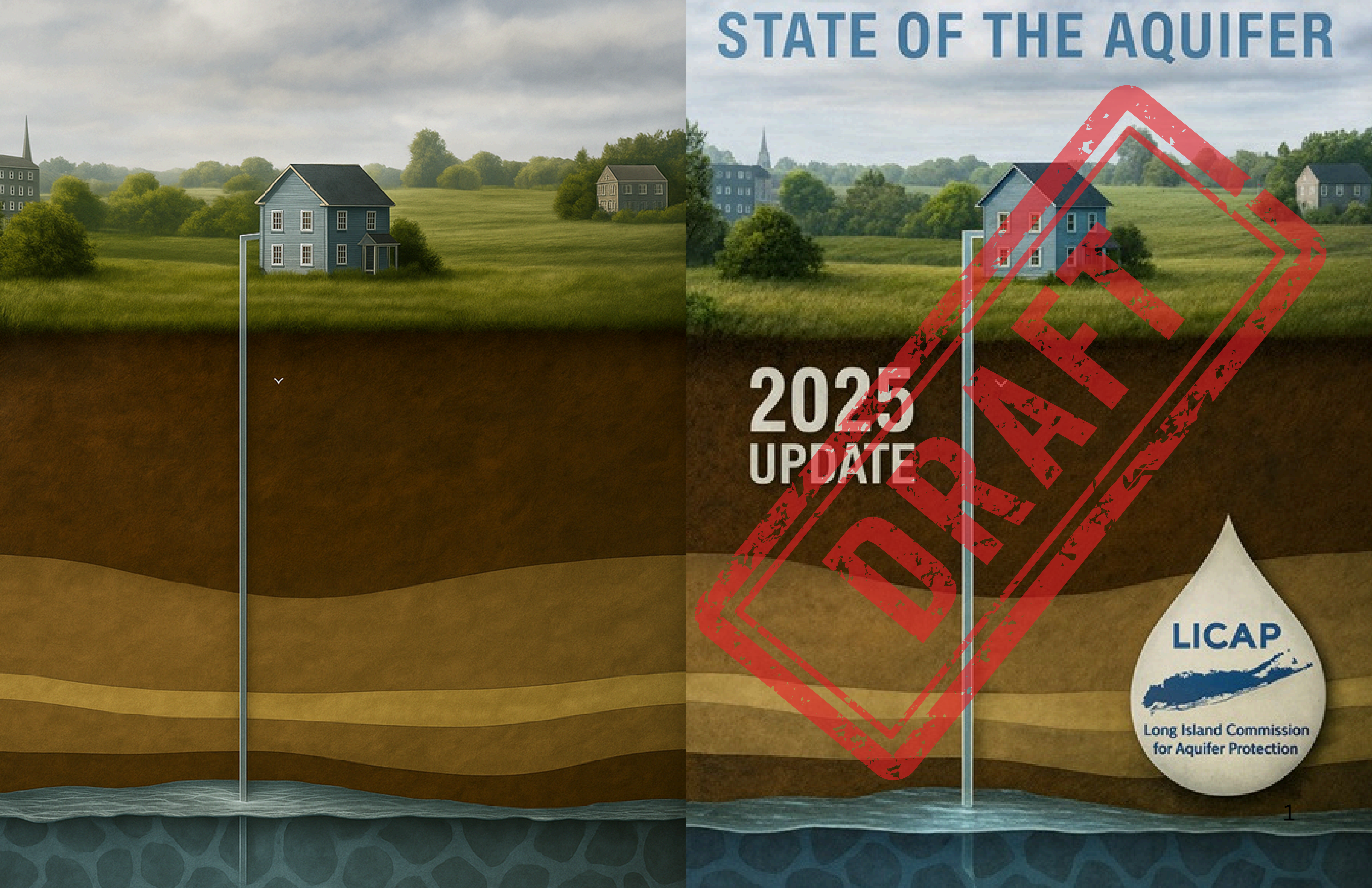

STATE OF THE AQUIFER
2025
UPDATE
DRAFT
LICAP
Long Island Commission
for Aquifer Protection

LICAP MEMBERS

Voting Members And The Organizations Or Offices They Represent

Jeffrey Szabo
Chairman
Suffolk County Water Authority

Jason Belle
Vice-Chairman
Nassua-Suffolk Water Commission Association

Paul Granger
Long Island Water Conference

John Sohngen
Suffolk County Commissioner of Health

Angela Pettinelli
Nassau County Commissioner of Health

Jennifer Juengst
Suffolk County Executive

(Vacant)
Nassau County Executive

Chris Ostuni
Nassau County Legislature Presiding Officer

Michael White
Suffolk County Legislature Presiding Officer

Brian Culhane
Suffolk County Soil and Water Conservation District

Derek Betts
Nassau County Soil and Water Conservation District

Ex Officio Members And The Offices They Represent

Richard Groh
Suffolk County Legislature Minority Leader

Sarah Meyland
Nassau County Legislature Minority Leader

Brian Schneider
U.S. Geological Survey
Long Island Program Office

Chris Engelhardt
New York State Department of
Environmental Conservation

Vacant Positions

Suffolk County Commissioner of Public Works

Suffolk County Commissioner of Parks,
Recreation and Conservation

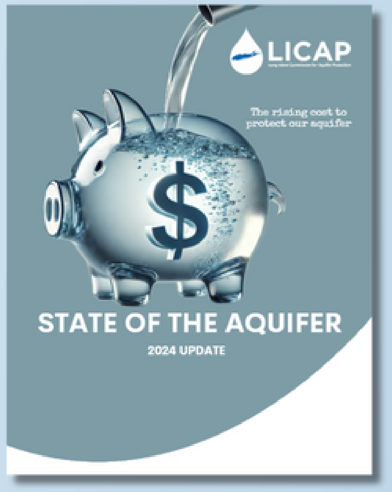
Nassau County Commissioner of Parks

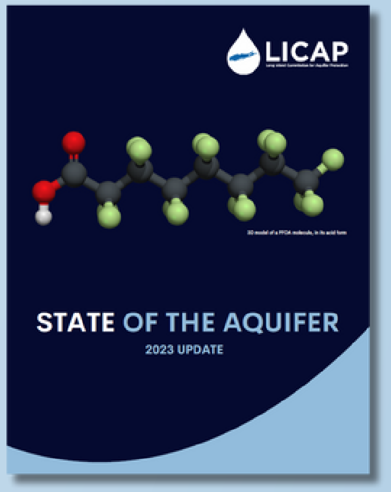
Nassau County Planning Commission

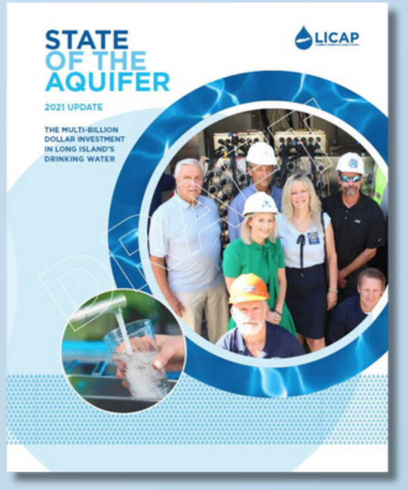
LIGRI (Long Island Groundwater Research Institute)

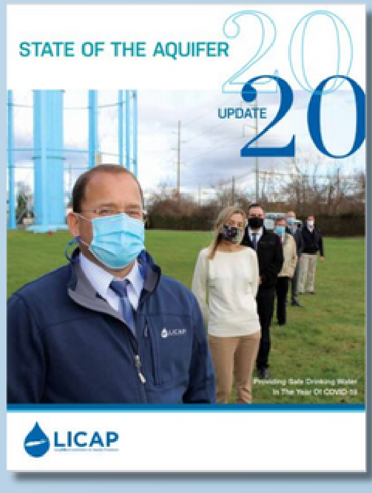
SUNY Stony Brook: School of Marine
and Atmospheric Sciences

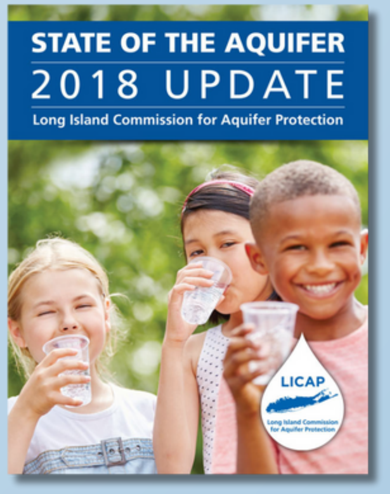
STATE OF THE AQUIFER THROUGH THE YEARS

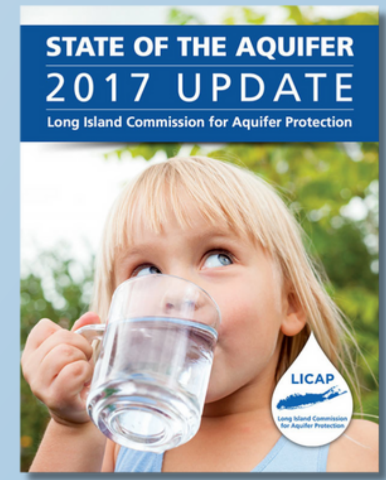












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Previous LICAP State of the Aquifer Reports Available at https://licaponline.com/reports/

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MESSAGE FROM THE CHAIRMAN

The following update to the Long Island Commission for Aquifer Protection's (LICAP) State of the Aquifer report covers many of the topics integral to our understanding of the sole source aquifer that provides 100% of Long Island's drinking water, including groundwater pumpage, hydrologic conditions and groundwater monitoring.

This year's State of the Aquifer Report comes at a critical moment for Long Island's drinking water. The PFAS regulatory environment in Washington continues to evolve, and the decisions being made will shape how every supplier plans treatment, funds capital work and communicates with customers. As EPA finalizes national standards and evaluates additional compounds, suppliers are adjusting operations and preparing for the next phase of compliance.

Conservation also remains central to protecting groundwater levels and managing seasonal demand. This year's report examines recent usage trends and outlines where further progress is needed to reduce the strain on our aquifer. As Long Island considers the role wastewater reuse may play in the future, the connection between reuse and long-term conservation becomes an important part of the planning process.

This report is also a significant moment for me personally. Over a decade ago I had an idea for a regional organization that would take a holistic approach to managing the most precious natural resource we have—our aquifer. That idea became LICAP and since its inception it has produced these State of the Aquifer reports, completed the Groundwater Resources Management Plan with more than 100 actionable policy recommendations, launched WaterTraq as the first unified regional water quality reporting tool, built the Sentinel Monitoring program and developed the Our Water Our Lives campaign. These efforts have increased transparency, informed policy discussions and elevated groundwater protection across Long Island.

At the end of this year, I will step down as LICAP Chair. It has been a privilege to help build this organization and work with so many dedicated professionals committed to safeguarding our aquifer for generations to come.

Looking ahead, LICAP will complete the Drinking Water 2050 report to guide aquifer management far into the future. The challenges are significant, but LICAP is positioned to continue providing clear, science-based guidance for Long Island.

JEFF SZABO

Chairman,
Long Island Commission for
Aquifer Protection

The State of the Aquifer

In 2025, Long Island's water landscape reflects both long-standing challenges and emerging pressures as agencies navigate new regulatory, hydrologic, and infrastructure realities. The revised federal PFAS framework continues to evolve, with EPA advancing 4-ppt standards for PFOA and PFOS while reconsidering regulation of other PFAS compounds. Water suppliers remain focused on compliance timelines that now extend to 2031, while pilot studies on short-chain PFAS are underway to identify treatment technologies that can meet future standards. At the same time, counties are expanding monitoring of private wells and surface waters, revealing a more complex PFAS footprint. Microplastics and nanoplastics have become an emerging concern and a USGS–LICAP pilot effort launched in 2025 aims to identify potential transport pathways in the unconfined aquifer system, with results expected in 2026.

Hydrologic conditions across Long Island show the importance of conservation, modeling, and coordinated planning. Precipitation in the 2025 water year was markedly below normal, contributing to declining groundwater levels after the temporary rebound of early 2024. Long-term records from wells in both Nassau and Suffolk Counties show sharp decreases beginning in late 2022, partial recovery in 2024, and renewed declines through 2025 as drier conditions persisted. Streamflows in Massapequa Creek, the Connetquot River, and the Peconic River followed the same pattern, with below-average discharge returning by year's end. These hydrologic realities elevate the importance of the statewide and regional conservation mandates, particularly the emphasis on modern irrigation controls, odd/even watering schedules, and peak-hour management, intended to reduce coastal stress, sustain streamflow, and preserve system reliability.

Local governments are strengthening source-water protection by integrating updated modeling, more precise recharge delineations, and expanded inventories of aquifer-relevant hazards. Brookhaven's drinking water source protection (DWSP2) planning relies on combined recharge area mapping using both average-flow and peak-flow models, designating Critical Source Areas where groundwater may reach wells within five years and applying protective strategies accordingly. This framework aligns with Suffolk County's broader assessments, reaffirming vulnerabilities tied to septic systems, subsurface discharges, storage sites, pesticides, de-icing salts, and emerging contaminants such as PFAS and 1,4-dioxane. Complementing these municipal planning efforts is a LICAP led hazardous-site inventory that documents more than 3,000 land-surface features influencing aquifer conditions, from recharge basins, to illegal dumping and disturbed lands. These datasets reveal need for integrated monitoring, enforcement, and land-use controls.

Water reuse, conservation technology, and emerging treatment strategies have taken on heightened significance as Long Island seeks long-term resilience. Reuse applications, from irrigation of golf courses to internal recycling at wastewater facilities, are gaining traction as tools to reduce nitrogen loading, curb consumptive withdrawals, and mitigate fertilizer demand. As water managers confront stricter standards, variable hydrologic patterns, and escalating operational costs, coordinated implementation of reuse, conservation, source-water protection, and scientific monitoring remains central to safeguarding Long Island's sole-source aquifer.

Mission

To advance a coordinated, regional approach to the protection of Long Island's sole source aquifer through the preparation of a State of the Aquifer report, updated annually, and a Groundwater Resources Management Plan.

Founded

By unanimous votes of the Suffolk County and Nassau County Legislatures in 2013. Reauthorized in 2018 and 2023.

Members

LICAP has 11 voting members. The Suffolk County Water Authority, the Long Island Water Conference, the Nassau-Suffolk Water Commissioners Association and the Nassau and Suffolk Departments of Health are permanent members. Additionally, the Nassau County and Suffolk County Executives each appoint one member, as do the Presiding Officers of the Nassau and Suffolk Legislatures and the Nassau and Suffolk Soil and Water Conservation Districts. There are also ex officio members with no voting power.

Commitee Structure

LICAP maintains two standing subcommittees:
The 2050 Drinking Water Report Committee identifies long-term challenges to groundwater resources. The Conservation Subcommittee develops strategies to educate Long Islanders about the importance of conserving our groundwater.

Meetings

LICAP is required to meet at least quarterly and hold one public hearing in each county annually.

WATER REUSE

Water reuse is a potential way to reduce pollution in Long Island's waters. In early 2010, the Town of Riverhead submitted to DEC an engineering report for their Advanced Wastewater Treatment Facility and Water Resource Recovery Facility (WRRF) that evaluated nitrogen treatment with membrane filtration and a golf course irrigation project. Riverhead worked with DEC to implement permit limits at the WRRF, and was awarded a $2 million Clean Air, Clean Water Bond Act grant to help with construction costs for the golf course irrigation project. Along with other measures, the irrigation project was designed to help meet water quality goals outlined in the Total Maximum Daily Load for Nitrogen in the Peconic Estuary (TMDL). To achieve the permit limits established for the WRRF pursuant to the TMDL, the facility is equipped with membrane biological reactors, ultrafiltration for solids/liquid separation and ultraviolet disinfection. These components are part of a system designed to remove 95% of the nitrogen in the raw sewage. The WRRF can provide up to 450,000 gallons of treated water per day to irrigate the adjacent Indian Island Golf Course which equates to as much as 100 million gallons of water per year that is no longer drawn from the aquifer. This project has the potential to provide the irrigation needed throughout a typical summer season.

In 2017, as one of the Long Island Nitrogen Action Plan's (LINAP) original projects, DEC formed the Water Reuse Advisory Workgroup to discuss the potential opportunities and challenges for water reuse on Long Island, as they relate to nitrogen removal. As an outcome of the work group discussion, DEC developed the Treated Wastewater Reuse Roadmap (https://dec.ny.gov/sites/default/files/2024-06/waterreuse_roadmap2024.pdf) which provides an overview of the DEC's permitting process with a focus on wastewater reuse projects.

Also, as part of the Water Reuse Advisory Workgroup's activities, DEC created an interactive map (https://nysdec.maps.arcgis.com/apps/View/index.html?appid=ccb00fd0cac841a8bf59dc0a4561c4d9&extent=-73.7355,40.5220,-71.9090,41.2725) to show the locations of golf courses and WWTPs on Long Island. The map helps municipalities understand the potential for future reuse projects in their area. You can click on the map features within the application to learn more information about a treatment facility, including its design flow/flow limit and current receiving waterbody. The layers tool allows users to visualize a set range of distances from any wastewater treatment facility and whether any golf course (or other location of interest to the user) falls within that distance to get a general idea of proximity.

