NEW YORK STATE | Department of Environmental Conservation

KATHY HOCHUL
Governor

AMANDA LEFTON
Commissioner

To Interested Parties: April 10, 2026

RE: **Oak Orchard Wastewater Treatment Plant, Conveyance Corridor, & Compensatory Wetland Mitigation Projects**
**Response to Public Comments**

Thank you for your comments on the Municipal State Pollutant Discharge Elimination System (SPDES) – Surface Discharge, Article 24 Freshwater Wetlands, and Section 401 Water Quality Certification permit applications for the above-mentioned projects. The New York State Department of Environmental Conservation (DEC) has carefully reviewed and considered the comments received during both the public comment period, and public hearings. The comments are summarized, and DEC's responses are provided in the enclosed responsiveness summary below.

After carefully considering the comments provided, DEC has issued the above-mentioned permits for the proposed action. The issued permits have been attached below.

If you have any questions, please email Comments.OakOrchard2025@dec.ny.gov.

Sincerely,

Trendon Choe
Deputy Regional Permit Administrator

Encl: Responsiveness Summary
Catalog of Commentors
Public Responses
Issued Permits

**Division of Environmental Permits, Region 7**
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**Responsiveness Summary**
**NYSDEC Permit Nos and Facility Names**:

| NYSDEC ID | Facility Name and Project | Description of NYSDEC Permit | Statutory and Regulatory Authority |
|---|---|---|---|
| 7-3124-00018/00001 | Oak Orchard Wastewater Treatment Plant (OOWWTP) – Renewal and Modification | Municipal SPDES – Surface Discharge (NY0030317) | ECL article 17 titles 7 and 8, 6 NYCRR Part 750 |
| 7-3124-00018/02005 | OOWWTP - Industrial Treatment Train Construction | Freshwater Wetlands | ECL article 24, 6 NYCRR Part 663 |
| 7-3124-00615/00001 | OOWWTP Conveyance Corridor - Construction | Freshwater Wetlands | ECL article 24, 6 NYCRR Part 663 |
| 7-3124-00615/00002 | Oak Orchard WWTP Conveyance Corridor - Construction | 401 Water Quality Certification | Section 401, Clean Water Act |
| 7-3124-00618/00001 | Youngs Creek Mitigation Site - Wetland Mitigation | Freshwater Wetlands | ECL article 24, 6 NYCRR Part 663 |
| 7-3554-00280/00001 | Fish Creek Mitigation Site - Wetland Mitigation | Freshwater Wetlands | ECL article 24, 6 NYCRR Part 663 |

## Background

On September 7, 2018, DEC received a Municipal SPDES renewal application from Onondaga County. As provided for in NYCRR 621.11(l) permit coverage was extended pursuant to section 401(2) of the State Administrative Procedures Act (SAPA), given the submission was submitted timely and sufficient, also known as SAPA extended. While the permit was SAPA extended, DEC received a permittee-initiated modification (PIM) from Onondaga County on June 18, 2025, for the increased permitted discharge, expansion of the existing municipal treatment train, and construction of a new industrial treatment train and conveyance corridor. Pursuant to 6 NYCRR Part 750, DEC conducted a full technical review and developed a draft SPDES permit.

On November 12, 2025, DEC issued a Notice of Complete Application, Public Comment Period, and Public Comment Hearing (Notice) to Onondaga County regarding all the required permits listed above. The Notice was published in DEC's Environmental Notice Bulletin (ENB) on November 12, 2025, and the permittee noticed in the Post-Standard on November 16, 2025.

## Opportunities for Public Review and Comment

The Notice included a brief description of the proposed projects and contained a link to digital copies of the application material (s), the draft SPDES permit and draft SPDES fact sheet, and SEQRA documents. Additionally, hard copies of the application material

were available at four Onondaga County Libraries in the Towns of Cicero, Brewerton, North Syracuse and the City of Syracuse; and at the Region 7 DEC office in the Town of Dewitt.

The Notice stated that DEC was accepting comments, via email or written, until December 23, 2025. Two virtual public comment hearing sessions were held before an Administrative Law Judge on December 16, 2025, at 2:00 pm, and December 17, 2025, at 6:00 pm. A stenographer was retained to prepare the transcripts of the hearings, and a copy of the transcripts were provided to DEC on March 5, 2026.

DEC received 17 written comments during the public comment period, and two (2) oral comments during the virtual public comment hearings. DEC has assessed all oral and written comments which are addressed together in the section below.

## Responsiveness Summary

In accordance with 6 NYCRR Part 621.10(e) DEC has prepared this Responsiveness Summary to address the relevant comments that were received during the public comment period and hearing.

Given the number of public comments that raised similar concerns, DEC has organized comments into broader categories to avoid repetitive responses addressing each comment individually. The full text of all comments received as part of the public notice process are included in Appendix A.

All comments are addressed below with comments IDs referenced next to each commenter's name. Timely comments were received from:

| | Commenter | Date Received | Comment Response IDs |
|---|---|---|---|
| 1 | Kate Bartholomew, Chair, on behalf of Sierra Club Atlantic Chapter | 12/2/2025, 12/23/2025 | I.B, I.C, I.D, I.E, I.G, I.I, I.J, I.H, I.K, I.L, I.M, I.N, I.O |
| 2 | Paul Doody | 12/4/2025 | I.B, I.C, I.D, I.I, I.J |
| 3 | Donald Hughes | 12/5/2025, 12/16/2025 | I.C, I.D, I.I, I.J, I.L |
| 4 | Alyson Shotz | 12/9/2025 | I.B, I.C, I.D, I.I, I.J |
| 5 | Aidan Craner | 12/11/2025 | I.B, I.C, I.D, I.I, I.J |
| 6 | John Przepiora | 12/16/2025, 12/23/2025 | I.A, I.B, I.C, I.D, I.F, I.I, I.J, I.L, II.A, II.B, II.D, II.G |
| 7 | Julie MacNamara, National Water Projects Coordinator for Clean Water Action & Clean Water Fund, on behalf of CHIPS Communities United and the Center for Public Environmental Oversight | 12/16/2025 | I.E, I.G, I.I, I.J, I.H, I.K, I.L, I.M, I.N, I.O |
| 8 | Sriram Narsipur | 12/19/2025 | I.C |

| | | | |
|---|---|---|---|
| 9 | Alma Lowry, Esq., from the Law Office of Joseph J. Heath, on behalf of the Onondaga Nation | 12/23/2025 | I.G, I.I, I.J, I.L, I.O, II.C, II.E |
| 10 | Anna Smith, Senior Researcher, on behalf of Jobs to Move America | 12/23/2025 | I.E, I.G, I.I, I.J, I.H, I.K, I.L, I.M, I.N, I.O |
| 11 | Bonita Siegel | 12/23/2025 | I.I |
| 12 | Liza Bernard | 12/23/2025 | I.C, I.I |
| 13 | Peter King | 12/23/2025 | I.A, II.F |
| 14 | Odean Dyer, Commissioner, on behalf Onondaga County Department of Water Environment Protection | 12/23/2025 | III.A, III.B, III.C, III.D, III.E, III.F, III.G |

As required by 6 NYCRR 621.10(e), DEC prepared this Responsiveness Summary to address the comments that were received on the draft permit. Frequently raised comments are summarized and presented as one general comment and are not repeated as specific comments under the Responsiveness Summary. The full text of all comments received as part of the public notice process are included in the Appendix of this Responsiveness Summary. All comments on the draft permit and fact sheet are addressed below with comments IDs referenced next to each commenter's name.

## Contents

# I. General Comments

## A. SEQRA negative declaration was flawed and should be re-initiated

Comment: DEC received several comments that the SEQRA review for the municipal treatment upgrades, and subsequent negative declaration, were flawed and should be re-initiated.

Response: The Proposed Project and associated connected actions, are subject to review under the State Environmental Quality Review Act (SEQRA).

With regards to the Industrial Treatment Train (ITT), on December 9, 2020, Onondaga County Industrial Development Agency (OCIDA) issued a Notice of Intent to be Lead Agency for the purpose of conducting a coordinated environmental review under SEQR. DEC was listed as an involved agency and received a lead agency coordination letter from OCIDA on January 8, 2021. On June 25, 2025, OCIDA, as joint lead agency with the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Program Office (CPO) created by the United States Department of Commerce, accepted the Draft Environmental Impact Statement (Draft EIS) for public review and comment for the proposed Micron New York Semiconductor Manufacturing Project, and associated connected actions. On November 5, 2025, OCIDA accepted a Final Environmental Impact Statement (FEIS).

With regards to the Municipal Treatment Train (MTT), on October 14, 2025, Onondaga County Department of Water Environment Protection (WEP) issued a Notice of Intent to Be Lead Agency for the purpose of conducting a coordinated environmental review under SEQR. DEC was listed as an involved agency and received a lead agency coordination letter from WEP on August 11, 2025. WEP issued a negative declaration on September 29, 2025.

WEP and OCIDA are independently responsible for following the requirements of SEQRA. DEC holds authority for issuing statewide regulations regarding the SEQR process, along with other duties, such as providing informal guidance and resolution of lead agency disputes. However, DEC does not enforce or review the SEQR process by other agencies and cannot provide formal legal opinions about other agencies' SEQR process.

## B. SPDES permit timing is premature

Comment: DEC received several comments that public notice of the draft SPDES permit is premature based on information shared publicly at the time of notice.

Response: Irrespective of project delays, Article 70 of the Environmental Conservation Law (ECL) establishes uniform review procedures for DEC's major regulatory programs and time periods for DEC action on permits under such programs, including State Pollutant Discharge Elimination System (SPDES). 6 NYCRR Part 621 implements ECL Article 70, the Uniform Procedures Act (UPA), and defines the time periods which DEC must follow when processing a permit application. DEC's final decision on Onondaga County's SPDES permit application must comply with the timeframes established within 6 NYCRR 621.10. Additionally, prior to construction of the modified treatment system and in accordance with 6 NYCRR 750-2.10, the permittee must have an issued SPDES permit and an approved or accepted design. The design of the system must conform to design standards accepted by DEC. The permittee needs time in between permit issuance and the start of construction to complete the design and accommodate the permit requirements. Onondaga County submitted a permittee-initiated modification request and presented sufficient project information in the application to develop permit phases that are protective of all applicable water quality standards and guidance values.

## C. Extend the public comment period

Comment: DEC received several comments requesting extensions to the public comment period to allow for more time to review documents related to the permit.

Response: Pursuant to 6 NYCRR 621.7(b)(6)(ii) and (iv), the timeframe for review and comment for a SPDES permit application shall not be less than 30 days after publication of the notice of complete application. The public comment period for the Oak Orchard Wastewater Treatment Plant SPDES permit exceeded the minimum. DEC also held two virtual public comment hearings.

### D. Hold public information sessions

Comment: DEC received several comments requesting DEC hold public informational meetings.

Response: 6 NYCRR Part 621 does not require public informational meetings. The SPDES permit application was made available in digital format on Onondaga County's website, in hardcopy at four local libraries, and at the DEC region 7 Syracuse office. The County continues to maintain the OCDWEP website (https://onondaga.gov/wep/public-review-documents/) for the Public Review materials associated with the Oak Orchard Wastewater Treatment Plant Permitting Documents. See also response to comment I.C regarding public notice.

### E. Clarify the overall project schedule, cost, and timing of compliance

Comment: DEC received several comments requesting a clearer and more detailed overall schedule for the permit and timing of compliance, and more information regarding impacts to sewer rates.

Response: No changes were made in response to this comment. The phases of the permit are based on the NY-2A application and reflect major milestones for both the ITT construction and the MTT upgrades. As described in the fact sheet, the permit limits will protect water quality through all phases of the permit. DEC does not require completion of the construction or upgrades by any predetermined date and as such, the SPDES permit does not include an overall project schedule. See response to comment I.B.

If Onondaga County expects changes to any major milestones in the permit, they will need to submit a permit modification request.

Sewer rates are outside the scope of the SPDES permit review.

### F. Clarify all inflows and outflows to the wastewater treatment plant

Comment: DEC received several comments regarding discrepancies between the various flow rates and statistics provided in the SPDES application materials and the Micron Final Environmental Impact Statement (FEIS).

Response: The SPDES permit represents flow rates and statistics only for the proposed design of the ITT and the upgraded MTT, which will accept

wastewaters from Micron FAB1 and FAB2. The FEIS represents flow rates and statistics for the total Micron project, including FABs 1 through 4. However, changes were made to the fact sheet in response to this comment to make this distinction. The limits for flow in the SPDES permit reflect the 30-day average design capacities of the ITT and the upgraded MTT. These do not represent the maximum or peak flows received by either the ITT or upgraded MTT and, therefore, are different than flows given in the FEIS. DEC added a water balance diagram to the fact sheet demonstrating all inflows and outflows to the Oak Orchard Wastewater Treatment Plant reflective of complete construction of the ITT and the MTT upgrades.

## G. Include permit limits for additional non-PFAS parameters

Comment: DEC received several comments regarding lack of discharge limits or monitoring for additional non-PFAS parameters including: tetramethyl ammonium hydroxide (TMAH); azoles including 1,2,4-triazole; 3-methoxy-3-methyl-1-butanol; polyethylene glycol; methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); and ethylene diamine tetraacetic acid (EDTA).

Response: Changes were made to the fact sheet in response to this comment. DEC added a reasonable potential evaluation to the fact sheet for the following parameters in the pollutant summary table: 1,2,4-triazole; 6-methylbenzotriazole; 3-methoxy-3-methyl-1-butanol; polyethylene glycol; and methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1). However, based on the results of the reasonable potential analysis, the permit does not require monitoring or include effluent limitations for these parameters.

As already discussed in the fact sheet, page 45, TMAH is expected to be absent in the effluent (<10 ug/L) and does not trigger reasonable potential. There are also no approved test methods under 40 CFR Part 136 for TMAH or Quaternary Ammonium Compounds (QACs) to confirm effluent levels. The fact sheet language now includes an additional statement on the permit strategy for requiring Whole Effluent Toxicity (WET) testing during the various phases to protect water quality in the absence of approved test methods.

Based on the NY-2A application, EDTA is not expected to be a parameter of concern in the influent to the ITT. Thus, the SPDES permit does not authorize the discharge of EDTA [reference 6 NYCRR 750-1.2(29)]. If Onondaga County determines that EDTA could become present in the influent to the ITT, due to a proposed use by an industrial user, the County would review the discharge request in accordance with its approved Industrial Pretreatment Program (IPP). Pursuant to 6 NYCRR 750-2.9(a)(1), the County would then need to provide adequate notice to DEC of a substantial change in character of pollutants to the POTW.

## H. Require an earlier industrial pollutant scan

Comment: DEC received several comments that the industrial pollutant scan be conducted prior to commencing operation of the ITT, instead of being required within the first 60 days after the initial receipt of wastewater to the ITT.

Response: Minor changes were made to the permit language pertaining to the industrial pollutant scan, but the substantive requirement remains unchanged. The purpose of the industrial pollutant scan is to capture the treatment performance of the ITT and confirm the effluent quality matches the assumptions from the NY-2A application and permit development. Requiring Onondaga County to perform the industrial pollutant scan before a sufficient startup period would only provide inconclusive information and impose additional costs on Onondaga County without benefit.

Note that the permit requires Onondaga County submit the results of the initial industrial pollutant scan within 60 days following initial receipt of process wastewater to the ITT. This means that the County will need to sample a sufficient amount of time before then to allow for laboratory analysis and reporting.

## I. Evaluate and eliminate PFAS discharge

Comment: DEC received several comments requesting that DEC explain whether the potential PFAS discharges would violate narrative water quality criteria.

DEC received several comments requesting elimination of the discharge of PFAS into NYS waterways. Some commenters requested prohibition on discharges containing PFAS at concentrations exceeding “background levels.” Some commenters requested a zero-discharge goal for all PFAS from industrial sources connected to the Oak Orchard Wastewater Treatment Plant, including Micron.

DEC received several comments requesting that DEC require the use of specific pollution control methods to limit the discharge of PFAS and other toxic parameters. Some commenters specifically requested that DEC require the use of treatment technologies which destroy rather than transfer PFAS.

Response: No changes have been made to the permit in response to these comments. The narrative water quality standard for toxic and other deleterious substances under 6 NYCRR 703.2 states “[n]one in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.” Through updates to Technical and Operational Guidance Series (TOGS) 1.1.1, DEC established water quality guidance values for PFOA and PFOS for specific waterbody

classes to protect the waters for their best usages. As described in the fact sheet, the Oak Orchard Wastewater Treatment Plant discharges to the Oneida River, which is a class B waterbody. The chronic aquatic guidance value of 160,000 ng/L for PFOS applies to class B waterbodies. Based on the NY-2A application, the current maximum reported concentration of PFOS in the Oak Orchard Wastewater Treatment Plant effluent is 16 ng/L. Therefore, there is no reasonable potential for the Oak Orchard Wastewater Treatment Plant to exceed the guidance value for PFOS. There is no applicable guidance value for PFOA to class B waterbodies (TOGS 1.1.1).

While there is no reasonable potential to violate current water quality criteria, DEC included in the permit action levels for PFOA and PFOS consistent with the conservative permitting strategy outlined in TOGS 1.3.14 "Publicly Owned Treatment Works (POTWs) Permitting Strategy for Implementing Guidance Values for PFOA, PFOS, and 1,4-dioxane." The action levels included in the permit for PFOA and PFOS represent DEC's current assessment of background levels. If these action levels are exceeded, the permit requires Onondaga County initiate a track down program aimed at identifying and minimizing or eliminating these contaminants at their sources.

The design of the system must conform to design standards accepted by DEC (6 NYCRR 750-2.10). Therefore, the SPDES permit does not require specific treatment technologies or elimination of the discharge.

## J. Expand PFAS monitoring locations, frequencies, methods, and limits

Comment: DEC received several comments requesting PFAS monitoring be required at more locations, higher frequencies, and with additional methods. Permit limits were requested for all PFAS present in the ITT effluent.

Response: No changes have been made to the permit in response to this comment. See response to comment I.I with respect to PFOA and PFOS. The permit requires monitoring and reporting for the remaining PFAS compounds that can be analyzed using U.S. Environmental Protection Agency (EPA) Method 1633/1633A, currently recommended by EPA for use in individual permits. Quarterly monitoring, as required by the permit, is consistent with guidance from EPA and TOGS 1.3.14. When action levels are exceeded, more frequent monitoring, additional monitoring locations, and additional test methods are required through the track down program.

## K. Develop PFAS minimization and management plans with each SIU

Comment: DEC received several comments requesting DEC and Onondaga County develop a PFAS minimization and management plan with each significant industrial user (SIU), including Micron, with the

following components: comprehensive PFAS inventories identifying uses or generation of PFAS and final deposition; analytical standards for every PFAS parameter; monthly PFAS monitoring before and after pretreatment using EPA Methods 1633 and 1621; replacement of PFAS with safer, non-PFAS alternatives when feasible; and reporting of all data within 30 days of sampling.

Response: Onondaga County implements an EPA-authorized Industrial Pretreatment Program that requires actions by their SIUs to ensure Onondaga County's compliance with all of its permit requirements, including PFOA and PFOS action levels. See responses to comments I.I and I.J.

## L. Include permit provisions for solid waste disposal

Comment: DEC received several comments requesting that the permit include provisions for managing solid wastes, including limits and a detailed PFAS waste management plan addressing PFAS in solid wastes produced by the ITT.

Response: The SPDES permit authorizes the point source discharge of treated wastewater into the Oneida River. The SPDES permit does not authorize disposal of solid waste.

Although outside the scope of the SPDES permit review, any transporter and solid waste facility that accepts solid waste generated by the treatment plant must follow the criteria outlined in the 6 NYCRR Part 360 Series regulations. This includes regulation of both transport under Part 364 and the end use destination, such as a landfill regulated under Part 363. The characteristics of the solid waste (e.g., quantity, pollutants present, etc.) play a role in determining how the material can ultimately be managed.

Action levels for PFOA and PFOS, and the subsequent track down program, are also implemented to prevent passthrough or interference with the operations of the plant, including interference with solids handling.

## M. Institute a long-term PFAS monitoring program for the Oneida River

Comment: DEC received several comments requesting that DEC implement routine monitoring for fish, sediments, biota, and ambient water quality for PFAS upstream and downstream of Outfall 001, as well as establish a long-term monitoring plan to track PFAS discharges in the Oneida River and downstream waterbodies.

Response: No changes were made in response to this comment. While outside the scope of the SPDES permit review, DEC's water quality monitoring strategy consists of multiple statewide programs, which collect and analyze data to inform decisions and address monitoring objectives,

consistent with state and federal laws and regulations. More information on this strategy can be found on DEC's Monitoring Program Design webpage. DEC, in consultation with EPA Region 2, conducts periodic reviews of the monitoring program strategy to determine how well the program serves water quality decision-making needs for all NYS waters, and meets the requirements from EPA.

## N. Ensure timely modification and renewal of the permit

Comment: DEC received several comments requesting that DEC commit to reviewing and renewing the permit on schedule, and ensure the permit includes mechanisms to account for changes in effluent limits, monitoring requirements, or treatment technologies that may evolve over time.

Response: Pursuant to 6 NYCRR 621.11(b) and 750-1.16(a), applications for renewal of SPDES permits must be submitted to DEC no less than 180 days prior to permit expiration. Pursuant to ECL 17-0817(4) and 6 NYCRR 750-1.19(c), the Environmental Benefit Permit Strategy (EBPS) establishes procedures to manage SPDES permit renewal applications in a manner that prioritizes permits based upon their potential or actual impact to the environment. In relevant part, TOGS 1.2.2, provides guidance for renewing, modifying, priority ranking and tracking existing SPDES permits using the EBPS system. Consistent with the categories beginning on page 21 of TOGS 1.2.2, certain SPDES permits are placed on a No Administrative Renewal List and are not administratively renewed. Instead, pursuant to section 401(2) of the State Administrative Procedure Act (SAPA), and 6 NYCRR 621.11(l), when a timely and sufficient application for renewal of a permit for an activity of a continuing nature is submitted, the existing permit does not expire until DEC has made a final decision on the renewal application. This is otherwise known as SAPA extended. Since OOWWTP meets categories #3 and #4 on page 22 of TOGS 1.2.2, the permit will not be administratively renewed but is eligible for SAPA extension.

Furthermore, pursuant to 6 NYCRR 750-2.9(a)(1), all Publicly Owned Treatment Works (POTWs) must provide adequate notice to DEC of substantial changes in volume or character of pollutants to the POTW. If DEC determines that a modification of the permit is necessary to assure maintenance of water quality standards and guidance values or compliance with other provisions of ECL Article 17, 6 NYCRR Part 750, or the Clean Water Act, then DEC may propose such a modification per 6 NYCRR 750-1.18(b) and 2.9(a)(2). Unless DEC determines that such permit modification is unnecessary, the noticed act is prohibited until the permit has been modified pursuant to 6 NYCRR Parts 621 and 750.

### O. Make all monitoring data available to the public

Comment: DEC received several comments requesting that all routine monitoring data and pollutant scan results be made publicly available online upon collection.

Response: Data from monthly Discharge Monitoring Reports (DMRs) may be downloaded using the NPDES Monitoring Data Download tool found at EPA's Enforcement and Compliance History (ECHO) site: https://echo.epa.gov/trends/loading-tool/get-data/monitoring-data-download.

Emerging contaminant monitoring will be required by the permit at Outfall 001 beginning with the effective date of the new permit, and Outfall 01B upon commencement of Phase 2 of the permit when Outfall 01B becomes active. In accordance with 6 NYCRR 750-2.5(e), the permittee is required to report emerging contaminant monitoring data on monthly DMRs.

In accordance with 40 CFR 122.21(j)(4)(vi) and 6 NYCRR 750-1.7(d), the permittee must submit the biennial pollutant scan data to DEC with its SPDES permit application. Pursuant to 6 NYCRR 750-1.23(a), effluent data and SPDES permit applications - encompassing the biennial pollutant scan - shall not be held confidential. Furthermore, sampling data is available to DEC pursuant to 6 NYCRR 750-2.1(i) and 750-2.5(c)(4).

Additionally, the Division of Water PFAS and 1,4-Dioxane Information Portal provides emerging contaminant monitoring data collected through SPDES permit applications as well as data collected through our ambient waters monitoring program.

## II. Specific Comments

### A. Characterize the 'bridging project' wastewaters

Comment: "Needing clarification is exactly what these 'bridging projects' are and whether Micron is being allowed to discharge to OOWWTP industrial process water which potentially contains hazardous materials such as PFAS or poly- and per-fluorinated substances. If so, how will the WWTP prevent release to the environment of these toxic substances prior to the IWWTP being completed?"

Response: No changes were made in response to this comment. The 'bridging project' is also referred to as the "maintenance of plant operations" or MOPO project and corresponds with Phase 1 of the SPDES permit. The MOPO project is described in the NY-2A permit application. Phase 1 activities are described in the Facility Information section of the fact sheet. Based on the NY-2A permit application, the wastewater to be discharged by Micron, and its construction contractors during the MOPO project, will consist of sanitary wastewater. If Onondaga County receives a request to receive industrial or construction-related wastewater during the

MOPO project, the County would review the discharge request in accordance with its approved IPP. Pursuant to 6 NYCRR 750-2.9(a)(1), the County would then need to provide adequate notice to DEC of a substantial change in character of pollutants to the POTW.

### B. Confirm no significant adverse effects on water resources

Comment: "[I]s this statement 'discharges from operation of the IWWTP are not anticipated to result in significant adverse effects on water resources' correct? And what about discharges from the OOWWTP prior to the completion of the IWWTP when OOWWTP is expected to receive, according to Micron and WEP, "Construction + Startup WW"?"

Response: No changes were made in response to this comment. The permit was drafted based on information submitted in the application and is protective of all applicable water quality standards and guidance values. Thus, the permit is not anticipated to result in significant adverse effects on water resources during all phases of the project.

### C. Clarify the design approval process

Comment: "Although the Draft Permit itself does not mandate specific control technologies, the permit does indicate that Oak Orchard will have to submit construction completion certificates for the 'approved design' of the Municipal Treatment Train (MTT) upgrades and the newly constructed 'Industrial Treatment Train' (ITT). (Draft Permit, pp. 42-44). Because the ITT design is critical to understanding PFAS control, DEC should specifically reference the approved design or, if the design is still in development, the process for approving the final design as part of this permit."

Response: See responses to comments I.B and I.E. On 11/21/2025, DEC approved [6 NYCRR 750-1.2(a)(8)] the Basis of Design Report for the ITT and MTT upgrade. The Basis of Design Report constitutes the "approved design" as referenced by the commenter.

### D. Clarify impact of PFAS on downstream drinking water (Lake Ontario)

Comment: "The Department needs to be proactive to prevent the introduction of new sources of PFAS [to Lake Ontario]. …Has there been any modeling to determine the probabilities for hazardous substances to enter public water supplies withdrawn from Lake Ontario? If not, why not?"

Response: In completing the reasonable potential analysis for this effluent discharge, DEC considered impacts to downstream drinking waters. Although the analysis didn't show reasonable potential to violate the guidance values in Lake Ontario, DEC is establishing action levels as a conservative approach to ensure protection of downstream waters, including drinking waters. See response to comment I.I.

## E. Clarify Industrial Pretreatment Program PFAS restriction authority

Comment: "The Draft Permit references the Industrial Pretreatment Program and the likely restrictions that program will impose on Micron's discharges to Oak Orchard (pp. 39 – 41), although there is no substantive discussion of the likely controls that would be imposed under this program. …In this case, the Draft Permit for Oak Orchard does not include discharge limits for the vast majority of PFAS compounds (38 of the 40 listed compounds). Accordingly, discharge of these unregulated compounds cannot result in pass through or interference, as defined by EPA regulations, and Oak Orchard is not directly authorized by these regulations to set TBLLs [technology based local limits] or pretreatment standards for PFAS compounds other than PFOA and PFOS. …it is not clear how or whether Oak Orchard can require restrictions on the discharge of PFAS compounds other than PFOA and PFOS. If Oak Orchard cannot impose restrictions on Micron's PFAS discharges under the Industrial Pretreatment Program, DEC should ensure that Oak Orchard can, through its own treatment processes, effectively remove whatever PFAS compounds are likely to be contained in Micron's industrial discharges. If DEC believes that Oak Orchard can impose restrictions on Micron's PFAS discharges under the Industrial Pretreatment Program, it should include specific language setting out the basis for that authority and potential restrictions that could be imposed."

Response: See responses to comments I.K and I.L.

## F. Consider local geological conditions during design review

Comment: "Whether or not named as 'Karst', we need to be aware, ground failure issues will likely prevail here, esp. as impacting pipes. … The County has been facing many wastewater issues in recent years, despite their 'Save-the-Rain' program. I think this is partly due to soils, climate changes and possibly the County's mismanagement. CNY generally has many soils which tend to be more prone to movement from weather / climatic extremes, as in wet / drought and freeze / thaw."

Response: No changes have been made in response to this comment. See response to comment I.B. In accordance with state standards and 6 NYCRR 750-2.10, engineering reports, plans, and specifications shall be prepared by a person or firm licensed to practice professional engineering in the State of New York. Typical wastewater treatment design elements include soil and geotechnical considerations, but these are generally outside the purview of DEC's review as they do not directly relate to wastewater treatment or capacity.

### G. Clarify air permitting for the OOWWTP

Comment: "Onondaga posted for public review a 411 page EAF pdf document related to the OOWWTP upgrade, but it contains very little information about the proposed expansion/upgrade of Oak Orchard except for the very perplexing appended 'Technical Memo on Air Permitting Strategy (by Brown and Caldwell)' for the OOWWTP upgrade which includes information about the conceptual design for the IWWTP. I'm perplexed by this attachment since this EAF by the applicant is for the municipal plant, not the IWWTP. And while this air permitting technical memo implies that an air permit will be needed for the IWWTP, there is yet to be seen an application for the air permit and yet the SPDES permit is proceeding. I'd like an explanation for this. If an air permit is needed why is the SPDES permit being processed independently?"

Response: No changes were made in response to this comment. The most recent Climate Leadership and Community Protection Act (CLCPA) analysis submitted for the upgraded OOWWTP indicates facility emissions fall within the thresholds for an air facility registration (AFR). The County submitted an AFR application to DEC on October 10, 2025 and can be found on the County's website at: FINAL OOWWTP Registration Application 101025.pdf

## III. Permittee Comments

### A. Allow reconsideration of the low flow statistics for the Oneida River

Comment: "The existing discharge limits based on protection of chronic surface water quality were calculated using a 7Q10 of 183 cubic feet per second (cfs). This is presented in the Drainage Basin Ratio table on page 12 of the Fact Sheet. The 7Q10 is the lowest 7-day average flow that occurs (on average) once every 10 years. However, the most complete record of Oneida River gage data shows the 7Q10 as being 192 cfs. There is also indication that this low 7Q10 value may be an artifact of the managed aspects of the Oneida River. As this project progresses, future SPDES permit modifications will use the most up to date 7Q10 for establishment of water quality-based discharge limits for chronic protection. It is the County's understanding that this will not be considered antibacksliding or antidegradation."

Response: No changes have been made in response to this comment. The 7Q10 value of 183 cfs, as presented in the draft permit and fact sheet, correctly represents the gage data from USGS for the period of record. If additional information becomes available to support the application of a different low flow value, the permittee can submit a permit modification to DEC. And if that permit modification results in higher dilution, less stringent limitations may be justified under 750-1.10(c)(2)(i).

## B. Apply total dissolved solids limit as a monthly average

Comment: "Starting in Phase 2, Outfall 001 has a 760 mg/L daily maximum total dissolved solids (TDS) discharge limit. We request DEC consider changing this limit from daily maximum to monthly average. The 6 NYCRR Part 703 narrative type regulation allows for this. For example, Dissolved Oxygen narrative has the wording "at any time" which leads to interpretation as a maximum requirement, however the TDS narrative standard does not include that wording or any specification as to whether it should be an average or a maximum. NYSDEC has also issued a monthly average TDS limit for at least one other SPDES permit. As such, we request the monthly average to be based on the mixing zone established as part of the anticipated new outfall."

