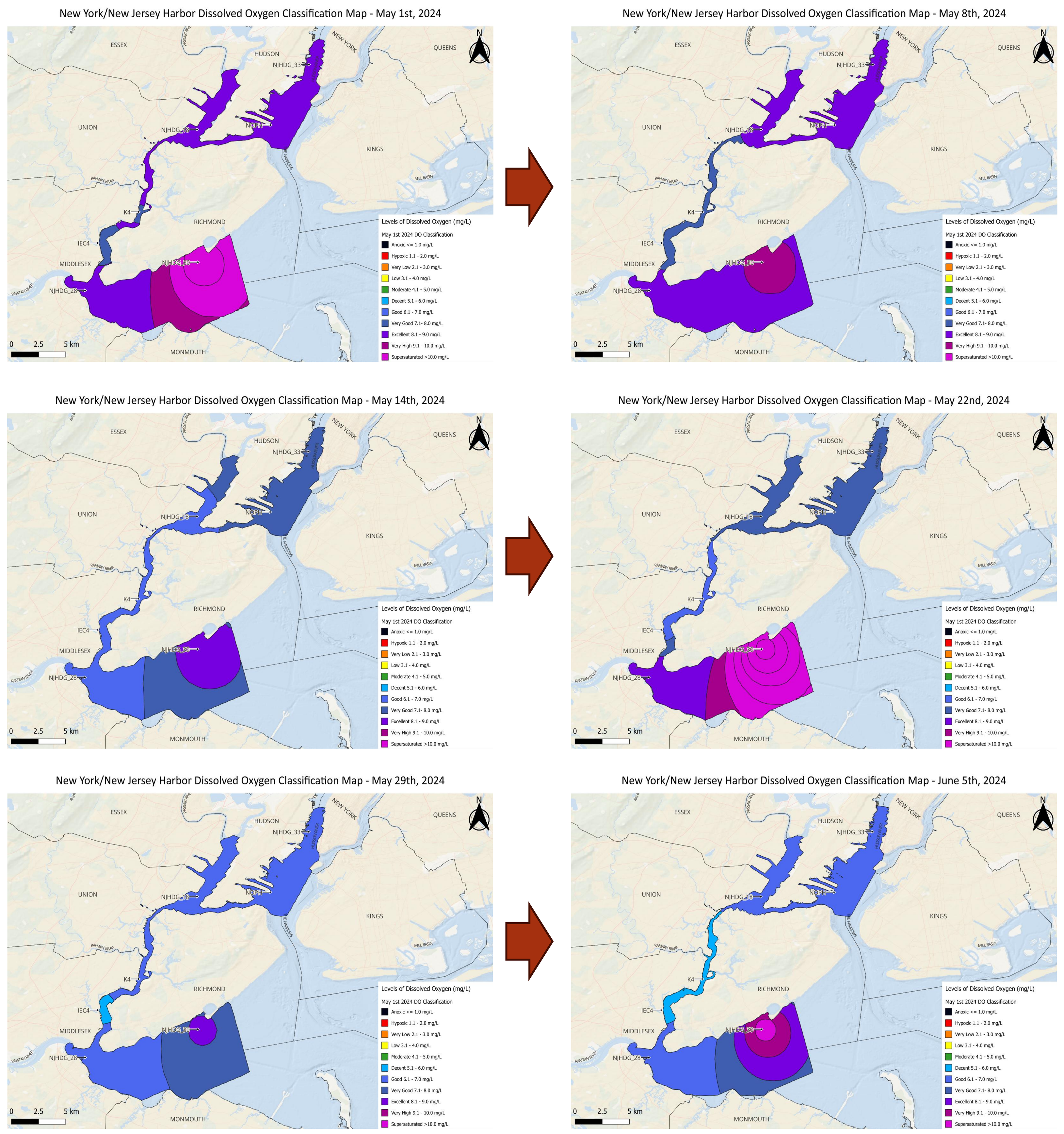


Figure 3: Maps generated using QGIS 3.44 Software. Week to week dissolved oxygen readings interpolated(IDW) from May 1st to June 5th, 2024. Coordinate Reference System: EPSG 4326, WGS 84.