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WATER REUSE
(CONTINUED)

In 2025, DEC released the Long Island Watershed Action Agenda – a 10-year strategic framework designed to guide actions and investments to engage Long Island residents in the state's comprehensive efforts to improve water quality. The Action Agenda builds from the foundation developed through LINAP to ensure the continued success of its efforts and expand them to meet emerging challenges to the region's water resources.

Included in the Action Agenda is an action to "Support water reuse infrastructure in new construction and retrofits in existing facilities." To provide support, DEC and its partners have been engaging with wastewater treatment plant operators who inquire about potential options for water reuse within their own plants. As an example of recent efforts, the DEC has engaged with Suffolk County to explore the opportunity to expand the use of treated wastewater effluent to irrigate golf courses throughout the county. Many courses annually have an agronomist test the soil to advise the superintendent on the correct fertilizer application rate. If the concentration of nitrogen in the effluent is within an acceptable agronomic range, the golf course would fertilize their turf with it. The benefits include a reduced demand on the aquifer and local water supply, the diversion of nitrogen from waterbodies, and the golf course applying less (or potentially no) commercial nitrogen-containing fertilizer. Additionally, most large wastewater facilities already reuse a portion of their treated water within their own operations, saving rate payers money and reducing freshwater needs at their own facilities. DEC will continue to support and encourage operations to adopt this practice where feasible.

To further support implementation of the Action Agenda, DEC encourages greywater reuse in new development or where there is significant redevelopment. Developers and contractors can incorporate water reuse methods and infrastructure into new buildings as they are being designed and constructed. In cases of major redevelopment projects, there is also an opportunity to implement innovative water reuse projects that create a reliable internal water supply and reduce pressure on the public water supply. One regionally relevant case study is the Domino District Non-Potable Water Reuse Project in Brooklyn, NY. Visit EPA's website to read more about this project (https://www.epa.gov/waterreuse/water-reuse-case-study-brooklyn-ny).

Although there are significant potential benefits to reusing STP wastewater it is important to consider and plan for the potential challenges including those related to operational controls, responsibility/ownership, disinfection requirements, and emerging contaminants fate and transport. For example, facilities need to consider the potential for additional treatment or sampling needs; or if the receiving facility (i.e., golf course) is owned by a separate entity, which entity is responsible for each aspect of the wastewater management. Each specific scenario requires the wastewater treatment plant to consider these challenges in relation to their operation to determine if water reuse is achievable for their operation and to what extent. DEC plans to continue to develop tools and guidance to help municipalities work through these challenges and understand the feasibility of reuse projects in their jurisdictions.

FURTHER REGIONAL DEVELOPMENTS IN WATER REUSE

Building on these initiatives, several regional studies and recent policy actions have expanded the understanding of water reuse potential across Long Island. The benefits of water recycling are becoming increasingly apparent to water management professionals both on Long Island and throughout the country. Currently about 10% of the nation's wastewater produced daily is reused, mostly for irrigating golf courses and other recreational areas, and various agricultural crops involving food and forage products. Wastewater is also reused in more limited applications such as for industrial cooling and product manufacture (i.e., concrete production), supplementing drinking water supplies, and augmenting flow in streams and other wetland. An additional use of recycled wastewater is for "internal reuse", at STP's, i.e. washdown water used for cleaning equipment. Several STP's on Long Island employ internal water reuse for such purposes such as the Great Neck STP, which according to the District Superintendent, saves about 27 million gallons of water annually, a supply which was once provided by the local water district. Nassau County's large Cedar Creek STP also employs internal water reuse, saving even more water.

To better quantify the potential benefits of water recycling for Long Islanders, the Seatuck Environmental Association in 2023, with financial support from the Greentree Foundation, and the engineering assistance of Cameron Engineering (now known as IMEG) and technical support from a group of advisors, developed and published a "Long Island Water Reuse Plan and Roadmap". An Executive Summary as well as the full report is available on Seatuck's website (www.seatuck.org). This roadmap assessed all of the existing STP's on Long Island, nearby (within two-mile radius) potential user targets (e.g. golf courses) and developed a prioritization matrix. This matrix considered such factors as amount of nitrogen reduced, water saved, transmission distance, potential for infrastructure sharing, among other factors. Therefore, the higher rated projects were those that cumulatively achieved the highest combination of factors, i.e. reduced the most amount of nitrogen, saved more water, had the shortest transmission distance, etc. The roadmap quantifies that, on an annual basis, if all of the seventeen Tier 1 projects were realized, approximately 15 tons of nitrogen would no longer discharge into the ground- or surface waters and nearly 600 million gallons of water would be kept in the ground.

User	ID	Score	Annual Usage (gal)	Capital Cost ($)	Normalized Cost ($/annual usage)	lb N removed annually	$/lb N removed Lifetime	End Users that Could Share C
Lake Success Golf Club	17	3.60	29,250,000	$22,250,000	$0.76	1217	$914	None
Glen Head Country Club	20	3.20	45,410,000	$18,220,000	$0.40	1891	$482	None
Nassau Country Club	14	3.60	38,890,000	$16,870,000	$0.43	1619	$521	None
North Shore Country Club	15	3.60	40,720,000	$18,690,000	$0.46	1695	$557	None
Fresh Meadows Country Club	3	3.45	41,760,000	$14,850,000	$0.36	1739	$427	Fresh Meadows Country Club, Deepdale Hills Country Club, Manhasset Secondar Greentree Campus
Deepdale Golf Club	7	3.25	45,150,000	$20,240,000	$0.45	1880	$558	
North Hills Country Club	11	3.15	38,370,000	$28,310,000	$0.74	1590	$886	
Mill River Club	13	3.65	31,840,000	$20,910,000	$0.66	1326	$789	Memorial Stadium
Village Club of Sands Point	1	3.65	53,770,000	$5,310,000	$0.10	2239	$119	Sands Point Golf Club
Bay Park Golf Course	16	3.60	11,220,000	$5,360,000	$0.48	467	$575	None
Willow Creek Country Club	5	3.40	35,040,000	$5,110,000	$0.15	2918	$88	None
Bergen Point Golf Course	4	3.40	37,060,000	$5,360,000	$0.14	1543	$174	None
Smithtown Landing Golf Course	12	3.10	41,760,000	$14,150,000	$0.34	3478	$203	None
Wind Watch Golf Course	6	3.35	32,850,000	$4,950,000	$0.15	2736	$90	None
St. Georges Country Club	2	3.60	34,450,000	$8,630,000	$0.25	1435	$301	None
SUNY Stony Brook Campus	9	3.25	13,020,000	$4,370,000	$0.34	542	$403	None
Greens Golf Course	8	3.25	22,450,000	$4,950,000	$0.22	1869	$132	None

Figure 1- Tier 1 Potential water reuse irrigation projects.

WATER REUSE
(CONTINUED)

Water reuse was given a significant boost recently when reuse projects were made definitionally eligible for funding as a Water Quality Improvement Project in the revised Suffolk County Drinking Water Protection Program, approved by Suffolk County voters on Election Day 2024. This was done by adding the clause, in the section dealing with wastewater facilities, "projects for the reuse of treated effluent from such treatment facilities". This language will allow for water recycling projects to join land acquisition, sewer district creation and expansion, and the installation of advanced and innovative wastewater systems at residences throughout the county for funding in the program which is estimated to generate about $6.1 billion by the year 2060 for projects to protect the county's water resources.

Water reuse was given a further boost when Suffolk County Executive Ed Romaine committed to having the Department of Public Works undertake a feasibility study for employing water reuse at the county's Bergen Point STP. The study will look at the details of employing highly treated wastewater for internal reuse and to irrigate the adjacent county-owned golf course. The study is expected to be completed in the coming months.

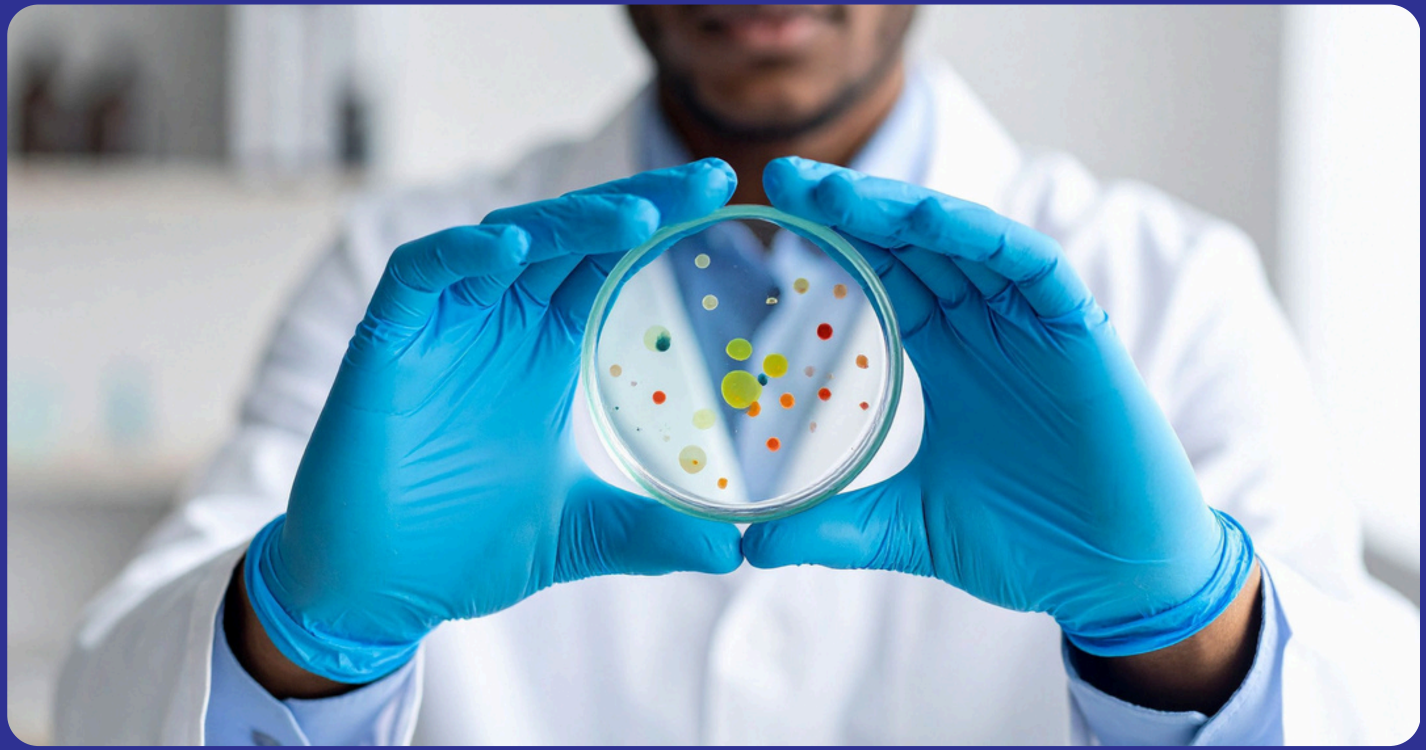
In 2006 New York State took a meaningful step toward promoting water recycling, when the New York State Legislature passed and the Governor signed into law an amendment to Article 15 of the Environmental Conservation Law (Water Resources) entitled "Water Efficiency and Reuse". This law required the NYSDEC to develop three work products: 1) A Reclaimed Wastewater Feasibility Study; 2) In consultation with the NYS Department of Health, the development of rules, regulations, and standards to guide and govern reuse applications and projects; and 3) The creation of a Reclaimed Wastewater Registry.

The State of New York also could play a highly valuable role by providing funding for water recycling projects. This is true for Nassau County as well, since several of the highest priority projects identified in Seatuck's Plan and Roadmap are situated in Nassau County. Indeed, in a few cases the existence of several golf courses in proximity to North Shore STP's (Great Neck and Oyster Bay, for example) and which are currently discharging into Long Island Sound provides the potential to redirect all of the wastewater for irrigation purposes at the golf courses, resulting in the elimination of all wastewater discharges into the Long Island Sound for approximately seven months of the year. Such is the promise of water recycling.

Water Reuse is an exciting topic that continues to expand and grow with many fresh avenues for government, business, academics and NGOs organizations to explore. Through DEC's work on the Long Island Watershed Action Agenda it will continue to support efforts and partner with entities interested in making water reuse a reality.

EMERGING TECHNOLOGY PROFILE: ENBIORGANIC MICROBIAL SYSTEMS

This article was prepared in collaboration with EnBiorganic Technologies, the manufacturer of the system described.



EMERGING TECHNOLOGY PROFILE: ENBIORGANIC MICROBIAL SYSTEMS (CONTINUED)

Across the US and New York, biosolids management has become one of the fastest-growing concerns for municipalities. Hauling, energy, and disposal costs have risen sharply, with the burden borne by taxpayers. At the same time, disposal options are narrowing under stricter oversight. Several states now require quarterly PFAS testing of land-applied biosolids, and New York has followed suit: DEC's 2023 Program Policy DMM 7 set PFOS/PFOA limits and compliance testing prior to reuse. Pending state legislation would extend this oversight by requiring quarterly PFAS monitoring at all SPDES-permitted wastewater facilities.

This evolving regulatory landscape highlights the value of upstream solutions that reduce solids before disposal, lowering compliance risks while controlling costs. One emerging option now under evaluation on Long Island is EnBiorganic.

EnBiorganic employs a bioaugmentation process using non-pathogenic Bacillus bacteria—naturally occurring organisms known for digesting organic matter. What distinguishes the system is its autonomous, on-site microbial generation. Instead of relying on imported cultures, the unit continuously produces active-state microbial solutions tailored to site conditions, then introduces them directly into wastewater or surface waters. This enables treatment at scales not feasible with conventional bioaugmentation.

Applications

- Wastewater Treatment Plants: Case studies show significant reductions in solids, fats, oils, and grease (FOG), along with lower energy use, odors, and corrosion[3].
- Surface Waters: At Sands Point Preserve, 1,400 cubic yards of sediment—about 70 truckloads—were reduced in 90 days, restoring clarity without dredging[4]. Old Town Pond in Southampton is pending regulatory review.
- Onsite Septic Systems: A prototype retrofit unit, comparable in size to a small appliance, is under early review with the Suffolk County Department of Health as a potential non-invasive alternative to system replacement.

Long Island Relevance

EnBiorganic is one of several tools that may help municipalities manage rising biosolids costs, comply with stricter contaminant regulations, and advance nitrogen reduction goals. While not a substitute for infrastructure investment, it offers a complementary, nature-based approach that aligns with Suffolk County's Clean Water Plan and Water Quality Restoration Fund. By integrating microbial augmentation into existing strategies, municipalities may achieve both cost savings and environmental restoration, supporting the long-term sustainability of the aquifer.

Key Metrics: EnBiorganic Performance

Parameter	Reported Reduction/Benefit
Total Solids	Up to 63%
Fats, Oils & Grease (FOG)	95%
Energy Demand	37%
Sludge Handling Costs	62%
Odor / H_2S	Significant reduction
Surface Water Sediment	1,400 cu. yds. removed in 90 days

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PFAS AND FEDERAL/STATE REGULATORY LANDSCAPE

As outlined in prior State of the Aquifer (SOTA) reports, on March 29, 2023, the U.S. Environmental Protection Agency (EPA) published its proposed National Primary Drinking Water Regulation (NPDWR) for per- and polyfluoroalkyl substances (PFAS). Following the public comment period, a Final Rule was issued on April 26, 2024. The final regulation established a maximum contaminant level (MCL) of 4 parts per trillion (ppt) each for perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), stricter than the current New York State limit of 10 ppt. The rule also proposed MCLs of 10 ppt each for hexafluoropropylene oxide dimer acid (GenX), perfluorononanoic acid (PFNA), and perfluorohexane sulfonic acid (PFHxS), as well as a requirement to address perfluorobutanesulfonic acid (PFBS) when it co-occurs with one or more of the three latter compounds. Although perfluorodecanoic acid (PFDA) was discussed, the EPA opted not to regulate it due to inconsistencies in the available health studies.

Under the current EPA administration, on May 14, 2025, the Agency announced that it would move forward with MCLs for PFOS and PFOA, extending the compliance deadline from 2029 to 2031, while rescinding and reconsidering the regulation of the remaining four PFAS compounds (GenX, PFNA, PFHxS, and PFBS). Because of these ongoing revisions and pending legal challenges, the New York State Department of Health (NYSDOH) has paused further action on additional PFAS drinking water regulations. This pause includes requirements under the State Public Health Law (PHL) related to the Emerging Contaminant Monitoring and Notification Level program for community and non-transient, non-community water suppliers.

Whether NYSDOH will adopt stricter PFAS standards will largely depend on EPA's final rulemaking. However, under the Safe Drinking Water Act (SDWA) primacy conditions, New York's Part 5 Sanitary Code must be at least as stringent as the federal standard. Notably, New York State legislation introduced in early 2025 (A8634/S3207A) would require the State Commissioner of Health to adopt the EPA's April 26, 2024 rule in its entirety, including the earlier compliance dates. Similar legislative actions have been introduced in other states. The NPDWR itself remains under litigation, and the outcome of these cases may ultimately determine its final implementation and enforceability.

STATE LEGISLATIVE AND REGULATORY DEVELOPMENTS

In 2021, the New York State Legislature amended the 2017 Public Health Law (PHL) related to Emerging Contaminants, directing the Commissioner of Health to establish unregulated contaminant monitoring and notification levels for 29 PFAS compounds (the same list included in EPA's Unregulated Contaminant Monitoring Rule 5 (UCMR5), as well as several volatile organic compounds (VOCs) and metals from UCMR3.