Response: No changes have been made in response to this comment. The water quality standard states that dissolved solids "[s]hall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L" (6 NYCRR 703.3). Consistent with the process described in TOGS 1.1.1, Part I, section C.3.a. for pollutants based on shorter-term adverse effects, a monthly average limit of 760 mg/L would not ensure continual compliance with the water quality standard for dissolved solids because there may be times, during that month, when the effluent is in excess of the calculated water quality based effluent limit. The limit for TDS is therefore applied as a daily maximum[1] to ensure compliance with the water quality standard.

The comment did not identify which other SPDES permit contains a monthly average TDS limit. Therefore, DEC cannot evaluate that SPDES permit or the commenter's assertions.

## C. Define "adequate notice" in the Industrial Pretreatment Program

Comment: "Under new Industrial Pretreatment Section E, item 1, a and b, there is a requirement to provide adequate notification of a material change. The definition of adequate notice is not defined. The County requests this be defined as 30 days."

Response: Changes have been made to the permit in response to this comment. The permit now requires that the permittee give 30 days' notice of a material change related to that section of the Industrial Pretreatment conditions. EPA also accepted this change in correspondence with DEC.

## D. Apply a less stringent 12-month rolling average mercury limit

Comment: "OCDWEP endeavors to discharge wastewater protective of our waterways. As recognized by NYSDEC in its Technical and Operational Guidance Services (TOGS) 1.3.10 Mercury State Pollutant

[1] 6 NYCRR 750-1.29(a)(26) *Daily maximum* means the highest allowable daily discharge for the reporting period.

Discharge Elimination System Permitting and Multiple Discharge Variance (MDV), mercury present at part per trillion levels or nanograms per liter (ng/L) levels cannot economically treated by publicly owned treatment works (POTWs), and continues to be present in statewide precipitation at about a 12 nanograms/Liter (ng/L) level and at similar levels in our lakes and rivers.

While POTWs are passive recipients of mercury present in sanitary wastewater, properly operated and maintained activated sludge POTWs, by their nature, already remove 85 to 99% of influent mercury and often discharge water with lower mercury concentrations than the receiving waterbody in New York State. POTWs follow their MMP requirements, but influent loadings are still variable because mercury can be discharged from any connection and cannot be controlled. Establishment of very low discharge limits, based on 'past performance', fails to recognize this inherent variability and inability to control the sources. These values, due to the nature of testing, rely on grab samples as well, which may not truly represent the range of mercury loadings, yet SPDES permit compliance will be based on these data.

The current discharge limit for OOWWTP is 50 ng/L, and mercury is often below analytical detection levels. However, several factors need to be considered in establishing the 12-month rolling average discharge limit for OOWWTP. These factors should be considered:

1. Regional or service area growth;
2. The potential for water reuse, and;
3. The inability to control some sources of mercury.

NYSDEC has proposed a 12-month rolling average discharge limit for mercury at Outfall 001 of 1.4 ng/L. This is based on achieving a mercury discharge concentration equal to the existing effluent quality (EEQ) calculated from the lognormal 95th percentile of mercury effluent samples collected over the past few years. This limit, however, fails to recognize the three factors listed above, and makes the possibility of providing reuse water to an industrial user challenging and cost prohibitive.

As part of its commitment, some level of reuse of municipal and ITT effluent is anticipated. The New York State's Green CHIPS Program has sustainability incentives. As part of these incentives, the State's Green CHIPs Sustainability Template requires that "participants … implement water conservation and efficiency measures. Such measures should target at least 75 percent water conservation by 2030 through reduction and avoidance measures, as well as through reuse, recycling, and restoration".

POTW effluent for reuse/recycling for industry is often treated with very fine filtration (e.g., reverse osmosis). These filtration units generate a reject or backwash, which generally contains most of the parameters remaining in the treated POTW effluent. For large flows of this reject,

subsequent treatment for mercury removal would be cost prohibitive and essentially precludes reuse as a sustainability initiative.

To address these considerations, Onondaga County requests that the Outfall 001 12-month rolling average mercury discharge concentration be revised to the GLCA of 25 ng/L as identified in NYSDEC's draft Division of Water (DOW) 1.3.10 Mercury – Multiple Discharge Variance. The proposed 12-month limit of 1.4 ng/L will impact the ability to provide reuse water to users while the MTT/MOPO are operational. The County requests that a future 12-month rolling average discharge limit be established based on future performance of the ITT and MTT at Outfall 001 while providing reclaim water.

The County also reserves the right to request an individual discharge variance for mercury."

Response: No changes have been made in response to this comment. As explained throughout DOW 1.3.10, the goal of the multiple discharge variance is to work towards compliance with the mercury water quality standard of 0.7 ng/L. Setting the 12-MRA based on a facility's performance holds the facility to their existing mercury concentration. With implementation of the MMP track-down and minimization, the 12-MRA is expected to decrease over time.

Setting the 12-MRA at a value of 25 ng/L[2] would allow OCDWEP to increase the mercury being discharged to the Oneida River from 1.4 ng/L (current performance) to 25 ng/L and does not demonstrate progress towards meeting the water quality standard. Any growth in the service area, or additional industrial users, must be able to meet the existing mercury concentration values to maintain compliance with the 12-MRA.

As explained in footnote 25 in III.G.2.b. of DOW 1.3.10, EPA's Technical Support Document for Water Quality Based Toxics Control, 1991 (TSD) outlines the methodology used to establish a 12-month rolling average (12-MRA) effluent limitation based on a facility's "past performance." The data set used to develop the 12-MRA represents existing operational conditions including controllable and uncontrollable sources in the collection system. The TSD methodology accounts for variability in the data set. Any increase in effluent mercury concentrations due to operation of the water reuse systems constitutes a controllable condition. Any water reuse must be done in a way to hold the facility at their existing performance and continue to show progress towards the water quality standard.

While atmospheric deposition has continued to measure mercury around 12 ng/L, DEC disagrees that we see "similar levels in our lakes and

[2] The 25 ng/L GLCA, from the draft DOW 1.3.10 (issued on 12/30/25), is not applicable to OCDWEP. The 50 ng/L GLCA, in OCDWEP's SPDES permit, followed DOW 1.3.10, effective 12/30/20. Regardless, a GLCA does not replace an EEQ-based 12-MRA.

rivers." The average concentration measured in waterbodies across NYS is only 1.9 ng/L (DOW 1.3.10, page 7 of 39).

Mercury is typically sampled as a grab sample because composite sampling must be done in the laboratory with individually collected grab samples and adds a complexity and cost that may not be necessary. Permittees can elect to perform additional grab sampling and lab compositing consistent with 6 NYCRR 750-2.5(a)(2)(ii).

## E. Modify the footnote for the boron action level at Outfall 001

Comment: "Footnote 4 (FN) indicates that if the boron action level was exceeded and confirmed, the permittee shall 'employ actions to reduce concentrations present in the discharge'. While this is a laudable goal, an exceedance of the action level may not warrant parameter reduction provided water quality is protected. For example, the action level may be only slightly exceeded, and in that case a permit discharge limit may be the appropriate regulatory action. We request that this portion of the FN be removed because FN4 already contains requirements for monitoring and analysis if the action level is exceeded."

Response: In response to this comment, DEC removed language requiring the permittee to "employ actions" to reduce effluent boron levels.

## F. Clarify disparate units in representation of ammonia limits

Comment: "It appears that the summer and winter load reductions at the bottom of page 3 of 91 are presented in 2 different units. For example, the current 307 lb/d of total ammonia (NH3) is presented, while the future Phase 4 limit of 205 lb/d presented is ammonia as nitrogen (NH3-N). Please provide a description that indicates that the 307 lb/d of total ammonia is such, and that the 205 lb/d is ammonia as nitrogen."

Response: Changes have been made to the fact sheet in response to this comment. DEC corrected the ammonia units in the Summary of Permit Changes section of the fact sheet (page 3).

## G. Correct errors in the Facility Information section of the fact sheet

Comment: "On page 6 of the fact sheet, the following three items require adjustment:

- Bullet #3 lists two primary clarifiers when Oak Orchard currently has four primary clarifiers.
- Bullet #4 lists one HPO aeration tank when Oak Orchard currently has two HPO aeration tanks.
- Bullet #5 lists three secondary clarifiers when Oak Orchard currently has six secondary clarifiers."

Response: Changes have been made to the fact sheet in response to this comment. DEC corrected that information in the Facility Information section of the fact sheet (page 6).

From: Aidan Craner
To: dec.sm.Comments.OakOrchard2025
Subject: Water Quality Permitting: Oak Orchard wastewater treatment plant (SPDES Permit # NY0030317; DEC 7-3124-00018/00001)
Date: Thursday, December 11, 2025 7:05:04 PM



To whom it may concern,

First, the permit comment period should be extended. The agency has released for public comment three permits related to the Oak Orchard wastewater plant in addition to this air permit for Micron. This comes on the heels of the release of the final EIS, and public hearings held by the county's industrial development agency, all related to Micron. The time of year could not be worse—the holiday season when the public is traveling or otherwise preoccupied with family and other community events. A 6-month extension is therefore requested.

Adequate and thoughtful public input for this permit is not possible given the scope of the permits and the length of the draft permit documents and the volume of supporting documentation. The SPDES permit alone is 143 pages. There are nearly 20 supporting documents, including two lengthy engineering reports (1,425 pages). Commenters must download over 270 megabytes of material from the Onondaga County website JUST to get started. Again, a much longer commenting period is warranted due to the volume of materials which need to be reviewed to provide meaningful comments.

In addition, the Department can and should hold informational meetings to engage with the public in a meaningful way. I recommend at least three such meetings. Onondaga County WEP Dept. staff and the design consultants should be brought in to describe the proposed wastewater treatment processes.

Secondly, the wastewater discharge permit is premature. The public was informed on November 8th that construction of the memory chip factories would be delayed by two to three years. According to the Micron Final EIS, the construction of the Onondaga Co wastewater treatment facilities at Oak Orchard are slated to begin in the fourth quarter of 2027, a full two years from now. There is ample time available to consider comments and release a final permit. The Department has been in no rush to renew the SPDES permit for the existing Oak Orchard wastewater treatment plant. That permit expired on June 30, 2019.

Third, I am disappointed to see that:
1) Testing for PFAS (per- and polyfluorinated alkyl substances) is limited to four times per year. Moreover, this testing is limited to only 40 compounds
2) No quantitative limits are imposed on any of the 40 compounds tested. Rather, "action levels" are set at 10 ng/L only for PFOA and PFOS. Neither PFOA nor PFOS are currently used by the semiconductor industry.

Thirdly, the SPDES permit needs to be revised to adequately monitor and eliminate the discharge of PFAS into our waterways. Our waterways, which includes Lake Ontario, already are burdened with dangerously high levels of PFAS. Lake Ontario provides drinking water for

over 8 million people in the U.S. and Canada. The Department needs to be proactive to not allow the introduction of new sources of PFAS.

Testing for forty compounds is simply inadequate because there are hundreds if not thousands of PFAS compounds produced in the semiconductor manufacturing process. Therefore we urge the DEC to require the applicant to regularly test (at least weekly) for Total Organic Fluorine in the effluent from the Industrial Wastewater Treatment Plant (Outfall 01A). Monthly testing should be required for the 40 PFAS compounds in Method 1633, supplemented by non-targeted PFAS analysis to identify unlisted compounds found in semiconductor water. Discharge limits need to be imposed on those PFAS which are present in the IWWTP wastewater. The Department should consult with other state agencies with experience regulating PFAS in wastewater. Minnesota, in particular, has developed robust monitoring strategies for the 3M plant at Cottage Grove.

There is simply not enough planned oversight in place to make it so the Micron campus does not negatively impact the health and well-being of all those around it. We already live in an area with significantly higher rates of Parkinson's, Multiple Sclerosis, and certain cancers linked to our history in the rust belt and the forever chemicals and toxic metals that already contaminate our environment. We do not need more. I am not opposed to economic growth, I am opposed to economic growth at the expense of the people that live here. We need a more comprehensive and enforceable plan to ensure that none of the waste from this plant makes it into the surrounding environment. If it is not possible, then we should not be willing to risk the lives and well being of everyone in this area for uncertain economic gain. At the very least, this needs more transparency and more time for the public to read, research, and comment on this. Everything needs to be accessible and public and released with enough time to allow for review. We live here, pay taxes here, and work here. If this is for our benefit, then before this moves forward we need to know definitively it won't impact our health.

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Be as you have always been,
**Aidan Craner**
*B.S. Ecology and Evolutionary Biology*
*University of Rochester Class of 2025*
*acraner03@gmail.com*

From: Studio
To: dec.sm.Comments.OakOrchard2025
Subject: Oak Orchard
Date: Tuesday, December 9, 2025 11:53:21 AM



**Re: Upgrades to wastewater treatment systems to be expanded by Onondaga County at the Oak Orchard treatment facility** First, the permit comment period should be extended. The agency has released for public comment three permits related to the Oak Orchard wastewater plant in addition to this air permit for Micron. This comes on the heels of the release of the final EIS, and public hearings held by the county's industrial development agency, all related to Micron. The time of year could not be worse—the holiday season when the public is traveling or otherwise preoccupied with family and other community events. **A 6-month extension is therefore requested.**

Adequate and thoughtful public input for this permit is not possible given the scope of the permits and the length of the draft permit documents and the volume of supporting documentation. The SPDES permit alone is 143 pages. There are nearly 20 supporting documents, including two lengthy engineering reports (1,425 pages). Commenters must download over 270 megabytes of material from the Onondaga County website JUST to get started. Again, a much longer commenting period is warranted due to the volume of materials which need to be reviewed to provide meaningful comments. In addition, **the Department can and should hold informational meetings to engage with the public in a meaningful way.** I recommend at least three such meetings. Onondaga County WEP Dept. staffand the design consultants should be brought in to describe the proposed wastewater treatment processes. Secondly, **the wastewater discharge permit is premature.** The public was informed on November 8th that construction of the memory chip factories would be delayed by two to three years. According to the Micron Final EIS, the construction of the Onondaga Co wastewater treatment facilities at Oak Orchard are slated to begin in the fourth quarter of 2027, a full two years from now. There is ample time available to consider comments and release a final permit. The Department has been in no rush to renew the SPDES permit for the existing Oak Orchard wastewater treatment plant. That permit expired on June 30, 2019. Third, I am disappointed to see that: 1) Testing for PFAS (per- and polyfluorinated alkyl substances) is limited to four times per year. Moreover, this testing is limited to only 40 compounds 2) No quantitative limits are imposed on any of the 40 compounds tested. Rather, "action levels" are set at 10 ng/L only for PFOA and PFOS. Neither PFOA nor PFOS are currently used by the semiconductor industry. Thirdly, the SPDES permit needs to be revised to adequately monitor and eliminate the discharge of PFAS into our waterways. Our waterways, which includes Lake Ontario, already are burdened with dangerously high levels of PFAS. Lake Ontario provides drinking water for over 8 million people in the U.S. and Canada. The Department needs to be proactive to not allow the introduction of new sources of PFAS. Testing for forty compounds is simply inadequate because there are hundreds if not thousands of PFAS compounds produced in the semiconductor manufacturing process. Therefore we urge the DEC to require the applicant to regularly test (at least weekly) for Total Organic Fluorine in the effluent from the Industrial Wastewater Treatment Plant (Outfall 01A). Monthly testing should be required for the 40 PFAS compounds in Method 1633, supplemented by non-targeted PFAS analysis to identify unlisted compounds found in semiconductor water. Discharge limits
need to be imposed on those PFAS which are present in the IWWTP wastewater. The Department should consult with other state agencies with experience regulating PFAS in wastewater. Minnesota, in particular, has developed robust monitoring strategies for the 3M plant at Cottage Grove.

Best,
Alyson Shotz

| | |
|---|---|
| From: | Anna Smith |
| To: | dec.sm.Comments.OakOrchard2025 |
| Cc: | Meredith Stewart; Demarest III, William F.; Eric Romann |
| Subject: | JMA Comments on Draft State Pollutant Discharge Elimination System (SPDES) Permit Number NY0030317 |
| Date: | Tuesday, December 23, 2025 12:55:41 PM |
| Attachments: | JMA comment_Oak Orchard Wastewaster Treatment Plant NPDES Permit.docx.pdf |



To Whom it May Concern,

Please find attached Jobs to Move America's comments on Micron's Draft State Pollutant Discharge Elimination System (SPDES) Permit Number NY0030317.

Sincerely,
Anna Smith

**Anna N. Smith (she/her)**
**Senior Researcher**
**Jobs to Move America**
Brooklyn, New York
M: 570-706-6512 | JobsToMoveAmerica.org

Sign up for our newsletter!

December 23, 2025

Trendon Choe
Deputy Regional Permit Administrator
NYSDEC Region 7
5786 Widewaters Parkway
Syracuse, NY 13214

*Submitted via: Comments.OakOrchard2025@dec.ny.gov*

**Re: Comments on Draft State Pollutant Discharge Elimination System (SPDES) Permit Number NY0030317**

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On behalf of Jobs to Move America (JMA), in coordination with CHIPS Communities United (CCU) and the Center for Public Environmental Oversight (CPEO), we respectfully submit the following comments to the New York State Department of Environmental Conservation (NYSDEC) on the Draft New York State Pollutant Discharge Elimination System (SPDES) Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant.

JMA is a strategic policy center that works to transform public spending and corporate behavior using a comprehensive approach that is rooted in racial and economic justice and community organizing. We seek to advance a fair and prosperous economy with good jobs and healthier communities for all.

JMA is a member of CHIPS Communities United, which is a national coalition organizing for an equitable and sustainable semiconductor manufacturing industry. CCU includes labor, environmental, social justice, civil rights, and community organizations representing millions of workers and community members nationwide. Based in Silicon Valley, CPEO experts have been working to clean up the semiconductor industry since the 1970s.

To meet the wastewater needs of the expansive Micron Campus planned in Clay, NY, the Onondaga County Department of Water Environment Protection (OCDWEP) is proposing to undertake a series of wastewater infrastructure and capacity improvements.

The semiconductor industry is known to use and discharge a broad range of harmful chemicals, including per- and polyfluoroalkyl substances (PFAS). Given the serious risks these chemicals pose to human health and the environment, it is imperative that NYSDEC and OCDWEP thoroughly plan for and address PFAS discharges, especially as they relate to Micron.

As currently drafted, the pollution limits and monitoring requirements for PFAS are inadequate to protect water quality, the environment, and the health of workers as well as surrounding communities. We urge NYSDEC to strengthen PFAS monitoring, treatment, and minimization requirements in the Oak Orchard Wastewater Treatment Plant SPDES Permit.

## I. Background

*The Planned Micron Semiconductor Manufacturing Campus*

Micron New York Semiconductor Manufacturing LLC (Micron) is proposing an expansive new manufacturing operation located in the Town of Clay, NY. The approximately 1,377-acre site will consist primarily of four dynamic random-access memory (DRAM) manufacturing facilities (known as "fabs").[1] The construction of the campus is anticipated to take place in stages over approximately 16 years, with full production anticipated by 2045.[2]

The wastewater generated at Micron's facility will be pre-treated and then sent for specialized treatment at the Oak Orchard Wastewater Treatment Plant. Micron's wastewater discharges to the Oak Orchard Wastewater Treatment Plant will be required to meet the pretreatment program requirements of the Oak Orchard Wastewater Treatment Plant SPDES permit, which is the subject of the draft SPDES permit described herein.

*Summary of Draft SPDES Permit*

The Oak Orchard Wastewater Treatment Plant is a publicly owned treatment works (POTW) that receives flow from domestic and industrial users, including Micron, and stormwater from on-site areas at the Oak Orchard facility. To serve the planned Micron Campus, Onondaga County requests approval to modify this permit to expand and upgrade the municipal wastewater treatment train (MTT) and construct a new industrial wastewater treatment train (ITT) and water reclamation facility. Construction of the new ITT includes equalization and diversion tanks, influent screening, biological treatment in mixed anoxic tanks followed by aeration tanks, membrane bioreactors, UV disinfection, centrifugal solids dewatering, effluent reuse with ion exchange resin (IX) and reverse osmosis (RO).[3]

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[1] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Final.pdf (pg 0-1).

[2] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Final.pdf (pg 0-1).

[3] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025,

At full build out, the Oak Orchard Wastewater Treatment Plant will include: Outfall 001 of treated sanitary and process wastewater, Internal Outfall 01A of MTT treated sanitary and process effluent wastewater to Outfall 001, Internal Outfall 01B of ITT treated process effluent wastewater to Outfall 001, Outfall 006 of MTT effluent reuse wastewater to Micron, and Outfall 007 of ITT effluent reuse wastewater to Micron.[4] When all phases are completed, the draft permit modification would increase the total monthly average design flow from 10 MGD to 30.8 MGD.[5]

The Oak Orchard Wastewater Treatment Plant (Outfall 001) will discharge treated sanitary and process wastewater to the Oneida River. The segment of the Oneida River at the point of discharge is classified as B. Classification B indicates the best usage for swimming and other recreation, and fishing. However, the Oneida River is a tributary of the Oswego River and part of the Lake Ontario watershed, which serves as a critical drinking water source for millions of people.

*Summary of Project Phases*

The Oak Orchard Wastewater Treatment Plant proposed expansion and associated upgrades will be completed in a series of four phases:

> PHASE 1: At the beginning of Phase 1, no upgrades to the MTT and no portion of the new ITT will be completed. During Phase 1, additional equipment will be installed, including moving bed bioreactor (MBBR) tanks. The facility will receive influent wastewater at flow rates up to 13.3 MGD, exceeding the design flow rate of the existing MTT (10 MGD).
>
> PHASE 2: Phase 2 will begin when the first portion of the new ITT becomes operational. The design flow of the ITT at that time will be 8.25 MGD. The design flow of the MTT will remain at 13.3 MGD during Phase 2. The combined effluent flow rate for Phase 2 is thus 21.6 MGD. Beginning in Phase 2, all SPDES permit requirements, related to the new internal Outfalls 01A for the MTT and 01B for the ITT, become effective.

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https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

[4] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

[5] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

PHASE 3: Phase 3 will begin when the upgrades to the MTT are completed. The design flow rate for the MTT at that time will be 14.3 MGD. The design flow rate of the completed first portion of the ITT will still be 8.25 MGD at that time. The combined effluent flow rate for Phase 3 is thus 22.5 MGD.

PHASE 4: Phase 4 will begin when the second portion of the new ITT becomes operational. The total design flow of the ITT at that time will be 16.5 MGD. The design flow of the upgraded MTT will still be 14.3 MGD at that time. The combined effluent flow rate for Phase 4 is thus 30.8 MGD.

EFFLUENT REUSE: The construction of the effluent reuse systems for the MTT and the ITT will be completed after start-up of the respective treatment trains. The schedule of construction of the new reuse outfalls (Outfall 006 for the MTT effluent reuse system, and Outfall 007 for the ITT effluent reuse system) is independent from the phases described above.

*Significant Adverse Effects Associated with PFAS*

We are particularly concerned about the monitoring, treatment, and prevention of PFAS chemical discharges. According to the Environmental Protection Agency (EPA), PFAS are "an urgent public health and environmental issue facing communities across the United States."[6]

PFAS are a class of thousands of different human-made chemicals that contain one or more fully-fluorinated carbon atoms. Since their introduction in the 1940s, PFAS have been widely used in many manufacturing processes as well as countless consumer products. PFAS chemicals are notable because their carbon-fluorine bonds are very resistant to degradation, resulting in extremely long lifetimes. Known as "forever chemicals," PFAS are highly persistent and mobile in the environment, easily traveling through streams, rivers, and other water bodies, including drinking water sources.[7] This persistence acts as a force-multiplier for toxicity.

Because they break down very slowly, PFAS can easily bioaccumulate in human beings, wildlife, and the environment over time.[8] PFAS are highly toxic and linked to serious health problems, including damage to liver, thyroid, and pancreatic function; increased risk of high blood pressure

[6] EPA, PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

[7] Ian T. Cousins et al., Why is High Persistence Alone a Major Cause of Concern?, 21 Env't Sci. Process Impacts 781, 785 (2019), https://pubs.rsc.org/en/content/articlelanding/2019/em/c8em00515j

[8] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks

or pre-eclampsia in pregnant women; developmental delays; immune system harm; hormone disruption; increased cholesterol levels; and increased risk of kidney or testicular cancer.[9,10]

*PFAS Usage in the Semiconductor Industry*

The Semiconductor Industry Association (SIA) acknowledges the use of many PFAS compounds in semiconductor fabrication-related processes, including photolithography, wet chemical processing, plasma etch and deposition, assembly and packaging materials, among others.[11] Semiconductor manufacturers are known to use and discharge a wide array of PFAS, posing a "substantial risk for PFAS contamination of the environment."[12] One investigation at a semiconductor manufacturing facility detected 78,000 parts per trillion (ppt) of PFAS in wastewater from some samples, compared to EPA's proposed limit of 4 ppt for some PFAS in drinking water.[13]

Several PFAS-laden processes are anticipated to be used at Micron, including, but not limited to, photolithography and plasma (dry) etching processes. Appendix L of the MICRON Final Environmental Impact Statement (FEIS) provides an overview of the general uses of PFAS

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[9] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks

[10] CDC, *How PFAS Impacts Your Health*, https://www.atsdr.cdc.gov/pfas/about/health-effects.html?CDC_AAref_Val=https://www.atsdr.cdc.gov/pfas/health-effects/index.html

[11] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

[12] National Institute of Standards and Technology, Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf (C-15)

[13] Tom Perkins, "Industry acts to head off regulation on PFAS pollution from semiconductors" The Guardian (August 24, 2024) https://www.theguardian.com/environment/article/2024/aug/24/pfas-toxic-waste-pollution-regulation-lobbying

anticipated at Micron; however, the specific types of PFAS to be used are not provided, in part due to claims of proprietary information.[14]

Semiconductor production is an innovative and constantly evolving industry. Over the past two decades, semiconductor manufacturers have reduced or replaced the use of certain PFAS. For example, long-chain PFAS compounds, such as PFOS (perfluorooctane sulfonic acid), have been replaced by short-chain PFAS and the use of PFOA (perfluorooctanoic acid) has also been phased out.[15] As a result, by the time Micron begins operations, it is likely that even newer chemicals may be used and discharged. Therefore, it is critical the SPDES permit remains flexible to be able to account for ongoing changes in the semiconductor industry's use of PFAS.

The Conceptual Design Engineering Report reveals that "Micron stated ... that PFAS and mercury are anticipated in low concentrations in the waste load coming from their facilities. These compounds will be limited in the discharge from Micron to a level that can be removed in the biological treatment to values below the discharge requirements."[16] However, it is well established that PFAS cannot be broken down biologically, and furthermore, the proposed "discharge requirements" are confined to action limits for just two compounds that Micron has stated they will not be using. Thus, Micron's statement fails to meaningfully address potentially hazardous PFAS discharge.

Overall, it is imperative that NYSDEC and OCDWEP adequately plan for and address PFAS discharges, especially as they relate to Micron, to ensure that surrounding communities do not suffer any further burdens.

## II. Regulatory Context

*Clean Water Act Effluent Limitation Guidelines (ELGs) and the National Pretreatment Program*

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[14] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, Appendix L-1 (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Appendix_L.pdf.

[15] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

[16] Brown and Caldwell, Onondaga County Department of Water Environment Protection Oak Orchard Industrial Wastewater Treatment Plant and Water Reclamation Facility Conceptual Design Engineering Report, (November 11, 2025) https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/SPDES/Engineering-Reports/OCDWEP%20IWWTP%20WRF%20CDE%20Report_111025.pdf (pg 1-9)

EPA promulgated the Electrical and Electronic Components (E&EC) Effluent Guidelines and Standards (40 CFR Part 469) in 1983. Subpart A regulates the semiconductor subcategory. In 2022, EPA conducted a detailed study of the E&EC category and concluded there was no need to revise the regulation at that time, but the study acknowledges that: "The PFAS data the EPA reviewed are limited; however, the EPA intends to continue to monitor discharges of PFAS from this category and expects to review additional data in the coming years to help identify any significant sources of these chemicals in future reviews."[17]

The Clean Water Act also establishes the National Pretreatment Program (40 CFR Part 403). The objectives of general pretreatment regulations are to:

a. Prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including interference with its use or disposal of municipal sludge;
b. Prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works; and
c. Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.

Under this program, any POTW with a total design flow greater than 5 million gallons per day (mgd) must implement a local pretreatment program to prevent pass-through and interference. Therefore, most of the responsibility of the pretreatment program falls on the local municipalities to establish pretreatment standards, local limits, and oversee compliance.

*Safe Drinking Water Act Maximum Contaminant Levels (MCLs)*

In 2024, EPA finalized enforceable Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) for PFOA and PFOS at 4 ppt, the lowest level that can be reliably measured in drinking water (40 CFR Part 141.61(c)(2)). This level effectively recognizes that there is no safe level of PFOA and PFOS in drinking water. Because research indicates that PFAS chemicals can cause health risks at lower levels and in mixtures, EPA has also finalized a hazard index approach to regulating four chemicals - PFHxS, HFPO-DA (GenX), PFNA, and PFBS - when they occur in mixtures. However, the Trump administration's EPA is currently working to eliminate the drinking water standards for those PFAS.[18]

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[17] EPA, "Electrical and Electronic Components Effluent Guidelines" https://www.epa.gov/eg/electrical-and-electronic-components-effluent-guidelines (November 2022).

[18] Earthjustice, EPA Seeks to Eliminate Critical PFAS Drinking Water Protections, (September 12, 2025), https://earthjustice.org/press/2025/epa-seeks-to-roll-back-pfas-drinking-water-rules-keeping-millions-exposed-to-toxic-forever-chemicals-in-tap-water

*EPA has Directed All Levels of Government to Limit PFAS Discharges*

EPA's *PFAS Strategic Roadmap* stresses that all levels of government (federal, Tribal, state and local) must "exercise increased and sustained leadership to accelerate progress to clean up PFAS contamination, prevent new contamination and make game-changing breakthroughs in the scientific understanding of PFAS."[19]

States do not have to wait for EPA to finalize additional PFAS ELGs to address PFAS in water pollution permits. Nor are states limited to addressing pollutants and contaminants with preexisting effluent limitations or guidance values. To the contrary, the Clean Water Act requires permits to include "technology based effluent limitations and standards," including "case-by-case effluent limitations" when other values are not available.[20] As a state designated to implement the National Pollutant Discharge Elimination System (NPDES) program, New York must adhere to these authorities.[21] In the absence of established standards and guidelines, NYSDEC must use its "best professional judgment" to establish limitations on all PFAS discharged by the expanded treatment plant.[22]

NYSDEC must also ensure that all discharges from the Oak Orchard Wastewater Treatment Plant comply with the state's narrative water quality criteria, including the prevention of releases that will "impair the [receiving] waters for their best usages."[23] Oak Orchard discharges wastewater to the Oneida River, a class B water. "The best usages of Class B waters are primary and secondary

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[19] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

[20] 40 C.F.R. § 122.44(a)(1); see also 33 U.S.C. § 1342(a)(1)(B) (a discharge permit should include "such conditions as the Administrator determines are necessary to carry out the provisions of this chapter); see also EPA, Technology-based Effluent Limits Flue Gas Desulfurization (FGD) Wastewater at Steam Electric Facilities, attach. A in National Pollutant Discharge Elimination System (NPDES) Permitting of Wastewater Discharges from Flue Gas Desulfurization (FGD) and Coal Combustion Residuals (CCR) Impoundments at Steam Electric Power Plants at 2 (June 7, 2010), https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1564.pdf ) ("[A]n authorized state must include technology-based effluent limitations in its permits for pollutants not addressed by the effluent guidelines for that industry ... In the absence of an effluent guideline for those pollutants, the CWA requires permitting authorities to conduct the [best professional judgment] analysis discussed above on a case-by-case basis for those pollutants in each permit.").