IEC received funding from the New Jersey Department of Environmental Protection to support this project.

All Parameters

Discrete Monitoring Readings
- Dissolved Oxygen (%Saturation, mg/L)
- Temperature (°C)
- Conductivity (µs/cm)
- Salinity (ppt)
- pH
- Chlorophyll a (µg/L)
- Depth (m)

Discrete Field Sampling
- Turbidity (NTU)
- Fecal coliform (CFU/100mL)
- Enterococci (CFU/100mL)
- E. coli (CFU/100mL)
- Nutrients – OPO4, NH3, NO2+NO3, TN, TP
- Metals – Ag, As, Cd, CR-T, Cu, Mn, Ni, Pb, Se, Zn, Cr(VI), Trace Hg
- Dissolved Organic Carbon (ppm)

Dissolved Oxygen Readings (mg/L) 2023-2025

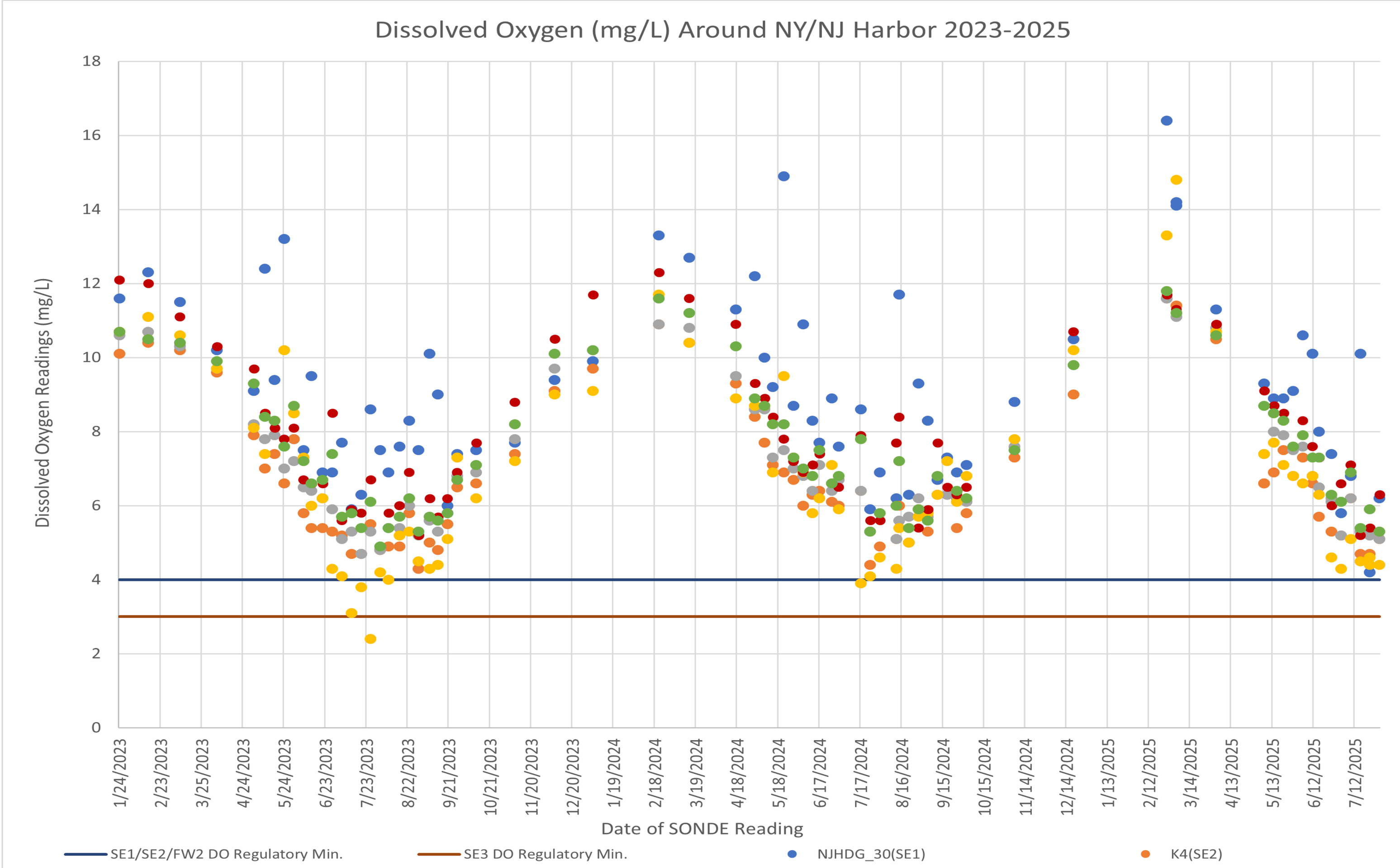


Figure 4: Three years of dissolved oxygen readings taken via YSI SONDE from sites located in the Harbor area. Data taken weekly from May - September and data taken monthly from October - April. More frequent readings are taken May – September due to the impact of warmer months on dissolved oxygen levels. Regulatory Min. refers to established dissolved oxygen criteria in N.J.A.C 7:9B where no discrete readings should fall under 4.0 mg/L at **ANY** time for classifications SE1, SE2, or FW2. Waters classified under SE3 should not fall under 3.0 mg/L at **ANY** time.