After subsequent negotiations, the Governor signed an amendment dividing the list into two categories:

- List 1: Required for monitoring and establishment of notification levels.
- List 2: Subject to modification by the Commissioner, in consultation with the Drinking Water Quality Council (DWQC).

The DWQC's November 3, 2023 meeting recommended that NYSDOH establish the notification level for the first 23 unregulated PFAS compounds at any confirmed detection above the method detection level (MDL), as defined by EPA Method 533. This would require public notification each time a detection occurs in an entry point sample. Currently, under the New York State Sanitary Code for PFOA and PFOS compliance, any PFAS detections must already be reported in public water suppliers' Annual Water Quality Reports (AWQRs). A similar reporting requirement also exists under the EPA's Unregulated Contaminant Monitoring Rule for systems serving populations over 3,300. NYSDOH has clarified that using the MDL as a notification level should not be treated as a precedent for other emerging contaminants. The framework and language for the public notification are under development by NYSDOH and will be presented for discussion at a future DWQC meeting.

Under PHL §1112, public notice must be issued within 90 days whenever an emerging contaminant is confirmed above the established notification level. This requirement, if finalized to apply at the MDL, would represent a significant shift in risk communication. It is important to note that detection does not necessarily indicate health risk, and limited toxicological data exist linking MDLs to adverse effects. There is concern that this approach could create unnecessary alarm among consumers, even with clear notification language.

At its June 25, 2025 meeting, NYSDOH reported that PFOS and PFOA detections are driving monitoring and reporting for List 1 PFAS compounds in the Annual Water Quality Reports. Further regulatory action under the PHL Emerging Contaminant Monitoring program is not expected in the near term. NYSDOH has cited staffing constraints due to competing priorities, specifically federal compliance with the Revised Lead and Copper Rule (LCRR), Consumer Confidence Report (CCR) requirements, and cybersecurity mandates.

The DWQC also reviewed "List 2" contaminants, which include five VOCs, five metals, two hormones, and four additional PFAS compounds. The Council elevated five of these (chromium-6 and four PFAS: NEtFOSAA, NMeFOSAA, PFTA, and PFTrDA) for additional monitoring. Notification levels for these contaminants will be discussed at a future DWQC meeting.

STATUS OF LEGAL CHALLENGES TO EPA ACTIONS

Several pending and forthcoming EPA regulatory actions stem from settlement agreements and consent decrees:

- A revised Microbial/Disinfection Byproduct Rule (M/DBP) is expected to address chlorite, cryptosporidium, giardia lamblia, haloacetic acids (HAAs), trihalomethanes (TTHMs), heterotrophic bacteria, legionella, and viruses, with final action due no later than October 2, 2028.
- Final actions on the Contaminant Candidate Lists (CCL 5 and CCL 6) are due by November 17, 2026.
- A proposed regulation on perchlorate is due November 21, 2025, with a final regulation by May 27, 2027.
- Within three years after completing the Integrated Risk Information System (IRIS) assessment for hexavalent chromium (Cr(VI)), the EPA must determine whether revisions to the existing total chromium NPDWR are warranted. The IRIS assessment was finalized in August 2024.

The Lead and Copper Rule Improvements (LCRI) also remain under judicial review. The litigation centers on the rule's 10-year lead service line replacement requirement and jurisdictional disputes over replacing privately owned service line portions. Proceedings were temporarily paused to allow the new EPA administration to review its approach. EPA has since indicated that the Department of Justice will defend the rule while the Agency develops new implementation tools to improve regulatory clarity and flexibility. Key deadlines for compliance remain set for 2027.

PFAS AND FEDERAL/STATE REGULATORY LANDSCAPE (CONTINUED)

HEXAVALENT CHROMIUM

Although EPA has not yet developed a Health Reference Level (HRL) for hexavalent chromium, the completed IRIS assessment positions the Agency to consider its health implications. The State of California has already established a 10 ppt MCL, citing treatment costs and competing ion exchange considerations as major factors.

Occurrence Data: According to UCMR3 results, nearly 90% of public water systems detected hexavalent chromium above the minimum reporting level (MRL) of 0.03 ppt. Most detections were below 1 ppt, suggesting natural occurrence, though concentrations up to 97.38 ppt were observed nationally. New York State results were much lower, with detections up to 7.3 ppt.

Historical Use and Sources: Hexavalent chromium has been used for over a century in pigments, coatings, plating, and corrosion inhibitors. Groundwater contamination was first identified in Nassau County in the 1940s due to aircraft plating operations. EPA banned the use of hexavalent chromium as a cooling system corrosion inhibitor in 1990.

The New York State Department of Health has evaluated whether oxidation during treatment could convert trivalent chromium (Cr(III)) to hexavalent chromium. Data from Advanced Oxidation Process (AOP) pilot studies and UCMR3 post-disinfection samples suggest that such conversion is not significant.

PERCHLORATE

Naturally occurring perchlorate is found primarily in arid regions and as an impurity in hypochlorite and nitrate-based products. New York State has maintained a two-tier perchlorate action level since 1998:

- 18 ppt, treated as a de facto MCL (triggering treatment or source removal and public notification).
- 5 ppt, triggering increased monitoring and operational control.

Although these action levels are not codified in Part 5 of the State Sanitary Code, both Nassau and Suffolk Counties require routine monitoring. Perchlorate has been detected in approximately 10% of public wells, with most detections below the state action levels. Disposable ion-exchange resins have proven effective for treatment.

PFAS IN DRINKING WATER: LONG ISLAND, NEW YORK, AND NATIONAL PERSPECTIVES

Long Island relies entirely on a sole-source aquifer for its public drinking water supply, making the protection of that resource a shared and longstanding priority among local water suppliers, regulators, and communities. Even before New York State adopted its 2020 MCLs for PFAS, 10 ppt for PFOA and PFOS, water suppliers on Long Island had already initiated design and construction of treatment systems to address these compounds.

During the COVID-19 pandemic, utilities continued implementing projects to install granular activated carbon (GAC) and ion-exchange (IX) systems at dozens of well sites, ensuring compliance with New York's new standards despite operational challenges. These actions positioned Long Island among the earliest regions in the nation to deploy full-scale PFAS treatment on a system-wide basis. At its June 2025 meeting, the New York State Drinking Water Quality Council (DWQC) discussed aligning the state's MCLs with the U.S. Environmental Protection Agency's (EPA) proposed 4-ppt limits for PFOA and PFOS and emphasized the importance of sustainable funding mechanisms and upstream pollution prevention measures. These strategies are intended to reduce reliance on expensive end-of-pipe treatment and to manage PFAS contamination at its source. Through coordinated state and local efforts, Long Island continues to serve as a model for early regulatory adoption and proactive compliance under evolving federal and state PFAS frameworks.

PILOT PROJECTS ON SHORT CHAIN COMPOUNDS

The Hicksville Water District, in collaboration with H2M architects + engineers, conducted a pilot study to evaluate a gel-type polystyrene-based anion exchange resin for the removal of currently unregulated emerging short-chain PFAS contaminants, particularly PFBA and PFPeA. This initiative was undertaken in response to the New York State Department of Health's October 2022 proposal to establish notification levels for nineteen (19) additional "List 1" PFAS compounds. With limited treatment options available for short-chain PFAS, the District is taking a proactive approach to identify viable technologies and avoid potential long-term complications associated with consumer notifications of detections. Preliminary findings of this pilot indicate that resins are improving, shown by longer run-times to breakthrough as compared to previously evaluated resins, with an advantage over granular activated carbon (GAC) on a cost per gallon basis when targeting these short-term PFAS compounds. The study also highlighted the impact of site-specific water quality anion parameters, particularly nitrates and perchlorates on resin performance, suggesting that the media may be most effective as a polishing step within a treatment train. The long-term objective is to obtain regulatory approval for this NSF International/CAN 60 approved resin as a cost-effective alternative to carbon-based media for long-term water treatment. As PFAS regulations continue to evolve, particularly for short-chain compounds, the District anticipates increased GAC demand, rising GAC costs, and longer lead times for procurement. Proactively piloting advanced technologies positions the District to meet these challenges while maintaining compliance and protecting public health.

PFAS AND FEDERAL/STATE REGULATORY LANDSCAPE (CONTINUED)

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES PFAS RESPONSE

In response to the emerging threat of PFAS, the Suffolk County Department of Health Services (SCDHS) began implementing measures in 2016 to address these and other contaminants. These efforts include:

- Developing in-house PFAS analytical testing capabilities at the Public and Environmental Health Laboratory (PEHL).
- Overseeing public water suppliers to ensure compliance with NYSDOH and USEPA standards including requiring continued monitoring of PFAS and other emerging contaminants beginning in 2016.
- Testing private drinking water wells for PFAS and other contaminants under the Private Well Water Testing Program.
- Conducting surveys of private drinking water wells for PFAS based on data from the private well water testing program and other special investigations.
- Supporting the New York State Department of Environmental Conservation (NYSDEC) and NYSDOH in groundwater investigations to define the extent of PFAS contamination; and,
- Sampling surface water for PFAS and other contaminants.

In 2023, Suffolk County expanded its PFAS testing capabilities, using EPA Methods 533 and 537.1 to analyze drinking water samples for 29 PFAS compounds. By the end of 2025 or early in 2026, the County plans to expand its in-house testing capability to include groundwater, surface water, and sludge using EPA Method 1633. This enhanced capacity will improve the County's ability to monitor and address PFAS contamination.

PUBLIC WATER SYSTEMS AND PRIVATE WELLS

The Suffolk County Department of Health Services (SCDHS) Office of Water Resources ensures that public water systems comply with all drinking water standards. Recent data shows that no major public water suppliers in Suffolk County deliver water exceeding MCLs for PFOS or PFOA. However, a few small systems have detected levels above the MCLs and are working to install treatment systems or connect to larger public water supplies, while providing notices to potential consumers.

Approximately 30,000 properties in Suffolk County rely on private wells as their primary source of drinking water. These wells, often shallower than public water supply wells, are more vulnerable to contamination. Since 2016, SCDHS has conducted nearly 90 private well surveys, collecting more than 2,100 private well samples in priority areas with a focus on PFAS. Approximately 20% of these wells have exceeded the NYSDOH MCLs for PFOS and/or PFOA. In response, NYSDOH and NYSDEC have offered alternative water supplies to affected residents in many cases, and several public water main extensions have been completed, with more planned.

In-house PFAS testing at the SCDHS PEHL was quickly integrated into routine private well sampling requests. The current fee for a typical private well test in Suffolk County is $100, covering over 300 contaminants, including PFAS. Residents with PFAS detections exceeding MCLs are advised to contact the SCDHS Office of Water Resources.

GROUNDWATER INVESTIGATIONS AND SURFACE WATER SAMPLING

Since the 1970s, SCDHS has utilized in-house drilling capabilities and sampling staff to monitor the quality of Long Island's aquifer system. The Department has established a network of over 200 permanent monitoring wells to assess the impact of various land uses on the aquifers. In recent years, PFAS monitoring has been integrated into this program, providing valuable data on the temporal changes in PFAS contamination.

In addition to routine monitoring, SCDHS conducts special investigations aimed at identifying sources of contamination and assessing the extent of known releases, including PFAS. The Department has investigated over 18 PFAS contamination sites and continues to support NYSDEC and NYSDOH in defining areas of concern for future remediation efforts.

SCDHS routinely samples nearly 50 fresh surface water bodies as part of its surface water monitoring program, which now includes PFAS analysis. PFAS analysis for soils, surface waters and groundwater is currently being conducted through an interim contract, while in-house capability at PEHL is being developed. This data complements the drinking water testing program, providing a more comprehensive understanding of potential PFAS sources and distribution across the county's water resources.

NASSAU COUNTY PUBLIC SUPPLY IMPACTS, TREATMENT AND MONITORING

Public Supply Well PFAS Testing

288 Nassau County public supply wells were tested for PFOA and PFOS in 2024. PFOA was detected in 143 public supply wells, representing a detection rate of 49.65%, while PFOS was detected in 98 public supply wells, representing a detection rate of 34.03%. Detections of PFOA above the New York State Department of Health maximum contaminant level of 10 ng/L occurred in 48 wells or 16.67%, and detections of PFOS above the New York State Department of Health maximum contaminant level of 10 ng/L occurred in 22 wells or 7.64%.

The United States Environmental Protection Agency has adopted a maximum contaminant level of 4 ng/L for both PFOA and PFOS which becomes enforceable in 2031. Detections of PFOA above 4 ng/L I occurred in 107 wells or 37.15%, and detections of PFOS above 4 ng/L occurred in 61 wells or 21.18%.

PFAS AND FEDERAL/STATE REGULATORY LANDSCAPE (CONTINUED)

PFOA and PFOS Removal Treatment

Granular activated carbon (GAC) is the only technology currently used in Nassau County for PFAS removal. As of 2024, the Nassau County Department of Health approved the construction of twenty-eight (28) GAC treatment systems and the operation of twenty-three (23) GAC treatment systems for the removal of PFOA and PFOS from the raw water of Nassau County wells.

All Nassau County public supply wells in service with PFOA or PFOS detections above the NYSDOH MCL of 10 ng/L are treated or blended for the removal/reduction of PFAs or removed from service to ensure potability. Of the 48 wells that exceeded the MCL for PFOA, 40 wells or 83.33% have GAC treatment, 2 wells or 4.16% are blended, and 6 wells or 12.5% remain out of service. Of the 22 wells that exceeded the MCL for PFOS, 21 wells or 95.45% have GAC treatment, and 1 well or 4.54% remains out of service.

Looking forward to the USEPA MCLs for PFOA and PFOS that become enforceable in 2031, of the 107 wells that had detections of PFOA above 4 ng/L, 71 wells or 66.36% have GAC treatment, 3 wells or 2.83% are blended, 27 wells or 25.23% are in service without treatment, and 6 wells or 5.61% remain out of service. Of the 61 wells that had detections of PFOS above 4 ng/L, 48 wells or 78.69% have GAC treatment, 1 well or 1.64% is blended, 8 wells or 13.11% are in service without treatment, and 4 wells or 6.56% remain out of service.

Ion exchange treatment using resins made of highly porous, polymeric material is another type of PFAS treatment that is available but not currently used in Nassau County. In addition to the pilot project previously discussed, a second water supplier is currently pilot testing a fourth resin also for the removal of short-chain PFAS.

Private Wells

The USEPA and New York State do not regulate private wells but the state's drinking water standards for PFOA and PFOS of 10 parts per trillion (PPT) and other drinking water contaminants can be used as guidelines to recommend actions to reduce exposure from private well contamination. Private well owners may however choose to reduce potential exposure to PFAS by using water filters given the expense of testing.

There are estimated to be only a few hundred private wells in the north shore areas of Nassau County, where public water mains have not been extended. Although these wells are generally found to be of excellent quality, private well owners may contact the Nassau County Department of Health or the New York State Department of Health Bureau of Environmental Exposure Investigation to determine where PFAS contamination has been detected and what steps are recommended.

HAZARDOUS SITES AND AQUIFER VULNERABILITY: MODERNIZING LONG ISLAND'S GROUNDWATER RISK INVENTORY

Long Island's aquifer system is one of the most sensitive and tightly coupled surface-subsurface environments in the Northeast. Because drinking water originates from local precipitation that infiltrates directly through unconsolidated sands and gravels, the boundary between the surface landscape and the aquifer is exceptionally thin. Suffolk County's long history of development, agriculture, industrial use, sand mining, and dumping has created a diverse set of land-surface features that influence aquifer health in ways both obvious and subtle. Although some hazards are well known and tightly regulated, many more are scattered in small pockets across the county, either undocumented or poorly understood.

In 2021 LICAP received a grant from the Suffolk County Water Quality Protection and Restoration Program (WQPRP) for a potential hazardous disposal site identification pilot program. This pilot project was initiated to identify potential hazardous waste sources and related features across Suffolk County using aerial imagery, GIS-based classification, and visual interpretation. The project revisits a 1990 Cornell University study that mapped hazardous disposal sites using multi-date aerial photographs. That original effort was groundbreaking for its time, but modern aquifer protection requires more detail than the coarse imagery of the late 20th century could provide. Since then, the conversation around groundwater protection has shifted toward emerging contaminants, diffuse recharge pathways, and subtle land-surface changes that exert increasing influence on water quality. The updated inventory uses high-resolution aerial imagery, a revised classification system, and extensive GIS and field verification to capture the hazardous features most relevant to today's aquifer conditions. The resulting dataset provides LICAP and partner agencies with a spatially consistent foundation for monitoring, enforcement, planning, and risk assessment.

SHIFTING THREATS TO A HIGHLY VULNERABLE AQUIFER

Aquifer threats today are far from the same hazards that defined groundwater discussions in the mid-20th century. Industrial discharges, sludge lagoons, and open landfills once dominated regulatory focus, but many of these sites have since been remediated, capped, and thoroughly documented in state databases. Meanwhile, a new suite of vulnerabilities has emerged, smaller, more scattered, and frequently tied to normal land use rather than large-scale industrial activity.

Recharge basins are one example. These structures are essential for maintaining groundwater levels in a landscape that long ago replaced natural infiltration with pavement, rooftops, and constructed drainage networks. Yet their beneficial role is paired with inherent vulnerability: being unlined, they can serve as direct infiltration points for stormwater that often carries petroleum residues, road salts, fertilizers, microplastics, and emerging contaminants.