[21] 40 C.F.R. § 123.25; N.Y. ECL § 17-0811 (McKinney 2024) (SPDES permits must include, where applicable, effluent limitations, standards of performance for new sources, and any further limitations to comply with water quality standards); 6 N.Y.C.R.R. §§ 750-1.11(a)(1-3).

[22] See also 6 N.Y.C.R.R. § 750-1.2

[23] 6 NYCRR 703.2.

contact recreation and fishing."[24] PFAS are known to contaminate fish tissue, and the severe health threats associated with even low levels of PFAS contamination impair other recreational uses of the water body as well. The New York State Department of Health has already set fish consumption advisories in several areas of New York, including L. Champlain, the Mohawk R., and Onondaga Lake, due to high levels of PFOS in fish.[25] The number of fish advisories is sure to increase as more types of PFAS are included.

A permit must include limitations to control pollutants that "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."[26] To analyze whether the source has reasonable potential, EPA considers whether the "discharge, alone or in combination with other sources…could lead to an excursion above an applicable water quality standard."[27] Here, however, there is no evidence that NYSDEC considered whether Oak Orchard's potential PFAS discharges would violate the state's narrative water quality criteria. NYSDEC must do so.

In December 2022, EPA issued a guidance memo directing states to use NPDES permits to limit discharges of PFAS to surface waters.[28] That memo affirms that "[s]ite-specific technology-based effluent limits (TBELs) for PFAS discharges developed on a best professional judgment (BPJ) basis may be appropriate for facilities for which there are no applicable effluent guidelines (see 40 CFR 122.44(a), 125.3)."[29] In addition, the memo makes specific recommendations for permit conditions (like monitoring requirements, Best Management Practices [BMPs], effluent limits, etc.), which states should require for industrial permittees known or suspected of discharging PFAS.

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[24] 6 NYCRR 701.7.

[25]New York State Department of Health, Advisory Listings by County, https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/by_county.htm (Accessed December 16, 2025).

[26] 40 C.F.R. § 122.44(d)(1)(i).

[27] EPA, Off. of Wastewater Mgmt., NPDES Permit Writers' Manual (EPA-833-K-10-001) at 6-23 (2010), https://www3.epa.gov/npdes/pubs/pwm_2010.pdf.

[28] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.

[29] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.

For example, for monitoring, the memo recommends using EPA Method 1633 at least quarterly to assess the presence and concentration of PFAS in discharges. In addition, if appropriate, the memo recommends the use of the adsorbable organic fluorine wastewater method (EPA Method 1621) in conjunction with EPA Method 1633. EPA's memo makes it clear that states and POTWs can use their existing water program authorities to address PFAS in wastewater discharges immediately.

In 2021, New York voters adopted the "Green Amendment"— codified as Article I, Section 19 of the New York Constitution—which provides that *"Each person shall have a right to clean air and water, and a healthful environment."* This constitutional environmental right became effective on January 1, 2022, after passing both legislative chambers in consecutive sessions and approval by referendum, joining only a few other states with similar protections.[30] The Green Amendment establishes a fundamental right to environmental quality that state actions, including SPDES permitting decisions, must be assessed against. Under this provision, issuance of permits that authorize PFAS discharges into State waters without meaningful and protective numeric limits is inconsistent with the constitutional guarantee of clean water and a healthful environment.

Therefore, NYSDEC and OCDWEP must make every effort to identify PFAS sources and hold industrial dischargers, including Micron, to the highest standards possible to minimize and prevent toxic PFAS discharges, as detailed below. Consistent with federal and state law, as well as EPA guidance, NYSDEC must exercise its best professional judgment to establish limits on all PFAS discharged by the Oak Orchard Wastewater Treatment Plant that are fully protective of public health and the environment.

## III. NYSDEC and OCDWEP Should Strengthen Pretreatment Requirements for PFAS

**Recommendations:**

As part of the industrial pretreatment program implementation requirements, NYSDEC and OCDWEP should develop a PFAS Minimization and Management Plan with each Significant Industrial User (SIU), including Micron. These plans should be prepared prior to beginning operations and updated annually. The draft permit should be amended to include a PFAS Minimization and Management Plan that:

1. Identifies the ways the facility uses, generates, or releases PFAS.
2. Requires a comprehensive PFAS inventory with known or suspected PFAS compounds present, final deposition, and purpose of use.

[30] Earth Justice, Article 1 Section 19: New York's New Environmental Right, https://earthjustice.org/wp-content/uploads/20230209_green_amendment.pdf

3. Requires industrial dischargers to obtain and provide NYSDEC and OCDWEP with analytical reference standards for every PFAS used in their facility, so those PFAS can be detected in wastewater effluent and in the environment.
4. Establishes a monthly PFAS monitoring plan that includes sampling before and after any pretreatment, using EPA Method 1633 and EPA Method 1621. The results should be made publicly available online promptly after the results are available.
5. Requires the use of safer, non-PFAS alternatives, wherever feasible.
6. Prohibits the discharge to surface waters or groundwater of any wastewater containing PFAS at concentrations exceeding background levels, using best management practices and optimized treatment.
7. Establishes reporting requirements and requires receipt of all data within 30 days of sampling.

**Rationale:**

In EPA's *PFAS Strategic Roadmap*, EPA identifies the need to prevent "PFAS from entering the environment in the first place—a foundational step to reducing the exposure and potential risks of future PFAS contamination."[31] The industrial pretreatment program is an integral part of the Clean Water Act, requiring indirect industrial dischargers to reduce or eliminate the discharge of harmful pollutants to POTWs.

The draft permit's industrial pretreatment program does not establish any requirements for PFAS. Under the Clean Water Act, industrial facilities are prohibited from sending any pollutant or wastewater to a POTW if the wastewater contains pollutants that will "pass through" the facility if inadequately treated prior to discharge into receiving water. Without PFAS-specific requirements, the POTW may be held accountable for pass-through releases of toxic PFAS compounds. In addition, accountability for pass-through releases of PFAS into the environment might add to the cost of operating the POTW. Therefore, the permit should institute a PFAS Minimization and Management Plan.

Although the draft permit refers to an Emerging Contaminant Minimization Plan on page 51, it only focuses on PFOA and PFOS and is only triggered when there is an exceedance of an action level. However, as described below in more detail, focusing solely on PFOA and PFOS is insufficient when considering the wide array of other PFAS used by the semiconductor industry.

Through the development of a PFAS Minimization and Management Plan as well as clear PFAS industrial pretreatment requirements, NYSDEC and OCDWEP would better understand the types and quantities of PFAS present in the effluent being sent to the POTW. A robust PFAS

[31] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

Minimization and Management Plan with each SIU would also help inform the monitoring requirements and treatment technologies necessary to effectively monitor, manage, and eliminate PFAS. Establishing a strong pretreatment program ensures that industrial users are held responsible for their pollution, rather than shifting the burden of treatment onto the POTW.

In addition, the draft permit requires that an industrial pollutant scan be conducted within the first 60 days after the initial receipt of wastewater to the ITT (Outfall 01B) using EPA Method 1633. This approach is insufficient. Allowing wastewater discharges for 60 days before completing the scan is inadequate to protect human health and the environment. Micron should instead be required to conduct the pollutant scan prior to commencing operations to ensure the early understanding and detection of contaminants. In addition, the industrial pollutant scan should be updated to include the additional PFAS monitoring strategies described in detail below, since EPA Method 1633 is inadequate for identifying the broad suite of PFAS discharged by semiconductor manufacturers.

Without these improvements, NYSDEC and OCDWEP will lack the information necessary and be unable to prevent the pass-through of toxic PFAS discharges. Therefore, a robust PFAS-specific pretreatment program should be implemented and incorporated into the permit.

## IV. NYSDEC and OCDWEP Should Significantly Expand Requirements to Monitor, Identify, Quantify, and Characterize all PFAS Discharged by Micron

**Background.** The draft permit would only require quarterly sampling and monitoring for PFAS compounds using EPA Method 1633/1633A, which provides a targeted analysis for approximately 40 PFAS. The permit proposes to limit the monitoring to Outfall 01B, which will discharge the treated effluent from the industrial wastewater treatment plant.

The proposed monitoring requirements cannot ensure adequate protection of water quality, human health, and the environment from the industrial use of PFAS by Micron because they fail to determine:

- The chemical identity of most PFAS compounds in the wastewater discharge;
- The efficacy of PFAS removal by industrial and sanitary wastewater treatment; and
- The impact of PFAS compounds on beneficial uses of all receiving waters.

PFAS and their breakdown products are extremely persistent, mobile, and toxic. Therefore, monitoring requirements should be designed to detect and quantify a broad spectrum of PFAS, such that a mass balance accounting of the fate and transport of all PFAS can be constructed. Only a comprehensive approach to monitoring using a variety of analytical methods can assist in virtually eliminating all PFAS releases to waterways.

Fortunately, significantly more expansive monitoring requirements are clearly authorized by New York water quality regulations (N.Y. Comp. Codes R. & Regs. Tit. 6 §§ 750-1.13).

**Recommendations:**

1. The permit should require the industrial user (Micron Technology) to fully characterize and identify all PFAS present in the influent and effluent for the industrial wastewater treatment train. This aim should be accomplished through application of all the following methods, in addition to monitoring wastewater using Method 1633:

    a. Expanded targeted analysis enabled by requiring industrial user Micron to provide high quality analytical reference standards and stable isotope-labeled standards for all unique PFAS used in its manufacturing process;
    b. Identification and quantification of ultra short-chain PFAS, through a method conducted by a qualified contract laboratory;
    c. Nuclear magnetic resonance spectroscopy ($^{19}$F NMR) to determine total organic fluorine, total polymeric fluorine, and total inorganic fluorine as a percent of total fluorine, in addition to providing information on chemical structure;
    d. EPA Method 1621 to determine total Adsorbable Organic Fluorine (AOF);
    e. Extractable Organic Fluorine (EOF), through a method conducted by a qualified contract laboratory;
    f. Total Organic Precursors (TOP) assay, conducted by a qualified contract laboratory;
    g. A non-targeted analysis using high-resolution mass spectrometry (HRMS) to characterize, semi-quantify, and identify PFAS compounds not detected by targeted analysis or measures of total organic fluorine; and
    h. The above data shall be submitted with a report that analyzes and interprets the monitoring results and computes and closes a mass balance of all fluorinated compounds present in the influent and effluent of the industrial wastewater treatment plant.

**Rationale:**

The draft permit would fail to detect the vast majority of PFAS that are present in Micron's wastewater including many chemical compounds and breakdown products that are uniquely used in semiconductor manufacturing. Without more rigorous monitoring and ongoing efforts to identify the chemical identity of the specific PFAS present in Micron's wastewater, it will be impossible to determine the effectiveness of wastewater treatment by the ITT or the impact of the

treated industrial effluent on the POTW, biosolids, and the beneficial uses of the receiving waters.

Given that there are thousands of types of PFAS, of which over one hundred PFAS are known to be used by the semiconductor industry, and new PFAS are constantly being introduced, EPA Method 1633 is completely inadequate for identifying the full suite of PFAS in semiconductor wastewater discharge.

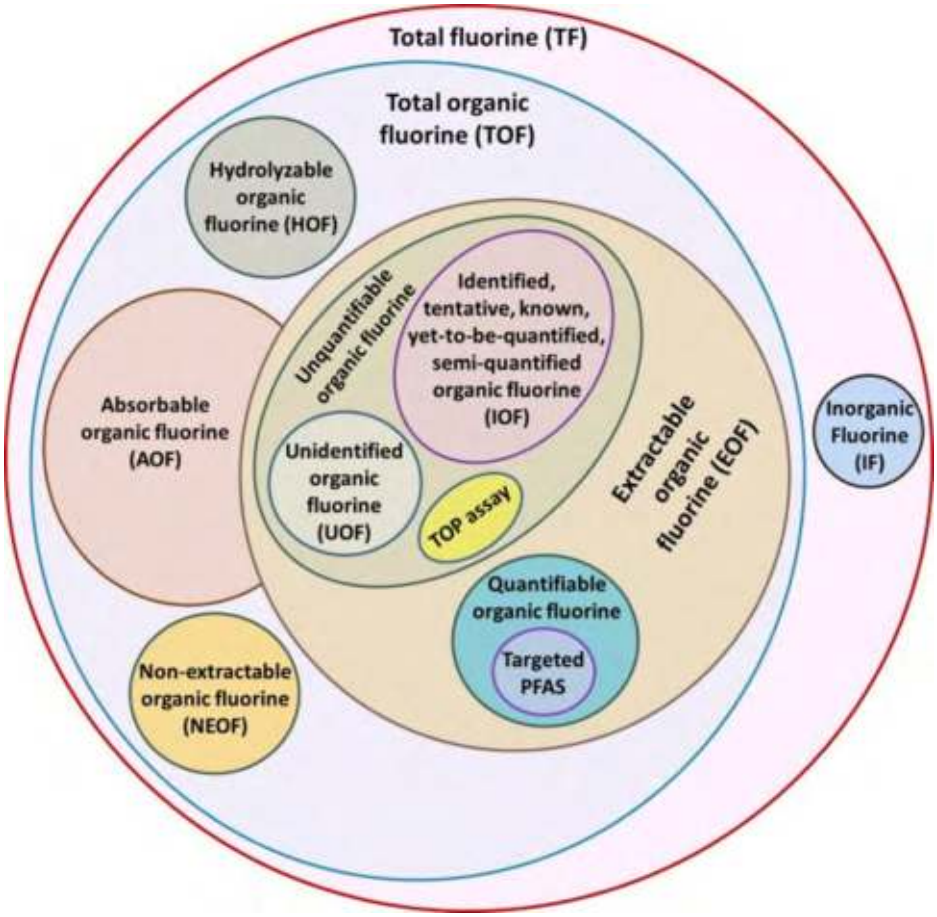
Method 1633 is a targeted analysis that identifies and quantifies only 40 chemical compounds in the PFAS class. **The peer-reviewed literature reports that targeted analysis often detects less than 10% of the total organic fluorine of environmental concern.**[32,33, 34]

The figure below is a Venn diagram that illustrates how targeted analysis (small circle labeled "Targeted PFAS") such as method 1633 captures only a small portion of PFAS compounds and how several other analytical methods that are routinely offered by contract laboratories enable a much broader characterization of PFAS in wastewater.

[32] Shelor, C. P.; Warren, C.; Odinaka, C. V.; Dumre, K. Comprehensive review of combustion ion chromatography for the analysis of total, adsorbable, and extractable organic fluorine. *J. Sep.Sci.* 2024, 47 (15), 2400235.

[33] Ersan, M. S.; WangWongWesterhoff, B. M. S. P.; Westerhoff, P. Advanced oxidation processes may transform unknown PFAS in groundwater into known products. *Chemosphere* 2024, 349, 140865.

[34] Schultes, L.; Vestergren, R.; Volkova, K.; Westberg, E.; Jacobson, T.; Benskin, J. P. Per- and polyfluoroalkyl substances and fluorine mass balance in cosmetic products from the Swedish market: implications for environmental emissions and human exposure. *Environ. Sci. Process. Impacts* 2018, 20 (12), 1680−1690.




Source: Ifeoluwa Grace Idowu, et al, A systematic review of methods for the analysis of total per- and polyfluoroalkyl substances (PFAS), Science of The Total Environment, Vol 967 (2025), https://doi.org/10.1016/j.scitotenv.2025.178644.

A recent journal article that reviewed analytical methods to characterize PFAS in the wastewater of semiconductor manufacturing facilities supports our recommendation: "The choice of the method used to cover a range of PFAS generally requires more than one analytical method, with some overlap between methods."[35]

**Targeted analysis.** For targeted analysis, this study concluded that "[T]o increase confidence in novel PFAS identified in semiconductor wastewater, high quality analytical standards and stable isotope-labeled standards will be needed."

[35] Droz B, Heron CG, Kim-Fu ML, Reardon PN, Roig-Paul M, Field JA. Practical Guidance on Selecting Analytical Methods for PFAS in Semiconductor Manufacturing Wastewater. *ACS Meas. Sci. Au.* 2025, 5, 399-423.

**Ultra short-chain PFAS.** Regarding the need to measure for ultra short-chain PFAS, this study advised: "[T]he shift to short-chain PFAS by the semiconductor industry indicates that monitoring only for > [or equal to] C4 PFCAs or greater may miss many C1-C3 short-chain precursors, unless methods for ultra short-chain PFCAs are utilized."

**Total organic fluorine.** Further, these same scientists concluded: "[U]ntil analytical standards become available for all relevant PFAS present in semiconductor wastewater, investigations will require suspect and nontarget PFAS analysis that require sophisticated identification and data techniques." And: "[T]his review also stresses the need for advanced techniques, including high-resolution mass spectrometry for suspect and nontarget analysis as well as nonspecific methods for total organic and inorganic fluorine."

**PFAS nuclear magnetic resonance ($^{19}$F NMR).** The Semiconductor PFAS Consortium of the Semiconductor Industry Association (SIA) commissioned a study by chemists at the University of Toronto that successfully adapted an analytical method known as PFAS nuclear magnetic resonance **(**$^{19}$F NMR) spectroscopy to characterize PFAS in semiconductor industry wastewater.[36]

The method distinguishes total organic fluorine from total polymeric fluorine, indicators of PFAS that pose high environmental concern, from total inorganic fluorine, which presents a relatively low hazard. The results are expressed as a percentage of total fluorine. The method also provides data-driven clues that can help characterize the chemical structure of as-yet unidentified PFAS.

The study concluded that "[B]ased on these promising results, multiple member companies of the Semiconductor PFAS Consortium are moving forward with acquiring the necessary equipment to begin this type of analysis in-house to assist in identifying and quantifying PFAS constituents in semiconductor manufacturing process wastewater."

Given that this study has been published on the SIA website, and Micron Technology is a member of the Semiconductor PFAS Consortium, and the method provides invaluable data, Micron should be required to apply this monitoring methods to its proposed wastewater discharge as recommended above.

**Method 1621.** As described above, the EPA's December 2022 memo recommends supplementing EPA Method 1633 with the Adsorbable Organic Fluorine (AOF) analysis using

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[36] Gauthier JR, Mabury SA (2025). $^{19}$F NMR analysis of semiconductor manufacturing facility wastewater samples for the Semiconductor PFAS Consortium, University of Toronto, Department of Chemistry, July 22. Available from https://www.semiconductors.org/19f-nmr-analysis-of-semiconductor-manufacturing-facility-wastewater-samples/.

EPA Method 1621, the only other EPA-approved standard analytical method for PFAS in wastewater.[37]

**Non-targeted analysis.** Non-target analysis is needed to identify more PFAS including novel PFAS from semiconductor processes that end up in the wastewater. This will help NYSDEC anticipate the introduction of new PFAS in semiconductor manufacturing and ensure that the permit remains protective.

Peer-reviewed literature demonstrates that targeted analysis of PFAS can only identify a fraction of the PFAS present in the wastewater of typical semiconductor fabrication facilities. For example, in a study of wastewater effluent from three semiconductor manufacturing plants, researchers found that the total PFAS concentration in wastewater determined through non-targeted analysis significantly exceeded the PFAS concentration indicated by a targeted analysis of 25 PFAS (all of which are included in EPA Method 1633).[38] In that study, Jacob et al. (2021) measured PFAS using the two different methods and found the following concentrations expressed as nanograms per liter (ng/L):

| Semiconductor Facility | Targeted analytes (25 PFAS) | Non-targeted analytes (133 PFAS) | TOTAL PFAS (sum of two methods) | Percent of PFAS (mass) missed by targeted analysis |
|---|---|---|---|---|
| Fab 1 | 623 | 867 | 1,490 | 58% |
| Fab 2 | 394 | 78,006 | 78,400 | 99.5% |
| Fab 3 | 376 | 1,794 | 2,170 | 83% |
| Source: Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoroalkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 Env't Sci. & Tech. 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690. | | | | |

The non-targeted analysis above revealed 41 homologous series of PFAS, which included 133 individual PFAS compounds. Chemical structures were proposed for 15 compounds, six of which were reported for the first time ever. None of these PFAS are detectable using EPA Method 1633.

[37] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.

[38] Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoralkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 *Env't Sci. & Tech.* 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690

Other peer-reviewed non-targeted analyses have also characterized many PFAS in semiconductor industry wastewater that cannot be detected by targeted analysis,[39, 40] such as through the use of Method 1633.

## V. NYSDEC and OCDWEP Should Expand the Locations and Frequency of PFAS Monitoring

PFAS monitoring must be comprehensive in order to capture the variability throughout the wastewater system. In addition to the need for robust identification and measurement of PFAS, the draft permit does not provide adequate monitoring for PFAS in terms of location and frequency.

**Recommendations:** The draft permit should be amended to:

1. Expand the monitoring points from effluent at internal Outfall 01B and Outfall 001 to influent and effluent at Outfall 01A, Outfall 01B, and Outfall 001; and
2. Increase the monitoring frequency from quarterly to, at minimum, monthly using the methods described above.

**Rationale:**

Influent monitoring is essential to better understand what is entering the POTW, while effluent monitoring is necessary to assess the effectiveness of treatment. The draft permit's current monitoring requirements are insufficient to track the variability of PFAS discharges and the effectiveness of treatment.

Influent and effluent monitoring at the industrial wastewater treatment plant is also needed to ascertain how much PFAS may be transferred to solid waste as treatment residues. Whether those solid residues are subject to PFAS destruction, which should be required, or simply transferred to another environmental media, such as landfill leachate, is an important consideration.

Similarly, monitoring of the influent (from the industrial treatment plant) and effluent from the final combined sanitary and industry treatment plant (POTW) is needed to determine the efficacy

[39] Chen, Y.-J.; Yang, J. S.; Lin, A. Y.-C. Comprehensive nontargeted analysis of fluorosurfactant byproducts and reaction products in wastewater from semiconductor manufacturing. *Sustain. Environ. Res.* 2024, 34, 14.

[40] Chen, Y. J.; Wang, R. D.; Shih, Y. L.; Chin, H. Y.; Lin, A. Y. Emerging perfluorobutane sulfonamido derivatives as a new trend of surfactants used in the semiconductor industry. *Environ. Sci. Technol*. 2024, 58 (3), 1648−1658.

of treatment in PFAS removal and the relative partitioning of PFAS between the final wastewater discharge to the receiving water and to biosolids whose ultimate management may raise additional environmental concerns.

Expanding the monitoring locations to include both influent and effluent at Outfall 01A, Outfall 01B, and Outfall 001 is necessary to evaluate PFAS levels throughout the system, to better identify where PFAS may be bypassing treatment processes and prevent dilution prior to monitoring for PFAS.

In addition, limiting monitoring to quarterly sampling at a single effluent location (Outfall 001) will fail to provide sufficient data to assess the types, amounts, and the potential for pass-through of PFAS. Quarterly monitoring would provide a very limited snapshot of PFAS discharges. Increasing the frequency of monitoring from quarterly to at least monthly is necessary to capture variability in PFAS discharges, given known fluctuations in the manufacturing processes. Therefore, the draft permit must be updated to expand the monitoring points for PFAS as well as the monitoring frequency.

## VI. NYSDEC Should Expand the Universe of PFAS Being Regulated and Establish a Goal of Complete Elimination of PFAS Discharges

**Recommendations:**

The permit should be amended to ensure that no PFAS are discharged into surface waters. To achieve this, the draft permit should be amended to:

1. Expand the universe of PFAS being regulated;
2. Establish a zero-discharge goal for PFAS from all industrial sources connected to the POTW, including Micron; and
3. Require the use of treatment technologies that destroy PFAS, rather than transfer PFAS.

**Rationale:**

The draft permit only proposes action levels for PFOA and PFOS. These limits rely on the NYS Department of Health (DOH) Maximum Contaminant Level (MCL) of 10 ng/L for drinking water for PFOA and PFOS. However, the semiconductor industry no longer uses these compounds; rather the industry relies on a wide range of PFAS for use in photolithography and related processes. The semiconductor industry heavily relies on short-chain PFAS, which have been found to be more mobile and more difficult to remove from waste streams than PFOS and PFOA.[41]

[41] C. Kwiatkowski et al., *Scientific Basis for Managing PFAS as a Chemical Class*, June 2020,

The CHIPS Program Office (2024) *Final Programmatic Environmental Assessment for the Modernization and Expansion of Existing Semiconductor Fabrication Facilities* contains considerable detail about the use of PFAS in wafer fabrication.[42] Appendix C of that document includes a 10-page table describing the over one hundred types of PFAS used by the semiconductor industry. Furthermore, these compounds undergo transformations during semiconductor production. Micron has objected to disclosure of all PFAS used in its processes on the basis that such information is confidential business information suggesting that there are potential PFAS compounds specific to the Micron facility. Consequently, one can expect thousands of different PFAS chemicals to exist in semiconductor plant wastewater.

Managing PFAS through limits for one chemical at a time will take years, delay critical protections, and may encourage the creation of alternatives that are just as harmful to skirt around protections. Given the persistent, bioaccumulative, and toxic nature of PFAS, NYSDEC should require a zero-discharge goal for PFAS from all industrial uses. Every additional release of PFAS builds up in the local, regional and global environment, leading to contamination of drinking water supplies, fish, wildlife, livestock, and in humans. It is especially important to control PFAS at point sources such as Micron and the Oak Orchard Wastewater Treatment Plant.

Based on the draft permit, the new ITT is expected to use biological treatment in mixed anoxic tanks followed by aeration tanks, membrane bioreactors, UV disinfection, centrifugal solids dewatering, effluent reuse with ion exchange resin (IX) and reverse osmosis (RO) treatment. However, this process does not destroy PFAS, and instead generates a concentrate containing high levels of PFAS that must be transported off-site for disposal. This concentrated waste stream poses numerous environmental and public health concerns, including:

- Exposure for workers who handle these wastes
- Potential exposure during transport of wastes through local communities
- Likely exposure in the vicinity of waste disposal sites, often sited near communities of color and low-income communities.

Industrial dischargers of PFAS-containing wastewater, such as Micron, should therefore be required to use treatment methods that destroy PFAS, rather than simply filter PFAS.

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https://pmc.ncbi.nlm.nih.gov/articles/PMC8297807/

[42] National Institute of Standards and Technology, *Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program* (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf

A growing variety of technologies exist which are capable of destroying PFAS (breaking the C-F bond).[43] These include:

- Supercritical water oxidation (SCWO)
- Hydrothermal alkaline Treatment (HALT)
- Electrochemical oxidation
- Surface Plasma

The Applicant (Onondaga County) should be required to investigate and install such a system to address the concentrated waste streams resulting from the ion exchange and RO treatment steps. For further information see:

1) U.S. Department of Defense-funded PFAS demo projects show promise for remediation and destruction (A. Reese, Waste Dive, Dec. 1, 2025) https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/
2) Competition to destroy 'forever chemicals' heats up (B. Erikson, Chem & Eng, News, Mar. 4, 2024) https://cen.acs.org/environment/persistent-pollutants/Competition-destroy-forever-chemicals-heats/102/i7

40 CFR 403.5(c)(4) authorizes POTWs to develop local limits in the form of Best Management Practices (BMPs) and source reduction opportunities.[44] As described above, NYSDEC and OCDWEP should develop a robust PFAS Minimization and Management Plan. The BMPs and the PFAS Minimization Plan must encompass a much broader range of PFAS, not just PFOA and PFOS.

NYSDEC should not permit the discharge of any PFAS into surface waters, because the complete elimination of PFAS is both technically feasible and available, and is consistent with the mandates of New York's Green Amendment., .

## VII. NYSDEC Should Limit Solid Waste Disposal

**Recommendations:**

[43] See, for example, https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/

[44] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.

The draft permit fails to adequately address the proper management of PFAS concentrate from the RO process. Based on the Conceptual Design Engineering Report, it is estimated that 75 tons/day will be generated.[45] This material, produced from crystallizing the RO permeate, is simply slated for off-site disposal at a landfill. The draft permit should be amended in the following ways:

1. The permit must describe NYSDEC's plans to coordinate with all relevant agencies responsible for solid and hazardous waste management and occupational safety as it relates to PFAS-contaminated solid waste;
2. A detailed PFAS waste management plan must be submitted to address the handling, storage, transportation, and disposal of the PFAS filtrate; and
3. Transparent documentation and reporting of final disposal locations must be required and made publicly available.

**Rationale:**

PFAS-contaminated solid waste poses significant occupational and environmental hazards if not properly managed. As described above, the new ITT process will use RO, which does not destroy PFAS and will create a concentrated brine solid that must be disposed of off-site. These residuals will contain concentrated levels of PFAS and other industrial compounds which are amenable to biological treatment, such as triazoles and tetramethyl ammonium compounds. The solids may need to be managed as hazardous waste. The permit should specify routine testing of this solid waste stream for PFAS, and other recalcitrant compounds.

These residuals are required to be managed as solid or hazardous waste and fall outside of the scope of SPDES permitting. As stated in EPA's December 2022, "Certain industrial processes may generate PFAS-contaminated solid waste or air emissions not covered by NPDES permitting and permitting agencies should coordinate with appropriate state authorities on proper containment and disposal to avoid cross-media contamination." [46] Without coordinated oversight of the PFAS concentrate from the RO process, unnecessary additional PFAS contamination and exposure could occur. Therefore, since the draft permit currently relies on RO, it is critical that

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[45] Brown and Caldwell, Onondaga County Department of Water Environment Protection Oak Orchard Industrial Wastewater Treatment Plant and Water Reclamation Facility Conceptual Design Engineering Report, (November 11, 2025) https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/SPDES/Engineering-Reports/OCDWEP%20IWWTP%20WRF%20CDE%20Report_111025.pdf (pg 3-30).

[46] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf.

NYSDEC coordinates closely with all relevant state agencies to ensure that the hazardous waste disposal is properly managed to protect workers and surrounding communities.

Overall, it is essential that NYSDEC coordinate and limit solid waste disposal to protect worker safety, human health, and the environment.

## VIII. NYSDEC Should Include Additional Pollution Limits for Other Toxic Constituents in Micron's Wastewater

**Recommendations:**

The draft permit should be amended to include effluent limits for other known toxic constituents in Micron's wastewater including Tetramethylammonium hydroxide (TMAH); 1-Butanol, 3-methoxy-3methyl; Polyethylene glycol; Methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); EDTA; and 1,2,4-Triazole.

**Rationale:**

As part of the Notice of Intent to Assess (NOIA) response documents available for review, the attachment entitled "Worst-Case Organic Wastewater Constituents to OCDWEP" identifies dozens of additional toxic and potentially hazardous constituents that are expected to be present in Micron's wastewater. These constituents warrant specific effluent limits and monitoring requirements in the SPDES permit. Among the constituents of concern are Tetramethylammonium hydroxide (TMAH); 1-Butanol, 3-methoxy-3methyl; Polyethylene glycol; Methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); EDTA; and 1,2,4-Triazole. It appears that most of these pollutants are simply assumed to be sufficiently treated to a concentration of 10 µg/L. But that level of needs to be verified during plant start-up, and periodically throughout its operation. Given that these constituents are toxic to humans, aquatic life, and, in some cases, are very persistent in the environment, NYSDEC should establish pollutant limits and appropriate monitoring as part of the permit.

## IX. NYSDEC Should Institute a Long-Term PFAS Monitoring Program for the Receiving Waters

**Recommendations:**

1. Require monitoring of fish, sediments, biota, and ambient water quality for PFAS upstream and downstream of the combined sanitary and industrial wastewater Outfall 001; and
2. Establish a long-term monitoring plan that tracks PFAS discharges in the Oneida River, Oswego River, and Lake Ontario.