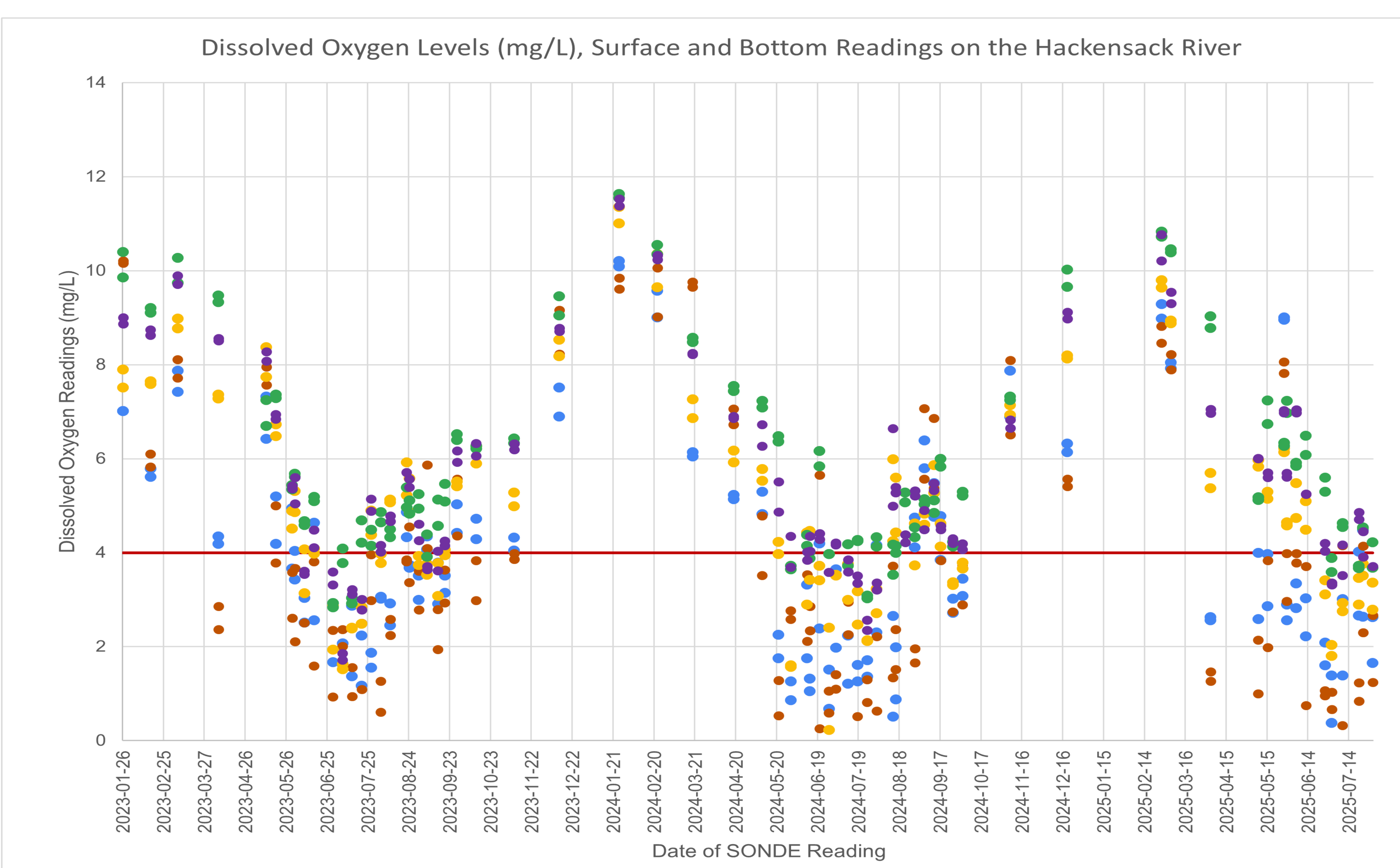


Figure 5: Three years of dissolved oxygen readings taken via YSI SONDE from sites located on the Hackensack River. Data taken weekly from May - September and data taken monthly from October - April. These five locations have dual readings taken 1-meter below the surface and 1-meter above the bottom.

604b New York Harbor Monitoring Program

Interstate Environmental Commission

Coordinated by Environmental Analysts Valeria Izeppi and Jovan Snyder

Background

The New York Harbor, East River, and its tributaries have had increasing demand for recreational use and the need for water quality monitoring has consequently increased. The Interstate Environmental Commission (IEC) has previously conducted monitoring in New York coastal recreation waters through its other programs, but with the launch of the 604b program, 10 discrete monitoring sites that lack historical fecal indicator bacteria data were added to IEC's scope of monitoring. IEC began collecting weekly water samples from land- and boat-based sites to test for Enterococci sp. and Fecal coliforms, and taking *in-situ* measurements of dissolved oxygen, pH, and temperature with a multi-parameter sonde, beginning in July 2024. Funding has been provided through Environmental Protection Agency (EPA) 604b grants, distributed by the New York State Department of Environmental Conservation.

Goals:

- ➢Generate data to inform water quality assessments, including potential future wet weather exemption designations
- ➢Target under-monitored and potential environmental justice areas
- ➢Monitor public access points and tributaries

Criteria Elements	Primary Contact and Secondary Contact and Fishing (Class SB)		Secondary Contact and Fishing (Class I)	
	GM (MPN or CFU/100 mL)	STV (MPN or CFU/100 mL)	GM (MPN or CFU/100 mL)	STV (MPN or CFU/100 mL)
Enterococci	35[1]	130 [1]	72 [2]	266 [2]
Fecal coliform	200[1]		200[1]	

Enterococci Standards in Class SB surface saline waters are applied during the period between May 1st and October 31st. "The geometric mean of samples collected over any consecutive 30-day period shall not exceed 35, and no more than 10 percent of the samples collected in the same 30-day period shall exceed 130".[1] Fecal coliform Standards in Class SB and I surface waters shall be met "when disinfection is required for SPDES permitted discharges directly into, of affecting the best usage of, the water, or when the department determines it necessary to protect human health." [1]

[1] 6 New York Codes, Rules and Regulations (NYCRR) 703.4
[2] New York State Fact Sheet, U.S. EPA (Russo, 2022)