Undocumented wells, including some agricultural and private wells, represent data gaps and their locations are not comprehensively captured in publicly available datasets. In the eastern portion of Long Island, where freshwater occurs in relatively thin lenses and both public-supply and private withdrawals intensify during the summer, a longstanding concern is the area's vulnerability to saltwater intrusion. Because well-installation requirements have changed over time, documenting their presence supports improved resource management.

HAZARDOUS SITES AND AQUIFER VULNERABILITY: MODERNIZING LONG ISLAND'S GROUNDWATER RISK INVENTORY (CONTINUED)

Illegal dumping adds another layer. While not always dramatic in size, dumpsites scattered along utility corridors, within remote wooded tracts, or on the perimeter of abandoned institutional properties introduce a mixture of metals, plastics, construction waste, and chemical residues directly into permeable soils. Their distribution is often tied to accessibility and lack of surveillance rather than industrial activity, which makes them persistent and spatially unpredictable.

Disturbed lands and mined areas further complicate the picture. Sand extraction sites, active or reclaimed, expose highly permeable soils that can potentially accelerate downward migration of contaminants. Investigations by state and county agencies in recent years have identified PFAS, petroleum hydrocarbons, and metals in groundwater within and around several mining areas. In addition, the removal of vegetative cover, topsoil, and organic-rich layers reduces the natural buffering capacity that would otherwise slow contaminant movement.

HYDROLOGIC CONDITIONS THAT AMPLIFY RISK

Recent State of the Aquifer reports have documented hydrologic variability that is making the region's groundwater system increasingly sensitive to surface inputs. Below-normal groundwater levels observed during 2022 and 2023 create environments where geochemical conditions may be altered and potentially release certain compounds that were once bound to sediments.

Seasonal pumpage patterns compound these stresses. Pumping can rise by as much as 200 million gallons per day during peak summer demand, drawing water - and contaminants - more quickly through the vadose zone and shallow aquifers. Higher pumping also increases the lateral movement of existing plumes and enhances saltwater intrusion risks in coastal agricultural districts.

Recharge itself is also becoming more variable. Drought years followed by intense rainfall events create alternating cycles that mobilize contaminants differently than steady, moderate recharge. Because many of the mapped hazardous sites sit atop areas of high infiltration, the hydrologic response of the aquifer is more tightly bound to land-surface conditions than at any time in recent memory.

MAPPING APPROACH AND CLASSIFICATION FRAMEWORK

To ensure complete spatial coverage, the study area was divided into a uniform 2×2-mile tile grid. Each tile was reviewed manually using ArcGIS Pro. The primary imagery source was Nearmap's high-resolution aerial imagery, which allows consistent detection of small objects such as unmarked wells, barrel clusters, small dumpsites, and narrow disturbed-soil signatures. DEC orthoimagery and Esri basemaps supplemented the review where needed.

The classification scheme builds on the 1990 Cornell methodology but incorporates modern groundwater management priorities. Agricultural wells were added as a standalone category, and recharge basins were elevated in importance due to their direct role in infiltration and contaminant transport. The project also reviewed 32 shallow public supply wells and their associated SWAP Time-of-Travel zones to evaluate whether mapped hazards were positioned in ways likely to influence wellhead protection or local recharge patterns.

Field verification included 68 representative sites visited using ArcGIS Field Maps. Geotagged photos, notes, and site sketches were collected to validate imagery-based classifications. Drone flights over selected basins provided additional detail in areas where canopy cover or shadows obscured aerial imagery. The imagery-based workflow proved reliable, with a 99% match rate between mapped classifications and field observations.

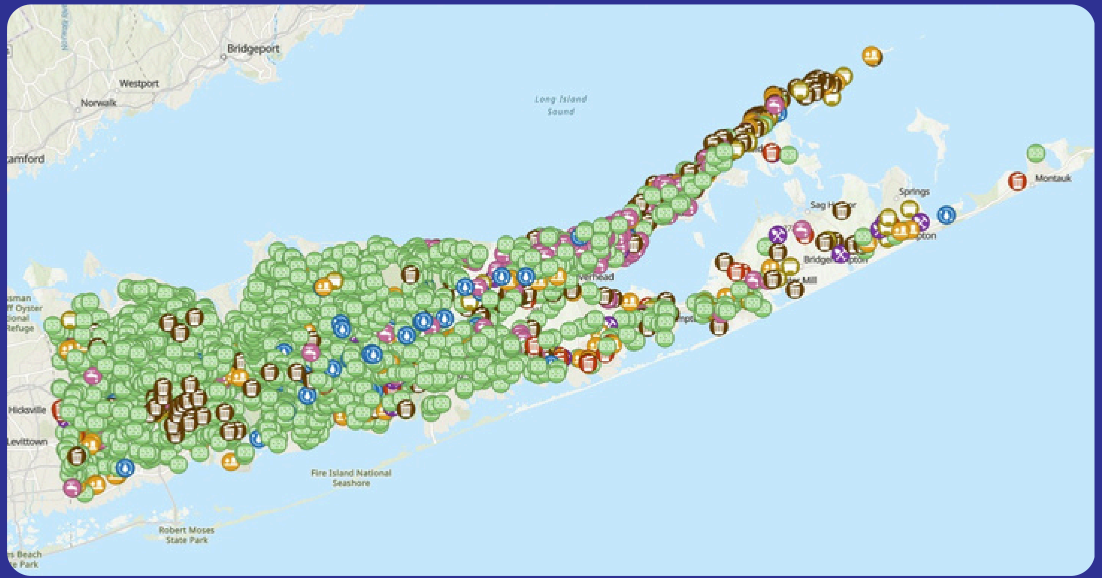


Fig 1. GIS dataset of potential hazardous sites

COUNTYWIDE SPATIAL TRENDS

The completed inventory documents over 3,000 hazardous features and 225 agricultural wells (fig.1). Several clear spatial patterns emerged. Recharge basins dominate suburban and transportation-heavy landscapes, particularly in western and central Suffolk County where stormwater infrastructure is extensive. Agricultural wells form concentrated clusters across the North Fork and appear in pockets of active horticulture and sod production on the South Fork. Illegal dumping is most pronounced in the Pine Barrens Core Preservation Area, along with scattered clusters near the long-shuttered Pilgrim Psychiatric Center property in Brentwood.

HAZARDOUS SITES AND AQUIFER VULNERABILITY: MODERNIZING LONG ISLAND'S GROUNDWATER RISK INVENTORY (CONTINUED)

Disturbed lands and mined areas occur throughout the county but often coincide with regions of high hydraulic conductivity and shallow groundwater. This combination heightens vulnerability because contaminants introduced at the surface can move quickly through the unsaturated zone. Aboveground tanks, drums/barrels, and scattered debris fields appear in both rural and residential settings, with several located close to recharge basins or shallow aquifer regions.

Approximately 85% of all mapped features influence either recharge or groundwater withdrawal directly. This percentage highlights how contemporary risk is shaped less by discrete industrial sites and more by everyday infrastructure and land use.

IMPLICATIONS FOR AQUIFER PROTECTION

The updated inventory offers several benefits for regional groundwater protection. It supports more precise targeting for emerging contaminant sampling, especially around infiltration points or wellhead contributing areas. It enhances wellhead protection by identifying features that could influence SWAP areas under varying hydrologic conditions. It also complements hydrologic modeling and the Long Island Groundwater Sustainability Project by providing a spatial dataset that can be incorporated into simulations and vulnerability assessments.

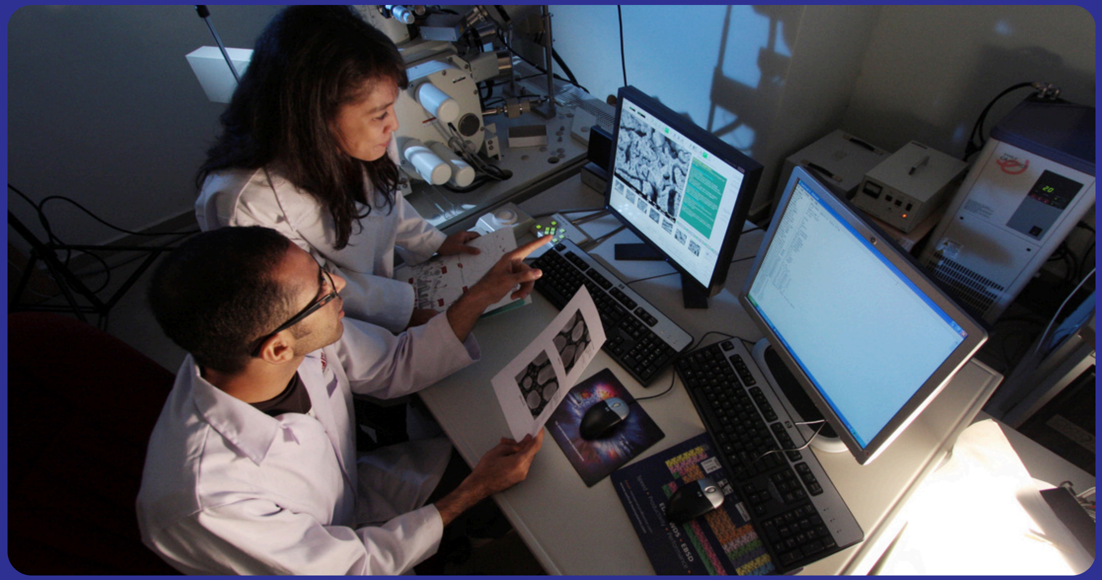
Moreover, the dataset helps clarify where regulatory datasets leave gaps. Several aboveground tanks, pits/basins, and disturbed lands identified in imagery were not present in existing regulatory layers, demonstrating that on-the-ground conditions evolve faster than static datasets can track. The inventory provides a mechanism to catch these changes and integrate them into groundwater management strategies.

RECOMMENDATIONS

Continued aquifer protection will benefit from routine evaluation and maintenance of recharge basins, with attention to debris accumulation and pollutant loading. Oversight of agricultural wells can be strengthened by comparing this dataset to current DEC permitted or registered well records to gain a clearer picture of the number of unpermitted or unregistered wells that may be out there. SWAP Time-of-Travel zones with multiple hazard types should receive heightened monitoring attention. Enhanced enforcement and surveillance will be important in dumping corridors, especially within the Pine Barrens. Finally, integrating the inventory with groundwater modeling will allow agencies to anticipate how these hazards behave under future scenarios involving drought, pumpage stress, or land-use change.

CONCLUSION

This updated hazardous-sites inventory provides Suffolk County with a contemporary, scientifically grounded, and spatially consistent understanding of the land-based features that influence aquifer vulnerability. The dataset reflects modern imaging capabilities, current groundwater challenges, and the hydrologic pressures documented in recent SOTA reports. As Long Island continues to confront emerging contaminants, variable recharge, and increasing demand, this inventory offers a practical foundation for protecting the region's sole-source aquifer. It supports LICAP's mission by ensuring that decisions are informed by accurate, up-to-date information on the features that pose the greatest potential risk.



HYDROLOGIC CONDITIONS IN NASSAU AND SUFFOLK COUNTIES

This section of the State of the Aquifer (SOTA) provides a snapshot of current hydrologic conditions on Long Island. The analysis was compiled by reviewing published National Oceanographic and Atmospheric Administration (NOAA) precipitation records and U.S. Geological Survey (USGS) groundwater and streamflow records from key stations located in Nassau and Suffolk Counties. Precipitation is the only natural means by which water enters Long Island's aquifers. Approximately half of all precipitation that falls recharges the aquifers. Most recharge on Long Island generally occurs during the non-growing season (October to May); from June through September, aquifer recharge is minimal.

PRECIPITATION IN RECENT YEARS

Normal, or long-term average precipitation for a given site, is calculated based on weather statistics from the previous three decades (climatic normal). These statistics are updated at the beginning of each new decade. For example, current normal precipitation levels are the average values from calendar years 1991 to 2020. In this manner, changing climatic patterns are accounted for, but do not skew the data excessively for any given decadal period. The current value for normal annual (calendar year) precipitation reported by the National Weather Service (NWS) for Islip-Long Island MacArthur Airport (MacArthur Airport), located in central Suffolk County, NY is 45.99 inches.

For this SOTA update, rather than utilizing calendar years, precipitation records from MacArthur Airport were examined in one-year increments for the period October 1 to September 30 for each year, or the water year. A water year is defined as the 12-month period from October 1, for any given year through September 30, of the following year. The water year is designated by the calendar year in which it ends, and which includes 9 of the 12 months. MacArthur Airport precipitation data was downloaded from the National Centers for Environmental Information (NCEI) website at www.ncei.noaa.gov.

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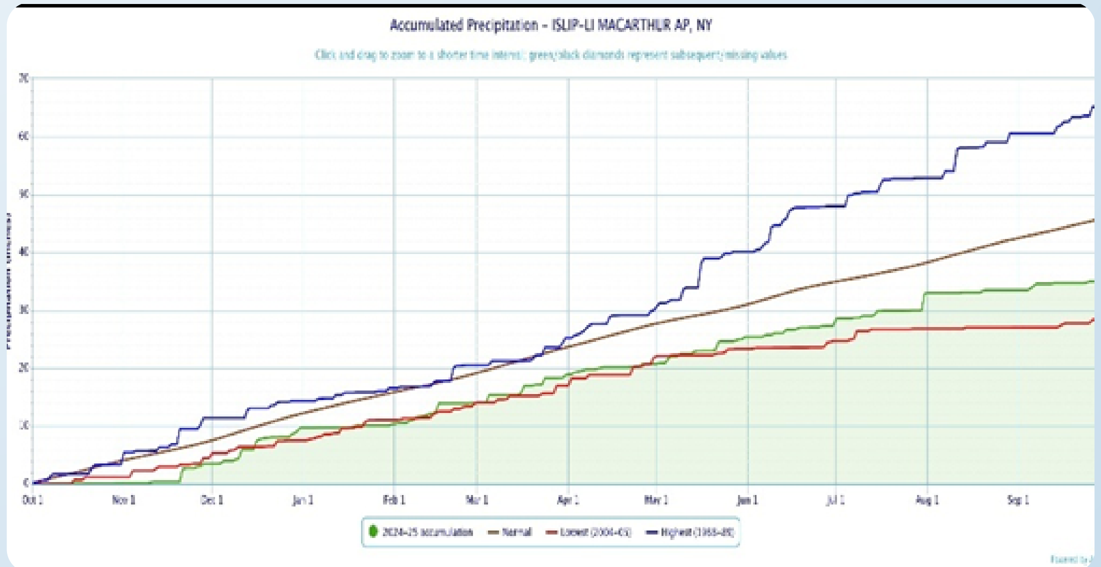
HYDROLOGIC CONDITIONS IN NASSAU AND SUFFOLK COUNTIES (CONTINUED)

Precipitation at MacArthur Airport for the 2025 water year was 35.05 inches, compared to the two prior water years of 2024 (51.99 inches) and 2023 (49.58 inches). While these values are not directly comparable to the 30-year climatic normal of 45.99 inches calculated for the calendar year, they can be used to indicate general periods of above- or below-normal precipitation. The data presented above indicates that water years 2023 and 2024 were wetter than normal, and water year 2025 was drier than normal.

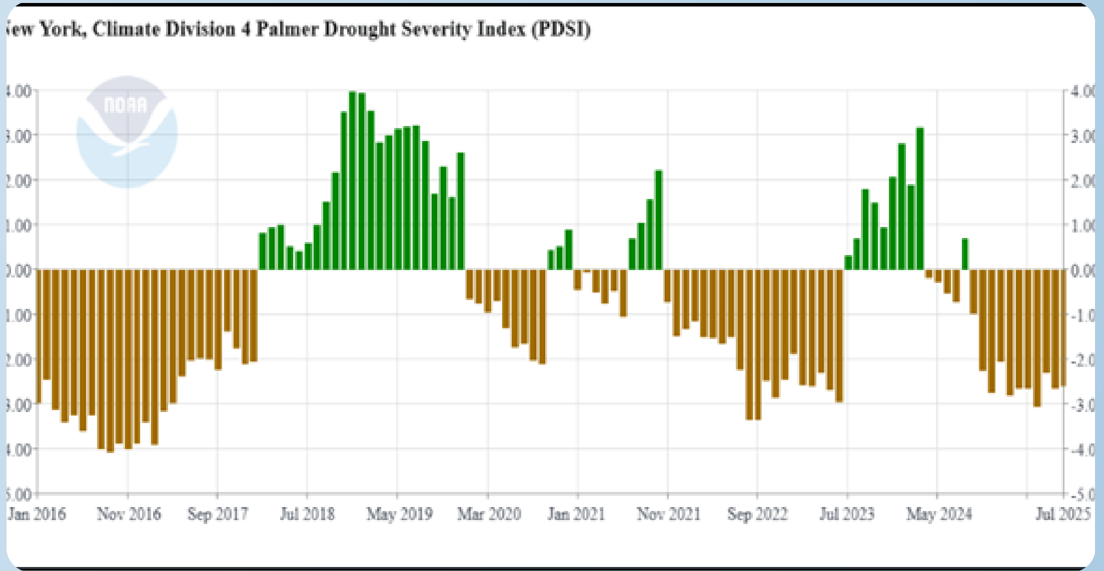
The figure below shows an accumulated precipitation graph at MacArthur Airport for water year 2025 (October 1, 2024 to September 30, 2025). This graph shows the annual accumulated precipitation (green) in relation to normal conditions (brown) and the historical years with the highest accumulated precipitation (blue) and lowest accumulated precipitation (red) for the station. The MacArthur Airport station has 62 years of record.