**Rationale:**

Many PFAS and their breakdown products are both extremely persistent and bioaccumulative, as well as highly toxic. If the goal of zero discharge of PFAS is not achieved, it's imperative that potential impacts on beneficial uses of the receiving waters be determined.

Upstream and downstream monitoring of sediments, fish, other representative biota, and ambient water quality should be required to determine whether PFAS are accumulating in the ecosystem and to enable NYSDEC to assess and understand the larger impacts of PFAS discharges. NYSDEC should establish a long-term monitoring program that tracks PFAS and other chemicals unique to Micron to understand the broader implications of PFAS discharges, bioaccumulation, persistence and potential risks to aquatic biota and drinking water sources.

Because the Oak Orchard Wastewater Treatment Plant discharges into the Oneida River, a tributary of the Oswego River that flows into Lake Ontario (a drinking water source and ecological haven), it is critical to monitor for emerging contaminants that are known to be highly persistent and toxic. The program should include regular upstream and downstream monitoring and sampling as well as monitoring in aquatic biota for accumulation.

A comprehensive long-term monitoring program will allow New York State to become a leader in understanding these emerging contaminants and help safeguard the Oneida River and Lake Ontario as a critical ecological resource and drinking water source. Such data will also help inform the establishment of water quality criteria and effluent limits for specific PFAS compounds.

## X. NYSDEC Should Require All Data be Made Publicly Available Online

**Recommendations:**

1. All influent, effluent, and biosolids monitoring and sampling data should be made publicly available online and updated regularly.

**Rationale:**

Public access to monitoring data ensures transparency, accountability, and public trust. NYSDEC should require that data be reported and posted to an easily accessible public website within 30 days of collection. Timely posting will build public trust in the effectiveness of minimization and treatment efforts and allow for the early detection of emerging issues.

## XI. NYSDEC and OCDWEP Should Clarify the Overall Schedule, Timing of Compliance, and Cost Implications

**Recommendations:**

1. NYSDEC and OCDWEP should provide a clearer and more detailed overall schedule for the permit and the timing of compliance; and
2. NYSDEC and OCDWEP should provide more information on how costs will be managed and passed onto ratepayers.

**Rationale:**

The permit's overall schedule, including the timing and sequence of compliance requirements, is vague and more clarity should be provided. The permit does not provide a clear sense of how long construction is anticipated to take. In addition, since Outfall 01B is associated with Micron, the schedule and compliance requirements are highly dependent on Micron's construction schedule. Therefore, additional information must be provided to understand the timing of the improvements at the Oak Orchard Wastewater Treatment Plant as well as Micron's schedule and how it relates to the phasing, overall schedule, and implementation of the requirements in the Oak Orchard Wastewater Treatment Plant permit.

It has been estimated that the cost of the project is $549.5 million, a significant project for the POTW.[47] It is unclear how this will impact local residents and ratepayers. Therefore, additional information should also be shared on how this substantial cost will be managed by OCDWEP and passed onto ratepayers. Transparent information is essential for improving public understanding of the improvements and providing meaningful stakeholder engagement.

## XII. NYSDEC Should Ensure the Timely Modification and Renewal of the Permit

**Recommendations:**

1. NYDEC must ensure the permit includes mechanisms to account for changes in effluent limits, monitoring requirements, or PFAS treatment technologies that may evolve over time; and
2. NYSDEC should commit to reviewing and renewing the permit on a strict schedule.

**Rationale:**

Given the evolving nature of the semiconductor industry, wastewater management at the Oak Orchard Wastewater Treatment Plant must be robust and flexible to prevent harmful environmental releases. Although semiconductor manufacturers have proven themselves willing to engineer solutions once regulations are in place, they also have a history of failing to share information with the affected public.

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[47] Tim Knauss, syracuse.com, Onondaga County's $549 million sewage project likely to hike your rate. But how much?, (December 16, 2025),https://www.syracuse.com/news/2025/12/onondaga-countys-549-million-sewage-project-likely-to-hike-your-rate-but-how-much.html (Accessed December 16, 2025).

By the time Micron begins operations, new chemicals (including additional PFAS) may be used and discharged. At the same time, treatment technologies for PFAS continue to rapidly advance. Since the landscape for this facility is expected to change significantly over the coming years, NYSDEC should include a condition in the permit allowing modification of effluent limitations outside the permit renewal cycle based on new information, if appropriate, to protect human health.

Per 40 CFR 122.46, NPDES permits should be reviewed and reissued at minimum every five years. Despite this, the current NPDES permit for the Oak Orchard Wastewater Treatment Plant has been administratively continued for nearly six years (since 2019). In this context, NYSDEC must ensure that the next permit is not only renewed timely but also updated to be sufficiently robust and flexible to prevent harmful PFAS releases.

## XIII. Conclusion

As currently drafted, the draft SPDES Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant is inadequate in protecting water quality, the environment, and the health of workers as well as surrounding communities. The permit is designed to support the operations of one of the largest factories in New York history, a facility that will use and discharge a broad and evolving range of harmful chemicals, including PFAS, so it deserves careful, deliberate review.

PFAS are toxic, highly persistent, and mobile in the environment, posing a significant risk to water quality, human health, and the environment. Without adequate monitoring, treatment, and oversight, PFAS discharges from industrial dischargers, such as Micron, can pass through the Oak Orchard Wastewater Treatment Plant and pose long-term risks to the Oneida River, Lake Ontario, downstream drinking water sources, and aquatic biota.

NYSDEC and OCDWEP must make every effort to identify PFAS sources and hold industrial dischargers, including Micron, to the highest standards possible to minimize and prevent toxic PFAS discharges.

The final permit should be amended based on the recommendations outlined above. Please specifically respond to each requested change in the Response-to-Comments issued in the final permit. Please provide the final permit and response to comments to the email provided below.

Sincerely,

Jobs to Move America

Author:

Julie MacNamara

National Water Projects Coordinator
Clean Water Action / Clean Water Fund
Jmacnamara@cleanwater.org

From: Bonita Siegel
To: dec.sm.Comments.OakOrchard2025
Subject: Comment
Date: Tuesday, December 23, 2025 2:23:01 PM



Comments regarding the Draft New York State Pollutant Discharge Elimination System (SPDES) Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant:

I am particularly concerned about the monitoring, treatment, and prevention of PFAS chemical discharges that could end up contaminating our environment and waterways when Micron comes to this region. The Environmental Protection Agency (EPA) has stated PFAS are an urgent public health and environmental issue across the United States. PFAS are known as “forever chemicals” because they are so resistant to breakdown! They are very mobile in the environment, being found in drinking water and common food sources. Concerns regarding levels of pollutants in fish found in various bodies of water in our state, including Onondaga Lake, has been issued by NYSDEC. If PFAS utilized by Micron accumulate in our environment and downstream water supplies, like Lake Ontario, are we being smart by welcoming this massive development into our region?

Micron has been unwilling to share the specific PFAS chemicals they will be using, claiming proprietary information. Is their right to proprietary information more important than our right to clean water, safe air and uncontaminated food sources?? In 2024, the EPA finalized enforceable Safe Water Drinking Act (SWDA) maximum contaminant levels (MCLs) for PFOA and PFOS at 4 ppt. Health risks have been found to exist at even lower levels! Hazard indices have been made to other specific chemicals. However, the reality exists that there are thousands of possible PFAS chemicals that can be made and utilized. Standards do not exist for all of these and, further, the Trump administration’s EPA is currently working to eliminate the drinking water standards for most PFAS. Who, then, will protect us in Central New York from dangerous environmental contaminants that we allow into our region if we choose blind ignorance? Our only hope lies in strong local and state advocacy to do what is right and demand high standards that protect us and ensure the success of such a phenomenal investment in our community.

I urge the Onondaga County Department of Water Environment Protection (OCDWEP) and the New York State Department of Environmental Conservation (NYSDEC) to secure much better protection standards as part of this permit for upgrading the Oak Orchard Treatment Plant. I am aligned with the recommendations from the Center for Public Environmental Oversight (CPEO) and I hope you will take their recommendations forward with serious revisions to this permit.

Thanks for your kind attention to this important matter.

Sincerely,
Bonita H. Siegel, BS, MS, MD
4959 Greenberry Dr
Clay, NY 13041

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|---|---|
| From: | Caitlin Ferrante |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | SPDES Permit # NY0030317; DEC 7-3124-00018/00001 (Oak Orchard/Micron) |
| Date: | Tuesday, December 2, 2025 10:58:44 AM |
| Attachments: | SCAC SPDES Permit Comments Micron Dec 2025.pdf |



Good morning -
Please find attached Sierra Club Atlantic Chapter's comments re: SPDES Permit # NY0030317; DEC 7-3124-00018/00001 (Oak Orchard/Micron)
Please reach out with any questions/concerns.
Best,
Caitlin

--

**Caitlin Ferrante**
**Conservation Program Manager**
**Sierra Club Atlantic Chapter**
**Pronouns: she/her/hers**
**518.426.9144, ext.102 (office) 607.221.4303 (cell)** | Eastern Time Zone
caitlin.ferrante@sierraclub.org

November 25, 2025

Trendon Choe
New York State Department of Environmental Conservation - Region 7
5786 Widewaters Parkway
Syracuse, NY 13214

**RE: SPDES Permit # NY0030317; DEC 7-3124-00018/00001 (Oak Orchard/Micron)**

Dear Mr. Choe –

Thank you for your consideration of the Sierra Club Atlantic Chapter's comments on the SPDES Permit # NY0030317; DEC 7-3124-00018/00001). We are a volunteer-led environmental organization with over 600,000 members nationwide, including over 40,000 members in New York state, all dedicated to protecting New York's air, water and remaining wild places.

**Water Quality Permitting: Oak Orchard wastewater treatment plant (SPDES Permit # NY0030317; DEC 7-3124-00018/00001)**

**Re: Upgrades to wastewater treatment systems to be expanded by Onondaga County at the Oak Orchard treatment facility**

First, the permit comment period should be extended. The agency has released for public comment three permits related to the Oak Orchard wastewater plant in addition to this air permit for Micron. This comes on the heels of the release of the final EIS, and public hearings held by the county's industrial development agency, all related to Micron. The time of year could not be worse—the holiday season when the public is traveling or otherwise preoccupied with family and other community events. **A 6-month extension is therefore requested.**

Adequate and thoughtful public input for this permit is not possible given the scope of the permits and the length of the draft permit documents and the volume of supporting documentation. The SPDES permit alone is 143 pages. There are nearly 20 supporting documents, including two lengthy engineering reports (1,425 pages). Commenters must download over 270 megabytes of material from the Onondaga County website JUST to get started. Again, a much longer commenting period is warranted due to the volume of materials which need to be reviewed to provide meaningful comments.

In addition, **the Department can and should hold informational meetings to engage with the public in a meaningful way.** We recommend at least three such meetings. Onondaga County WEP Dept. staff and the design consultants should be brought in to describe the proposed wastewater treatment processes.

Secondly, **the wastewater discharge permit is premature.** The public was informed on November 8th that construction of the memory chip factories would be delayed by two to three years. According to the Micron Final EIS, the construction of the Onondaga Co wastewater treatment facilities at Oak Orchard are slated to begin in the fourth quarter of 2027, a full two years from now. There is ample time available to consider comments and release a final permit. The Department has been in no rush to renew the SPDES permit for the existing Oak Orchard wastewater treatment plant. That permit expired on June 30, 2019.

Third, we are disappointed to see that:

1. Testing for PFAS (per- and polyfluorinated alkyl substances) is limited to four times per year. Moreover, this testing is limited to only 40 compounds
2. No quantitative limits are imposed on any of the 40 compounds tested. Rather, "action levels" are set at 10 ng/L only for PFOA and PFOS. Neither PFOA nor PFOS are currently used by the semiconductor industry.
3. The SPDES permit needs to be revised to adequately monitor and eliminate the discharge of PFAS into our waterways. These bodies of water, which include Lake Ontario, already are burdened with dangerously high levels of PFAS. Lake Ontario provides drinking water for over 8 million people in the U.S. and Canada. The Department needs to be proactive to not allow the introduction of new sources of PFAS.

Testing for forty compounds is simply inadequate because there are hundreds if not thousands of PFAS compounds produced in the semiconductor manufacturing process. **Therefore, we urge the DEC to require the applicant to regularly test (at least weekly) for Total Organic Fluorine in the effluent from the Industrial Wastewater Treatment Plant (Outfall 01A). Monthly testing should be required for the 40 PFAS compounds in Method 1633, supplemented by non-targeted PFAS analysis to identify unlisted compounds found in semiconductor water. Discharge limits need to be imposed on those PFAS which are present in the IWWTP wastewater.** The Department should consult with other state agencies with experience regulating PFAS in wastewater. Minnesota has developed robust monitoring strategies for the 3M plant at Cottage Grove.

Thank you for your time and consideration into this manner.

Sincerely,

Kate Bartholomew,
Chair
Sierra Club Atlantic Chapter

| | |
|---|---|
| From: | Caitlin Ferrante |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | Comments SPDES Permit # NY0030317; DEC 7-3124-00018/00001 (Oak Orchard/Micron) |
| Date: | Tuesday, December 23, 2025 4:27:00 PM |
| Attachments: | SCAC SPDES FINAL Permit Comments Micron 23 Dec 2025.pdf |



Good evening -

Please find attached Sierra Club Atlantic Chapter's updated comments re: SPDES Permit # NY0030317; DEC 7-3124-00018/00001 (Oak Orchard/Micron)

Please reach out with any questions/concerns.

Thank you for the opportunity to comments.

Best,

Caitlin Ferrante

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**Caitlin Ferrante**

**Conservation Program Manager**

**Sierra Club Atlantic Chapter**

**Pronouns: she/her/hers**

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SIERRA CLUB
ATLANTIC CHAPTER

744 Broadway
Albany, NY 12207

December 23, 2025

New York State Department of Environmental Conservation - Region 7
Trendon Choe
5786 Widewaters Parkway
Syracuse, NY 13214
*Submitted via: Comments.OakOrchard2025@dec.ny.gov*

**Re: Comments on Draft State Pollutant Discharge Elimination System (SPDES) Permit Number NY#0030317**

Dear Mr. Choe,

On behalf of the Sierra Club Atlantic Chapter, we respectfully submit the following comments to the New York State Department of Environmental Conservation (NYSDEC) on the Draft New York State Pollutant Discharge Elimination System (SPDES) Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant.

The Sierra Club is a volunteer-led environmental organization with over 600,000 members nationwide, including over 40,000 members in New York state (the Atlantic Chapter), all dedicated to protecting New York's air, water and remaining wild places. We thank you for the opportunity to provide comment on this issue. These comments are submitted in collaboration with CHIPS Communities United (CCU) and the Center for Public Environmental Oversight (CPEO).

The Comment Period

As noted in Sierra Club's prior comments, dated November 25, 2025, the public comment period of about 45 days during the holiday season is far too short. It should be extended at least 45 days. In addition, the NYSDEC should undertake some public information sessions to explain the project in terms that the general public can understand. As it stands, the public has to wade through over 1,000

pages of technical reports to get a grasp of this enormous. The buildout of just Phase 1 is slated to cost Onondaga County residents $550-million.

The schedule

To meet the wastewater needs of the expansive Micron Campus planned in Clay, NY, along with anticipated population growth, the Onondaga County Department of Water Environment Protection (OCDWEP) is proposing to undertake a series of significant wastewater infrastructure and capacity improvements. These improvements would be spread across the next 7-10 years.

Micron announced with the publication of its Final EIS on November 7, 2025 that the buildout of it first two factories (Fabs 1 and 2) would be delayed by two to three years. It does not appear that this delay has been incorporated into the design and implementation of the subject matter of this permit, which is the Oak Orchard Wastewater Expansion Project. Engineering documents which lay the foundation for the construction schedule assume that Micron is following the original schedule.

The Carollo Engineering Report, dated Nov. 2025 (p. 21) states that "OOWWTP will supply Micron with up to 2 mgd of recycled water starting in March 2028."[1] However, The Micron Fab 1 is not scheduled to come online until the third quarter of 2030. Carollo's report goes on to say "By May 2029, both Fabs 1 and 2 are anticipated to be operational, increasing the total recycled water demand to 4 mgd." According to the Final EIS for Micron's semiconductor plant, Fab 2 is expected to come online at the end of 2033. The permit should be adjusted to accommodate these significant changes in Micron's buildout. These schedule changes call into the question the need to issue a SPDES permit for the IWWTP at this time.

Harmful chemicals

The semiconductor industry is known to use and discharge a broad range of harmful chemicals, including per- and polyfluoroalkyl substances (PFAS). Given the serious risks these chemicals pose to human health and the environment, it is imperative that NYSDEC and OCDWEP thoroughly plan for and address PFAS discharges, especially as they relate to Micron.

As currently drafted, the pollution limits and monitoring requirements for PFAS are inadequate to protect water quality, the environment, and the health of workers as well as surrounding communities. We urge NYSDEC to strengthen PFAS

[1] Carollo Engineers. OOWWTP Expansion Program Basis of Design/DEC Engineering Report, *FOR SPDES PERMITTING* (Nov. 2025)

monitoring, treatment, and minimization requirements in the Oak Orchard Wastewater Treatment Plant SPDES Permit.

## I. Background

*The Planned Micron Semiconductor Manufacturing Campus*

The Micron New York Semiconductor Manufacturing LLC (Micron) is proposing an expansive new manufacturing operation located in the Town of Clay, NY. The approximately 1,377-acre site will consist primarily of four dynamic random-access memory (DRAM) manufacturing facilities (known as "fabs").[2] The construction of the campus is anticipated to take place in stages over approximately 16 years, with full production anticipated by 2045.[3]

The wastewater generated at Micron's facility will be pre-treated and then sent for specialized treatment at the Oak Orchard Wastewater Treatment Plant. Micron's wastewater discharges to the Oak Orchard Wastewater Treatment Plant will be required to meet the pretreatment program requirements of the Oak Orchard Wastewater Treatment Plant SPDES permit, which is the subject of the draft SPDES permit described herein.

*Summary of Draft SPDES Permit*

The Oak Orchard Wastewater Treatment Plant is a publicly owned treatment works (POTW) that currently receives flow from domestic and two industrial users. To serve the planned Micron Campus, Onondaga County requests approval to modify this permit to expand and upgrade the municipal wastewater treatment train (MTT) and construct a new industrial wastewater treatment train (ITT) and water reclamation facility. Construction of the new ITT includes equalization and diversion tanks, influent screening, biological treatment in mixed anoxic tanks followed by aeration tanks, membrane bioreactors, UV disinfection, centrifugal solids dewatering, effluent reuse with ion exchange resin (IX) and reverse osmosis (RO).[4]

At full build out, the Oak Orchard Wastewater Treatment Plant will include: Outfall 001 of treated sanitary and process wastewater, Internal Outfall 01A of MTT treated sanitary and process effluent wastewater to Outfall 001, Internal Outfall 01B of ITT treated process effluent wastewater to Outfall 001, Outfall 006 of MTT effluent reuse

[2] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Final.pdf (pg 0-1).
[3] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Final.pdf (pg 0-1).
[4] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

wastewater to Micron, and Outfall 007 of ITT effluent reuse wastewater to Micron.[5] When all phases are completed, the draft permit modification would increase the total monthly average design flow from 10 MGD to 30.8 MGD.[6]

The Oak Orchard Wastewater Treatment Plant (Outfall 001) will discharge treated sanitary and process wastewater to the Oneida River. The segment of the Oneida River at the point of discharge is classified as B. Classification B indicates the best usage for swimming and other recreation, and fishing. However, the Oneida River is a tributary of the Oswego River and part of the Lake Ontario watershed, which serves as a critical drinking water source for millions of people.

*Significant Adverse Effects Associated with PFAS*

We are particularly concerned about the monitoring, treatment, and prevention of PFAS chemical discharges. According to the Environmental Protection Agency (EPA), PFAS are "an urgent public health and environmental issue facing communities across the United States."[7]

PFAS are a class of thousands of different human-made chemicals that contain one or more fully-fluorinated carbon atoms. Since their introduction in the 1940s, PFAS have been widely used in many manufacturing processes as well as countless consumer products. PFAS chemicals are notable because their carbon-fluorine bonds are very resistant to degradation, resulting in extremely long lifetimes. Known as "forever chemicals," PFAS are highly persistent and mobile in the environment, easily traveling through streams, rivers, and other water bodies, including drinking water sources.[8] This persistence acts as a force-multiplier for toxicity.

Because they break down very slowly, PFAS can easily bioaccumulate in human beings, wildlife, and the environment over time.[9] PFAS are highly toxic and linked to serious health problems, including damage to liver, thyroid, and pancreatic function; increased risk of high blood pressure or pre-eclampsia in pregnant

[5] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

[6] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

[7] EPA, PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

[8] Ian T. Cousins et al., Why is High Persistence Alone a Major Cause of Concern?, 21 Env't Sci. Process Impacts 781, 785 (2019), https://pubs.rsc.org/en/content/articlelanding/2019/em/c8em00515j

[9] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks

women; developmental delays; immune system harm; hormone disruption; increased cholesterol levels; and increased risk of kidney or testicular cancer.[10,11]

*PFAS Usage in the Semiconductor Industry*

The Semiconductor Industry Association (SIA) acknowledges the use of many PFAS compounds in semiconductor fabrication-related processes, including photolithography, wet chemical processing, plasma etch and deposition, assembly and packaging materials, among others.[12] Semiconductor manufacturers are known to use and discharge a wide array of PFAS, posing a "substantial risk for PFAS contamination of the environment."[13] One investigation at a semiconductor manufacturing facility detected 78,000 parts per trillion (ppt) of PFAS in wastewater from some samples, compared to EPA's proposed limit of 4 ppt for some PFAS in drinking water.[14]

Several PFAS-laden processes are anticipated to be used at Micron, including, but not limited to, photolithography and plasma (dry) etching processes. Appendix L of the MICRON Final Environmental Impact Statement (FEIS) provides an overview of the general uses of PFAS anticipated at Micron; however, the specific types of PFAS to be used are not provided, in part due to claims of proprietary information.[15]

Semiconductor production is an innovative and constantly evolving industry. Over the past two decades, semiconductor manufacturers have reduced or replaced the use of certain PFAS. For example, long-chain PFAS compounds, such as PFOS (perfluorooctane sulfonic acid), have been replaced by short-chain PFAS and the use of PFOA (perfluorooctanoic acid) has also been phased out.[16] As a result, by the time Micron begins operations, it is likely that even newer chemicals may be used

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[10] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks

[11] CDC, *How PFAS Impacts Your Health*, https://www.atsdr.cdc.gov/pfas/about/health-effects.html?CDC_AAref_Val=https://www.atsdr.cdc.gov/pfas/health-effects/index.html

[12] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

[13] National Institute of Standards and Technology, Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf (C-15)

[14] Tom Perkins, "Industry acts to head off regulation on PFAS pollution from semiconductors"The Guardian (August 24, 2024) https://www.theguardian.com/environment/article/2024/aug/24/pfas-toxic-waste-pollution-regulation-lobbying

[15] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, Appendix L-1 (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Appendix_L.pdf.

[16] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

and discharged. Therefore, it is critical the SPDES permit remains flexible to be able to account for ongoing changes in semiconductor industry.

It is revealed in the Conceptual Design Engineering Report that "Micron stated … that PFAS and mercury are anticipated in low concentrations in the waste load coming from their facilities. These compounds will be limited in the discharge from Micron to a level that can be removed in the biological treatment to values below the discharge requirements."[17] However, it is well established that PFAS cannot be broken down biologically, and furthermore, the proposed "discharge requirements" are confined to action limits for two compounds that Micron has stated they will not be using.

Overall, it is imperative that NYSDEC and OCDWEP adequately plan for and address PFAS discharges, especially as they relate to Micron, to ensure that surrounding communities do not suffer any further burdens.

## II. **Regulatory Context**

*Clean Water Act Effluent Limitation Guidelines (ELGs) and the National Pretreatment Program*

EPA promulgated the Electrical and Electronic Components (E&EC) Effluent Guidelines and Standards (40 CFR Part 469) in 1983. Subpart A regulates the semiconductor subcategory. In 2022, EPA conducted a detailed study of the E&EC category and concluded there was no need to revise the regulation at that time, but the study acknowledges that: "The PFAS data the EPA reviewed are limited; however, the EPA intends to continue to monitor discharges of PFAS from this category and expects to review additional data in the coming years to help identify any significant sources of these chemicals in future reviews."[18]

The Clean Water Act also establishes the National Pretreatment Program (40 CFR Part 403). The objectives of general pretreatment regulations are to:

a. Prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including interference with its use or disposal of municipal sludge;
b. Prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works; and
c. Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.

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[17] Brown and Caldwell, Onondaga County Department of Water Environment Protection Oak Orchard Industrial Wastewater Treatment Plant and Water Reclamation Facility Conceptual Design Engineering Report, (November 11, 2025) https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/SPDES/Engineering-Reports/OCDWEP%20IWWTP%20WRF%20CDE%20Report_111025.pdf (pg 1-9)

[18] EPA, "Electrical and Electronic Components Effluent Guidelines" https://www.epa.gov/eg/electrical-and-electronic-components-effluent-guidelines (November 2022).

Under this program, any POTW with a total design flow greater than 5 million gallons per day (mgd) must implement a local pretreatment program to prevent pass-through and interference. Therefore, most of the responsibility of the pretreatment program falls on the local municipalities to establish pretreatment standards, local limits, and oversee compliance.

*Safe Drinking Water Act Maximum Contaminant Levels (MCLs)*

In 2024, EPA finalized enforceable Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) for PFOA and PFOS at 4 ppt, the lowest level that can be reliably measured in drinking water (40 CFR Part 141.61(c)(2)). Because research indicates that PFAS chemicals can cause health risks at lower levels and in mixtures, EPA has also finalized a hazard index approach to regulating four chemicals - PFHxS, HFPO-DA (GenX), PFNA, and PFBS - when they occur in mixtures. However, the Trump administration's EPA is currently working to eliminate the drinking water standards for those PFAS.[19]

*EPA has Directed All Levels of Government to Limit PFAS Discharges*

EPA's *PFAS Strategic Roadmap* stresses that all levels of government (federal, Tribal, state and local) must "exercise increased and sustained leadership to accelerate progress to clean up PFAS contamination, prevent new contamination and make game-changing breakthroughs in the scientific understanding of PFAS."[20]

States do not have to wait for EPA to finalize additional PFAS ELGs to address PFAS in water pollution permits. Nor are states limited to addressing pollutants and contaminants with preexisting effluent limitations or guidance values. To the contrary, the Clean Water Act requires permits to include "technology based effluent limitations and standards," including "case-by-case effluent limitations" when other values are not available.[21] As a state designated to implement the National Pollutant Discharge Elimination System (NPDES) program, New York must

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[19] Earthjustice, EPA Seeks to Eliminate Critical PFAS Drinking Water Protections, (September 12, 2025), https://earthjustice.org/press/2025/epa-seeks-to-roll-back-pfas-drinking-water-rules-keeping-millions-exposed-to-toxic-forever-chemicals-in-tap-water

[20] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

[21] 40 C.F.R. § 122.44(a)(1); *see also* 33 U.S.C. § 1342(a)(1)(B) (a discharge permit should include "such conditions as the Administrator determines are necessary to carry out the provisions of this chapter); *see also* EPA, *Technology-based Effluent Limits Flue Gas Desulfurization (FGD) Wastewater at Steam Electric Facilities*, attach. A *in National Pollutant Discharge Elimination System (NPDES) Permitting of Wastewater Discharges from Flue Gas Desulfurization (FGD) and Coal Combustion Residuals (CCR) Impoundments at Steam Electric Power Plants* at 2 (June 7, 2010), https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1564.pdf ) ("[A]n authorized state must include technology-based effluent limitations in its permits for pollutants not addressed by the effluent guidelines for that industry … In the absence of an effluent guideline for those pollutants, the CWA requires permitting authorities to conduct the [best professional judgment] analysis discussed above on a case-by-case basis for those pollutants in each permit.").

adhere to these authorities.[22] In the absence of established standards and guidelines, NYSDEC must use its "best professional judgment" to establish limitations on all PFAS discharged by the expanded treatment plant.[23]

NYSDEC must also ensure that all discharges from the Oak Orchard Wastewater Treatment Plant comply with the state's narrative water quality criteria, including the prevention of releases that will "impair the [receiving] waters for their best usages."[24] Oak Orchard discharges wastewater to the Oneida River, a class B water. "The best usages of Class B waters are primary and secondary contact recreation and fishing."[25] PFAS are known to contaminate fish tissue, and the severe health threats associated with even low levels of PFAS contamination impair other recreational uses of the water body as well. The state's Dept. of Health has already set fish consumption advisories in several areas of New York, including L. Champlain, the Mohawk R., and Onondaga Lake, due to high levels of PFOS in fish.[26] The number of fish advisories is sure to increase as more types of PFAS are included.

A permit must include limitations to control pollutants that "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."[27] To analyze whether the source has reasonable potential, EPA considers whether the "discharge, alone or in combination with other sources…could lead to an excursion above an applicable water quality standard."[28] Here, however, there is no evidence that NYSDEC considered whether Oak Orchard's potential PFAS discharges would violate the state's narrative water quality criteria. NYSDEC must do so.

In December 2022, EPA issued a guidance memo directing states to use NPDES permits to limit discharges of PFAS to surface waters.[29] That memo affirms that "[s]ite-specific technology-based effluent limits (TBELs) for PFAS discharges developed on a best professional judgment (BPJ) basis may be appropriate for facilities for which there are no applicable effluent guidelines (see 40 CFR 122.44(a),

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[22] 40 C.F.R. § 123.25; N.Y. ECL § 17-0811 (McKinney 2024) (SPDES permits must include, where applicable, effluent limitations, standards of performance for new sources, and any further limitations to comply with water quality standards); 6 N.Y.C.R.R. §§ 750-1.11(a)(1-3).
[23] *See also* 6 N.Y.C.R.R. § 750-1.2
[24] 6 NYCRR 703.2.
[25] 6 NYCRR 701.7.
[26] New York State Department of Health, Advisory Listings by County, https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/by_county.htm (Accessed December 16, 2025)
[27] 40 C.F.R. § 122.44(d)(1)(i).
[28] EPA, Off. of Wastewater Mgmt., NPDES Permit Writers' Manual (EPA-833-K-10-001) at 6-23 (2010), https://www3.epa.gov/npdes/pubs/pwm_2010.pdf
[29] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

125.3)."[30] In addition, the memo makes specific recommendations for permit conditions (like monitoring requirements, Best Management Practices [BMPs], effluent limits, etc.), which states should require for industrial permittees known or suspected of discharging PFAS.

For example, for monitoring, the memo recommends using EPA Method 1633 at least quarterly to assess the presence and concentration of PFAS in discharges. In addition, if appropriate, the memo recommends the use of the adsorbable organic fluorine wastewater method (EPA Method 1621) in conjunction with EPA Method 1633. EPA's memo makes it clear that states and POTWs can use their existing water program authorities to address PFAS in wastewater discharges immediately.

Therefore, NYSDEC and OCDWEP must make every effort to identify PFAS sources and hold industrial dischargers, including Micron, to the highest standards possible to minimize and prevent toxic PFAS discharges, as detailed below. Consistent with federal and state law, as well as EPA guidance, NYSDEC must exercise its best professional judgment to establish limits on all PFAS discharged by the Oak Orchard Wastewater Treatment Plant that are fully protective of public health and the environment.