GM= Geometric Mean (Geomean), STV= Statistical Threshold Value

2024 Trends*

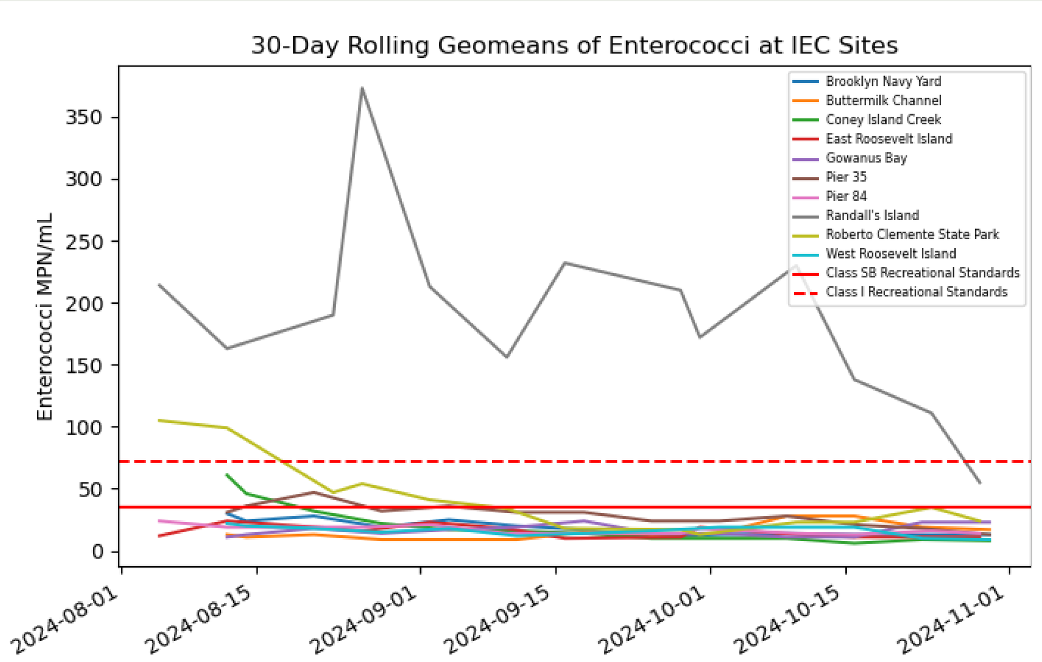


Figure 1. Rolling geometric means of enterococci levels at each site

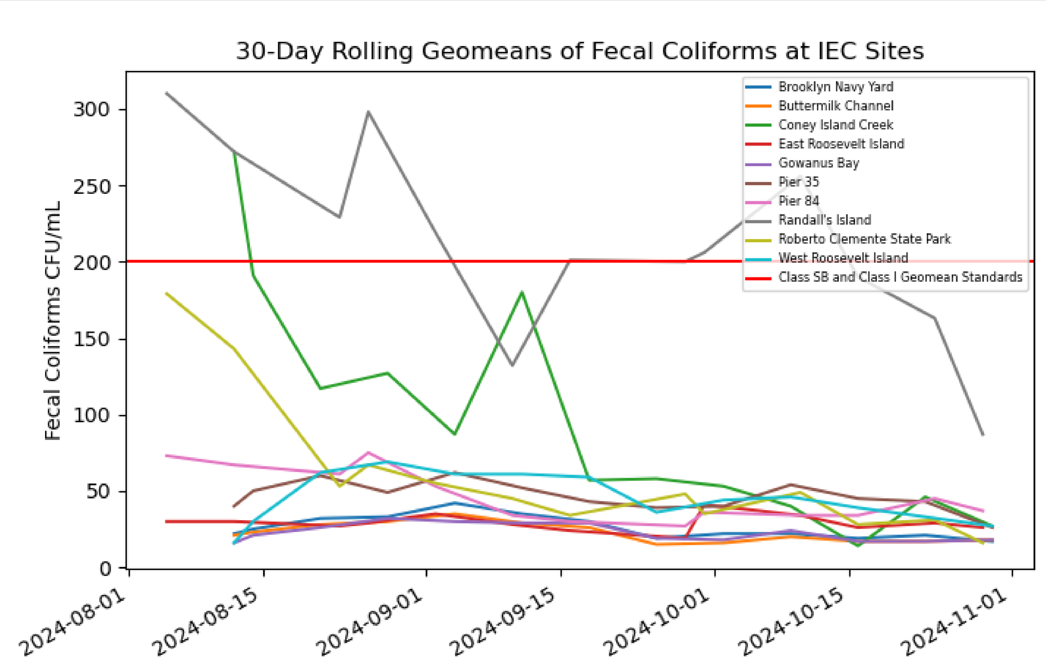


Figure 2. Rolling geometric means of fecal coliform levels at each site