Source: Northeast Regional Climate Center, CLIMOD 2 Data Access, http:/climod2.nrcc.cornell.edu

During the 2025 water year, accumulated precipitation at MacArthur Airport was below normal for the entire water year. The lowest monthly precipitation totals for the last twenty years were recorded in October and November 2024 and January 2025.

The figure below shows the Palmer Drought Severity Index (PDSI) for approximately the past 10 calendar years (January 1, 2016 to October 31, 2025) for the coastal region of New York State (Climate Division 4). This index is commonly used for monitoring drought and uses precipitation and temperature data to estimate moisture supply based on a supply-and-demand model of soil moisture. A PDSI around zero is normal; with positive numbers indicating moist conditions and negative numbers indicating dry conditions. Since 2016, Long Island has been in 3 periods of unusually moist conditions or greater (PDSI +2.0 or above) in 2018-19, 2021, and 2023-24 and 4 periods of moderate drought or greater (PDSI -2.0 or below) in 2016-17, 2020, 2022-23, and 2024-25).



Source: NOAA National Centers for Environmental Information, Climate at a Glance: Divisional Time Series, https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/divisional/time-series

GROUNDWATER LEVELS

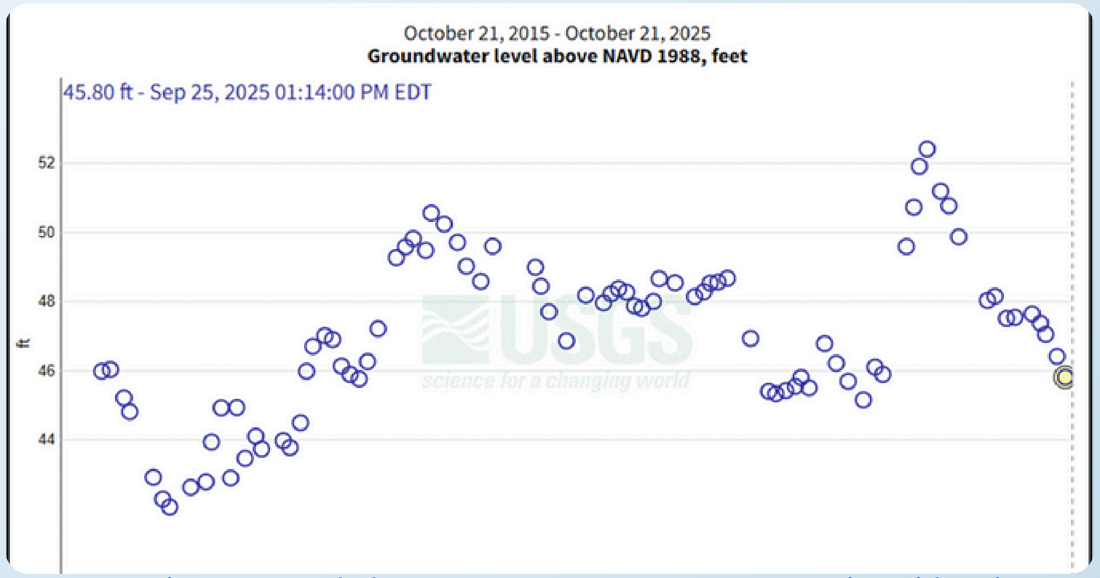
Background information pertaining to specific wells and streamflow gages represented in this section can be obtained from the USGS report entitled "Statistical Analysis of Long-Term Hydrologic Records for Selection of Drought-Monitoring Sites on Long Island, New York," accessible at the following web address: https://pubs.er.usgs.gov/publication/sir20045152.

Aquifer levels on Long Island have fluctuated historically due to human influences such as pumping and sewering, and fluctuate seasonally due to precipitation, recharge, and evapotranspiration. Regardless of these stresses, groundwater levels beneath most of Long Island are usually highest in March, April, and May and lowest in September, October, and November. The following is a snapshot of hydrologic conditions in the aquifer system of Long Island, with the focus being on the 10-year period from October 1, 2015 to September 30, 2025.

Generally, groundwater levels and streamflows have declined from highs reached in 2019 after a period of well above normal precipitation, to more average levels during 2020 to early 2022, and then to below average levels from late 2022 through 2023 in response to a period of below average precipitation. Starting in 2024, groundwater levels and streamflow increased to average to above average levels in response to increased precipitation. Groundwater levels and streamflow have decreased throughout 2025 in response to below average precipitation. A more detailed look at these trends is shown in the figures on the following pages.

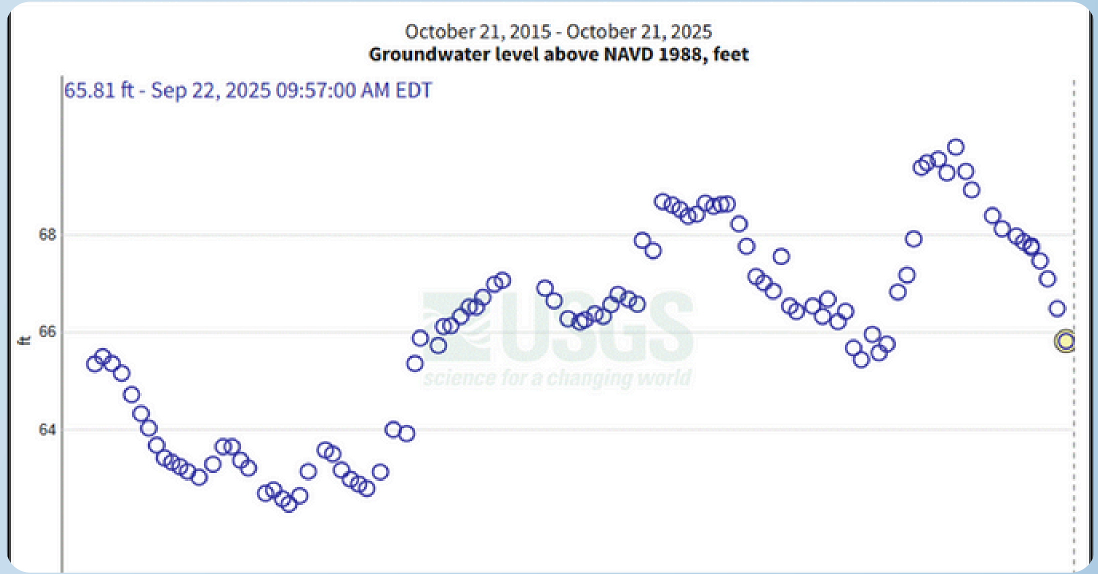
HYDROLOGIC CONDITIONS IN NASSAU AND SUFFOLK COUNTIES (CONTINUED)

The 10-year hydrograph below shows that water levels at well N1259.5, located in Plainedge in southeastern Nassau County and screened in the upper glacial aquifer (41 ft deep), increased sharply to above normal levels in 2019 from the lows reached in late 2016. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. Water levels returned to more normal levels in 2020 as precipitation totals for 2020 through early 2022 were closer to average. A sharp decline in water levels began later in 2022 as conditions became significantly drier. Water levels sharply increased in early 2024 to the highest levels in the 10-year period as the result of well above normal precipitation. Water levels began to decline again in mid-2024 and continued to decline through the 2025 water year as conditions became drier.



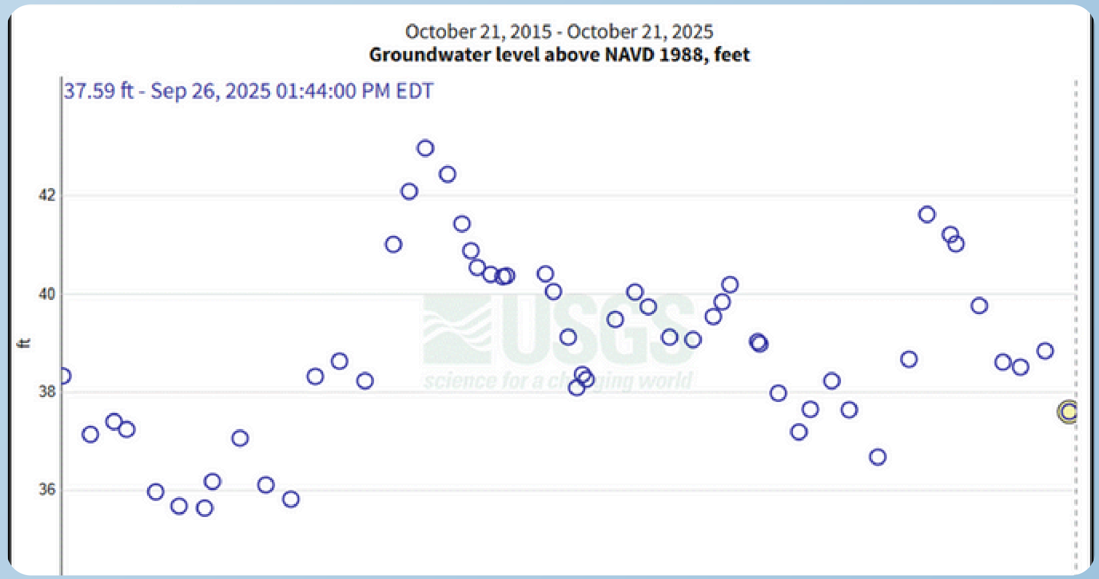
Source: Northeast Regional Climate Center, CLIMOD 2 Data Access, http:/climod2.nrcc.cornell.edu

The 10-year hydrograph below shows that water levels at well N2528.2, located in Old Brookville in northeastern Nassau County and screened in the Magothy aquifer (328 ft deep), increased sharply to more normal levels in 2020 from the lows reached in early 2018. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. Water levels sharply increased in 2021 and remained at these levels through early 2022. A sharp decline in water levels began later in 2022, as conditions became substantially drier, and continued to decline through most of the 2023 water year. Water levels sharply increased in early 2024 to the highest levels in the 10-year period as the result of well above normal precipitation and then sharply decreased through the 2025 water year to more normal levels.



Source: https://waterdata.usgs.gov/monitoring-location/USGS-405101073343401/#dataTypeId=measurements-62611-0&period=P10Y&showFieldMeasurements=false

Similar to the wells in Nassau County, the 10-year hydrograph below shows that water levels at well S5517.1, located at Brookhaven National Laboratory in east-central Suffolk County and screened in the upper glacial aquifer (91 ft deep), increased sharply to above normal levels in 2019 from the lows reached in late 2017. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. One difference to the wells in Nassau County is the significant decline in water levels in late 2020 that is related to much drier conditions on the east end during that year. Water levels then varied seasonally through early 2022, during a period of relatively average precipitation, but began a sharp decline later in 2022 as conditions became significantly drier, recovered somewhat in early 2023, then began to decline for the remainder of the water year. Water levels sharply increased in early 2024 as the result of well above normal precipitation. Water levels began to decline again in mid-2024 as conditions became drier and reached below normal levels in 2025.



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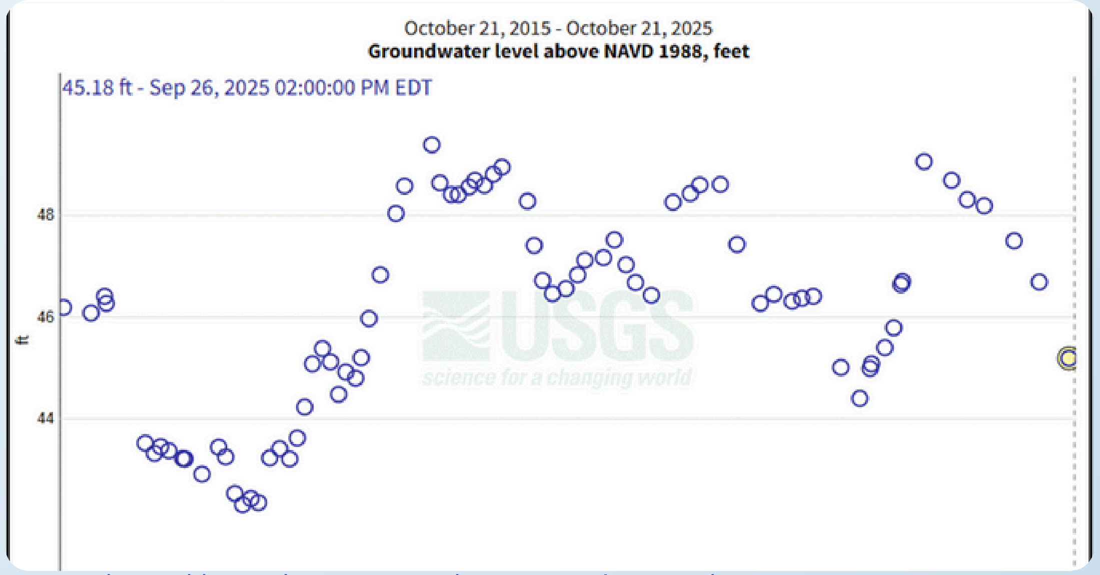
Source: https://waterdata.usgs.gov/monitoring-location/USGS-405149072532201/#dataTypeId=measurements-62611-0&period=P10Y&showFieldMeasurements=false

HYDROLOGIC CONDITIONS IN NASSAU AND SUFFOLK COUNTIES (CONTINUED)

Similar to the other hydrographs shown above, the 10-year hydrograph below shows that water levels at well S33380.1, located in Ronkonkoma in central Suffolk County and screened in the Magothy aquifer (855 ft deep), increased sharply to more normal levels in 2019 from the lows reached in late 2017. This was in response to higher-than-normal precipitation during 2018 and 2019 after a 3-year period of well below normal precipitation. Water levels varied seasonally with changes in precipitation through early 2022. A sharp decline in water levels began later in 2022 as conditions became significantly drier, leveled off in early 2023, then began to decline sharply for the remainder of the water year. Water levels sharply increased in early 2024 as the result of well above normal precipitation. Water levels began to decline again in mid-2024 and through the 2025 water year as conditions became drier.



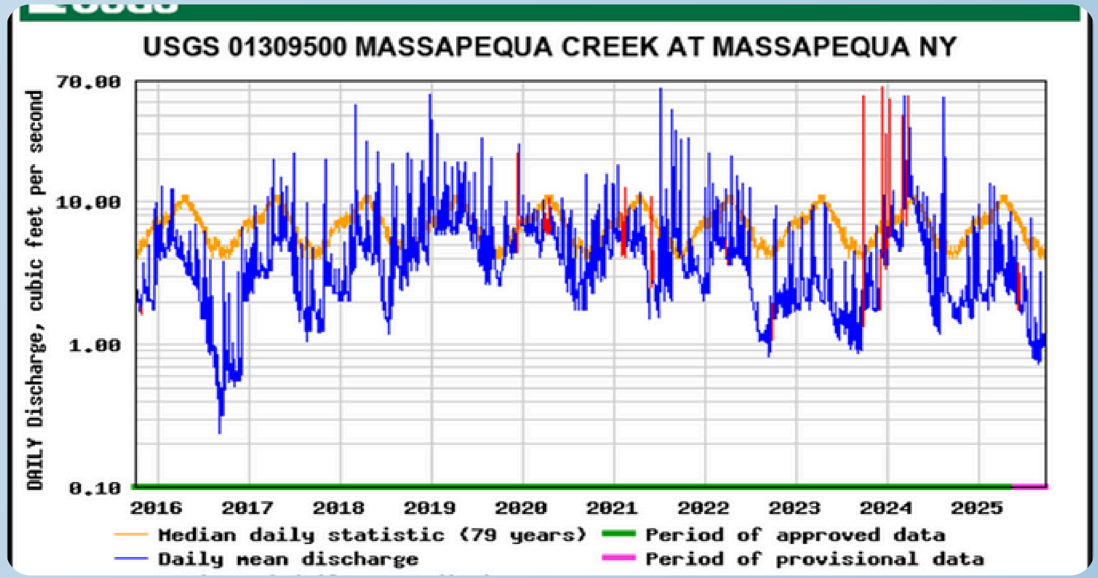
Source: https://waterdata.usgs.gov/monitoring-location/USGS-404932073055902/#dataTypeId=measurements-62611-0&period=P10Y&showFieldMeasurements=false

STREAMFLOWS

Since all of Long Island's streams are in direct hydraulic contact with the upper glacial aquifer, their flows closely reflect changes in water-table elevation. As with groundwater levels, streamflow (stream discharge) fluctuates throughout the year, from highs in the spring to lows in late summer. For each of the hydrographs shown below, the orange line represents the historical average stream discharge, and the blue line represents the actual recorded discharge. The three streams shown below are reflective of different conditions of development or urbanization, with Massapequa Creek being located in the most highly developed area, Connetquot River located in an area of intermediate development, and the Peconic River located in the most minimally developed area.

Massapequa Creek: Streamflow at most Nassau County streams, including Massapequa Creek, reflect the long-term effects of substantial human impacts from sewering and pumping on water levels within the upper glacial and deeper aquifers. Discharges in most streams in Nassau County have decreased markedly since the 1960s and have not recovered due to these impacts.