## III. NYSDEC and OCDWEP Should Strengthen Pretreatment Requirements for PFAS

**Recommendations:**

As part of the industrial pretreatment program implementation requirements, NYSDEC and OCDWEP should develop a PFAS Minimization and Management Plan with each Significant Industrial User (SIU), including Micron. These plans should be prepared prior to beginning operations and updated annually. The draft permit should be amended to include a PFAS Minimization and Management Plan that:

1. Identifies the ways the facility uses, generates, or releases PFAS.
2. Requires a comprehensive PFAS inventory with known or suspected PFAS compounds present, final deposition, and purpose of use.
3. Requires industrial dischargers to obtain and provide NYSDEC and OCDWEP with analytical reference standards for every PFAS used in their facility, so those PFAS can be detected in wastewater effluent and in the environment.
4. Establishes a monthly PFAS monitoring plan that includes sampling before and after any pretreatment, using EPA Method 1633 and EPA Method 1621. The results should be made publicly available online promptly after the results are available.
5. Requires the use of safer, non-PFAS alternatives, wherever feasible.

[30] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

6. Prohibits the discharge to surface waters or groundwater of any wastewater containing PFAS at concentrations exceeding background levels, using best management practices and optimized treatment.
7. Establishes reporting requirements and requires receipt of all data within 30 days of sampling.

**Rationale:**

In EPA's *PFAS Strategic Roadmap*, EPA identifies the need to prevent "PFAS from entering the environment in the first place—a foundational step to reducing the exposure and potential risks of future PFAS contamination."[31] The industrial pretreatment program is an integral part of the Clean Water Act, requiring indirect industrial dischargers to reduce or eliminate the discharge of harmful pollutants to POTWs.

The draft permit's industrial pretreatment program does not establish any requirements for PFAS. Under the Clean Water Act, industrial facilities are prohibited from sending any pollutant or wastewater to a POTW if the wastewater contains pollutants that will "pass through" the facility if inadequately treated prior to discharge into receiving water. Without PFAS-specific requirements, the POTW may be held accountable for pass-through releases of toxic PFAS compounds. In addition, accountability for pass-through releases of PFAS into the environment might add to the cost of operating the POTW. Therefore, the permit should institute a PFAS Minimization and Management Plan.

Although the draft permit refers to an Emerging Contaminant Minimization Plan on page 51, it only focuses on PFOA and PFOS and is only triggered when there is an exceedance of an action level. However, as described below in more detail, focusing solely on PFOA and PFOS is insufficient when considering the wide array of other PFAS used by the semiconductor industry.

Through the development of a PFAS Minimization and Management Plan as well as clear PFAS industrial pretreatment requirements, NYSDEC and OCDWEP would better understand the types and quantities of PFAS present in the effluent being sent to the POTW. A robust PFAS Minimization and Management Plan with each SIU would also help inform the monitoring requirements and treatment technologies necessary to effectively monitor, manage, and eliminate PFAS. Establishing a strong pretreatment program ensures that industrial users are held responsible for their pollution, rather than shifting the burden of treatment onto the POTW.

In addition, the draft permit requires that an industrial pollutant scan be conducted within the first 60 days after the initial receipt of wastewater to the ITT (Outfall 01B)

[31] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

using EPA Method 1633. This approach is insufficient. Allowing wastewater discharges for 60 days before completing the scan is inadequate to protect human health and the environment. Micron should instead be required to conduct the pollutant scan prior to commencing operations to ensure the early understanding and detection of contaminants. In addition, the industrial pollutant scan should be updated to include the additional PFAS monitoring strategies described in detail below, since EPA Method 1633 is inadequate for identifying the broad suite of PFAS discharged by semiconductor manufacturers.

Without these improvements, NYSDEC and OCDWEP will lack the information necessary and be unable to prevent the pass-through of toxic PFAS discharges. Therefore, a robust PFAS-specific pretreatment program should be implemented and incorporated into the permit.

## IV. NYSDEC and OCDWEP Should Significantly Expand Requirements to Monitor, Identify, Quantify, and Characterize all PFAS Discharged by Micron

**Background.** The draft permit would only require quarterly sampling and monitoring for PFAS compounds using EPA Method 1633/1633A, which provides a targeted analysis for approximately 40 PFAS. The permit proposes to limit the monitoring to Outfall 01B, which will discharge the treated effluent from the industrial wastewater treatment plant.

The proposed monitoring requirements cannot ensure adequate protection of water quality, human health, and the environment from the industrial use of PFAS by Micron because they fail to determine:

- The chemical identity of most PFAS compounds in the wastewater discharge;
- The efficacy of PFAS removal by industrial and sanitary wastewater treatment; and
- The impact of PFAS compounds on beneficial uses of all receiving waters.

PFAS and their breakdown products are extremely persistent, mobile, and toxic. Therefore, monitoring requirements should be designed to detect and quantify a broad spectrum of PFAS, such that a mass balance accounting of the fate and transport of all PFAS can be constructed. Only a comprehensive approach to monitoring using a variety of analytical methods can assist in virtually eliminating all PFAS releases to waterways.

Fortunately, significantly more expansive monitoring requirements are clearly authorized by New York water quality regulations (N.Y. Comp. Codes R. & Regs. Tit. 6 §§ 750-1.13).

**Recommendations:**

1. The permit should require the industrial user (Micron Technology) to fully characterize and identify all PFAS present in the influent and effluent for the industrial wastewater treatment train. This aim should be accomplished through application of all the following methods, in addition to monitoring wastewater using Method 1633:

    a. Expanded targeted analysis enabled by requiring industrial user Micron to provide high quality analytical reference standards and stable isotope-labeled standards for all unique PFAS used in its manufacturing process;
    b. Identification and quantification of ultra short-chain PFAS, through a method conducted by a qualified contract laboratory;
    c. Nuclear magnetic resonance spectroscopy ($^{19}$F NMR) to determine total organic fluorine, total polymeric fluorine, and total inorganic fluorine as a percent of total fluorine, in addition to providing information on chemical structure;
    d. EPA Method 1621 to determine total Adsorbable Organic Fluorine (AOF);
    e. Extractable Organic Fluorine (EOF), through a method conducted by a qualified contract laboratory;
    f. Total Organic Precursors (TOP) assay, conducted by a qualified contract laboratory;
    g. A non-targeted analysis using high-resolution mass spectrometry (HRMS) to characterize, semi-quantify, and identify PFAS compounds not detected by targeted analysis or measures of total organic fluorine; and
    h. The above data shall be submitted with a report that analyzes and interprets the monitoring results and computes and closes a mass balance of all fluorinated compounds present in the influent and effluent of the industrial wastewater treatment plant.

**Rationale:**

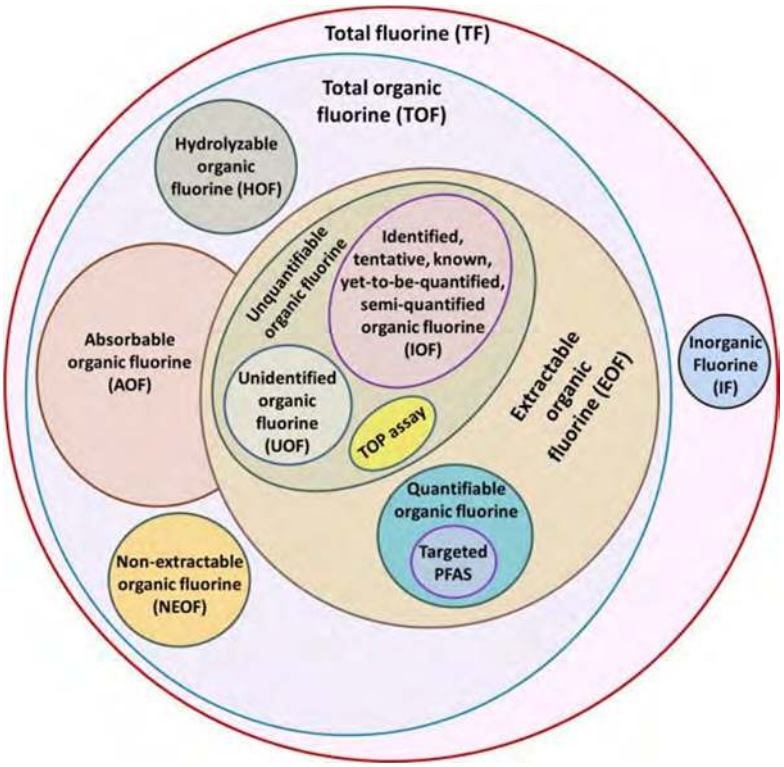
The draft permit would fail to detect the vast majority of PFAS that are present in Micron's wastewater including many chemical compounds and breakdown products that are uniquely used in semiconductor manufacturing. Without more rigorous monitoring and ongoing efforts to identify the chemical identity of the specific PFAS present in Micron's wastewater, it will be impossible to determine the effectiveness of wastewater treatment by the ITT or the impact of the treated industrial effluent on the POTW, biosolids, and the beneficial uses of the receiving waters.

Given that there are thousands of types of PFAS, of which over one hundred PFAS are known to be used by the semiconductor industry, and new PFAS are constantly

being introduced, EPA Method 1633 is completely inadequate for identifying the full suite of PFAS in semiconductor wastewater discharge.

Method 1633 is a targeted analysis that identifies and quantifies only 40 chemical compounds in the PFAS class. **The peer-reviewed literature reports that targeted analysis often detects less than 10% of the total organic fluorine of environmental concern.**[32,33, 34]

The figure below is a Venn diagram that illustrates how targeted analysis (small circle labeled "Targeted PFAS") such as method 1633 captures only a small portion of PFAS compounds and how several other analytical methods that are routinely offered by contract laboratories enable a much broader characterization of PFAS in wastewater.




Source: Ifeoluwa Grace Idowu, et al, A systematic review of methods for the analysis of total per- and polyfluoroalkyl substances (PFAS), Science of The Total Environment, Vol 967 (2025), https://doi.org/10.1016/j.scitotenv.2025.178644.

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[32] Shelor, C. P.; Warren, C.; Odinaka, C. V.; Dumre, K. Comprehensive review of combustion ion chromatography for the analysis of total, adsorbable, and extractable organic fluorine. *J. Sep.Sci.* 2024, 47 (15), 2400235.
[33] Ersan, M. S.; WangWongWesterhoff, B. M. S. P.; Westerhoff, P. Advanced oxidation processes may transform unknown PFAS in groundwater into known products. *Chemosphere* 2024, 349, 140865.
[34] Schultes, L.; Vestergren, R.; Volkova, K.; Westberg, E.; Jacobson, T.; Benskin, J. P. Per- and polyfluoroalkyl substances and fluorine mass balance in cosmetic products from the Swedish market: implications for environmental emissions and human exposure. *Environ. Sci. Process. Impacts* 2018, 20 (12), 1680–1690.

A recent journal article that reviewed analytical methods to characterize PFAS in the wastewater of semiconductor manufacturing facilities supports our recommendation: "The choice of the method used to cover a range of PFAS generally requires more than one analytical method, with some overlap between methods."[35]

**Targeted analysis.** For targeted analysis, this study concluded that "[T]o increase confidence in novel PFAS identified in semiconductor wastewater, high quality analytical standards and stable isotope-labeled standards will be needed."

**Ultra short-chain PFAS.** Regarding the need to measure for ultra short-chain PFAS, this study advised: "[T]he shift to short-chain PFAS by the semiconductor industry indicates that monitoring only for > [or equal to] C4 PFCAs or greater may miss many C1-C3 short-chain precursors, unless methods for ultra short-chain PFCAs are utilized."

**Total organic fluorine.** Further, these same scientists concluded: "[U]ntil analytical standards become available for all relevant PFAS present in semiconductor wastewater, investigations will require suspect and nontarget PFAS analysis that require sophisticated identification and data techniques." And: "[T]his review also stresses the need for advanced techniques, including high-resolution mass spectrometry for suspect and nontarget analysis as well as nonspecific methods for total organic and inorganic fluorine."

**PFAS nuclear magnetic resonance ($^{19}$F NMR).** The Semiconductor PFAS Consortium of the Semiconductor Industry Association (SIA) commissioned a study by chemists at the University of Toronto that successfully adapted an analytical method known as PFAS nuclear magnetic resonance **(**$^{19}$F NMR) spectroscopy to characterize PFAS in semiconductor industry wastewater.[36]

The method distinguishes total organic fluorine from total polymeric fluorine, indicators of PFAS that pose high environmental concern, from total inorganic fluorine, which presents a relatively low hazard. The results are expressed as a percentage of total fluorine. The method also provides data-driven clues that can help characterize the chemical structure of as-yet unidentified PFAS.

The study concluded that "[B]ased on these promising results, multiple member companies of the Semiconductor PFAS Consortium are moving forward with acquiring the necessary equipment to begin this type of analysis in-house to assist

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[35] Droz B, Heron CG, Kim-Fu ML, Reardon PN, Roig-Paul M, Field JA. Practical Guidance on Selecting Analytical Methods for PFAS in Semiconductor Manufacturing Wastewater. *ACS Meas. Sci. Au*. 2025, 5, 399-423.

[36] Gauthier JR, Mabury SA (2025). $^{19}$F NMR analysis of semiconductor manufacturing facility wastewater samples for the Semiconductor PFAS Consortium, University of Toronto, Department of Chemistry, July 22. Available from https://www.semiconductors.org/19f-nmr-analysis-of-semiconductor-manufacturing-facility-wastewater-samples/.

in identifying and quantifying PFAS constituents in semiconductor manufacturing process wastewater."

Given that this study has been published on the SIA website, and Micron Technology is a member of the Semiconductor PFAS Consortium, and the method provides invaluable data, Micron should be required to apply this monitoring methods to it proposed wastewater discharge as recommended above.

**Method 1621.** As described above, the EPA's December 2022 memo recommends supplementing EPA Method 1633 with the Adsorbable Organic Fluorine (AOF) analysis using EPA Method 1621, the only other EPA-approved standard analytical method for PFAS in wastewater.[37]

**Non-targeted analysis.** Non-target analysis is needed to identify more PFAS including novel PFAS from semiconductor processes that end up in the wastewater. This will help NYSDEC anticipate the introduction of new PFAS in semiconductor manufacturing and ensure that the permit remains protective.

Peer-reviewed literature demonstrates that targeted analysis of PFAS can only identify a fraction of the PFAS present in the wastewater of typical semiconductor fabrication facilities. For example, in a study of wastewater effluent from three semiconductor manufacturing plants, researchers found that the total PFAS concentration in wastewater determined through non-targeted analysis significantly exceeded the PFAS concentration indicated by a targeted analysis of 25 PFAS (all of which are included in EPA Method 1633).[38] In that study, Jacob et al. (2021) measured PFAS using the two different methods and found the following concentrations expressed as nanograms per liter (ng/L):

| Semiconductor Facility | **Targeted analytes** (25 PFAS) | **Non-targeted analytes** (133 PFAS) | **TOTAL PFAS** (sum of two methods) | **Percent of PFAS (mass) missed by targeted analysis** |
|---|---|---|---|---|
| Fab 1 | 623 | 867 | 1,490 | 58% |
| Fab 2 | 394 | 78,006 | 78,400 | 99.5% |
| Fab 3 | 376 | 1,794 | 2,170 | 83% |
| Source: Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoroalkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 Env't Sci. & Tech. 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690. | | | | |

[37] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

[38] Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoralkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 *Env't Sci. & Tech.* 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690

The non-targeted analysis above revealed 41 homologous series of PFAS, which included 133 individual PFAS compounds. Chemical structures were proposed for 15 compounds, six of which were reported for the first time ever. None of these PFAS are detectable using EPA Method 1633.

Other peer-reviewed non-targeted analyses have also characterized many PFAS in semiconductor industry wastewater that cannot be detected by targeted analysis,[39, 40] such as through the use of Method 1633.

## V. NYSDEC and OCDWEP Should Expand the Locations and Frequency of PFAS Monitoring

PFAS monitoring must be comprehensive in order to capture the variability throughout the wastewater system. In addition to the need for robust identification and measurement of PFAS, the draft permit does not provide adequate monitoring for PFAS in terms of location and frequency.

**Recommendations:** The draft permit should be amended to:

1. Expand the monitoring points from effluent at internal Outfall 01B and Outfall 001 to influent and effluent at Outfall 01A, Outfall 01B, and Outfall 001; and
2. Increase the monitoring frequency from quarterly to, at minimum, monthly using the methods described above.

**Rationale:**

Influent monitoring is essential to better understand what is entering the POTW, while effluent monitoring is necessary to assess the effectiveness of treatment. The draft permit's current monitoring requirements are insufficient to track the variability of PFAS discharges and the effectiveness of treatment.

Influent and effluent monitoring of both the municipal treatment train (MTT) industrial wastewater treatment plant (IWWTP) is also needed to ascertain how much PFAS may be transferred to solid waste as treatment residues. Whether those solid residues are subject to PFAS destruction, which should be required, or simply transferred to another environmental media, such as landfill leachate, is an essential consideration.

Similarly, monitoring of the influent (from the industrial treatment plant) and effluent from the final combined sanitary and industry treatment plant (POTW) is needed to determine the efficacy of treatment in PFAS removal and the relative

[39] Chen, Y.-J.; Yang, J. S.; Lin, A. Y.-C. Comprehensive nontargeted analysis of fluorosurfactant byproducts and reaction products in wastewater from semiconductor manufacturing. *Sustain. Environ. Res.* 2024, 34, 14.
[40] Chen, Y. J.; Wang, R. D.; Shih, Y. L.; Chin, H. Y.; Lin, A. Y. Emerging perfluorobutane sulfonamido derivatives as a new trend of surfactants used in the semiconductor industry. *Environ. Sci. Technol*. 2024, 58 (3), 1648–1658.

partitioning of PFAS between the final wastewater discharge to the receiving water and to biosolids whose ultimate management may raise additional environmental concerns.

Expanding the monitoring locations to include both influent and effluent at Outfall 01A, Outfall 01B, and Outfall 001 is necessary to evaluate PFAS levels throughout the system, to better identify where PFAS may be bypassing treatment processes and prevent dilution prior to monitoring for PFAS.

In addition, limiting monitoring to quarterly sampling at a single effluent location (Outfall 001) will fail to provide sufficient data to assess the types, amounts, and the potential for pass-through of PFAS. Quarterly monitoring would provide a very limited snapshot of PFAS discharges. Increasing the frequency of monitoring from quarterly to at least monthly is necessary to capture variability in PFAS discharges, given known fluctuations in the manufacturing processes. Therefore, the draft permit must be updated to expand the monitoring points for PFAS as well as the monitoring frequency.

## VI. NYSDEC Should Expand the Universe of PFAS Being Regulated and Establish a Goal of Complete Elimination of PFAS Discharges

**Recommendations:**

The permit should be amended to ensure that no PFAS are discharged into surface waters. To achieve this, the draft permit should be amended to:

1. Expand the universe of PFAS being regulated;
2. Establish a zero-discharge goal for PFAS from all industrial sources connected to the POTW, including Micron; and
3. Require the use of treatment technologies that destroy PFAS, rather than transfer PFAS.

**Rationale:**

The draft permit only proposes action levels for PFOA and PFOS. These limits rely on the NYS Department of Health (DOH) Maximum Contaminant Level (MCL) of 10 ng/L for drinking water for PFOA and PFOS. However, the semiconductor industry no longer uses these compounds; rather the industry relies on a wide range of PFAS for use in photolithography and related processes. The semiconductor industry heavily relies on short-chain PFAS, which have been found to be more mobile and more difficult to remove from waste streams than PFOS and PFOA.[41]

[41] C. Kwiatkowski et al., *Scientific Basis for Managing PFAS as a Chemical Class*, June 2020, https://pmc.ncbi.nlm.nih.gov/articles/PMC8297807/

The CHIPS Program Office (2024) *Final Programmatic Environmental Assessment for the Modernization and Expansion of Existing Semiconductor Fabrication Facilities* contains considerable detail about the use of PFAS in wafer fabrication.[42] Appendix C of that document includes a 10-page table describing the over one hundred types of PFAS used by the semiconductor industry. Furthermore, these compounds undergo transformations during semiconductor production. Consequently, one can expect thousands of different PFAS chemicals to exist in semiconductor plant wastewater.

Managing PFAS through limits for one chemical at a time will take years, delay critical protections, and may encourage the creation of alternatives that are just as harmful to skirt around protections. Given the persistent, bioaccumulative, and toxic nature of PFAS, NYSDEC should require a zero-discharge goal for PFAS from all industrial uses. Every additional release of PFAS builds up in the local, regional and global environment, leading to contamination of drinking water supplies, fish, wildlife, livestock, and in humans. It is especially important to control PFAS at point sources such as Micron and the Oak Orchard Wastewater Treatment Plant.

Based on the draft permit, the new ITT is expected to use biological treatment in mixed anoxic tanks followed by aeration tanks, membrane bioreactors, UV disinfection, centrifugal solids dewatering, effluent reuse with ion exchange resin (IX) and reverse osmosis (RO) treatment. However, this process does not destroy PFAS, and instead generates a concentrate containing high levels of PFAS that must be transported off-site for disposal. This concentrated waste stream poses numerous environmental and public health concerns, including:

- Exposure for workers who handle these wastes
- Potential exposure during transport of wastes through local communities
- Likely exposure in the vicinity of waste disposal sites, often sited near communities of color and low-income communities.

Industrial dischargers of PFAS-containing wastewater, such as Micron, should therefore be required to use treatment methods that destroy PFAS, rather than simply filter PFAS.

[42] National Institute of Standards and Technology, *Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program* (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf

A growing variety of technologies exist which are capable of destroying PFAS (breaking the C-F bond). (See, for example, https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/ ) These include:

- Supercritical water oxidation (SCWO)
- Hydrothermal alkaline Treatment (HALT)
- Electrochemical oxidation
- Surface Plasma

The Applicant (Onondaga County) should be required to investigate and install such a system to address the concentrated waste streams resulting from the ion exchange and RO treatment steps. For further information see:

1) U.S. Department of Defense-funded PFAS demo projects show promise for remediation and destruction (A. Reese, Waste Dive, Dec. 1, 2025) https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/
2) Competition to destroy 'forever chemicals' heats up (B. Erikson, Chem & Eng, News, Mar. 4, 2024) https://cen.acs.org/environment/persistent-pollutants/Competition-destroy-forever-chemicals-heats/102/i7

40 CFR 403.5(c)(4) authorizes POTWs to develop local limits in the form of Best Management Practices (BMPs) and source reduction opportunities.[43] As described above, NYSDEC and OCDWEP should develop a robust PFAS Minimization and Management Plan. The BMPs and the PFAS Minimization Plan must encompass a much broader range of PFAS, not just PFOA and PFOS.

Because the complete elimination of PFAS is both technically feasible and available, NYSDEC should not permit the discharge of any PFAS into surface waters.

## VII. NYSDEC Should Limit Solid Waste Disposal

### Recommendations:

The draft permit fails to adequately address the proper management of PFAS concentrate from the RO process. Based on the Conceptual Design Engineering Report, it is estimated that 75 tons/day will be generated.[44] This material, produced from crystallizing the RO permeate, is simply slated for off-site disposal at a landfill. The draft permit should be amended in the following ways:

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[43] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

[44] Brown and Caldwell, Onondaga County Department of Water Environment Protection Oak Orchard Industrial Wastewater Treatment Plant and Water Reclamation Facility Conceptual Design Engineering Report, (November 11, 2025) https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/SPDES/Engineering-Reports/OCDWEP%20IWWTP%20WRF%20CDE%20Report_111025.pdf (pg 3-30)

1. The permit must describe NYSDEC's plans to coordinate with all relevant agencies responsible for solid and hazardous waste management and occupational safety as it relates to PFAS-contaminated solid waste;
2. A detailed PFAS waste management plan must be submitted to address the handling, storage, transportation, and disposal of the PFAS filtrate; and
3. Transparent documentation and reporting of final disposal locations must be required and made publicly available.

**Rationale:**

PFAS-contaminated solid waste poses significant occupational and environmental hazards if not properly managed. As described above, the new ITT process will use RO, which does not destroy PFAS and will create a concentrated brine solid that must be disposed of off-site. The MTT will be accepting wastewater from Micron that is likely to contain PFAS contaminants, These residuals generated from each operation will contain concentrated levels of PFAS and other industrial compounds which are NOT amenable to biological treatment, such as triazoles and tetramethyl ammonium compounds. The solids may need to be managed as hazardous waste. The permit should specify routine testing of this solid waste stream for PFAS, and other recalcitrant compounds.

These residuals are required to be managed as solid or hazardous waste and fall outside of the scope of SPDES permitting. As stated in EPA's December 2022, "Certain industrial processes may generate PFAS-contaminated solid waste or air emissions not covered by NPDES permitting and permitting agencies should coordinate with appropriate state authorities on proper containment and disposal to avoid cross-media contamination." [45] Without coordinated oversight of the PFAS concentrate from the RO process, unnecessary additional PFAS contamination and exposure could occur. Therefore, since the draft permit currently relies on RO, it is critical that NYSDEC coordinates closely with all relevant state agencies to ensure that the hazardous waste disposal is properly managed to protect workers and surrounding communities.

Overall, it is essential that NYSDEC coordinate and limit solid waste disposal to protect worker safety, human health, and the environment.

[45] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

## VIII. NYSDEC Should Include Additional Pollution Limits for Other Toxic Constituents in Micron's Wastewater

**Recommendations:**

The draft permit should be amended to include effluent limits for other known toxic constituents in Micron's wastewater including Tetramethylammonium hydroxide (TMAH); 1-Butanol, 3-methoxy-3methyl; Polyethylene glycol; Methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); EDTA; and 1,2,4-Triazole.

**Rationale:**

As part of the Notice of Intent to Assess (NOIA) response documents available for review, the attachment entitled "Worst-Case Organic Wastewater Constituents to OCDWEP" identifies dozens of additional toxic and potentially hazardous constituents that are expected to be present in Micron's wastewater. These constituents warrant specific effluent limits and monitoring requirements in the SPDES permit. Among the constituents of concern are Tetramethylammonium hydroxide (TMAH); 1-Butanol, 3-methoxy-3methyl; Polyethylene glycol; Methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); EDTA; and 1,2,4-Triazole. It appears that most of these pollutants are simply assumed to be sufficiently treated to a concentration of 10 µg/L. But that level of needs to be verified during plant start-up, and periodically throughout its operation. Given that these constituents are toxic to humans, aquatic life, and, in some cases, are very persistent in the environment, NYSDEC should establish pollutant limits and appropriate monitoring as part of the permit.

## IX. NYSDEC Should Institute a Long-Term PFAS Monitoring Program for the Receiving Waters

**Recommendations:**

1. Require monitoring of fish, sediments, biota, and ambient water quality for PFAS upstream and downstream of the combined sanitary and industrial wastewater Outfall 001; and
2. Establish a long-term monitoring plan that tracks PFAS discharges in the Oneida River, Oswego River, and Lake Ontario.

**Rationale:**

Many PFAS and their breakdown products are both extremely persistent and bioaccumulative, as well as highly toxic. If the goal of zero discharge of PFAS is not achieved, it's imperative that potential impacts on beneficial uses of the receiving waters be determined.

Upstream and downstream monitoring of sediments, fish, other representative biota, and ambient water quality should be required to determine whether PFAS

are accumulating in the ecosystem and to enable NYSDEC to assess and understand the larger impacts of PFAS discharges. NYSDEC should establish a long-term monitoring program that tracks PFAS and other chemicals unique to Micron to understand the broader implications of PFAS discharges, bioaccumulation, persistence and potential risks to aquatic biota and drinking water sources.

Because the Oak Orchard Wastewater Treatment Plant discharges into the Oneida River, a tributary of the Oswego River that flows into Lake Ontario (a drinking water source and ecological haven), it is critical to monitor for emerging contaminants that are known to be highly persistent and toxic. The program should include regular upstream and downstream monitoring and sampling as well as monitoring in aquatic biota for accumulation.

A comprehensive long-term monitoring program will allow New York State to become a leader in understanding these emerging contaminants and help safeguard the Oneida River and Lake Ontario as a critical ecological resource and drinking water source. Such data will also help inform the establishment of water quality criteria and effluent limits for specific PFAS compounds.

## X. NYSDEC Should Require All Data be Made Publicly Available Online

**Recommendations:**

1. All influent, effluent, and biosolids monitoring and sampling data should be made publicly available online and updated regularly.

**Rationale:**

Public access to monitoring data ensures transparency, accountability, and public trust. NYSDEC should require data be reported and posted to an easily accessible public website within 30 days of collection. Timely posting will build public trust in the effectiveness of minimization and treatment efforts and allow for the early detection of emerging issues.

## XI. NYSDEC and OCDWEP Should Clarify the Overall Schedule, Timing of Compliance, and Cost Implications

**Recommendations:**

1. NYSDEC and OCDWEP should provide a clearer and more detailed overall schedule for the permit and the timing of compliance; and
2. NYSDEC and OCDWEP should provide more information on how costs will be managed and passed onto ratepayers.

**Rationale:**

The permit's overall schedule, including the timing and sequence of compliance requirements, is vague and more clarity should be provided. The permit does not provide a clear sense of how long construction is anticipated to take. In addition, since Outfall 01B is associated with Micron, the schedule and compliance requirements are highly dependent on Micron's construction schedule. Therefore, additional information must be provided to understand the timing of the improvements at the Oak Orchard Wastewater Treatment Plant as well as Micron's schedule and how it relates to the phasing, overall schedule, and implementation of the requirements in the Oak Orchard Wastewater Treatment Plant permit.

It has been estimated that the cost of the project is $549.5 million, a significant project for the POTW.[46] It is unclear how this will impact local residents and ratepayers. Therefore, additional information should also be shared on how this substantial cost will be managed by OCDWEP and passed onto ratepayers. Transparent information is essential for improving public understanding of the improvements and providing meaningful stakeholder engagement.

## XII. NYSDEC Should Ensure the Timely Modification and Renewal of the Permit

**Recommendations:**

1. NYDEC must ensure the permit includes mechanisms to account for changes in effluent limits, monitoring requirements, or PFAS treatment technologies that may evolve over time; and
2. NYSDEC should commit to reviewing and renewing the permit on schedule.

**Rationale:**

Given the evolving nature of the semiconductor industry, wastewater management at the Oak Orchard Wastewater Treatment Plant must be robust and flexible to prevent harmful environmental releases. Although semiconductor manufacturers have proven themselves willing to engineer solutions once regulations are in place, they also have a history of failing to share information with the affected public.

By the time Micron begins operations, new chemicals (including additional PFAS) may be used and discharged. At the same time, treatment technologies for PFAS continue to rapidly advance. Since the landscape for this facility is expected to change significantly over the coming years, NYSDEC should include a condition in the permit allowing modification of effluent limitations outside the permit renewal cycle based on new information, if appropriate, to protect human health.

[46] Tim Knauss, syracuse.com, Onondaga County's $549 million sewage project likely to hike your rate. But how much?, (December 16, 2025) https://www.syracuse.com/news/2025/12/onondaga-countys-549-million-sewage-project-likely-to-hike-your-rate-but-how-much.html (Accessed December 16, 2025)

Per 40 CFR 122.46, NPDES permits should be reviewed and reissued at minimum every five years. Despite this, the current NPDES permit for the Oak Orchard Wastewater Treatment Plant has been administratively continued for nearly six years (since 2019). In this context, NYSDEC must ensure that the next permit is not only renewed timely but also updated to be sufficiently robust and flexible to prevent harmful PFAS releases.

## XIII. Conclusion

As currently drafted, the draft SPDES Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant is inadequate in protecting water quality, the environment, and the health of workers as well as surrounding communities. The permit is designed to support the operations of one of the largest factories in New York history, a facility that will use and discharge a broad and evolving range of harmful chemicals, including PFAS, so it deserves careful, deliberate review.

PFAS are toxic, highly persistent, and mobile in the environment, posing a significant risk to water quality, human health, and the environment. Without adequate monitoring, treatment, and oversight, PFAS discharges from industrial dischargers, such as Micron, can pass through the Oak Orchard Wastewater Treatment Plant and pose long-term risks to the Oneida River, Lake Ontario, downstream drinking water sources, and aquatic biota.