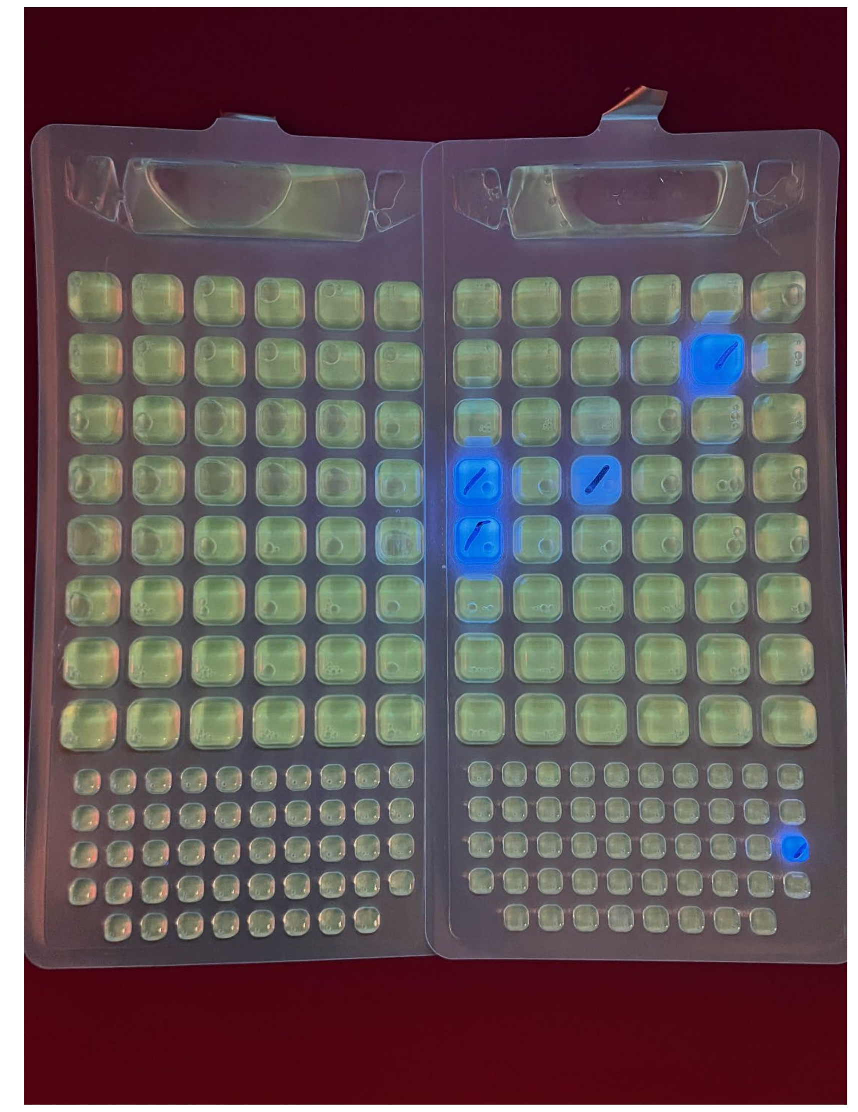
Sites that exceeded STV limit (Enterococci)

Class SB Sites that exceeded 130 MPN/100 mL in >10% samples analyzed that month:
IEC_CIC (July) and IEC GOB (October)
Class I Sites that exceed 266 MPN/100 mL in >10% samples analyzed that month:
IEC_RAI (July, August, September)