Stream discharge at Massapequa Creek prior to 2016 fluctuated around the long-term average, with a few more pronounced periods of above or below average related to changes in precipitation. However, in response to the 3-year period of well-below-normal precipitation during 2015, 2016, and 2017, stream discharge declined substantially over that period reaching a low in late 2016. Since that time, stream discharge increased to above normal in 2019 and then remained near the long-term average until mid-2022, when stream discharge declined sharply to well-below average in response to below-normal precipitation. Stream discharge remained below to well-below average throughout most of the 2023 water year. Stream discharge returned to near average conditions in 2024 with some variations due to changes in precipitation, then began a sharp decline near the end of the water year and has continued through the 2025 water year.



Source:https://nwis.waterdata.usgs.gov/ny/nwis/dv/?ts_id=104768&format=img_stats&site_no=01309500&begin_date=20151001&end_date=20250930

Connetquot River: This stream, located in south-central Suffolk County, borders areas showing significant human impacts (to the west) and minimal human impacts (to the east). Therefore, it is a good stream to use as a comparison to the more urbanized streams to the west and less human impacted streams to the east.

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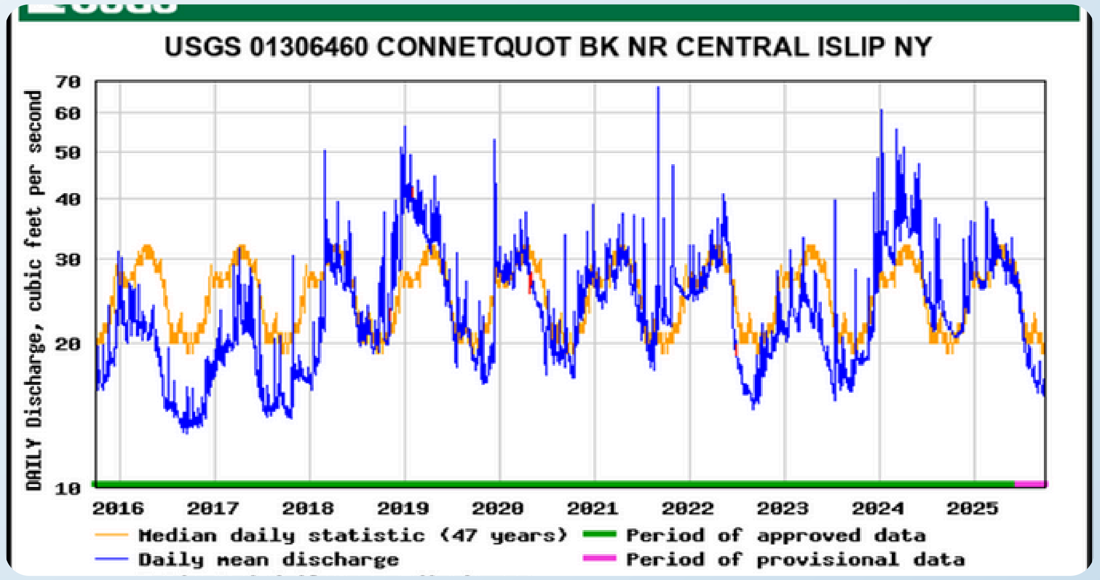
HYDROLOGIC CONDITIONS IN NASSAU AND SUFFOLK COUNTIES
(CONTINUED)

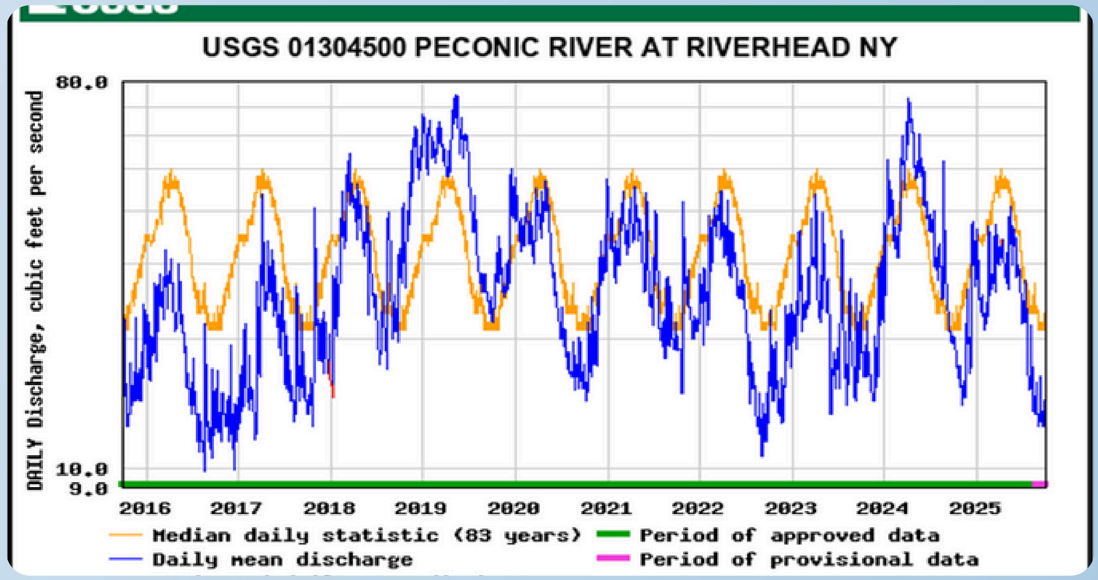
Similar to Massapequa Creek, stream discharge at Connetquot Brook prior to 2016 fluctuated around the long-term average, with a few more pronounced periods of above or below average related to changes in precipitation. However, in response to the 3-year period of well-below-normal precipitation during 2015, 2016, and 2017, stream discharge declined substantially reaching a low in late 2016. Since that time, stream discharge increased to above normal in 2019 and then remained near the long-term average until mid-2022, when stream discharge declined sharply to well-below average in response to below-normal precipitation. Stream discharge remained below to well-below average throughout most of the 2023 water year. Stream discharge then increased to average to above average conditions for most of 2024 during a period of above average precipitation. Stream discharge was near normal through the remainder of 2024 and early 2025 and decreased to slightly below normal at the end of the water year.



Source:https://nwis.waterdata.usgs.gov/ny/nwis/dv/?ts_id=226479&format=img_stats&site_no=01306460&begin_date=20151001&end_date=20250930

Peconic River: This stream located in eastern Suffolk County is situated in an area with minimal human impact. It is also the one major stream on Long Island that flows from west to east, discharging into the Peconic Bay.

Similar to the other two streams, stream discharge at Peconic River prior to 2016 fluctuated around the long-term average, with a few more pronounced periods of above or below average related to changes in precipitation. However, in response to the 3-year period of well-below-normal precipitation during 2015, 2016, and 2017, which was somewhat more pronounced in eastern parts of Long Island, stream discharge declined significantly over that period reaching a low in late 2016. Since that time, stream discharge increased to above normal in 2019 and then remained near the long-term average until mid-2022, when stream discharge declined sharply to well-below average in response to below-normal precipitation. Stream discharge remained below to well-below average throughout most of the 2023 water year. Stream discharge then increased to average to above average conditions for most of 2024 during a period of above average precipitation and dropped to below average at the end of 2024 through most of 2025.



Source:https://nwis.waterdata.usgs.gov/ny/nwis/dv/?ts_id=104691&format=img_stats&site_no=01304500&begin_date=20151001&end_date=20250930

The data displayed in the hydrographs in this section show that Long Island has experienced the full range of hydrologic conditions in a very short time frame, from low conditions as recently as 2017 and 2023 to generally above to well above normal conditions in 2019 and 2024. The abundance of groundwater and surface-water data collected by the USGS and other agencies over a long period of time ensures that water suppliers, regulatory agencies, and the public are well informed about groundwater and surface-water conditions at any given time. This data is an invaluable aid in making decisions to protect both public health and the health of the environment.

HOW CAN I FIND OUT MORE INFORMATION ON LONG ISLAND'S HYDROLOGIC CONDITIONS?

The USGS has a website providing data and resources from their ongoing cooperative groundwater and surface-water hydrologic monitoring program on Long Island that can be accessed at: https://www.usgs.gov/centers/ny-water/science/us-geological-survey-hydrologic-monitoring-long-island-new-york.

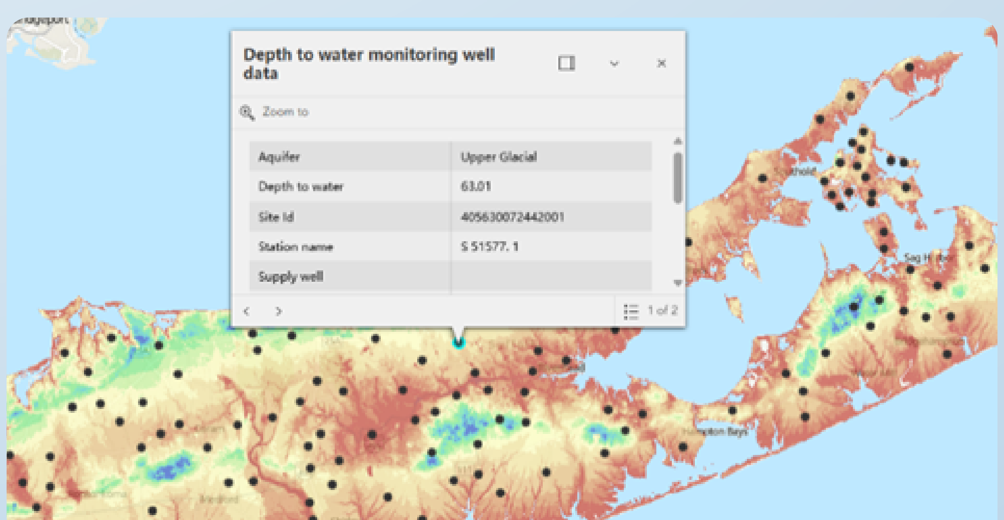
The USGS also maintains a depth-to-water map for Nassau and Suffolk Counties. The map is shown below, with the color-coded intervals to its right. Each color represents an interval of depth below land surface, below which groundwater will be encountered. Also shown below (as black dots) are the locations of USGS monitoring wells that were utilized in creating the map.

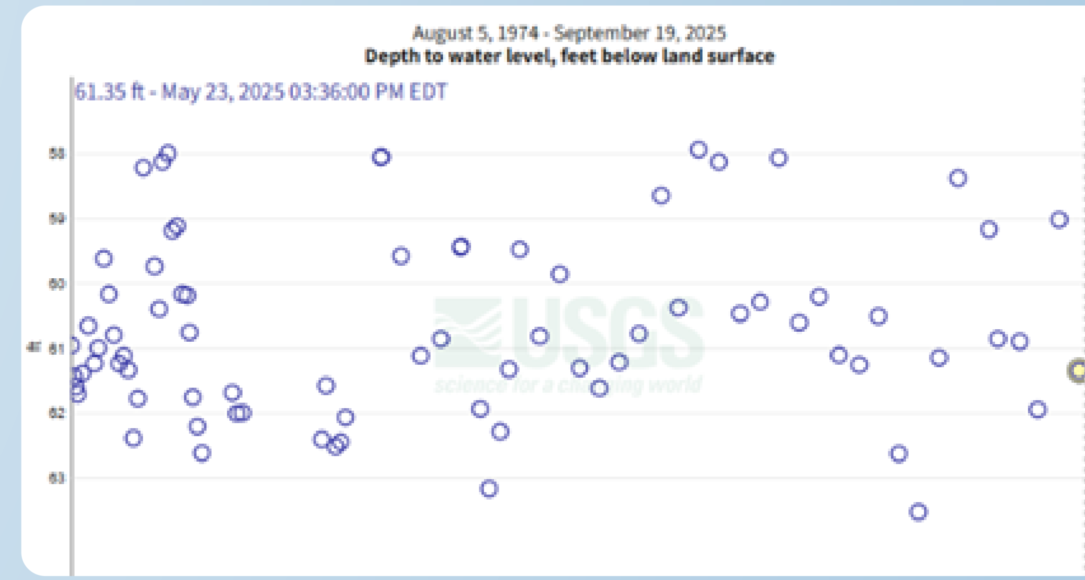
HYDROLOGIC CONDITIONS IN NASSAU AND SUFFOLK COUNTIES (CONTINUED)

The map is fully interactive and available at the following web address: https://ny.water.usgs.gov/maps/li-dtw.

To use it, click on a monitoring well to get a measured depth to water, or click elsewhere on the map to get an estimated depth to water. The map allows the user to zoom in to a particular area for greater detail.

Below is an example of a close up of the depth to water mapper in eastern Suffolk County. When the user clicks on a particular monitoring well (in this case well number S-51577.1), its information is displayed, including a link to its historical water-level record. Clicking on "Click here to go to Water Data for the Nation" will display the hydrograph shown to the right of the figure. The user can then specify a particular time period for which data is desired and see a graph of water levels within that time period.





By utilizing this and other publicly-available websites and web tools, anyone can obtain instant information on hydrologic conditions anywhere in Nassau and Suffolk Counties and compare current data with past trends.

GROUNDWATER PUMPAGE

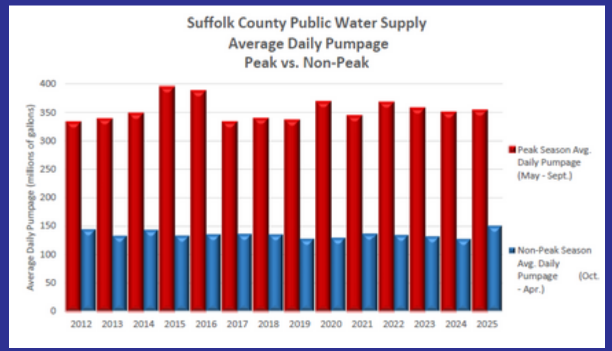
In 2025, the average daily pumpage for Nassau and Suffolk Counties was approximately 180 million gallons per day (mgd) and 236 mgd, respectively, and their respective 2012 to 2024 averages were 182 mgd and 227 mgd. Yearly pumpage estimates are provided from October through September, so the 2025 reporting year contains data from October 2024 through September 2025. The 2025 Nassau County average daily pumpage was approximately 2 mgd below the 2012 to 2024 average while the 2025 Suffolk County average daily pumpage was approximately 9 mgd above the 2012 to 2024 average. Peak season average daily pumpage (May -September) is approximately 100 – 200 mgd more than non-peak season average daily pumpage (October -April). In 2025, the peak season average daily pumpage for Nassau and Suffolk Counties was approximately 239 mgd and 354 mgd, respectively, and their respective 2012 to 2024 averages were 249 mgd and 354 mgd.The 2025 Nassau County peak season average daily pumpage was approximately 10 mgd below the 2012 to 2024 average and the Suffolk County peak season average daily pumpage was the same as the 2012 to 2024 average.

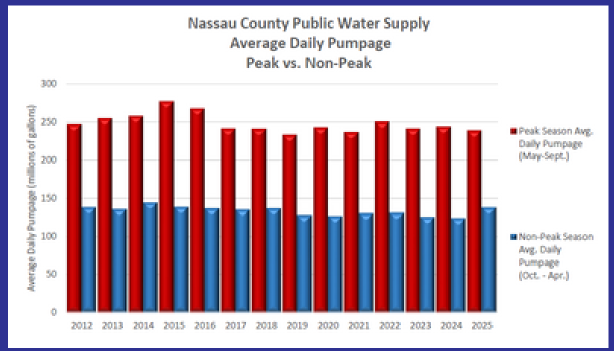
	Nassau County Public Water Supply Non-Peak Season Avg. Daily Pumpage (mgd)	Nassau County Public Water Supply Peak Season Avg. Daily Pumpage (mgd)	Nassau County Public Water Supply Avg. Daily Pumpage (mgd)
Year*	Oct.-April	May-Sept.	All months
2012	137.91	247.43	183.69
2013	135.22	255.12	185.48
2014	144.49	258.11	192.12
2015	138.26	277.61	196.67
2016	136.46	268.21	191.54
2017	134.69	241.89	179.63
2018	136.46	241.47	180.48
2019	127.09	233.66	171.77
2020	126.26	243.32	175.20
2021	129.70	237.16**	174.74**
2022	130.50	250.68	180.88
2023	124.89	241.64**	173.83**
2024	123.53**	244.33**	174.02**
2025	137.50	239.29	180.17
Avg. (2012-2024)	132.73	249.28	181.54

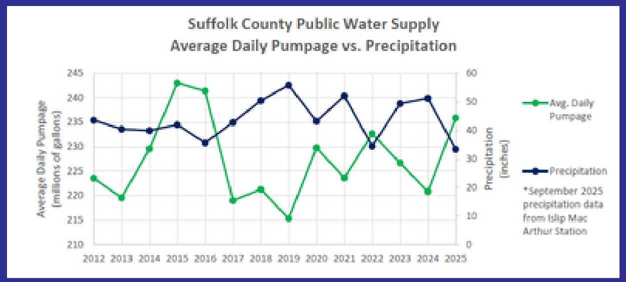
*Yearly pumpage estimates are provided from October – September (i.e. 2012 reporting year contains data from October 2011 through September 2012).
**Updated from last year's SOTA report based on data corrections and newly submitted public water supply pumpage reports.