NYSDEC and OCDWEP must make every effort to identify PFAS sources and hold industrial dischargers, including Micron, to the highest standards possible to minimize and prevent toxic PFAS discharges.

The final permit should be amended based on the recommendations outlined above. Please specifically respond to each requested change in the Response-to-Comments issued in the final permit. Please provide the final permit and response to comments to the email provided below.

Sincerely,

Kate Bartholomew
Chair
Sierra Club Atlantic Chapter
atlantic.chapter@sierraclub.org

From: Hughes, Donald
To: dec.sm.Comments.OakOrchard2025; Don Hughes
Subject: Comments on Oak Orchard SPDES permits
Date: Friday, December 5, 2025 12:32:41 AM



To: Trendon Choe
Deputy Regional Permit Administrator
NYSDEC Region 7
5786 Widewaters Parkway
Syracuse, NY 13214
From: Donald J. Hughes

**Re: Upgrades to wastewater treatment systems to be expanded by Onondaga County at the Oak Orchard treatment facility (SPDES Permit # NY0030317; DEC 7-3124-00018/00001)**

Dear Mr. Choe,
I am writing with respect to the above-captioned matter--expension of the Oak Orchard treatment plant owned and operated by Onondaga County. Irequest an extension of the public comment period for a period to May 31, 2026 to afford the public--myself included--time to locate, read and understand the voluminous technical materials, and create comments. The ENB notice was published on Nov. 12, 2025. The Department of Environmental Conservation has allowed the public only 41 days to submit comments. That is, quite simply, insufficient time. Moreover, this coincides with the holiday season when the people are traveling or otherwise preoccupied with family and community events. I note that the SPDES permit alone is 143 pages. There are many supporting documents, including two lengthy engineering reports comprising 1,425 pages. Commenters must download over 270 megabytes of material from the Onondaga County website JUST to get started.

I note that the Department has been in no rush to renew the SPDES permit for the existing Oak Orchard wastewater treatment plant. That permit expired on June 30, 2019. According to the Micron final EIS, construction of the Onondaga Co wastewater treatment facilities at Oak Orchard is scheduled to **begin** in the fourth quarter of 2027, a full two years from now. Micron's first fabrication plant won't start operating until the third quarter of 2030, which is **five years away.** There is ample

time available to consider comments and release a final permit.

I urge the Department to also conduct several public meetings to inform citizens about the design of the facility, and how their tax dollars are being used to treat wastewater. Onondaga County and Micron staff/consultants should participate in such meetings.

Coincident with the SPDES and wetlands permits, the Department has released for comment a Title V air permit for the Micron facility. This places an additional burden on the public which is very concerned about the huge environmental impacts of the gigantic Micron semiconductor fabrication facility in Clay.

For all of the foregoing reasons, I request that you extend the comment period to May 31, 2026.

respectfully,

Donald J. Hughes, Ph.D.
157 Strong Ave.
Syracuse, NY 13210

***Chemistry Adjunct Professor***
hughesdj@lemoyne.edu
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"When you look on a tombstone, you see when you are born and when you die and the dash in between. That dash? It all depends on what you do in life in that dash.'' -Larry Demeritte, professional horse trainer and cancer survivor

| | |
|---|---|
| From: | John Przepiora |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | Water Quality Permitting: Oak Orchard wastewater treatment plant (SPDES Permit # NY0030317; DEC 7-3124-00018/00001) |
| Date: | Tuesday, December 23, 2025 1:14:32 PM |
| Attachments: | image001.png<br>DEC Oak Orchard WWTP SPDES permit written comments of jprzepiora.pdf |



Attached please find written comments and questions in the form of a PDF I request be addressed and included in the public record of this referenced permit. Please let me know as soon as possible if there are questions or of any difficulty in the opening of the file and inclusion in the record. These comments reflect an expanded version of oral comments previously submitted during the virtual public hearing of December 16, 2025.

John Przepiora, PE (retired/unregistered)
Syracuse, NY
President & Director
**GreeningUSA, Inc.**
(315) 382-3829
GreeningUSA.org

***...Advocating for sustainable communities to the benefit of local economies and environments.***

To: Trendon Choe
Deputy Regional Permit Administrator
NYSDEC Region 7
5786 Widewaters Parkway
Syracuse, NY 13214
Via email to: Comments.OakOrchard2025@dec.ny.gov

From: John Przepiora, Syracuse, NY

Date: December 23, 2025

Re: Water Quality Permitting: Oak Orchard wastewater treatment plant (SPDES Permit # NY0030317; DEC 7-3124-00018/00001)

Thank you for the opportunity to comment on Micron Technology's SPDES Permit. First, the comment period must be extended.

DEC has released for public comment three permits related to the Oak Orchard wastewater plant in addition to the Air Quality (Title V) Permit for Micron, all of which the public must carefully consider in a short time period, in the middle of December, a time which makes it difficult for the public to engage because people are traveling or otherwise preoccupied with family and other community events in celebration of the holidays. An extension is therefore requested at a minimum to the extent the regulations allow—which I believe means delaying the close

of comments to perhaps the 3rd week of January which is better but still not nearly enough time given the complexity of the issue and the plethora of documents and pages of documentation related to this permit action including 2 SEQRA reviews, the draft SPDES permit alone is 143 pages. There are nearly 20 supporting documents, including two lengthy engineering reports (1,425 pages). Commenters must download over 270 megabytes of material from the Onondaga County website just to get started. A 6-month extension of the comment period is warranted due to the volume of materials which need to be reviewed to provide meaningful input. And I would suggest that within this time period that the applicant and DEC hold public information meetings open to the public to allow the public to gain information and understand just what this permit will be sanctioning.

This wastewater discharge permit is premature. The public was informed on November 8th that construction of the memory chip factories would be delayed by two to three years. According to the Micron Final EIS, the construction of the Onondaga Co. wastewater treatment facilities at Oak Orchard are slated to begin in the fourth quarter of 2027, a full two years from now. Allowing additional time for public engagement and understanding what is being proposed here seems possible. WEP and DEC have been in no rush to renew the SPDES permit

for the existing Oak Orchard wastewater treatment plant since it expired on June 30, 2019. Time seems to be available for additional citizen engagement about this complex and important environmental protection project, and additional public engagement seems to be necessary.

Given the little time to review these materials I have only brief substantive comments and questions to offer at this time as follows.

1. There is Inadequate testing for PFAS (per- and polyfluorinated alkyl substances) which is limited to four times per year.
2. Moreover, this testing is limited to only 40 compounds.
3. No quantitative limits are imposed on any of the 40 compounds tested. Rather, “action levels” are set at 10 ng/L only for PFOA and PFOS yet neither PFOA nor PFOS are currently used by the semiconductor industry.
4. The SPDES permit needs to be revised to adequately monitor and eliminate the discharge of PFAS into our waterways, including Lake Ontario, which are already impacted by PFAS. Lake Ontario provides drinking water for over 8 million people in the U.S. and Canada. The Department needs to be proactive to prevent the introduction of new sources of PFAS. Please clarify what is

being done to assess whether there is any potential for health impacting chemicals to reach potable water intakes in Lake Ontario. Has there been modeling to determine the probabilities for hazardous substances to enter public water supplies withdrawn from Lake Ontario? If not, why not?

5. Testing for forty PFAS compounds is simply inadequate because there reportedly are hundreds if not thousands of PFAS compounds produced in the semiconductor manufacturing process. Therefore I urge the DEC to require the applicant to regularly test (at least weekly) for Total Organic Fluorine in the effluent from the Industrial Wastewater Treatment Plant (Outfall 01A). Monthly testing should be required for the 40 PFAS compounds in Method 1633, supplemented by non-targeted PFAS analysis to identify unlisted compounds found in semiconductor waste. Discharge limits need to be imposed on those PFAS which are present in the IWWTP wastewater. The Department should consult with other state agencies with experience regulating PFAS in wastewater. Reportedly, Minnesota has developed robust monitoring strategies for the 3M plant at Cottage Grove.
6. I also want to know more about how biosolids from the plant will impact the environment including: how will PFAS be eliminated from these waste residuals? What is

required of Micron and Onondaga County to ensure PFAS is destroyed or sequestered?

7. The SEQRA review and subsequent negative declaration for the sanitary WWTP upgrade failed to consider, estimate and disclose the growth inducing aspects of the Oak Orchard upgrades, and the subsequent implications and impacts of that growth in the plant's service area. I believe the SEQRA determination was flawed and should be re-initiated.
8. Onondaga posted for public review a 411 page EAF pdf document related to the OOWWTP upgrade, but it contains very little information about the proposed expansion/upgrade of Oak Orchard except for the very perplexing appended 'Technical Memo on Air Permitting Strategy (by Brown and Caldwell)' for the OOWWTP upgrade which includes information about the conceptual design for the IWWTP. I'm perplexed by this attachment since this EAF by the applicant is for the municipal plant, not the IWWTP. And while this air permitting technical memo implies that an air permit will be needed for the IWWTP, there is yet to be seen an application for the air permit and yet the SPDES permit is proceeding. I'd like an explanation for this. If an air permit is needed why is the SPDES permit being processed independently? If nothing else, this confusion illustrates the maze-like nature of the

documents and proceedings related to this permit and justifies the need for additional time and healthy doses of public information and public engagement about this plant upgrade prior to issuance of any permits. See more below on the complex, maze like documentation and description of the proposed OOWWTP upgrade and IWWTP development.

9. One confusing matter relates to the volumetric capacity of the proposed plant upgrade and the IWWTP. According to the FEIS, the IWWTP would be designed to accommodate a total maximum industrial wastewater discharge volume of 42 MGD (see FEIS p3-288 or pdf p. 407). Yet the Draft SPDES permit [Draft SPDES Permit 7-3124-00018/00001] will limit discharge to Oneida River to 14.3 MGD for sanitary WW and 16.5 MGD for IWW, a total of 30.8 MGD. While two other outfalls for reuse water intended to be sent back to Micron are mentioned, their capacity is undefined as far as I can tell; and whether such a reuse will actually be accomplished is uncertain. I'd like to see clarification of all allowable inflows and outflows (and losses) at this WWTP and IWWTP.
    **a.** The IWWTP review presented in the FEIS seems to be somewhat limited though finding every mention of its description and impacts is like going through a maze. The FEIS has just 5 pages that describe the IWWTP

and the related 'bridging' project (see FEIS pdf pages 107-111; and 5 pages environmental consequences at FEIS pdf pages 406-410). Below I've summarized some of the information about these WWTP projects, which has relevance to the permit review.

**b. WW Flow volumes** as described in the FEIS: Micron's **sanitary discharge** is estimated to be: approximately 2.6 MGD of sanitary wastewater at full build-out in 2041. Treatment of this **sanitary wastewater** would be within the OOWWTP's current maximum month-rated treatment capacity of 10 MGD and within the planned Major Upgrade Project capacity of up to 25 MGD by 2041. Accounting for the staggered fab construction schedule, the Proposed Project as a whole would be conservatively estimated to discharge up to 8.25 MGD of **industrial wastewater** in 2029, 16.5 MGD in 2030, 23.6 MGD in 2035, and 33.5 MGD at full build-out in 2041 (p3-287 or pdf page 406).

**c.** Accounting for redundancy and excess capacity, the IWWTP would be designed to accommodate a total maximum industrial wastewater discharge volume of 42 MGD (see FEIS p3-288 or pdf p. 407).

d. The Draft SPDES permit [Draft SPDES Permit 7-3124-00018/00001] will allow discharge to Oneida River to be 14.3 MGD for sanitary WW and 16.5 MGD for

IWW, a total of 30.8 MGD. Two other outfalls for reuse water intended to be sent back to Micron have no definition as far as I can tell. Perhaps that is why the FEIS says the plant will be designed for 25 MGD while permitted Oneida River discharge will be 14.3 MGD (though some of this difference could be the difference between inflow capacity and residual outflow as some water is lost in processing but I don't know how much is estimated for that).

e. **Bridging Projects**: During the construction stages of the IWWTP, in addition to receiving sanitary wastewater from the Proposed Project, the OOWWTP would receive **startup industrial wastewater** from the Micron Campus. Under the Preferred Action Alternative, OCDWEP would undertake additional improvements to the OOWWTP as needed, such as a **bridging project** between the OOWWTP and under-construction IWWTP to accommodate the **Micron Campus startup industrial wastewater flows**, which would vary throughout construction, with anticipated peak flows ranging from approximately 1 to 3.7 MGD(see FEIS p3-288 or pdf p. 407).
f. Needing clarification is exactly what these 'bridging projects' are and whether Micron is being allowed to discharge to OOWWTP industrial process water which

potentially contains hazardous materials such as PFAS or poly- and per-fluorinated substances. If so, how will the WWTP prevent release to the environment of these toxic substances prior to the IWWTP being completed?

g. The **effects on surface water of the industrial WW** are described in section 3.3.4 of the FEIS. This is what is said about IWW: "OCDWEP is designing the IWWTP to use the most advanced pollutant treatment and removal technologies available. These technologies would be designed to treat industrial wastewater containing organic compounds, heavy metals, nitrogen, phosphorous, and other pollutants. To comply with its SPDES permit for the IWWTP, OCDWEP would be required to perform regular analytical testing of surface water and effluent samples collected using NYSDEC approved methods and would be subject to ongoing sampling, monitoring, and reporting requirements. For additional discussion of potential effects from operation of the IWWTP relating to solid and hazardous waste, see Section 3.8 (Solid Waste, Hazardous Waste, and Hazardous Materials). For additional discussion on management of PFAS, see Appendix L-1. Micron Semiconductor Manufacturing

Project - FEIS - Appendix L] Based on these measures, industrial wastewater discharges from operation of the IWWTP are not anticipated to result in significant adverse effects on water resources."(see FEIS p3-87 or pdf p 206) **My question to the NYSDEC is**: is this statement "discharges from operation of the IWWTP are not anticipated to result in significant adverse effects on water resources" correct? And what about discharges from the OOWWTP prior to the completion of the IWWTP when OOWWTP is expected to receive, according to Micron and WEP, "Construction + Startup WW"?

h. Information on PFAS and the IWWTP is also included in the Hazardous Materials section of the FEIS [Micron Semiconductor Manufacturing Project - Final Environmental Impact Statement], section 3.8.3.2. It is absolutely astonishing that given the way information about the Micron fabs and the supposed related environmental protections is distributed throughout various sections of the FEIS and numerous other documents that anyone can expect the public to be able to offer public comments on the proposed SPDES permit withing the short period of time made available to the public and during a month when the public is preoccupied with end of semester

responsibilities, travel and an interest in celebrating the holidays and not taking the time to perform civic responsibilities.

It is for all these foregoing reasons and questions I respectfully request that the processing of this SPDES permit be paused and that a substantial public engagement be initiated to allow the public an opportunity to ask questions and gain a complete understanding of the complex public health implications which the development of the Micron chip fabs and the related WWT systems present.

I also request that answers be provided to the questions raised here and, should processing of this permit go forward, that DEC carefully consider the issues presented here.

Thank you for your consideration.

| | |
|---|---|
| From: | Julie MacNamara |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | Comments on Draft State Pollutant Discharge Elimination System (SPDES) Permit Number NY0030317 |
| Date: | Tuesday, December 16, 2025 5:38:58 PM |
| Attachments: | Outlook-hejyax2o.png<br>20251216_CCU Comments_Oak Orchard Wastewater Treatment Plant NPDES Permit.pdf |



Good Evening,

On behalf of CHIPS Communities United (CCU) and the Center for Public Environmental Oversight (CPEO), we respectfully submit the attached comments to the New York State Department of Environmental Conservation (NYSDEC) on the Draft New York State Pollutant Discharge Elimination System (SPDES) Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant.

Please confirm receipt of the attached comments and feel free to reach out with any questions.

Sincerely,
Julie MacNamara

Julie MacNamara
(She/Her/Hers)
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(202) 948-4316
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December 16, 2025

New York State Department of Environmental Conservation
Division of Environmental Permits
5786 Widewaters Pkwy
Syracuse, NY 13214

*Submitted via: Comments.OakOrchard2025@dec.ny.gov*

**Re: Comments on Draft State Pollutant Discharge Elimination System (SPDES) Permit Number NY0030317**

Dear Agency,

On behalf of CHIPS Communities United (CCU) and the Center for Public Environmental Oversight (CPEO), we respectfully submit the following comments to the New York State Department of Environmental Conservation (NYSDEC) on the Draft New York State Pollutant Discharge Elimination System (SPDES) Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant.

CCU is a national coalition organizing for an equitable and sustainable semiconductor manufacturing industry. CCU includes labor, environmental, social justice, civil rights, and community organizations representing millions of workers and community members nationwide. Based in Silicon Valley, CPEO experts have been working to clean up the semiconductor industry since the 1970s.

To meet the wastewater needs of the expansive Micron Campus planned in Clay, NY, the Onondaga County Department of Water Environment Protection (OCDWEP) is proposing to undertake a series of wastewater infrastructure and capacity improvements.

The semiconductor industry is known to use and discharge a broad range of harmful chemicals, including per- and polyfluoroalkyl substances (PFAS). Given the serious risks these chemicals pose to human health and the environment, it is imperative that NYSDEC and OCDWEP thoroughly plan for and address PFAS discharges, especially as they relate to Micron.

As currently drafted, the pollution limits and monitoring requirements for PFAS are inadequate to protect water quality, the environment, and the health of workers as well as

surrounding communities. We urge NYSDEC to strengthen PFAS monitoring, treatment, and minimization requirements in the Oak Orchard Wastewater Treatment Plant SPDES Permit.

## I. Background

*The Planned Micron Semiconductor Manufacturing Campus*

The Micron New York Semiconductor Manufacturing LLC (Micron) is proposing an expansive new manufacturing operation located in the Town of Clay, NY. The approximately 1,377-acre site will consist primarily of four dynamic random-access memory (DRAM) manufacturing facilities (known as "fabs").[1] The construction of the campus is anticipated to take place in stages over approximately 16 years, with full production anticipated by 2045.[2]

The wastewater generated at Micron's facility will be pre-treated and then sent for specialized treatment at the Oak Orchard Wastewater Treatment Plant. Micron's wastewater discharges to the Oak Orchard Wastewater Treatment Plant will be required to meet the pretreatment program requirements of the Oak Orchard Wastewater Treatment Plant SPDES permit, which is the subject of the draft SPDES permit described herein.

*Summary of Draft SPDES Permit*

The Oak Orchard Wastewater Treatment Plant is a publicly owned treatment works (POTW) that receives flow from domestic and industrial users, including Micron, and stormwater from on-site areas at the Oak Orchard facility. To serve the planned Micron Campus, Onondaga County requests approval to modify this permit to expand and upgrade the municipal wastewater treatment train (MTT) and construct a new industrial wastewater treatment train (ITT) and water reclamation facility. Construction of the new ITT includes equalization and diversion tanks, influent screening, biological treatment in mixed anoxic tanks followed by aeration tanks, membrane bioreactors, UV disinfection, centrifugal solids dewatering, effluent reuse with ion exchange resin (IX) and reverse osmosis (RO).[3]

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[1] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Final.pdf (pg 0-1).
[2] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Final.pdf (pg 0-1).
[3] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

At full build out, the Oak Orchard Wastewater Treatment Plant will include: Outfall 001 of treated sanitary and process wastewater, Internal Outfall 01A of MTT treated sanitary and process effluent wastewater to Outfall 001, Internal Outfall 01B of ITT treated process effluent wastewater to Outfall 001, Outfall 006 of MTT effluent reuse wastewater to Micron, and Outfall 007 of ITT effluent reuse wastewater to Micron.[4] When all phases are completed, the draft permit modification would increase the total monthly average design flow from 10 MGD to 30.8 MGD.[5]

The Oak Orchard Wastewater Treatment Plant (Outfall 001) will discharge treated sanitary and process wastewater to the Oneida River. The segment of the Oneida River at the point of discharge is classified as B. Classification B indicates the best usage for swimming and other recreation, and fishing. However, the Oneida River is a tributary of the Oswego River and part of the Lake Ontario watershed, which serves as a critical drinking water source for millions of people.

*Summary of Project Phases*

The Oak Orchard Wastewater Treatment Plant proposed expansion and associated upgrades will be completed in a series of four phases:

> PHASE 1: At the beginning of Phase 1, no upgrades to the MTT and no portion of the new ITT will be completed. During Phase 1, additional equipment will be installed, including moving bed bioreactor (MBBR) tanks. The facility will receive influent wastewater at flow rates up to 13.3 MGD, exceeding the design flow rate of the existing MTT (10 MGD).
>
> PHASE 2: Phase 2 will begin when the first portion of the new ITT becomes operational. The design flow of the ITT at that time will be 8.25 MGD. The design flow of the MTT will remain at 13.3 MGD during Phase 2. The combined effluent flow rate for Phase 2 is thus 21.6 MGD. Beginning in Phase 2, all SPDES permit requirements, related to the new internal Outfalls 01A for the MTT and 01B for the ITT, become effective.
>
> PHASE 3: Phase 3 will begin when the upgrades to the MTT are completed. The design flow rate for the MTT at that time will be 14.3 MGD. The design flow rate of

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[4] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

[5] NYSDEC, "Notice of Complete Application, Notice of Public Comment Period, Notice of Public Comment Hearing", November 12, 2025, https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/7-3124-00018%20Oak%20Orchard%20WWTP%20NOCA.pdf

the completed first portion of the ITT will still be 8.25 MGD at that time. The combined effluent flow rate for Phase 3 is thus 22.5 MGD.

PHASE 4: Phase 4 will begin when the second portion of the new ITT becomes operational. The total design flow of the ITT at that time will be 16.5 MGD. The design flow of the upgraded MTT will still be 14.3 MGD at that time. The combined effluent flow rate for Phase 4 is thus 30.8 MGD.

EFFLUENT REUSE: The construction of the effluent reuse systems for the MTT and the ITT will be completed after start-up of the respective treatment trains. The schedule of construction of the new reuse outfalls (Outfall 006 for the MTT effluent reuse system, and Outfall 007 for the ITT effluent reuse system) is independent from the phases described above.

*Significant Adverse Effects Associated with PFAS*

We are particularly concerned about the monitoring, treatment, and prevention of PFAS chemical discharges. According to the Environmental Protection Agency (EPA), PFAS are "an urgent public health and environmental issue facing communities across the United States."[6]

PFAS are a class of thousands of different human-made chemicals that contain one or more fully-fluorinated carbon atoms. Since their introduction in the 1940s, PFAS have been widely used in many manufacturing processes as well as countless consumer products. PFAS chemicals are notable because their carbon-fluorine bonds are very resistant to degradation, resulting in extremely long lifetimes. Known as "forever chemicals," PFAS are highly persistent and mobile in the environment, easily traveling through streams, rivers, and other water bodies, including drinking water sources.[7] This persistence acts as a force-multiplier for toxicity.

Because they break down very slowly, PFAS can easily bioaccumulate in human beings, wildlife, and the environment over time.[8] PFAS are highly toxic and linked to serious health problems, including damage to liver, thyroid, and pancreatic function; increased risk of high blood pressure or pre-eclampsia in pregnant women; developmental delays; immune

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[6] EPA, PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

[7] Ian T. Cousins et al., Why is High Persistence Alone a Major Cause of Concern?, 21 Env't Sci. Process Impacts 781, 785 (2019), https://pubs.rsc.org/en/content/articlelanding/2019/em/c8em00515j

[8] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks

system harm; hormone disruption; increased cholesterol levels; and increased risk of kidney or testicular cancer.[9,10]

*PFAS Usage in the Semiconductor Industry*

The Semiconductor Industry Association (SIA) acknowledges the use of many PFAS compounds in semiconductor fabrication-related processes, including photolithography, wet chemical processing, plasma etch and deposition, assembly and packaging materials, among others.[11] Semiconductor manufacturers are known to use and discharge a wide array of PFAS, posing a "substantial risk for PFAS contamination of the environment."[12] One investigation at a semiconductor manufacturing facility detected 78,000 parts per trillion (ppt) of PFAS in wastewater from some samples, compared to EPA's proposed limit of 4 ppt for some PFAS in drinking water.[13]

Several PFAS-laden processes are anticipated to be used at Micron, including, but not limited to, photolithography and plasma (dry) etching processes. Appendix L of the MICRON Final Environmental Impact Statement (FEIS) provides an overview of the general uses of PFAS anticipated at Micron; however, the specific types of PFAS to be used are not provided, in part due to claims of proprietary information.[14]

Semiconductor production is an innovative and constantly evolving industry. Over the past two decades, semiconductor manufacturers have reduced or replaced the use of certain PFAS. For example, long-chain PFAS compounds, such as PFOS (perfluorooctane sulfonic acid), have been replaced by short-chain PFAS and the use of PFOA (perfluorooctanoic

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[9] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks

[10] CDC, *How PFAS Impacts Your Health*, https://www.atsdr.cdc.gov/pfas/about/health-effects.html?CDC_AAref_Val=https://www.atsdr.cdc.gov/pfas/health-effects/index.html

[11] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

[12] National Institute of Standards and Technology, Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf (C-15)

[13] Tom Perkins, "Industry acts to head off regulation on PFAS pollution from semiconductors"The Guardian (August 24, 2024) https://www.theguardian.com/environment/article/2024/aug/24/pfas-toxic-waste-pollution-regulation-lobbying

[14] U.S. Department of Commerce et al, Micron Semiconductor Manufacturing Project, Clay, NY Final Environmental Impact Statement, Appendix L-1 (November 2025), https://ongoved.com/wp-content/uploads/2025/11/2025_1105_MicronNY_FEIS_Appendix_L.pdf.

acid) has also been phased out.[15] As a result, by the time Micron begins operations, it is likely that even newer chemicals may be used and discharged. Therefore, it is critical the SPDES permit remains flexible to be able to account for ongoing changes in semiconductor industry.

It is revealed in the Conceptual Design Engineering Report that "Micron stated … that PFAS and mercury are anticipated in low concentrations in the waste load coming from their facilities. These compounds will be limited in the discharge from Micron to a level that can be removed in the biological treatment to values below the discharge requirements."[16] However, it is well established that PFAS cannot be broken down biologically, and furthermore, the proposed "discharge requirements" are confined to action limits for two compounds that Micron has stated they will not be using.

Overall, it is imperative that NYSDEC and OCDWEP adequately plan for and address PFAS discharges, especially as they relate to Micron, to ensure that surrounding communities do not suffer any further burdens.

## II. **Regulatory Context**

*Clean Water Act Effluent Limitation Guidelines (ELGs) and the National Pretreatment Program*

EPA promulgated the Electrical and Electronic Components (E&EC) Effluent Guidelines and Standards (40 CFR Part 469) in 1983. Subpart A regulates the semiconductor subcategory. In 2022, EPA conducted a detailed study of the E&EC category and concluded there was no need to revise the regulation at that time, but the study acknowledges that: "The PFAS data the EPA reviewed are limited; however, the EPA intends to continue to monitor discharges of PFAS from this category and expects to review additional data in the coming years to help identify any significant sources of these chemicals in future reviews."[17]

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[15] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

[16] Brown and Caldwell, Onondaga County Department of Water Environment Protection Oak Orchard Industrial Wastewater Treatment Plant and Water Reclamation Facility Conceptual Design Engineering Report, (November 11, 2025) https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/SPDES/Engineering-Reports/OCDWEP%20IWWTP%20WRF%20CDE%20Report_111025.pdf (pg 1-9)

[17] EPA, "Electrical and Electronic Components Effluent Guidelines" https://www.epa.gov/eg/electrical-and-electronic-components-effluent-guidelines (November 2022).

The Clean Water Act also establishes the National Pretreatment Program (40 CFR Part 403). The objectives of general pretreatment regulations are to:

a. Prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including interference with its use or disposal of municipal sludge;
b. Prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works; and
c. Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.

Under this program, any POTW with a total design flow greater than 5 million gallons per day (mgd) must implement a local pretreatment program to prevent pass-through and interference. Therefore, most of the responsibility of the pretreatment program falls on the local municipalities to establish pretreatment standards, local limits, and oversee compliance.

*Safe Drinking Water Act Maximum Contaminant Levels (MCLs)*

In 2024, EPA finalized enforceable Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) for PFOA and PFOS at 4 ppt, the lowest level that can be reliably measured in drinking water (40 CFR Part 141.61(c)(2)). Because research indicates that PFAS chemicals can cause health risks at lower levels and in mixtures, EPA has also finalized a hazard index approach to regulating four chemicals - PFHxS, HFPO-DA (GenX), PFNA, and PFBS - when they occur in mixtures. However, the Trump administration's EPA is currently working to eliminate the drinking water standards for those PFAS.[18]

*EPA has Directed All Levels of Government to Limit PFAS Discharges*

EPA's *PFAS Strategic Roadmap* stresses that all levels of government (federal, Tribal, state and local) must "exercise increased and sustained leadership to accelerate progress to clean up PFAS contamination, prevent new contamination and make game-changing breakthroughs in the scientific understanding of PFAS."[19]

States do not have to wait for EPA to finalize additional PFAS ELGs to address PFAS in water pollution permits. Nor are states limited to addressing pollutants and contaminants

[18] Earthjustice, EPA Seeks to Eliminate Critical PFAS Drinking Water Protections, (September 12, 2025), https://earthjustice.org/press/2025/epa-seeks-to-roll-back-pfas-drinking-water-rules-keeping-millions-exposed-to-toxic-forever-chemicals-in-tap-water

[19] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

with preexisting effluent limitations or guidance values. To the contrary, the Clean Water Act requires permits to include "technology based effluent limitations and standards," including "case-by-case effluent limitations" when other values are not available.[20] As a state designated to implement the National Pollutant Discharge Elimination System (NPDES) program, New York must adhere to these authorities.[21] In the absence of established standards and guidelines, NYSDEC must use its "best professional judgment" to establish limitations on all PFAS discharged by the expanded treatment plant.[22]

NYSDEC must also ensure that all discharges from the Oak Orchard Wastewater Treatment Plant comply with the state's narrative water quality criteria, including the prevention of releases that will "impair the [receiving] waters for their best usages."[23] Oak Orchard discharges wastewater to the Oneida River, a class B water. "The best usages of Class B waters are primary and secondary contact recreation and fishing."[24] PFAS are known to contaminate fish tissue, and the severe health threats associated with even low levels of PFAS contamination impair other recreational uses of the water body as well. The state's Dept. of Health has already set fish consumption advisories in several areas of New York, including L. Champlain, the Mohawk R., and Onondaga Lake, due to high levels of

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[20] 40 C.F.R. § 122.44(a)(1); *see also* 33 U.S.C. § 1342(a)(1)(B) (a discharge permit should include "such conditions as the Administrator determines are necessary to carry out the provisions of this chapter); *see also* EPA, *Technology-based Effluent Limits Flue Gas Desulfurization (FGD) Wastewater at Steam Electric Facilities*, attach. A *in National Pollutant Discharge Elimination System (NPDES) Permitting of Wastewater Discharges from Flue Gas Desulfurization (FGD) and Coal Combustion Residuals (CCR) Impoundments at Steam Electric Power Plants* at 2 (June 7, 2010), https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1564.pdf ) ("[A]n authorized state must include technology-based effluent limitations in its permits for pollutants not addressed by the effluent guidelines for that industry ... In the absence of an effluent guideline for those pollutants, the CWA requires permitting authorities to conduct the [best professional judgment] analysis discussed above on a case-by-case basis for those pollutants in each permit.").

[21] 40 C.F.R. § 123.25; N.Y. ECL § 17-0811 (McKinney 2024) (SPDES permits must include, where applicable, effluent limitations, standards of performance for new sources, and any further limitations to comply with water quality standards); 6 N.Y.C.R.R. §§ 750-1.11(a)(1-3).

[22] *See also* 6 N.Y.C.R.R. § 750-1.2

[23] 6 NYCRR 703.2.

[24] 6 NYCRR 701.7.