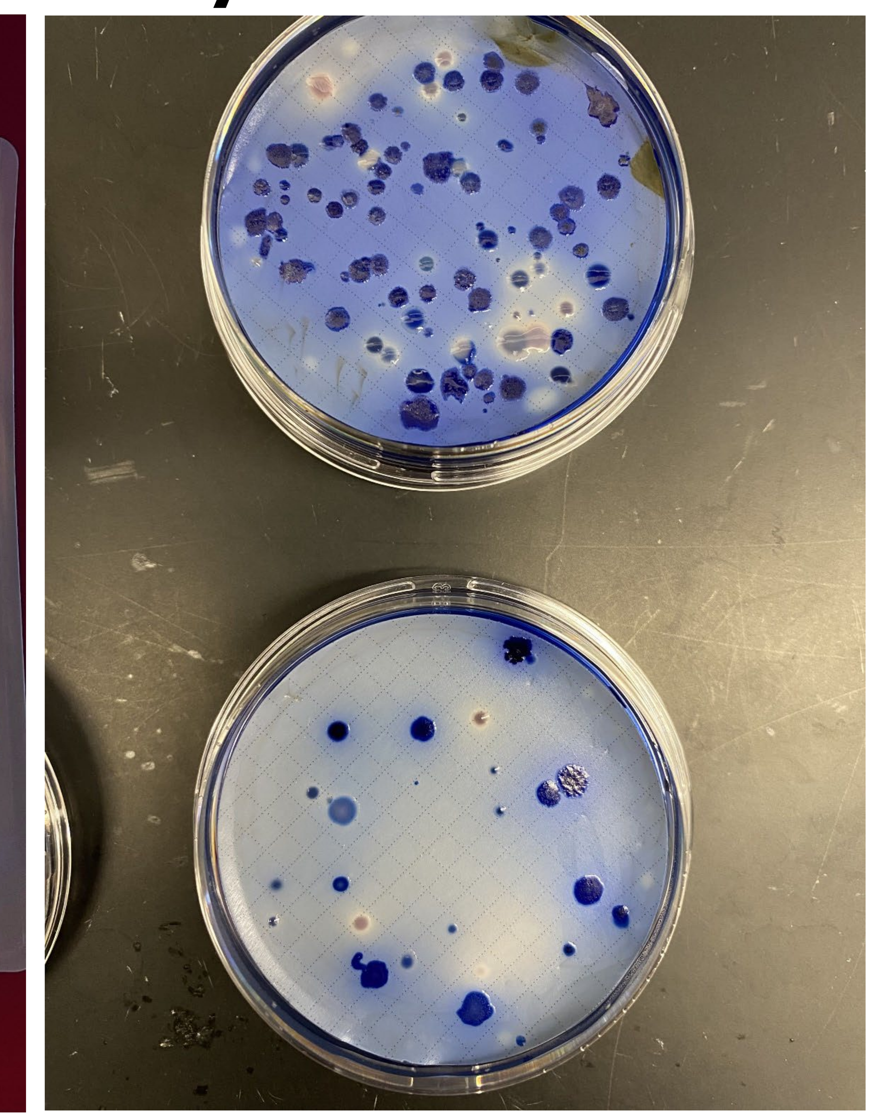
*Preliminary Data Used, awaiting QC

Methods of Analyses

Fecal Indicator Bacteria Analyses



IDEXX
Enterococci (MPN/100 mL)
Method: 9320D-2013 (Enterolert)