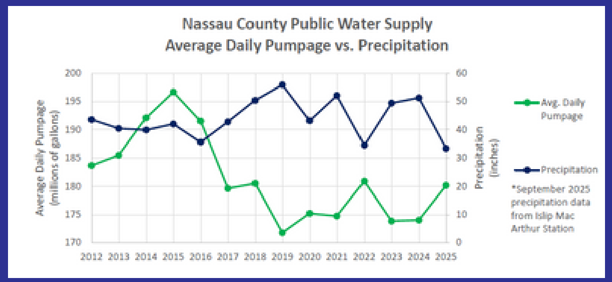
	Suffolk County Public Water Supply Non-Peak Season Avg. Daily Pumpage (mgd)	Suffolk County Public Water Supply Peak Season Avg. Daily Pumpage (mgd)	Suffolk County Public Water Supply Avg. Daily Pumpage (mgd)
Year*	Oct.-April	May-Sept.	All months
2012	144.66	333.38	223.55
2013	133.31	339.08	219.56
2014	143.57	348.74	229.57
2015	133.52	394.83	243.05
2016	135.98	388.23	241.43
2017	136.33	333.51	218.99
2018	135.72	339.83	221.28
2019	127.67	336.75	215.31
2020	129.83	368.96	229.79
2021	136.55	344.25	223.61
2022	134.80	368.26	232.66
2023	132.13	357.70	226.68
2024	127.61	350.58	220.82
2025	150.64	354.01	235.89
Avg. (2012-2024)	134.74	354.16	226.64

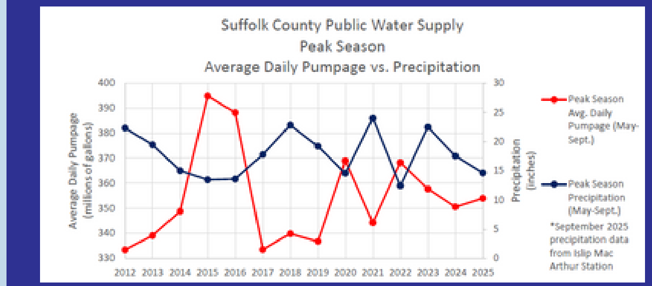
*Yearly pumpage estimates are provided from October – September (i.e. 2012 reporting year contains data from October 2011 through September 2012).

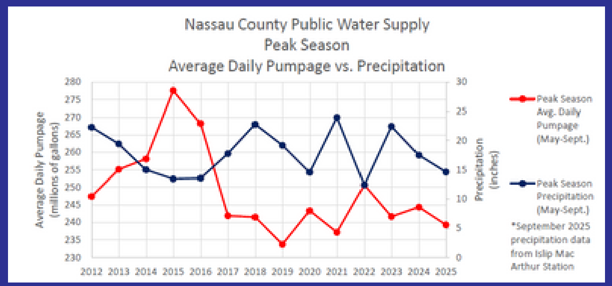


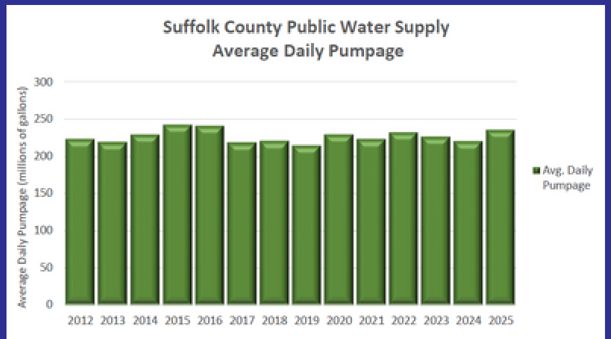


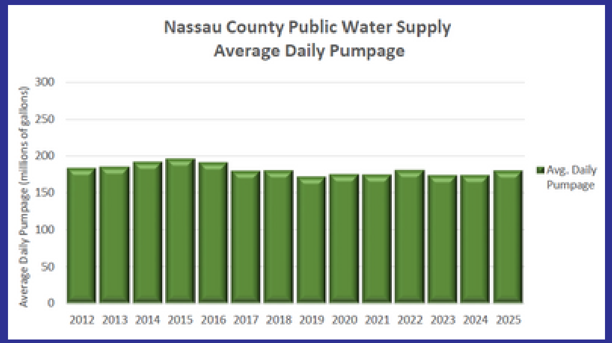












Source: Email Communications NYSDEC

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CONSERVATION, QUANTITY ISSUES AND INFRASTRUCTURE ALTERNATIVES

INTRODUCTION

On Long Island, the only prime source of water supply is the vast groundwater system made up of a series of tiered aquifers below the island's surface. More than 1,500 wells serve community systems across the Island, tapping one of the nation's most critical and prolific sole-source aquifers that serves all 3 million residents. The system delivers on the order of 408 million gallons per day on average, rising sharply in summer. Long-term patterns such as heavy peak-season pumpage, sea-level rise, and continued ocean discharge of treated wastewater, have reduced water table elevations in places and allowed saltwater to press landward in several coastal areas.

The U.S. Geological Survey (USGS) and NYSDEC's Long Island Groundwater Sustainability Project (Phase 1 results released Aug. 20, 2024) documents saltwater intrusion in western Long Island and northern Nassau, and a growing brackish wedge in parts of southwestern Nassau. Several public-supply wells have been affected or shut down in Brooklyn and Queens counties over decades as the interface has moved landward. Long-term stresses (pumping patterns, sewering that exports recharge to the ocean, and sea-level rise), have lowered water tables, reduced baseflow to streams, and increased salinity risks.

TO ACHIEVE SUSTAINABILITY OF GROUNDWATER, IT'S ESSENTIAL TO DEFINE IT AND MEASURE IT.

The LI Groundwater Sustainability Study was intended to update our scientific understanding of groundwater and the aquifers of LI. It created a new groundwater model that allows for future projections of groundwater system responses to various stress conditions. The study envisioned to create tools to help decision makers make scientifically based decisions to sustainably manage Long Island's water resources. With this new tool, LICAP is committed to working with the regulatory agencies and stakeholders to define sustainability and its application as a groundwater management tool.

WHY CONSERVING IN PEAK SEASON IS NON-NEGOTIABLE

In a January 5, 2016 letter, the New York State Department of Environmental Conservation (DEC) directed all Long Island public water suppliers to reduce summer pumpage by 15%. DEC's rationale was blunt: both Nassau and Suffolk Counties had at times exceeded the "safe yield" estimates cited in the 1986 Long Island Groundwater Management Plan, and ongoing over-withdrawal raises risks including saltwater intrusion, contaminant plume migration, saltwater upconing, and escalating conflicts among competing demands.

CLIMATE CHANGE TIGHTENS THE SQUEEZE

Climate change is expected to intensify the operational challenges facing Long Island's groundwater system. Regional and national assessments consistently indicate a warming trend, an increase in the frequency of very hot days, and a gradual rise in sea level, all factors that heighten seasonal demand and coastal pressures on the aquifer. While estimates vary among modeling groups, major datasets project continued warming and measurable sea-level rise through mid-century. Hotter summers will drive higher outdoor irrigation demand and increase evaporative losses, making short dry spells more consequential for system reliability.

CAPACITY IS ALSO CONSTRAINED BY STRICTER DRINKING-WATER STANDARDS

New, more protective maximum contaminant levels (MCLs) set by New York State have required districts to construct advanced treatment (e.g., GAC for PFAS, AOP for 1,4-dioxane). During construction and commissioning, districts often rotate wells offline, leaving less headroom on the hottest mornings unless demand is controlled.

WHY WATER EFFICIENCY IS THE FIRST, FASTEST AND LEAST-COST "NEW SUPPLY"

Across Long Island, system demand more than doubles, and in some systems nearly triples, between winter and the hottest, driest summer mornings. Studies and supplier reports consistently identify automatic landscape irrigation as the dominant driver of those peaks. The most effective way to stabilize the aquifer's coastal heads and maintain fire-flow resilience is to reduce and redistribute irrigation-season demand (watering less, watering smarter, and not all at once). Less peak pumpage means lower electric demand, reduced wear on critical assets, and lower hydraulic stress near coastal interfaces, while preserving fire-flow protection under worst-case conditions. Targeting irrigation with modern controls, enforcement-by-education, and better landscape design is the highest-leverage way to restore headroom without compromising reliability.

CURRENT WATER CONSERVATION AND EFFICIENCY INITIATIVES

Suffolk County Water Authority (SCWA)

SCWA has adopted an odd/even watering schedule and prohibits irrigation from 10:00 a.m. to 4:00 p.m., paired with customer outreach and conservation incentives. SCWA also uses a tiered rate structure ("conservation rate") to discourage high-volume seasonal use. In July–August 2025, SCWA issued a temporary Stage 1 alert tied to extremely high demand, an approach that prioritized system reliability while minimizing disruption.

Port Washington Water District (PWWD)

Beginning January 1, 2025, PWWD requires smart irrigation controllers on all automatic systems, and limits manual irrigation to 15 minutes per zone. PWWD enforces Nassau County's odd/even schedule and mid-day watering prohibition. PWWD couples the requirement with co-sponsored contractor training and resources with the Roslyn Water District, a commitment form, and defined watering windows by zone to spread load across the early-morning peak. Through its "Oops" education-first enforcement program, PWWD has helped nearly 1,000 residents correct violations, with only 3% repeating—a clear sign of success.

Roslyn Water District (RWD)

RWD requires smart controllers on all automatic systems as of January 1, 2025 and promotes the "Save 2" program, cutting two minutes per zone from each zone's existing programmed run time, which their outreach materials indicate can reduce irrigation use roughly 10% without harming turf health. The district provides co-sponsored contractor training and resources with the Port Washington Water District, forms, guidance, and enforcement sequencing focused on education and compliance rather than penalties.

Hicksville Water District (HWD)

HWD runs targeted business-sector engagement (e.g., "Blue Business"), seasonal contractor outreach before spring startups, and a smart-controller rebate program, complementing countywide conservation rules with local ordinances requiring rain/soil-moisture sensors on new systems.

REGULATORY CONTEXT THAT SHAPES CONSERVATION

Nassau County Water Conservation Ordinance (No. 248-A-1987; amended 2016). Nassau's ordinance focuses on outdoor use: odd/even schedules aligned with address parity and a ban on irrigation between 10:00 a.m. and 4:00 p.m., supplemented by controls on hose use for pavements. Suppliers report more uniform outdoor demand and lower peaks under the odd/even framework.

Suffolk County and Towns. While Suffolk County has not adopted an ordinance analogous to Nassau's, SCWA's Board resolution mandates odd/even scheduling and a mid-day ban systemwide. In 2025, the Town of Southold enacted a local conservation law requiring smart controllers and rain sensors on new systems, retrofits on existing systems within three years, odd/even schedules, and authority to suspend irrigation during extreme drought, with enforcement emphasizing warnings and education before fines.

DEC Water Conservation Plans and annual reporting. Since 1988, conservation plans have been a permit condition for public water suppliers; since 2016, DEC has required explicit, measurable short-term objectives, schedules, funding commitments, and annual reporting, moving plans from "should" to "will implement."

Historic Nassau pumpage caps. DEC's 1987 five-year average "caps" for Nassau County public water suppliers constrained growth and helped normalize conservation, but DEC and suppliers alike recognized the need for a tool capable of simulating the aquifer system and how it would be expected to respond to different stresses. The current trajectory is toward caps and targets that reflect an updated understanding of the aquifer system, based on the USGS/DEC sustainability modeling.

Lloyd Aquifer protections (ECL §15-1528). New York's Lloyd Moratorium prohibits new wells drawing from the Lloyd sands outside limited coastal exemptions and explicitly prohibits storage or pumping of water into the Lloyd across all areas, reflecting the aquifer's unique vulnerability to saltwater intrusion and contamination.

POTENTIAL LICAP RECOMMENDED ACTIONS FOR 2025–2030

Phase 1 of the Groundwater Sustainability Study shows water supply vulnerability around the coastal margins of Nassau County. The science developed by the study provides guidance for actions and practices that water suppliers can implement within the next five years.
The practices described below address vulnerabilities and should become operating practices over the next five years.

a) Peak-season irrigation management as standard operations.
Adopt Island-wide best practices for automatic irrigation: (i) require EPA WaterSense-labeled smart controllers and functional rain/soil-moisture sensors on all new systems, with a phased retrofit schedule for existing systems; (ii) enforce odd/even watering with a universal 10:00 a.m.–4:00 p.m. ban; and (iii) use time-window "zone maps" in constrained pressure districts so not every neighborhood waters pre-dawn. Maintain clearly communicated "Save 2–4 minutes per zone from each zone's existing programmed run time" set-back guidance as the default homeowner action at spring startup. Suppliers with demonstrated coastal head sensitivity should pilot stricter windows during July–August to flatten the 4–6 a.m. spike.

b) Enforcement that changes behavior, not just issues tickets.
Prioritize education-first, warning-based programs (courtesy tags, door-hangers, and contractor notifications) with simple, time-bound corrective steps before fines. This approach has proved effective at building voluntary compliance in Nassau while reserving penalties for repeat offenders. Track violations, repeat rates, and corrected behaviors so that communication can be refined season to season.

c) Targeted municipal efficiency retrofits.
Seek funding to replace at least 10% of inefficient toilets annually in municipal buildings, schools, and multifamily common areas and push high-efficiency fixtures. New York City's long-running retrofit initiatives demonstrate persistent, metered savings at scale. (Program design can mirror NYC DEP's performance-based incentives while adapting to Long Island's metering and rate context.)

d) Distribution-system integrity as a conservation program.
Audit roughly one-third of each system annually (full coverage every three years), integrating leak detection with pressure-management and storage-tank overflow controls. Promote rapid detection and response protocols for any leaks identified through audits or monitoring systems.

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CONSERVATION, QUANTITY ISSUES AND INFRASTRUCTURE (CONTINUED)

e) Planning board guidance and landscape standards.
Work collaboratively with interested partners to draft language to help water suppliers update legislative intent of irrigation code to incorporate findings from the DEC/USGS sustainability study to justify stronger conservation measures.

f) Irrigation industry professionalism.
Support statewide certification requirements for irrigation contractors based on best-management practices and device standards. In the interim, districts should preferentially communicate through certified contractors each spring; HWD's pre-season outreach letter is an effective pattern to replicate.

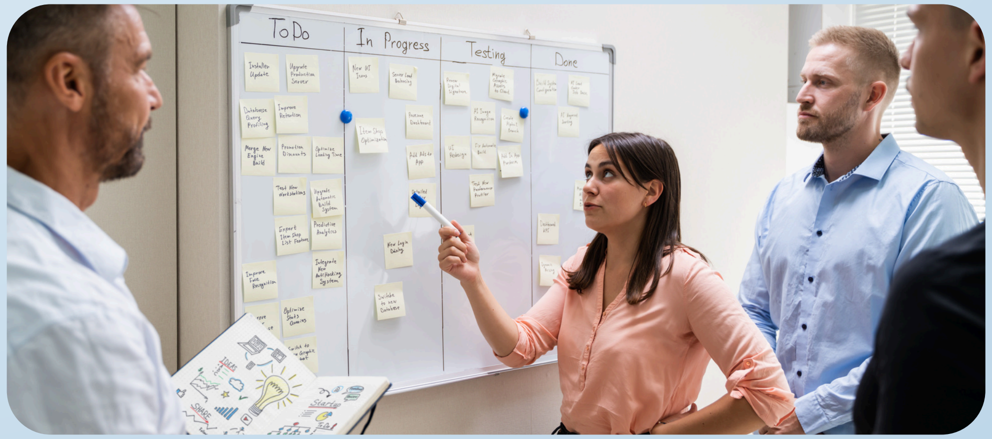
g) Pursue funding to help water suppliers scale up smart metering capabilities.
Installing additional data collectors, and providing customers with 24/7 access to real-time water usage through apps or online portals, enabling them to set conservation goals, monitor usage trends, and detect leaks early.

h) Planning boards and water-friendly landscaping.
Districts should provide model conditions to planning boards, developed in collaboration with Cornell Cooperative Extension, to limit irrigated turf, require native/drought-tolerant plantings, mandate WaterSense components, and adopt efficient zone design. Xeriscape principles remain valid even in humid climates when adapted to local species and soils; fewer irrigated acres paired with smart controls is the surest route to peak-demand stability.

i) Study water saving best practices of sectors that are large users such as golf courses and water pollution control districts.

j) Drought education so public understands what actions they are supposed to take.

k) Utilize new state funding secured by NYS Senator Siela Bynoe for smart irrigation controller rebates.