PFOS in fish.[25] The number of fish advisories is sure to increase as more types of PFAS are included.

A permit must include limitations to control pollutants that "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."[26] To analyze whether the source has reasonable potential, EPA considers whether the "discharge, alone or in combination with other sources…could lead to an excursion above an applicable water quality standard."[27] Here, however, there is no evidence that NYSDEC considered whether Oak Orchard's potential PFAS discharges would violate the state's narrative water quality criteria. NYSDEC must do so.

In December 2022, EPA issued a guidance memo directing states to use NPDES permits to limit discharges of PFAS to surface waters.[28] That memo affirms that "[s]ite-specific technology-based effluent limits (TBELs) for PFAS discharges developed on a best professional judgment (BPJ) basis may be appropriate for facilities for which there are no applicable effluent guidelines (see 40 CFR 122.44(a), 125.3)."[29] In addition, the memo makes specific recommendations for permit conditions (like monitoring requirements, Best Management Practices [BMPs], effluent limits, etc.), which states should require for industrial permittees known or suspected of discharging PFAS.

For example, for monitoring, the memo recommends using EPA Method 1633 at least quarterly to assess the presence and concentration of PFAS in discharges. In addition, if appropriate, the memo recommends the use of the adsorbable organic fluorine wastewater method (EPA Method 1621) in conjunction with EPA Method 1633. EPA's memo makes it clear that states and POTWs can use their existing water program authorities to address PFAS in wastewater discharges immediately.

Therefore, NYSDEC and OCDWEP must make every effort to identify PFAS sources and hold industrial dischargers, including Micron, to the highest standards possible to minimize and prevent toxic PFAS discharges, as detailed below. Consistent with federal

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[25]New York State Department of Health, Advisory Listings by County, https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/by_county.htm (Accessed December 16, 2025)

[26] 40 C.F.R. § 122.44(d)(1)(i).

[27] EPA, Off. of Wastewater Mgmt., NPDES Permit Writers' Manual (EPA-833-K-10-001) at 6-23 (2010), https://www3.epa.gov/npdes/pubs/pwm_2010.pdf

[28] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

[29] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

and state law, as well as EPA guidance, NYSDEC must exercise its best professional judgment to establish limits on all PFAS discharged by the Oak Orchard Wastewater Treatment Plant that are fully protective of public health and the environment.

## III. NYSDEC and OCDWEP Should Strengthen Pretreatment Requirements for PFAS

**Recommendations:**

As part of the industrial pretreatment program implementation requirements, NYSDEC and OCDWEP should develop a PFAS Minimization and Management Plan with each Significant Industrial User (SIU), including Micron. These plans should be prepared prior to beginning operations and updated annually. The draft permit should be amended to include a PFAS Minimization and Management Plan that:

1. Identifies the ways the facility uses, generates, or releases PFAS.
2. Requires a comprehensive PFAS inventory with known or suspected PFAS compounds present, final deposition, and purpose of use.
3. Requires industrial dischargers to obtain and provide NYSDEC and OCDWEP with analytical reference standards for every PFAS used in their facility, so those PFAS can be detected in wastewater effluent and in the environment.
4. Establishes a monthly PFAS monitoring plan that includes sampling before and after any pretreatment, using EPA Method 1633 and EPA Method 1621. The results should be made publicly available online promptly after the results are available.
5. Requires the use of safer, non-PFAS alternatives, wherever feasible.
6. Prohibits the discharge to surface waters or groundwater of any wastewater containing PFAS at concentrations exceeding background levels, using best management practices and optimized treatment.
7. Establishes reporting requirements and requires receipt of all data within 30 days of sampling.

**Rationale:**

In EPA's *PFAS Strategic Roadmap*, EPA identifies the need to prevent "PFAS from entering the environment in the first place—a foundational step to reducing the exposure and potential risks of future PFAS contamination."[30] The industrial pretreatment program is an integral part of the Clean Water Act, requiring indirect industrial dischargers to reduce or eliminate the discharge of harmful pollutants to POTWs.

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[30] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

The draft permit's industrial pretreatment program does not establish any requirements for PFAS. Under the Clean Water Act, industrial facilities are prohibited from sending any pollutant or wastewater to a POTW if the wastewater contains pollutants that will "pass through" the facility if inadequately treated prior to discharge into receiving water. Without PFAS-specific requirements, the POTW may be held accountable for pass-through releases of toxic PFAS compounds. In addition, accountability for pass-through releases of PFAS into the environment might add to the cost of operating the POTW. Therefore, the permit should institute a PFAS Minimization and Management Plan.

Although the draft permit refers to an Emerging Contaminant Minimization Plan on page 51, it only focuses on PFOA and PFOS and is only triggered when there is an exceedance of an action level. However, as described below in more detail, focusing solely on PFOA and PFOS is insufficient when considering the wide array of other PFAS used by the semiconductor industry.

Through the development of a PFAS Minimization and Management Plan as well as clear PFAS industrial pretreatment requirements, NYSDEC and OCDWEP would better understand the types and quantities of PFAS present in the effluent being sent to the POTW. A robust PFAS Minimization and Management Plan with each SIU would also help inform the monitoring requirements and treatment technologies necessary to effectively monitor, manage, and eliminate PFAS. Establishing a strong pretreatment program ensures that industrial users are held responsible for their pollution, rather than shifting the burden of treatment onto the POTW.

In addition, the draft permit requires that an industrial pollutant scan be conducted within the first 60 days after the initial receipt of wastewater to the ITT (Outfall 01B) using EPA Method 1633. This approach is insufficient. Allowing wastewater discharges for 60 days before completing the scan is inadequate to protect human health and the environment. Micron should instead be required to conduct the pollutant scan prior to commencing operations to ensure the early understanding and detection of contaminants. In addition, the industrial pollutant scan should be updated to include the additional PFAS monitoring strategies described in detail below, since EPA Method 1633 is inadequate for identifying the broad suite of PFAS discharged by semiconductor manufacturers.

Without these improvements, NYSDEC and OCDWEP will lack the information necessary and be unable to prevent the pass-through of toxic PFAS discharges. Therefore, a robust PFAS-specific pretreatment program should be implemented and incorporated into the permit.

## IV. NYSDEC and OCDWEP Should Significantly Expand Requirements to Monitor, Identify, Quantify, and Characterize all PFAS Discharged by Micron

**Background.** The draft permit would only require quarterly sampling and monitoring for PFAS compounds using EPA Method 1633/1633A, which provides a targeted analysis for approximately 40 PFAS. The permit proposes to limit the monitoring to Outfall 01B, which will discharge the treated effluent from the industrial wastewater treatment plant.

The proposed monitoring requirements cannot ensure adequate protection of water quality, human health, and the environment from the industrial use of PFAS by Micron because they fail to determine:

- The chemical identity of most PFAS compounds in the wastewater discharge;
- The efficacy of PFAS removal by industrial and sanitary wastewater treatment; and
- The impact of PFAS compounds on beneficial uses of all receiving waters.

PFAS and their breakdown products are extremely persistent, mobile, and toxic. Therefore, monitoring requirements should be designed to detect and quantify a broad spectrum of PFAS, such that a mass balance accounting of the fate and transport of all PFAS can be constructed. Only a comprehensive approach to monitoring using a variety of analytical methods can assist in virtually eliminating all PFAS releases to waterways.

Fortunately, significantly more expansive monitoring requirements are clearly authorized by New York water quality regulations (N.Y. Comp. Codes R. & Regs. Tit. 6 §§ 750-1.13).

**Recommendations:**

1. The permit should require the industrial user (Micron Technology) to fully characterize and identify all PFAS present in the influent and effluent for the industrial wastewater treatment train. This aim should be accomplished through application of all the following methods, in addition to monitoring wastewater using Method 1633:

    a. Expanded targeted analysis enabled by requiring industrial user Micron to provide high quality analytical reference standards and stable isotope-labeled standards for all unique PFAS used in its manufacturing process;
    b. Identification and quantification of ultra short-chain PFAS, through a method conducted by a qualified contract laboratory;
    c. Nuclear magnetic resonance spectroscopy ($^{19}$F NMR) to determine total organic fluorine, total polymeric fluorine, and total inorganic fluorine as a

percent of total fluorine, in addition to providing information on chemical structure;

d. EPA Method 1621 to determine total Adsorbable Organic Fluorine (AOF);
e. Extractable Organic Fluorine (EOF), through a method conducted by a qualified contract laboratory;
f. Total Organic Precursors (TOP) assay, conducted by a qualified contract laboratory;
g. A non-targeted analysis using high-resolution mass spectrometry (HRMS) to characterize, semi-quantify, and identify PFAS compounds not detected by targeted analysis or measures of total organic fluorine; and
h. The above data shall be submitted with a report that analyzes and interprets the monitoring results and computes and closes a mass balance of all fluorinated compounds present in the influent and effluent of the industrial wastewater treatment plant.

**Rationale:**

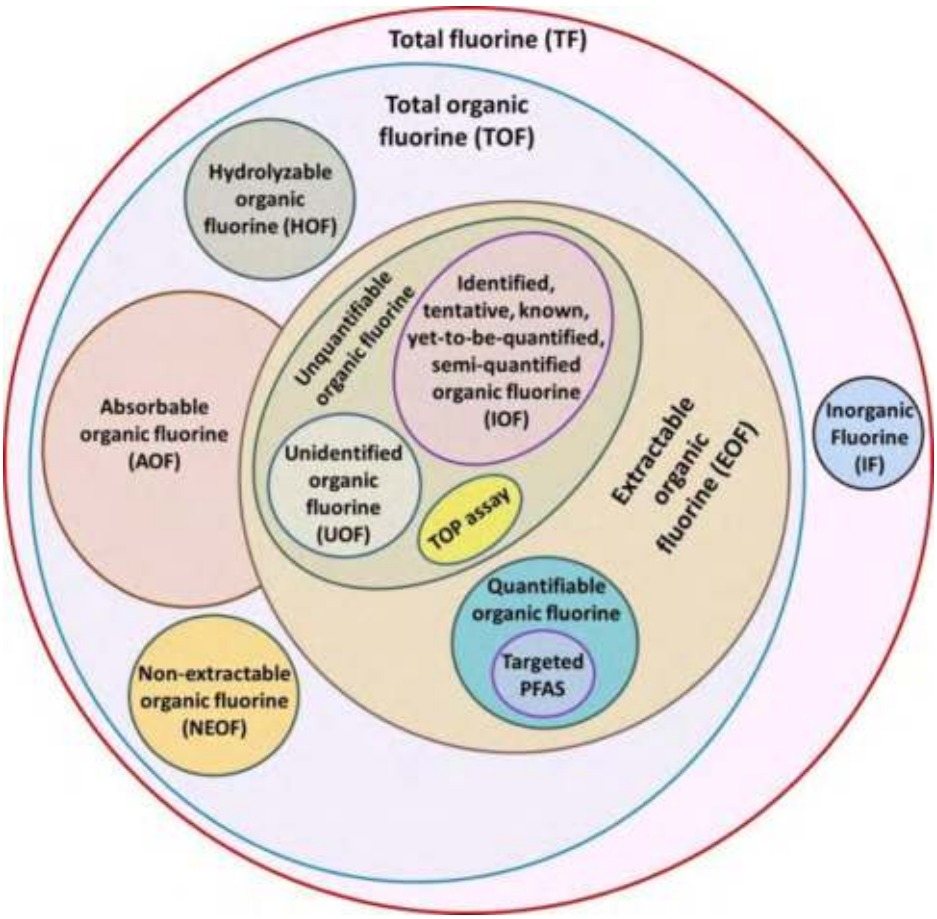
The draft permit would fail to detect the vast majority of PFAS that are present in Micron's wastewater including many chemical compounds and breakdown products that are uniquely used in semiconductor manufacturing. Without more rigorous monitoring and ongoing efforts to identify the chemical identity of the specific PFAS present in Micron's wastewater, it will be impossible to determine the effectiveness of wastewater treatment by the ITT or the impact of the treated industrial effluent on the POTW, biosolids, and the beneficial uses of the receiving waters.

Given that there are thousands of types of PFAS, of which over one hundred PFAS are known to be used by the semiconductor industry, and new PFAS are constantly being introduced, EPA Method 1633 is completely inadequate for identifying the full suite of PFAS in semiconductor wastewater discharge.

Method 1633 is a targeted analysis that identifies and quantifies only 40 chemical compounds in the PFAS class. **The peer-reviewed literature reports that targeted**

**analysis often detects less than 10% of the total organic fluorine of environmental concern.**[31,32, 33]

The figure below is a Venn diagram that illustrates how targeted analysis (small circle labeled "Targeted PFAS") such as method 1633 captures only a small portion of PFAS compounds and how several other analytical methods that are routinely offered by contract laboratories enable a much broader characterization of PFAS in wastewater.




Source: Ifeoluwa Grace Idowu, et al, A systematic review of methods for the analysis of total per- and polyfluoroalkyl substances (PFAS), Science of The Total Environment, Vol 967 (2025), https://doi.org/10.1016/j.scitotenv.2025.178644.

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[31] Shelor, C. P.; Warren, C.; Odinaka, C. V.; Dumre, K. Comprehensive review of combustion ion chromatography for the analysis of total, adsorbable, and extractable organic fluorine. *J. Sep.Sci.* 2024, 47 (15), 2400235.

[32] Ersan, M. S.; WangWongWesterhoff, B. M. S. P.; Westerhoff, P. Advanced oxidation processes may transform unknown PFAS in groundwater into known products. *Chemosphere* 2024, 349, 140865.

[33] Schultes, L.; Vestergren, R.; Volkova, K.; Westberg, E.; Jacobson, T.; Benskin, J. P. Per- and polyfluoroalkyl substances and fluorine mass balance in cosmetic products from the Swedish market: implications for environmental emissions and human exposure. *Environ. Sci. Process. Impacts* 2018, 20 (12), 1680–1690.

A recent journal article that reviewed analytical methods to characterize PFAS in the wastewater of semiconductor manufacturing facilities supports our recommendation: "The choice of the method used to cover a range of PFAS generally requires more than one analytical method, with some overlap between methods."[34]

**Targeted analysis.** For targeted analysis, this study concluded that "[T]o increase confidence in novel PFAS identified in semiconductor wastewater, high quality analytical standards and stable isotope-labeled standards will be needed."

**Ultra short-chain PFAS.** Regarding the need to measure for ultra short-chain PFAS, this study advised: "[T]he shift to short-chain PFAS by the semiconductor industry indicates that monitoring only for > [or equal to] C4 PFCAs or greater may miss many C1-C3 short-chain precursors, unless methods for ultra short-chain PFCAs are utilized."

**Total organic fluorine.** Further, these same scientists concluded: "[U]ntil analytical standards become available for all relevant PFAS present in semiconductor wastewater, investigations will require suspect and nontarget PFAS analysis that require sophisticated identification and data techniques." And: "[T]his review also stresses the need for advanced techniques, including high-resolution mass spectrometry for suspect and nontarget analysis as well as nonspecific methods for total organic and inorganic fluorine."

**PFAS nuclear magnetic resonance ($^{19}$F NMR).** The Semiconductor PFAS Consortium of the Semiconductor Industry Association (SIA) commissioned a study by chemists at the University of Toronto that successfully adapted an analytical method known as PFAS nuclear magnetic resonance **(**$^{19}$F NMR) spectroscopy to characterize PFAS in semiconductor industry wastewater.[35]

The method distinguishes total organic fluorine from total polymeric fluorine, indicators of PFAS that pose high environmental concern, from total inorganic fluorine, which presents a relatively low hazard. The results are expressed as a percentage of total fluorine. The method also provides data-driven clues that can help characterize the chemical structure of as-yet unidentified PFAS.

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[34] Droz B, Heron CG, Kim-Fu ML, Reardon PN, Roig-Paul M, Field JA. Practical Guidance on Selecting Analytical Methods for PFAS in Semiconductor Manufacturing Wastewater. *ACS Meas. Sci. Au.* 2025, 5, 399-423.

[35] Gauthier JR, Mabury SA (2025). $^{19}$F NMR analysis of semiconductor manufacturing facility wastewater samples for the Semiconductor PFAS Consortium, University of Toronto, Department of Chemistry, July 22. Available from https://www.semiconductors.org/19f-nmr-analysis-of-semiconductor-manufacturing-facility-wastewater-samples/.

The study concluded that "[B]ased on these promising results, multiple member companies of the Semiconductor PFAS Consortium are moving forward with acquiring the necessary equipment to begin this type of analysis in-house to assist in identifying and quantifying PFAS constituents in semiconductor manufacturing process wastewater."

Given that this study has been published on the SIA website, and Micron Technology is a member of the Semiconductor PFAS Consortium, and the method provides invaluable data, Micron should be required to apply this monitoring methods to it proposed wastewater discharge as recommended above.

**Method 1621.** As described above, the EPA's December 2022 memo recommends supplementing EPA Method 1633 with the Adsorbable Organic Fluorine (AOF) analysis using EPA Method 1621, the only other EPA-approved standard analytical method for PFAS in wastewater.[36]

**Non-targeted analysis.** Non-target analysis is needed to identify more PFAS including novel PFAS from semiconductor processes that end up in the wastewater. This will help NYSDEC anticipate the introduction of new PFAS in semiconductor manufacturing and ensure that the permit remains protective.

Peer-reviewed literature demonstrates that targeted analysis of PFAS can only identify a fraction of the PFAS present in the wastewater of typical semiconductor fabrication facilities. For example, in a study of wastewater effluent from three semiconductor manufacturing plants, researchers found that the total PFAS concentration in wastewater determined through non-targeted analysis significantly exceeded the PFAS concentration indicated by a targeted analysis of 25 PFAS (all of which are included in EPA Method 1633).[37] In that study, Jacob et al. (2021) measured PFAS using the two different methods and found the following concentrations expressed as nanograms per liter (ng/L):

| Semiconductor Facility | Targeted analytes (25 PFAS) | Non-targeted analytes (133 PFAS) | TOTAL PFAS (sum of two methods) | Percent of PFAS (mass) missed by targeted analysis |
|---|---|---|---|---|
| Fab 1 | 623 | 867 | 1,490 | 58% |

[36] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

[37] Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoralkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 *Env't Sci. & Tech.* 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690

| | | | | |
|---|---|---|---|---|
| Fab 2 | 394 | 78,006 | 78,400 | 99.5% |
| Fab 3 | 376 | 1,794 | 2,170 | 83% |
| Source: Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoroalkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 Env't Sci. & Tech. 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690. | | | | |

The non-targeted analysis above revealed 41 homologous series of PFAS, which included 133 individual PFAS compounds. Chemical structures were proposed for 15 compounds, six of which were reported for the first time ever. None of these PFAS are detectable using EPA Method 1633.

Other peer-reviewed non-targeted analyses have also characterized many PFAS in semiconductor industry wastewater that cannot be detected by targeted analysis,[38, 39] such as through the use of Method 1633.

## V. NYSDEC and OCDWEP Should Expand the Locations and Frequency of PFAS Monitoring

PFAS monitoring must be comprehensive in order to capture the variability throughout the wastewater system. In addition to the need for robust identification and measurement of PFAS, the draft permit does not provide adequate monitoring for PFAS in terms of location and frequency.

**Recommendations:** The draft permit should be amended to:

1. Expand the monitoring points from effluent at internal Outfall 01B and Outfall 001 to influent and effluent at Outfall 01A, Outfall 01B, and Outfall 001; and
2. Increase the monitoring frequency from quarterly to, at minimum, monthly using the methods described above.

**Rationale:**

Influent monitoring is essential to better understand what is entering the POTW, while effluent monitoring is necessary to assess the effectiveness of treatment. The draft

[38] Chen, Y.-J.; Yang, J. S.; Lin, A. Y.-C. Comprehensive nontargeted analysis of fluorosurfactant byproducts and reaction products in wastewater from semiconductor manufacturing. *Sustain. Environ. Res.* 2024, 34, 14.

[39] Chen, Y. J.; Wang, R. D.; Shih, Y. L.; Chin, H. Y.; Lin, A. Y. Emerging perfluorobutane sulfonamido derivatives as a new trend of surfactants used in the semiconductor industry. *Environ. Sci. Technol*. 2024, 58 (3), 1648−1658.

permit's current monitoring requirements are insufficient to track the variability of PFAS discharges and the effectiveness of treatment.

Influent and effluent monitoring at the industrial wastewater treatment plant is also needed to ascertain how much PFAS may be transferred to solid waste as treatment residues. Whether those solid residues are subject to PFAS destruction, which should be required, or simply transferred to another environmental media, such as landfill leachate, is an important consideration.

Similarly, monitoring of the influent (from the industrial treatment plant) and effluent from the final combined sanitary and industry treatment plant (POTW) is needed to determine the efficacy of treatment in PFAS removal and the relative partitioning of PFAS between the final wastewater discharge to the receiving water and to biosolids whose ultimate management may raise additional environmental concerns.

Expanding the monitoring locations to include both influent and effluent at Outfall 01A, Outfall 01B, and Outfall 001 is necessary to evaluate PFAS levels throughout the system, to better identify where PFAS may be bypassing treatment processes and prevent dilution prior to monitoring for PFAS.

In addition, limiting monitoring to quarterly sampling at a single effluent location (Outfall 001) will fail to provide sufficient data to assess the types, amounts, and the potential for pass-through of PFAS. Quarterly monitoring would provide a very limited snapshot of PFAS discharges. Increasing the frequency of monitoring from quarterly to at least monthly is necessary to capture variability in PFAS discharges, given known fluctuations in the manufacturing processes. Therefore, the draft permit must be updated to expand the monitoring points for PFAS as well as the monitoring frequency.

## VI. NYSDEC Should Expand the Universe of PFAS Being Regulated and Establish a Goal of Complete Elimination of PFAS Discharges

**Recommendations:**

The permit should be amended to ensure that no PFAS are discharged into surface waters. To achieve this, the draft permit should be amended to:

1. Expand the universe of PFAS being regulated;
2. Establish a zero-discharge goal for PFAS from all industrial sources connected to the POTW, including Micron; and

3. Require the use of treatment technologies that destroy PFAS, rather than transfer PFAS.

**Rationale:**

The draft permit only proposes action levels for PFOA and PFOS. These limits rely on the NYS Department of Health (DOH) Maximum Contaminant Level (MCL) of 10 ng/L for drinking water for PFOA and PFOS. However, the semiconductor industry no longer uses these compounds; rather the industry relies on a wide range of PFAS for use in photolithography and related processes. The semiconductor industry heavily relies on short-chain PFAS, which have been found to be more mobile and more difficult to remove from waste streams than PFOS and PFOA.[40]

The CHIPS Program Office (2024) *Final Programmatic Environmental Assessment for the Modernization and Expansion of Existing Semiconductor Fabrication Facilities* contains considerable detail about the use of PFAS in wafer fabrication.[41] Appendix C of that document includes a 10-page table describing the over one hundred types of PFAS used by the semiconductor industry. Furthermore, these compounds undergo transformations during semiconductor production. Consequently, one can expect thousands of different PFAS chemicals to exist in semiconductor plant wastewater.

Managing PFAS through limits for one chemical at a time will take years, delay critical protections, and may encourage the creation of alternatives that are just as harmful to skirt around protections. Given the persistent, bioaccumulative, and toxic nature of PFAS, NYSDEC should require a zero-discharge goal for PFAS from all industrial uses. Every additional release of PFAS builds up in the local, regional and global environment, leading to contamination of drinking water supplies, fish, wildlife, livestock, and in humans. It is especially important to control PFAS at point sources such as Micron and the Oak Orchard Wastewater Treatment Plant.

Based on the draft permit, the new ITT is expected to use biological treatment in mixed anoxic tanks followed by aeration tanks, membrane bioreactors, UV disinfection, centrifugal solids dewatering, effluent reuse with ion exchange resin (IX) and reverse osmosis (RO) treatment. However, this process does not destroy PFAS, and instead

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[40] C. Kwiatkowski et al., *Scientific Basis for Managing PFAS as a Chemical Class*, June 2020, https://pmc.ncbi.nlm.nih.gov/articles/PMC8297807/

[41] National Institute of Standards and Technology, *Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program* (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf

generates a concentrate containing high levels of PFAS that must be transported off-site for disposal. This concentrated waste stream poses numerous environmental and public health concerns, including:

- Exposure for workers who handle these wastes
- Potential exposure during transport of wastes through local communities
- Likely exposure in the vicinity of waste disposal sites, often sited near communities of color and low-income communities.

Industrial dischargers of PFAS-containing wastewater, such as Micron, should therefore be required to use treatment methods that destroy PFAS, rather than simply filter PFAS.

A growing variety of technologies exist which are capable of destroying PFAS (breaking the C-F bond). (See, for example, https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/ ) These include:

- Supercritical water oxidation (SCWO)
- Hydrothermal alkaline Treatment (HALT)
- Electrochemical oxidation
- Surface Plasma

The Applicant (Onondaga County) should be required to investigate and install such a system to address the concentrated waste streams resulting from the ion exchange and RO treatment steps. For further information see:

1) U.S. Department of Defense-funded PFAS demo projects show promise for remediation and destruction (A. Reese, Waste Dive, Dec. 1, 2025) https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/
2) Competition to destroy 'forever chemicals' heats up (B. Erikson, Chem & Eng, News, Mar. 4, 2024) https://cen.acs.org/environment/persistent-pollutants/Competition-destroy-forever-chemicals-heats/102/i7

40 CFR 403.5(c)(4) authorizes POTWs to develop local limits in the form of Best Management Practices (BMPs) and source reduction opportunities.[42] As described above, NYSDEC and OCDWEP should develop a robust PFAS Minimization and Management Plan.

[42] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

The BMPs and the PFAS Minimization Plan must encompass a much broader range of PFAS, not just PFOA and PFOS.

Because the complete elimination of PFAS is both technically feasible and available, NYSDEC should not permit the discharge of any PFAS into surface waters.

## VII. NYSDEC Should Limit Solid Waste Disposal

**Recommendations:**

The draft permit fails to adequately address the proper management of PFAS concentrate from the RO process. Based on the Conceptual Design Engineering Report, it is estimated that 75 tons/day will be generated.[43] This material, produced from crystallizing the RO permeate, is simply slated for off-site disposal at a landfill. The draft permit should be amended in the following ways:

1. The permit must describe NYSDEC's plans to coordinate with all relevant agencies responsible for solid and hazardous waste management and occupational safety as it relates to PFAS-contaminated solid waste;
2. A detailed PFAS waste management plan must be submitted to address the handling, storage, transportation, and disposal of the PFAS filtrate; and
3. Transparent documentation and reporting of final disposal locations must be required and made publicly available.

**Rationale:**

PFAS-contaminated solid waste poses significant occupational and environmental hazards if not properly managed. As described above, the new ITT process will use RO, which does not destroy PFAS and will create a concentrated brine solid that must be disposed of off-site. These residuals will contain concentrated levels of PFAS and other industrial compounds which are amenable to biological treatment, such as triazoles and tetramethyl ammonium compounds. The solids may need to be managed as hazardous waste. The permit should specify routine testing of this solid waste stream for PFAS, and other recalcitrant compounds.

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[43] Brown and Caldwell, Onondaga County Department of Water Environment Protection Oak Orchard Industrial Wastewater Treatment Plant and Water Reclamation Facility Conceptual Design Engineering Report, (November 11, 2025) https://static.ongov.net/WEP/OakOrchard_WWTP/permitting/SPDES/Engineering-Reports/OCDWEP%20IWWTP%20WRF%20CDE%20Report_111025.pdf (pg 3-30)

These residuals are required to be managed as solid or hazardous waste and fall outside of the scope of SPDES permitting. As stated in EPA's December 2022, "Certain industrial processes may generate PFAS-contaminated solid waste or air emissions not covered by NPDES permitting and permitting agencies should coordinate with appropriate state authorities on proper containment and disposal to avoid cross-media contamination." [44] Without coordinated oversight of the PFAS concentrate from the RO process, unnecessary additional PFAS contamination and exposure could occur. Therefore, since the draft permit currently relies on RO, it is critical that NYSDEC coordinates closely with all relevant state agencies to ensure that the hazardous waste disposal is properly managed to protect workers and surrounding communities.

Overall, it is essential that NYSDEC coordinate and limit solid waste disposal to protect worker safety, human health, and the environment.

## VIII. NYSDEC Should Include Additional Pollution Limits for Other Toxic Constituents in Micron's Wastewater

**Recommendations:**

The draft permit should be amended to include effluent limits for other known toxic constituents in Micron's wastewater including Tetramethylammonium hydroxide (TMAH); 1-Butanol, 3-methoxy-3methyl; Polyethylene glycol; Methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); EDTA; and 1,2,4-Triazole.

**Rationale:**

As part of the Notice of Intent to Assess (NOIA) response documents available for review, the attachment entitled "Worst-Case Organic Wastewater Constituents to OCDWEP" identifies dozens of additional toxic and potentially hazardous constituents that are expected to be present in Micron's wastewater. These constituents warrant specific effluent limits and monitoring requirements in the SPDES permit. Among the constituents of concern are Tetramethylammonium hydroxide (TMAH); 1-Butanol, 3-methoxy-3methyl; Polyethylene glycol; Methoxyirane polymer with oxirane, ether with 2,4,7,9-tetramethyl-5-decyne-4,7-cicl (2:1); EDTA; and 1,2,4-Triazole. It appears that most of these pollutants are simply assumed to be sufficiently treated to a concentration of 10 µg/L. But that level of needs to be verified during plant start-up, and periodically throughout its operation. Given that these constituents are toxic to humans, aquatic life, and, in some cases, are very

[44] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

persistent in the environment, NYSDEC should establish pollutant limits and appropriate monitoring as part of the permit.

## IX. NYSDEC Should Institute a Long-Term PFAS Monitoring Program for the Receiving Waters

**Recommendations:**

1. Require monitoring of fish, sediments, biota, and ambient water quality for PFAS upstream and downstream of the combined sanitary and industrial wastewater Outfall 001; and
2. Establish a long-term monitoring plan that tracks PFAS discharges in the Oneida River, Oswego River, and Lake Ontario.

**Rationale:**

Many PFAS and their breakdown products are both extremely persistent and bioaccumulative, as well as highly toxic. If the goal of zero discharge of PFAS is not achieved, it's imperative that potential impacts on beneficial uses of the receiving waters be determined.

Upstream and downstream monitoring of sediments, fish, other representative biota, and ambient water quality should be required to determine whether PFAS are accumulating in the ecosystem and to enable NYSDEC to assess and understand the larger impacts of PFAS discharges. NYSDEC should establish a long-term monitoring program that tracks PFAS and other chemicals unique to Micron to understand the broader implications of PFAS discharges, bioaccumulation, persistence and potential risks to aquatic biota and drinking water sources.

Because the Oak Orchard Wastewater Treatment Plant discharges into the Oneida River, a tributary of the Oswego River that flows into Lake Ontario (a drinking water source and ecological haven), it is critical to monitor for emerging contaminants that are known to be highly persistent and toxic. The program should include regular upstream and downstream monitoring and sampling as well as monitoring in aquatic biota for accumulation.

A comprehensive long-term monitoring program will allow New York State to become a leader in understanding these emerging contaminants and help safeguard the Oneida River and Lake Ontario as a critical ecological resource and drinking water source. Such data will also help inform the establishment of water quality criteria and effluent limits for specific PFAS compounds.

## X. NYSDEC Should Require All Data be Made Publicly Available Online

**Recommendations:**

1. All influent, effluent, and biosolids monitoring and sampling data should be made publicly available online and updated regularly.

**Rationale:**

Public access to monitoring data ensures transparency, accountability, and public trust. NYSDEC should require data be reported and posted to an easily accessible public website within 30 days of collection. Timely posting will build public trust in the effectiveness of minimization and treatment efforts and allow for the early detection of emerging issues.