Membrane Filtration
Fecal coliform (CFU/100 mL)
Method: SM9222D-2015

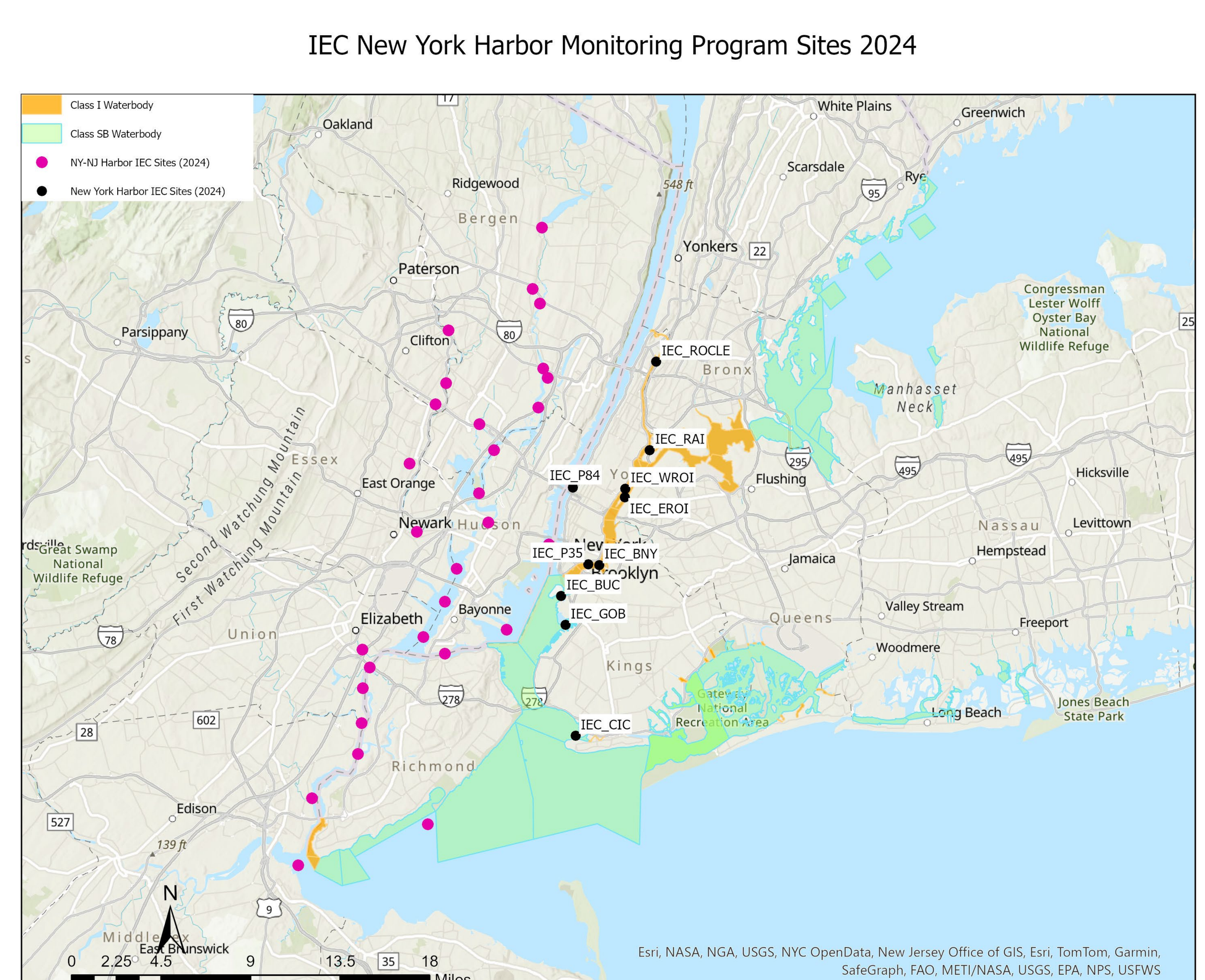
In-Situ Field Measurements

Field Parameters:

- → pH[3]
- →Temperature[3]
- → Dissolved Oxygen[3]
- → Clarity(Secchi Disk)

[3]YSI EXO1 Multiparameter Water Quality Meter

Site Map



Map 1. Map of proposed discrete monitoring locations

Site ID	Site Name/Location	Class	Land/Boat Access
IEC_ROCLE	Roberto Clemente State Park	I	Land
IEC_WROI	West Roosevelt Island	I	Boat
IEC_EROI	East Roosevelt Island	I	Land
IEC_P35	Pier 35	I	Boat
IEC_RAI	West side of Randall's Island	I	Land
IEC_GOB	Gowanus Bay	SB	Boat
IEC_BUC	Buttermilk Channel, Between Governor's Island and Brooklyn	SB	Boat
IEC_CIC	Gravesend Bay/ Coney Island Creek	SB	Boat
IEC_BNY	Brooklyn Navy Yard	I	Boat
IEC_P84	Pier 84	NA	Land

Table 1. Table of monitoring locations, NYSDEC water quality classifications, and site access

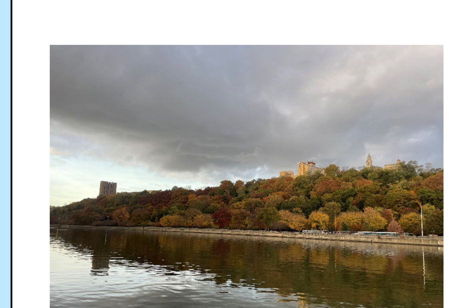


Figure 3. Pictured is IEC_EROI (left), IEC_RAI (center), and EC_P84 (right)