LONG-TERM ALTERNATIVES AND REGIONAL OPTIONS

Groundwater Sustainability and Long-Term Resilience

LICAP is investing in the science and planning needed to ensure Long Island's long-term water sustainability conducting a 2050 investigation, a forward-looking assessment of what actions must be taken over the next twenty-five years to secure lasting resilience. Phase One of the USGS Groundwater Sustainability Study revealed Long Island's growing vulnerability to saltwater intrusion. Strategies that should be evaluated to reduce this vulnerability include: (1) effective conservation, (2) rainwater capture and aquifer storage and recovery (ASR), (3) water reuse, (4) desalination, and (5) development of a regional distribution network. The 2050 investigation may help to determine how Long Island can succeed in the first three strategies, conservation, capture, and reuse, to avoid the costly and invasive measures of desalination and regional distribution. Future studies, such as the upcoming 2050 drinking water report should assess current conservation policies and practices, along with the viability of the following:

Aquifer Storage and Recovery (ASR)

Aquifer Storage and Recovery (ASR) refer to the process of recharge, storage, and recovery of water in an aquifer. ASR systems are currently and successfully used throughout the United States for the storage of potable drinking water, partially treated surface water, groundwater, and reclaimed water. In some cases, the practice helps mitigate saltwater intrusion. The Orange County Water District (OCWD) maintains one of the world's most advanced aquifer recharge systems to replace the water that is pumped from wells belonging to local water agencies, cities and other groundwater users. In addition, the OCWD currently operates two seawater intrusion barriers. ASR facilities have been used in Florida and throughout the United States for about 40 years. Currently, there are over thirty ASR systems operating throughout the state, utilizing approximately 100 wells for recharge, storage, and recovery. Texas implemented an ASR to proactively address the depletion of groundwater demand during extreme drought. Excess water is pumped into Edwards Aquifer. Later, during hot and dry stress periods as well as during extended droughts, the drinking water is pumped back into the distribution system to help meet demand. Washington State has a larger ASR program that has proven to be a cost-effective way to capture and store water when it is available so it can be used during times when it is limited. Groundwater storage can serve the same purposes as surface water reservoirs, without many of the issues and costs associated with dams. In New York State ASR is prohibited in the Lloyd aquifer, a highly protected water source under Long Island. Concerns over saltwater intrusion and contamination have led New York State to ban the storage or pumping of water into the aquifer. The ban was implemented in response to a proposal from the New York City Department of Environmental Protection to conduct a demonstration test involving pumping surface water into the aquifer. The prohibition was prompted when some scientists and environmentalists warned that injecting oxygen-rich, chlorinated, and fluoridated surface water could have unintended consequences for the aquifer's pristine, thousands-of-years-old water.

Water Reuse (Non-Potable and Indirect Potable).

A potential strategy for supplying water for the irrigation of landscaped properties, agricultural crops, and golf courses is through water reuse. This involves irrigation utilizing wastewater from either a regional sewage treatment plant or a homeowner's on-site sanitary system (with appropriate treatment) rather than using water pumped from Long Island's underground aquifers. An important benefit of using reclaimed wastewater for irrigation purposes is that it can improve water quality in the receiving waters into which the wastewater was formerly discharged. Perhaps as importantly, reusing wastewater for irrigation purposes can supplant the consumptive use of groundwater, thereby reducing stress on the groundwater system due to reduced pumping.

Reclaimed wastewater from sewage treatment plants has been reliably and safely used for irrigation purposes for many decades throughout the United States, most notably in California, Florida, and the arid Southwest. The main recipients of the treated effluent have typically been golf courses, landscaped green spaces, and non-food crop agricultural areas. Other uses have included industrial cooling and wetland creation. As of 2008, the United States used approximately 2.2 billion gallons of reclaimed wastewater per day for these purposes. Additionally, reclaimed wastewater has been used in a number of other countries, such as Israel, where 70% of the wastewater is reused for irrigation and other purposes. During this time a very extensive and comprehensive performance record has developed and no known human health problems have emerged from the use of, and exposure to, reclaimed water in these applications. Suffolk County officials use treated wastewater from a Riverhead sewage plant to irrigate the county-owned Indian Island Golf Course. Throughout Long Island, water reuse has great potential to reduce pumping demand on the groundwater system for non-potable purposes, while also reducing contaminant loadings and ecological impacts to the Island's surface water ecosystems.

Cross-County Transmission and NYC–Nassau Connections.

The water supply and transmission structure on Long Island historically has been composed of individual water purveyors providing the production and distribution of drinking water for their local residents. Groundwater contamination in these water supply areas is typically handled locally through on-site groundwater remediation technologies. Saltwater intrusion is increasingly becoming a water supply contamination issue for certain coastal water suppliers whose main source of supply is threatened by such intrusion. Also, many Long Island water suppliers maintain emergency interconnection agreements with neighboring suppliers, some of which may be informal and unmetered. Groundwater modeling across the region could be utilized as a tool for mapping saltwater intrusion and contamination plumes and assessing aquifer sustainability under the regional approach.

During August of 2022 Ramboll Engineering issued the New York City-Nassau County Water Supply Interconnection Feasibility Study (Feasibility Study) is to evaluate the feasibility of connecting New York City (NYC) public water supply to Nassau County. The study stated that Long Island, and Nassau County more specifically, is one of a very few locations in the U.S. where a high density of residential and commercial development overlies a sole source aquifer on which the residents rely for drinking water. The combination of decades of development and increased stress on the aquifer has produced unique challenges involving saltwater intrusion and providing drinking water that meets more stringent regulatory standards. Small and large scale scenarios were evaluated as follows:

Small-scale scenario:

- The supply of 20 million gallons per day (MGD) from NYC based on the capacity of existing (inactive) interconnections between NYC and Nassau County along the Queens border. The existing connections would need to be rehabilitated prior to use.

Large-scale scenarios would have significant challenges:

- Limited supply of NYC water, with projections out to 2040, indicating very little if any excess capacity by that time. The Feasibility Study estimated that there may currently be up to 200 MGD of NYC supply in excess of the city's demand, however excess capacity can change on a significantly based on many factors. In addition, NYC projects their demand to increase, so excess capacity is expected to shrink over time. Nassau County has an average daily water demand of approximately 180 MGD.
- Financial and organizational challenges in creating new water sharing and distribution districts.

The implementation of a NYC to Nassau County pipeline is not a plug-and-play solution. A regional groundwater model should first be used to assess long-term aquifer sustainability. If a NYC to Nassau County pipeline is determined to be warranted, the model assessment should be followed by high-resolution route planning and cost-benefit analysis. Simultaneously, state-level legal and regulatory frameworks should be reviewed and updated to allow cross-jurisdictional infrastructure, if needed. Incentives should be created to formalize existing emergency interconnections and convert them into metered, governed agreements. While such a pipeline can serve as a supplemental or drought-relief supply, it should not be viewed as a full replacement for existing groundwater systems. Investment in wellhead treatment for contaminants such as 1,4-dioxane and PFAS will remain necessary regardless of the interconnection's implementation. Possible incompatibilities and unintended consequences of supplementation into the distribution systems of neighboring public supplies should be recognized as a concern warranting further study.

CONCLUSION

Long Island's aquifers face simultaneous pressures: coastal saltwater intrusion in localized areas, peak-season demand spikes driven by irrigation, warmer summers and episodic drought, and temporary capacity constraints during treatment plant buildouts. The lowest-cost, lowest-risk path over the next five years remains conservation at scale—smart controllers, functioning sensors, odd/even distribution with midday bans, enforcement-by-education, targeted retrofits, interval-data analytics, and water-wise landscaping backed by planning board conditions. In parallel, districts should complete treatment programs to meet state MCLs and continue evaluating interconnections and non-potable reuse where they relieve peak-hour stress or mitigate nutrient discharges.

LICAP's 2050 investigation represents a strategic investment to ensure these immediate actions are guided by long-term science and coordinated regional planning.

LICAP LAUNCHES ENHANCED VERSION OF WATERTRAQ WITH DECADE LONG TREND TRACKING

The Long Island Commission for Aquifer Protection launched a major update to WaterTraq, its groundwater quality mapping and data system, which has been collecting and making publicly available water quality data from most Long Island water suppliers for over a decade. With the new enhancements, users can now not only search for the presence of chemical compounds but also view long-term trends in concentrations over the past ten years.

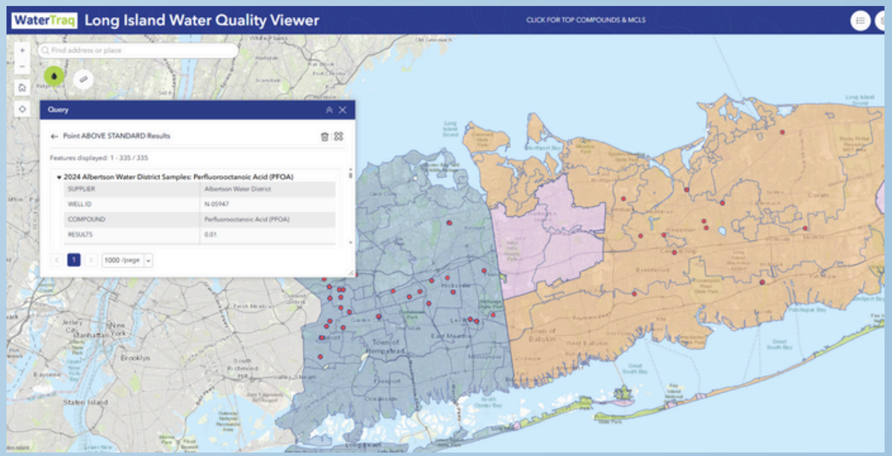
WaterTraq, a GIS-based platform developed in partnership with the Suffolk County Water Authority, has long served as a central resource for regulators, water professionals and the public to access raw and treated water quality data across Long Island. Updated functionality gives users the ability to chart how levels of contaminants have changed over time in specific sections of Long Island.

"This update transforms WaterTraq from a snapshot tool into a dynamic resource that tells the full story of our groundwater's health," said Jeff Szabo, Chairman of LICAP and Chief Executive Officer of the Suffolk County Water Authority. "Users can see whether compound concentrations have increased, decreased or remained stable—giving them the information that supports smarter decisions, deeper research and stronger protections for Long Island's water supply."

LICAP Vice Chair and Superintendent of the Hicksville Water District Paul Granger, P.E. added "The transparency and ability to proactively track groundwater quality trends is invaluable for water suppliers. WaterTraq is a vital public health protection tool for wellhead treatment planning."

By layering maps with historical water quality data, users can overlay contaminant concentrations with geographic features like aquifer boundaries, well locations and topography. The tool serves both technical users and residents seeking clearer access to data.

To try the updated WaterTraq tool, visit the LICAP website: licaponline.com/long-island-water-quality-viewer



DRINKING WATER SOURCE PROTECTION PROGRAM (DWSP2) - TOWN OF BROOKHAVEN

INTRODUCTION

The Town of Brookhaven was part of the first wave of communities in New York State to benefit from the state-supported Drinking Water Source Protection Program (DWSP2) intended to develop and implement a plan to improve and protect their public water sources and the surrounding environment. In 2021, the Town of Brookhaven applied for free technical assistance to prepare a DWSP2 plan to protect its local source water.

A New York State-approved technical assistance team led by LaBella Associates was assigned to the Town and worked closely with a Brookhaven Community Advisory Group (CAG) as well as local and county partners to develop a DWSP2 plan. The DWSP2 plan (PWS ID: NY5110526) was developed using the New York State Departments of Environmental Conservation (NYSDEC) and Health (NYSDOH) draft DWSP2 Framework to assist municipalities with assessing and supporting public drinking water source protection.

OUR AQUIFER

The aquifers are an extensive natural resource that serves as our public drinking water supply. The quality of that water is directly related to our land use activities and how we manage and protect our natural environment as individuals and as a community.

The SCWA 2023 Annual Water Quality Report shared susceptibility ratings for Suffolk County's community supply wells summarized from a 1999 Source Water Assessment Program (SWAP) prepared by the NYSDOH. The 1999 SWAP suggested that wells in the Town had a high susceptibility for nitrate and volatile organic compounds (VOCs), a medium susceptibility for pesticides, and a low susceptibility for microbial contaminants.

DRINKING WATER SOURCE PROTECTION
(CONTINUED)

INFRASTRUCTURE

There are approximately 175 drinking water supply wells located in parts of five Suffolk County Water Authority (SCWA) water distribution areas across the Town of Brookhaven. For comparison, there is a total of 592 active wells across the total SCWA system (2023 SCWA Annual Water Quality Report). Water quality from the wells mostly meets current drinking water standards, typically requiring only standard disinfection and sometimes pH adjustment for corrosion control. A few require additional treatment, including, in some cases, granular activated carbon to address organic contaminants associated with local groundwater contamination occurrences. Source water recharge areas for SCWA wells in Brookhaven have been studied and modeled at various times by the Suffolk County Department of Health Services (SCDHS) and its consultants. Complex computer-based models have been prepared. One SCDHS model set completed in 2020 was based on average water withdrawal flows, while an earlier model completed in 2015 focused on peak withdrawal flows, which is predictive of future demand flows and their associated recharge areas. These recharge area maps were reviewed by the LaBella DWSP2 consultant team and shared visually with DWSP2 CAG members during meetings.

FINDINGS

The consultant team overlaid the two model results, and the CAG agreed that protective strategies should primarily rely on the higher withdrawal rate model with its modestly more extensive recharge area boundaries. This decision provides a more comprehensive source protection strategy. Recharge areas mapped under the 2020 average withdrawal rate model were only prioritized where newer information led to delineated areas exceeding those of the prior (2015) model. The consultant team used the combined recharge area map and details from the SCDHS maps to separate the aquifer recharge areas into higher and lower priority protection areas. Where groundwater might reach a public water system well in five years or less, the recharge areas were recognized as Brookhaven's wellfield Critical Source Areas.

Based on the same modeling studies, the balance of the recharge areas for each well were then identified as the Extended Source Areas for each public water system well. Groundwater recharge occurring in the Extended Source Areas migrates for five or more years through the aquifer before reaching the well intakes. Some travel distances in Brookhaven are 100 or more years distant from specific wells.

DRINKING WATER SOURCE PROTECTION
(CONTINUED)

Broadly speaking, the Town of Brookhaven's potential groundwater contaminant sources include the following topic areas warranting planning protection under the DWSP2 plan:

- Septic systems and wastewater treatment plants (WWTPs) releasing chemicals and nutrients with treated wastewater either in unsewered areas reliant on septic systems or from numerous subsurface discharges from permitted sewage treatment plants.
- Petroleum and chemical storage or handling sites, including an extensive array of spills of various sizes, most of which are resolved as closed cases.
- Regulated bulk storage and underground petroleum tanks, numbering in the hundreds.
- Closed landfills and inactive hazardous waste or other regulated remediation sites that continue to pose potential risks.
- Road de-icing operations introducing salts to the groundwater system.
- Industrial and consumer product use involving chemicals recently recognized as emerging contaminants, including Per- and Polyfluoroalkyl Substances (PFAS) and 1,4-Dioxane.

The potential and existing contaminant source categories and the protection and management recommendations are generally consistent with those presented in Suffolk County's 2015 Comprehensive Water Resources Management Plan, including improving wastewater management, utilizing green planning practices in new development, improving pesticide management, acquiring undeveloped lands, reducing saltwater intrusion, improving stormwater management, and general pollution reduction efforts. The strategies and collaboration outlined in both plans will be used to support implementation efforts, including the pursuit of potential funding sources supporting plan implementation.

DRINKING WATER SOURCE PROTECTION
(CONTINUED)

CONCLUSION

The DWSP2 plan is intended to protect the long-term viability of the Town's public water supply sources and is anticipated to contribute significantly to the conservation of natural resources and preservation of public health. Protection of water source quality also creates other benefits, including drinking water treatment cost savings, general liability insurance savings, maintenance of real estate values, and increased source resilience responsive to climate change.

Please visit the town's website to get the latest news. You can read the DWSP2 protection plan by visiting this link:

https://www.brookhavenny.gov/DocumentCenter/View/37263/Town-of-Brookhaven-Drinking-Water-Source-Protection-Plan-DWSP2-03-14-2024

The Town was recently interviewed by DEC and highlighted in the April DWSP2 newsletter. You can read more about the Town of Brookhaven DWSP2 interview by visiting this link:

https://content.govdelivery.com/accounts/NYSDEC/bulletins/3ddb426

MICROPLASTICS AND NANOPLASTICS IN GROUNDWATER RESOURCES OF LONG ISLAND

INTRODUCTION

To begin addressing concerns over microplastics and public health as outlined in the 2024 update to the SOTA report, LICAP and USGS have initiated a pilot study to assess Long Island's groundwater resources for the presence of microplastics and nanoplastics. The study began September 2025 and involves selecting shallow groundwater wells throughout Nassau and Suffolk Counties based on existing water-quality data, surrounding land use, proximity to contamination sources (such as recharge basins and sewage treatment plants with subsurface discharges), and groundwater-flows based on USGS recharge and particle-tracking models. The goal of this assessment is to determine whether plastic contamination can be detected in shallow wells previously found to be influenced by human contamination; and, if plastic contamination is detected, begin to identify potential sources based on polymer type and nearby sources.

By leveraging existing water-quality data and working with LICAP members to identify areas of interest, the USGS will collect representative groundwater samples using techniques that minimize the use of plastics during sample collection and processing.

Laboratory analyses will include visual inspection for particles and fibers within the microplastics range (roughly 5 millimeters to 20 micrometers) as well as state-of-the-art characterization of identified microplastic particles and of chemical signatures of polymers in the nanoplastics range (less than 1 micrometer). Quality-assurance procedures will include a system of checks for cross-contamination in the field and in the laboratory.

Data from this study will include particle type (such as fiber, bead, fragment; if present in a sample), plastic type (such as polyethylene, polypropylene, polystyrene), and relative size of the particle (based on filtration). Chemical signatures of plastics (polymers) from water samples will provide insight into the extent to which plastic contamination can transport through the sand and gravel aquifer of Long Island.

Results will be available to LICAP members and the public by the end of 2026. Future studies would seek to assess contaminant sources and better understand the physical transport of microplastics and nanoplastics particles in the sandy subsurface.

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