## XI. NYSDEC and OCDWEP Should Clarify the Overall Schedule, Timing of Compliance, and Cost Implications

**Recommendations:**

1. NYSDEC and OCDWEP should provide a clearer and more detailed overall schedule for the permit and the timing of compliance; and
2. NYSDEC and OCDWEP should provide more information on how costs will be managed and passed onto ratepayers.

**Rationale:**

The permit's overall schedule, including the timing and sequence of compliance requirements, is vague and more clarity should be provided. The permit does not provide a clear sense of how long construction is anticipated to take. In addition, since Outfall 01B is associated with Micron, the schedule and compliance requirements are highly dependent on Micron's construction schedule. Therefore, additional information must be provided to understand the timing of the improvements at the Oak Orchard Wastewater Treatment Plant as well as Micron's schedule and how it relates to the phasing, overall schedule, and implementation of the requirements in the Oak Orchard Wastewater Treatment Plant permit.

It has been estimated that the cost of the project is $549.5 million, a significant project for the POTW.[45] It is unclear how this will impact local residents and ratepayers. Therefore,

[45] Tim Knauss, syracuse.com, Onondaga County's $549 million sewage project likely to hike your rate. But how much?, (December 16, 2025) https://www.syracuse.com/news/2025/12/onondaga-countys-549-million-sewage-project-likely-to-hike-your-rate-but-how-much.html (Accessed December 16, 2025)

additional information should also be shared on how this substantial cost will be managed by OCDWEP and passed onto ratepayers. Transparent information is essential for improving public understanding of the improvements and providing meaningful stakeholder engagement.

## XII. NYSDEC Should Ensure the Timely Modification and Renewal of the Permit

**Recommendations:**

1. NYDEC must ensure the permit includes mechanisms to account for changes in effluent limits, monitoring requirements, or PFAS treatment technologies that may evolve over time; and
2. NYSDEC should commit to reviewing and renewing the permit on schedule.

**Rationale:**

Given the evolving nature of the semiconductor industry, wastewater management at the Oak Orchard Wastewater Treatment Plant must be robust and flexible to prevent harmful environmental releases. Although semiconductor manufacturers have proven themselves willing to engineer solutions once regulations are in place, they also have a history of failing to share information with the affected public.

By the time Micron begins operations, new chemicals (including additional PFAS) may be used and discharged. At the same time, treatment technologies for PFAS continue to rapidly advance. Since the landscape for this facility is expected to change significantly over the coming years, NYSDEC should include a condition in the permit allowing modification of effluent limitations outside the permit renewal cycle based on new information, if appropriate, to protect human health.

Per 40 CFR 122.46, NPDES permits should be reviewed and reissued at minimum every five years. Despite this, the current NPDES permit for the Oak Orchard Wastewater Treatment Plant has been administratively continued for nearly six years (since 2019). In this context, NYSDEC must ensure that the next permit is not only renewed timely but also updated to be sufficiently robust and flexible to prevent harmful PFAS releases.

## XIII. Conclusion

As currently drafted, the draft SPDES Permit NY#0030317 for the Oak Orchard Wastewater Treatment Plant is inadequate in protecting water quality, the environment, and the health of workers as well as surrounding communities. The permit is designed to support the operations of one of the largest factories in New York history, a facility that will use and

discharge a broad and evolving range of harmful chemicals, including PFAS, so it deserves careful, deliberate review.

PFAS are toxic, highly persistent, and mobile in the environment, posing a significant risk to water quality, human health, and the environment. Without adequate monitoring, treatment, and oversight, PFAS discharges from industrial dischargers, such as Micron, can pass through the Oak Orchard Wastewater Treatment Plant and pose long-term risks to the Oneida River, Lake Ontario, downstream drinking water sources, and aquatic biota.

NYSDEC and OCDWEP must make every effort to identify PFAS sources and hold industrial dischargers, including Micron, to the highest standards possible to minimize and prevent toxic PFAS discharges.

The final permit should be amended based on the recommendations outlined above. Please specifically respond to each requested change in the Response-to-Comments issued in the final permit. Please provide the final permit and response to comments to the email provided below.

Sincerely,

Julie MacNamara
National Water Projects Coordinator
Clean Water Action / Clean Water Fund
Jmacnamara@cleanwater.org

| | |
|---|---|
| From: | dec.sm.Comments.Micron2025 |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | FW: Oak Orchard WWTP |
| Date: | Wednesday, December 24, 2025 8:58:18 AM |

**From:** Liza Bernard <lizabernard@gmail.com>
**Sent:** Tuesday, December 23, 2025 9:53 AM
**To:** dec.sm.Comments.Micron2025 <Comments.Micron2025@dec.ny.gov>
**Subject:** Oak Orchard WWTP



Good morning,

I do not believe that the public has enough time to to review the proposed Oak Orchard Wastewater Treatment Plant. It is also extremely concerning that Micron plans to use this WWTP even though the plant does not have the capability to clean water of PFAs.

I urge the DEC to allow for more time to review these permits. The DEC also needs to prevent PFAs from being discharged into New York State waters.

Thanks,
Liza Bernard

| | |
|---|---|
| From: | Alma Lowry |
| To: | Choe, Trendon P (DEC); dec.sm.Comments.OakOrchard2025 |
| Cc: | Joe Heath; Jessica Shenandoah; hazel powless; Spencer Lyons |
| Subject: | Onondaga Nation Comments on Oak Orchard Modified SPDES Permit |
| Date: | Tuesday, December 23, 2025 3:43:42 PM |
| Attachments: | Onondaga Nation Comments on Oak Orchard SPDES Permit Modification.pdf |



Trendon:

On behalf of the Onondaga Nation, I am submitting the attached comments on the Draft SPDES Permit modification for the Oak Orchard Wastewater Treatment Plant. Please let me know if you need anything else.

Best,

Alma Lowry

--
Alma Lowry, Of Counsel
Law Office of Joseph Heath
General Counsel to the Onondaga Nation

**LAW OFFICE OF JOSEPH J. HEATH**
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SYRACUSE, NEW YORK 13210-1502

December 23, 2025

Trendon Choe
Department of Environmental Conservation
Region 7
Division of Environmental Permits
5786 Widewaters Parkway
Syracuse, NY 13214
trendon.choe@dec.ny.gov

VIA ELECTRONIC MAIL

**Re: Draft SPDES Permit Modification for Oak Orchard WWTP**

Dear Mr. Choe:

On behalf of the Onondaga Nation, I am submitting the following comments on the draft State Pollution Discharge Elimination System (SPDES) permit modification currently proposed for the Oak Orchard Waste Water Treatment Plant (Oak Orchard WWTP or Oak Orchard). The modified permit is being requested to ensure that Oak Orchard can manage industrial wastewater discharges anticipated from the Micron project. These comments are part of the Nation's government-to-government consultation with the United States and with the New York Department of Environmental Conservation (DEC) as the delegated permitting authority under the federal Clean Water Act. Although the Nation has not been able to review all portions of the draft SPDES permit in detail, we have identified several issues that we believe should be addressed in the final permit.

Specifically, the Nation is concerned that the Draft Permit does not include discharge limits or best management practices for PFAS, tetramethyl ammonium hydroxide, or "azoles" including 1,2,4-Triazole – all identified as "noteworthy wastewater parameters" in the Conceptual Design Engineering Report (CDER) submitted by Oak Orchard (CDER, pp. 1-9 and 1-10). Other typical wastewater contaminants associated with semi-conductor manufacturing may similarly be absent from this permit, which focuses on standard industrial waste parameters included in New York's regulations.

The proposed modifications to Oak Orchard include the addition of an Industrial Treatment Train (ITT) specifically intended to manage industrial wastewater discharges from Micron. The proposed ITT design includes membrane bioreactors that rely on

ultrafine membranes to capture small particles. This appears to be the only ITT component that may address PFAS and other "noteworthy" contaminants. However, neither the Draft Permit nor the CDER include any discussion or evaluation of the likely effectiveness of this method be at capturing short- or long-chain PFAS or other contaminants of concern in Micron's wastewater discharges. As far as the Nation can discern, the Draft Permit relies primarily on routine monitoring, with uncertain public access to the data, and yet-to-be-developed pretreatment standards applicable to the planned Micron facility to control PFAS discharges. More is required.

DEC should mandate more specific pollution control methods and/or other best management practices to limit Oak Orchard's discharge of PFAS and other toxic materials likely to be contained in Micron's industrial wastewater. In its permit application materials Oak Orchard should be required to provide a more detailed assessment of how its proposed ITT will control PFAS discharges. All routine monitoring for PFAS and other toxins potentially associated with Micron should be publicly available upon collection. Finally, DEC should consider an action trigger based on percentage increase in PFAS discharges post-Micron construction. Ideally, the Nation would like to see additional control actions triggered if there is any increase in PFAS discharges from Oak Orchard post-Micron construction.

## I. The Proposed Permit Modification Should Include Effluent Limits, Best Management Practices, or Mandated Control Systems to Address PFAS.

The Draft Permit sets effluent discharge limits for five outfalls – one external outfall (Outfall 01), which discharges to the Oneida River, two internal outfalls (Outfalls 01A and 01B), which discharge treated municipal/process water and treated industrial waste water to the external outfall, and two return discharges (Outfalls 06 and 07), which discharge treated effluent from the municipal treatment train (MTT) and the ITT to Micron. The Draft Permit anticipates that discharges from Outfall 01 will increase by 300% from the currently permitted 10 million gallons per day (mgd) to 30.8 mgd. While the draft permit sets effluent limits for several phases of the project, the only PFAS-related effluent limits are for PFOA and PFOS. The vast majority of PFAS compounds used and discharged by semi-conductor facilities are left unregulated under this permit.

Although the Draft Permit itself does not mandate specific control technologies, the permit does indicate that Oak Orchard will have to submit construction completion certificates for the "approved design" of the Municipal Treatment Train (MTT) upgrades and the newly constructed "Industrial Treatment Train" (ITT). (Draft Permit, pp. 42-44). Because the ITT design is critical to understanding PFAS control, DEC should specifically reference the approved design or, if the design is still in development, the process for approving the final design as part of this permit.

Assuming that the "approved design" refers to the preferred alternatives described in the CDER, there are limited elements that might control PFAS discharges to the environment. Based on a review of EPA and other technical sources, PFAS is most effectively removed from wastewater or drinking water through the use of specially configured Granular Activated Carbon (GAC), anion exchange resins, high pressure membranes, or membrane bioreactors. *See* Thomas Speth, EPA Office of Research and Development, PFAS Treatment in Drinking Water and Wastewater – State of the Science, PFAS Science Webinars for Region 1 and State & Tribal Partners, Sept. 16, 2020 (available on-line at https://www.epa.gov/sites/default/files/2020-09/documents/r1-pfas_webinar_day_1_session_3_speth.pdf); SL Environmental Law Group (2024, Apr 1), PFAS Removal from Wastewater: Traditional vs Modern Treatment Methods, available on-line at https://www.slenvironment.com/blog/pfas-removal-from-wastewater-traditional-vs-modern-treatment-methods. The only element in either the MTT or the ITT that may be useful in controlling PFAS discharges via Outfall 01 appears to be the membrane bioreactor system.[1] (Draft Permit, pp 7 – 8.)

Before approving this design or incorporating it by reference into the Draft Permit, DEC should require Oak Orchard to assess the effectiveness of the membrane bioreactor to remove PFAS from industrial wastewaters, Oak Orchard should also specifically assess the effectiveness of other alternative in controlling PFAS and, if those alternatives do not include components specifically tied to PFAS removal, new alternatives should be considered that focus on these controls. With this data, Oak Orchard should then explicitly evaluate which control method are best suited to eliminate the PFAS and other contaminants anticipated to be discharged by Micron.

The Draft Permit and "approved design" of the MTT and ITT should also address the control systems in which PFAS contaminants may be captured. Control structures like membrane bioreactors and specially configured GAC systems may remove PFAS from the water column, but they do not destroy or break down PFAS molecules. These control systems generate concentrated PFAS wastes, which must be managed as biosolids or sludge. *See* Speth, 2020; SL Environmental Law Group, 2024. The CDER or Draft Permit should include provisions for managing these wastes as well.

## II. **The Draft Permit Should Include An Action Trigger and Public Access Mandates In Addition to Monitoring Requirements**.

The Draft Permit requires routine monitoring for a large suite of potential contaminants in anticipation of permit renewal and additional monitoring for emerging contaminants specifically. However, it includes no clear triggers for action based on

[1] Although The CDER also lists an ion exchange resin, it is unclear whether this is an anion exchange resin or a cation exchange resin and this component also appears to be focused on treating discharges from Outfalls 06 and 07. (Draft Permit, pp. 7-8.)

those results. In addition, not all of the monitoring data is required to be reported to DEC – and therefore publicly available – on a timely basis. DEC should revise the draft permit to address both shortcomings.

The Draft Permit appears to require monitoring PFAS compounds under at least two, and possibly three, provisions. First, Oak Orchard must monitor Outfalls 01 for all pollutants listed in NY-2A Application, Tables A through D, every other year. This requirement includes 40 identified PFAS compounds. However, this data is not immediately reported to DEC. Instead, Oak Orchard is simply required to retain the information and report it as part of its next permit renewal application. (Draft Permit, p 50.) Second, the Draft Permit also requires quarterly monitoring at Outfalls 01 and 01B for emerging contaminants, which again includes the same 40 identified PFAS compounds. It is unclear when or whether this data is reported to DEC. (Draft Permit, pp. 5 – 6, 9 – 10, 12, 14, 16-17,19, 21-23, 25, 27-28). Last, PFAS compounds may also be measured during an "industrial pollutant scan" required for Outfall 01B after the ITT comes on line (Draft Permit, p. 51).

While this data is important, the Draft Permit does not include action triggers for most of the monitored PFAS compounds (38 of the 40) nor does it guarantee that the data will be made public or made public in a timely fashion. While there is reference in some sections to "action levels" that may be exceeded (Draft Permit, p. 51), DEC is clear in the SPDES Permit Fact Sheet accompanying the Draft Permit that monitoring of PFAS compounds is only designed to "support establishment of future standards or performance-based requirements" (SPDES Permit Fact Sheet, p. 48 – 53, 78 - 83). This is insufficient. At minimum, DEC should commit to a reevaluation of control technologies or adoption of best management practices – either at Oak Orchard or at Micron – if measured PFAS discharges from Outfall 01 rise significantly from pre-Micron levels.

Further, DEC should mandate that monitoring data from all PFAS monitoring, including the biennial pollutant scan for Outfall 01, the industrial pollutant scan for Outfall 01B, and quarterly monitoring for emerging contaminants, be made publicly available <u>when the data is collected</u>. This does not appear to be the case for the biennial pollution scan required to support NY-2A applications. This data may be collected by the permit holder and maintained in on-site records until its next permit renewal application is filed. This means that data may not be reported to DEC for the full life of a permit renewal – five years. Other monitoring data appears to be reportable to DEC immediately, which makes it available to the public through a Freedom of Information request. However, that process can be cumbersome.

Public concern over the Micron facility and over PFAS contamination generally is already high. Collecting data that is not reported to DEC for four to five years (the NY-2A data, which is only reported on permit renewal applications) will only serve to increase public mistrust and concern. Rather than keeping this data close to the chest or

requiring the public to seek information on an individual basis, DEC should commit to making all monitoring data from Oak Orchard public within a reasonable time frame of its collection (weeks, not years) in a well-advertised and easily accessible public database. This publicly accessible database should also include the pre-Micron monitoring data provided in the permit application to allow easy comparison. Certainly, DEC has the discretion to do so.

## III. The Draft Permit Should Not Rely on Yet-To-Be Developed Industrial Pretreatment Standards for PFAS Controls.

The Draft Permit references the Industrial Pretreatment Program and the likely restrictions that program will impose on Micron's discharges to Oak Orchard (pp. 39 – 41), although there is no substantive discussion of the likely controls that would be imposed under this program. The CDER goes further, stating that, in addition to federally imposed technology based effluent limits (TBELs), "technically based local limits (TBLLs) will also be developed and incorporated for protection of pas-through and interference" and that these "[p]retreatment permit limits are anticipated to include, but not limited to, PFAS, mercury, hydrogen peroxide, cyanide, and metals." (CDER, p. 1-12). However, this reassurance has little weight.

First, the federal pretreatment and effluent limits established specifically for new semi-conductor facilities focus on discharge limits for fluoride, pH, and "total toxic organics." 40 C.F.R. §§ 469.17, 469.18. Total toxic organics do not include PFAS compounds. 40 C.F.R. § 469.12. Thus, it does not appear that there are established federal regulations on the discharge of PFAS from industrial facilities to wastewater treatment facilities.

As noted in the CDER, wastewater treatment plants can set their own local limits to avoid "pass through and interference" caused by industrial waste discharges. 40 C.F.R. § 403.5. However, the terms "pass through and interference" are defined as industrial discharges that cause a wastewater treatment plant to violate its own discharge permit. 40 C.F.R. §§ 403.3(k), (p). In this case, the Draft Permit for Oak Orchard does not include discharge limits for the vast majority of PFAS compounds (38 of the 40 listed compounds). Accordingly, discharge of these unregulated compounds cannot result in pass through or interference, as defined by EPA regulations, and Oak Orchard is not directly authorized by these regulations to set TBLLs or pretreatment standards for PFAS compounds other than PFOA and PFOS. Since they are no longer used in semi-conductor fabrication, limits on PFOA and PFOS are of little value.

Oak Orchard can require Micron to monitor for PFAS in its discharges. (Draft Permit, (p. 40). However, it is not clear how or whether Oak Orchard can require restrictions on the discharge of PFAS compounds other than PFOA and PFOS. If Oak Orchard cannot impose restrictions on Micron's PFAS discharges under the Industrial Pretreatment

Program, DEC should ensure that Oak Orchard can, through its own treatment processes, effectively remove whatever PFAS compounds are likely to be contained in Micron's industrial discharges. If DEC believes that Oak Orchard can impose restrictions on Micron's PFAS discharges under the Industrial Pretreatment Program, it should include specific language setting out the basis for that authority and potential restrictions that could be imposed. Neither DEC nor Oak Orchard (through its CDER) should be able to rely on hollow assertions about pretreatment restrictions that are based on non-existent permit limits.

Thank you for your attention to these comments. Although our review was only able to skim this draft permit, the Nation looks forward to seeing a more complete, transparent, and lay reader-friendly version of this permit in future.

Sincerely,

Alma Lowry, Esq.

Cc: Onondaga Council of Chiefs
Joseph Heath, General Counsel
Jeanne Shenandoah, Onondaga Nation
Hazel Powless, HETF/Onondaga Nation Representative

From: Paul Doody
To: dec.sm.Comments.OakOrchard2025
Subject: Draft SPDES permit for expansion of Onondaga County Oak Orchard treatment plant
Date: Thursday, December 4, 2025 3:48:21 PM



I am requesting that public comment period for the above-referenced permit be extended. The agency has released for public comment three permits related to the Oak Orchard wastewater plant in addition to the air permit for Micron. This comes on the heels of the release of the final EIS, and public hearings held by the county's industrial development agency, all related to Micron. The time of year could not be worse—the holiday season when the public is traveling or otherwise preoccupied with family and other community events. **A three to six month extension is therefore requested.**

Adequate and thoughtful public input for this permit is not possible given the scope of the permits and the length of the draft permit documents and the volume of supporting documentation. The SPDES permit alone is 143 pages. There are nearly 20 supporting documents, including two lengthy engineering reports (1,425 pages). Commenters must download over 270 megabytes of material from the Onondaga County website JUST to get started. Again, a much longer period is warranted due to the volume of materials which need to be reviewed to provide meaningful comments.

In addition, **the Department can and should hold informational meetings to engage with the public in a meaningful way.** I recommend at least two to three such meetings. Onondaga County WEP Dept. staff and its design consultants along with engineers representing Micron should be brought in to describe the wastewater quality expected from Micron as well as the proposed wastewater treatment processes at Oak Orchard.

Secondly, **the wastewater discharge permit is premature.** The public was informed on November 8th that construction of the memory chip factories would be delayed by two to three years. According to the Micron Final EIS, the construction of the Onondaga County wastewater treatment facilities at Oak Orchard are slated to begin in the fourth quarter of 2027, a full two years from now. There is ample time available to consider comments and release a final permit. The Department has been in no rush to renew the SPDES permit for the existing Oak Orchard wastewater treatment plant. That permit expired on June 30, 2019.

Third, I am disappointed to see that:

1.

Testing for PFAS (per- and polyfluorinated alkyl substances) is limited to four times per year. At a minimum there should be monthly monitoring and reporting, which could be reduced if data after 6 to 12 months shows acceptably low concentrations in the discharges.

2. No quantitative limits are imposed on any of the 40 compounds tested. Rather, “action levels” are set at 10 ng/L only for PFOA and PFOS. Neither PFOA nor PFOS are currently used by the semiconductor industry.

Thirdly, the SPDES permit needs to be revised to adequately monitor and eliminate the discharge of PFAS into our waterways. Our waterways, which includes Lake Ontario, already are burdened with PFAS. Lake Ontario provides drinking water for over 8 million people in the U.S. and Canada, including Onondaga County. The water intake for Onondaga County (and City of Oswego) is located perilously close to the Oswego River discharge. The Department needs to be proactive to not allow the introduction of new sources of PFAS into our waterways (and potentially our drinking water).

Testing for forty compounds is simply inadequate because there are hundreds if not thousands of PFAS compounds produced in the semiconductor manufacturing process. Therefore I urge the DEC to require the applicant to regularly test (at least weekly) for Total Organic Fluorine in the effluent from the Industrial Wastewater Treatment Plant (Outfall 01A). Monthly testing should be required for the 40 PFAS compounds in Method 1633, supplemented by non-targeted PFAS analysis to identify unlisted compounds found in semiconductor water. Discharge limits need to be imposed on those PFAS which are present in the IWWTP wastewater. The Department should consult with other state agencies with experience regulating PFAS in wastewater. Minnesota, in particular, has developed robust monitoring strategies for the 3M plant at Cottage Grove.

Thank you for the opportunity to comment on this highly consequential permit related to the Micron facility in Clay.

Paul Doody
pauldoody1978@gmail.com
315-409-5643

| | |
|---|---|
| From: | Peter King |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | Re: Oak Orchard Wastewater Treatment Plant municipal treatment train upgrades SEQR |
| Date: | Tuesday, December 23, 2025 4:40:49 PM |
| Attachments: | The_impact_of_droughts_and_climate_chang.pdf<br>Section5.4.4-GeologicHazFINAL.pdf |



Date: Dec. 23rd, 2025
From: Peter King, Syracuse, NY
To: DEC Permit review.
Re: "Oak Orchard Wastewater Treatment Plant municipal treatment train upgrades SEQR", from this page =>
Town of Clay - Micron New York Semiconductor Manufacturing Project - NYSDEC Notice of Acceptance of Drat EIS and Public Hearing
--https://dec.ny.gov/news/environmental-notice-bulletin/2025-06-25/seqr/town-of-clay-micron-new-york-semiconductor-manufacturing-project

Hello DEC,

Given the shortness of time, I will simply send these brief comments.

I contest the negative declaration for SEQR on this project, as the Micron 'fab' being built will likely contribute many PFAS, not even sure if anyone will notice.
I completely agree with the comments from CHIPS Communities United as already submitted, and available from this link.
Micron to Use and Discharge PFAS “Forever Chemicals” With Little Oversight Under Draft Wastewater Permit - CHIPS Communities United

https://chipscommunitiesunited.org/news/micron-to-use-and-discharge-pfas-forever-chemicals/

In addition, and as framing this risk:

We know the County has had many wastewater issues in recent years.

Whether or not named as "Karst", we need to be aware, ground failure issues will likely prevail here, esp. as impacting pipes. In the news now...
Water authority urges people to use less water in 6 Central NY towns after major break - syracuse.com
By Greta Stuckey | gstuckey@syracuse.com
"Syracuse, N.Y. — The Onondaga County Water Authority is urging customers in six towns to conserve water after a major break in a large-diameter transmission main, officials said Saturday.
The damaged 42-inch pipe carries Lake Ontario water from a pump station in Clay to reservoirs that serve the eastern half of OCWA’s system, officials said in a news release.
Crews are working to complete what officials described as a complex repair that could take up

to one week.
The break is at the intersection of Taft Road and Northern Boulevard in the town of Cicero, according to Jeffrey Brown, executive director of OCWA.
The break was caused by shifting soil exacerbated by excessive ground water, Brown said...."

The County has been facing many wastewater issues in recent years, despite their 'Save-the-Rain' program. I think this is partly due to soils, climate changes and possibly the County's mismanagement. CNY generally has many soils which tend to be more prone to movement from weather / climatic extremes, as in wet / drought and freeze / thaw. Soils like Clay, Silt, Sand and especially evaporites like salt, gypsum can become more volatile with water extremes. A frequently quoted paper linking Climate change, water and karst issues is

Linares, R., Roqué, C., Gutiérrez, F., Zarroca, M., Carbonel, D., Bach, J., & Fabregat, I. (2017). The impact of droughts and climate change on sinkhole occurrence. A case study from the evaporite karst of the Fluvia Valley, NE Spain. Science of the total environment, 579, 345-358.

The authors link drought periods with sinkholes in Spain, seeing also they note periods of strong rainfall in between. They say the most intensive period for sinkhole formation seems the most recent. Downloaded from => Francisco Gutierrez - University of Zaragoza (ATTACHED)

Back in 2018-2019, the County was facing mega leakage & backup issues on the entire sewage system.
2019 => Onondaga County faces $500 million sewer bill to save creeks, jobs - syracuse.com
Oct. 2018 => $9 million sewer repair just the start of tough fixes for Onondaga County - syracuse.com
Not sure if this municipal cooperation is still required.
"The Meadowbrook-Limestone problem is compounded by the fact that while the county is responsible for treating sewage, many of the underground pipes that lead to the plant are owned and maintained by other municipalities. DEC this summer sent letters to Syracuse, the towns of DeWitt and Manlius, and the villages of Manlius and Fayetteville, telling them they're on the hook to help the county fix the problem. "To put it more bluntly," the DEC said, "that cooperation is legally required.""

2025 => 'Town of Clay Comments and Expectations Regarding the Draft Environmental Impact Statement for the Micron Project'
<https://townofclayny.gov/sites/default/files/2025-08/ToC%20Micron%20DEIS%20Comments.pdf>
"Date: August 8, 2025"
"The Oak Orchard Wastewater Treatment Plant (OWWTP) will require phased upgrades to handle wastewater from Micron's operations, with Phase 1 improvements in place before initial operations and a new treatment train completed prior to Phase 2. Air permitting modifications must also be completed as necessary. These upgrades must be fully funded by Micron and its partners to prevent any financial or service impacts on existing customers and to safeguard downstream water quality."

Onondaga County still has its share of sewage violations.
Nov. 2024 = Onondaga County fined nearly $100,000 for sending 36 million gallons of sewage into the lake - syracuse.com
June 2025 = Onondaga County fined for letting sewage back up in parking lots and Onondaga

Lake - syracuse.com

Overall, the CNY area will likely continue to see issues in Ground hazards.
(From) 2019 Update on, Onondaga County Multi-Jurisdictional Hazard Mitigation Plan
Section 5 - Risk Assessment - Section5.4.4-GeologicHazFINAL.pdf
Figure 5.4.4-3. Landslide Susceptibility in Onondaga County (ATTACHED)
Entire north side of Clay including MIcron, Oak Orchard WWTP are in an area with "moderate susceptibility" to landslides. Note, the entire Clay area is so flat, considering 'landslides' seems silly, but 'ground failure' may have recently happened with OCWA's big pipes in Cicero last week (See link above)

Thank yous,
Peter King,
Syracuse

# 5.4.4 Geological Hazards

This section provides a profile and vulnerability assessment for the geological hazard.

## 5.4.4.1 Hazard Profile

This section provides profile information including description, extent, location, previous occurrences and losses and the probability of future occurrences.

### Description

Geological hazards are any geological or hydrological processes that pose a threat to human lives and natural lands. These types of hazards can include earthquakes, landslides and other slope failures, mudflows, sinkholes, and flooding. For the purpose of this HMP update, landslides, land subsidence, and mudboils will be discussed in this hazard profile. Earthquakes and flooding are addressed in separate sections of this plan, Section 5.4.2 (Earthquake) and Section 5.4.3 (Flood), respectively.

#### Landslide

Landslides are a type of slope failure, resulting in a downward and outward movement of rock, debris or soil down a slope under the force of gravity (New York State Disaster Preparedness Commission [NYSDPC], 2008). They are one of the forms of erosion called mass wasting, which is broadly defined as erosion involving gravity as the agent causing movement. Because gravity constantly acts on a slope, landslides only occur when the stress produced by the force of the gravity exceeds the resistance of the material (Organization of American States [OAS], 1991).

**Figure 5.4.4-1. Photograph of the 1993 Tully Farm Road Landslide (Largest New York State Landslide in the Past 75 Years)**

*Source: Jäger and Wieczorek, 2001*

Landslides consist of free-falling material from cliffs, broken or unbroken masses sliding down mountains or hillsides, or fluid flows. Materials can move up to 120 miles per hour (mph) or more, and slides can last a few

seconds or a few minutes, or can be gradual, slower movements over several hours or days. There are several different types of landslides including:

- *Rock Falls* are when a mass detaches from a steep slope or cliff and descends by free-fall, bounding, or rolling.
- *Rock Topples* are when a mass tilts or rotates forward as a unit.
- *Slides* are when a mass displaces on one or more recognizable surfaces, which may be curved or planar.
- *Flows* are when a mass moves downslope with a fluid motion. A significant amount of water may or may not be part of the mass (OAS, 1991).

Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors that include:

- Erosion by rivers, glaciers, or ocean waves create over-steepened slopes
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- Earthquakes create stresses that make weak slopes fail
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows
- Excess weight from accumulation of rain or snow or stockpiling of rock or ore, from waste piles or man-made structures may stress weak slopes to failure.(USGS 2016).

Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes caused by construction or erosion, earthquakes, and changes in groundwater levels. Areas generally prone to landslide hazards include previous landslide areas, bases of steep slopes, bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires (NYS DHSES 2014). Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation cover. Warning signs for landslide activity include:

- Springs, seeps, or saturated ground in areas that have not typically been wet before
- New cracks or unusual bulges in the ground, street pavement, or sidewalk
- Soil moving away from foundations
- Ancillary structures, such as decks and patios, tilting and moving relative to the main house
- Tilting or cracking of concrete floors and foundations
- Broken water lines and other underground utilities
- Leaning telephone poles, trees, retaining walls, or fences
- Offset fence lines
- Sunken or down-dropped road beds
- Rapid increase in creek water levels, possibly accompanied by increased turbidity
- Sudden increase in creek water levels while rain is still falling or just recently ended
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb
- A faint rumbling sound that increases in volume as the landslide nears
- Unusual sounds, such as trees cracking or boulders knocking together (USGS 2013).

Landslide materials may be composed of natural rock, soil, artificial fill, or a combination of these materials. They can be caused by numerous factors such as volcanic eruptions, earthquakes, fire, storms, and by human land modifications. Landslides can transpire quickly with little to no warning. Depending on the location of a

landslide, they can pose significant risks to health, safety, transportation, as well as other services. Annually, landslides in the U.S. cause approximately $3.5 billion in damages and between 25 and 50 fatalities (NYS DHSES 2014).

### Land Subsidence

Land subsidence can be defined as depressions, cracks, and sinkholes in the earth's surface which can threaten people and property. Land subsidence is caused by a loss of subsurface support which may result from a number of natural and human caused occurrences including subsurface mining, the pumping of oil, or ground water. Subsidence depressions, which normally occur over many days to a few years, may damage structures with low strain tolerances such as dams, factories, and utility lines. The sudden collapse of the ground surface to form sinkholes, many yards wide and deep, within the span of a few minutes to a few hours poses immediate threat to life and property (NYS DHSES 2014).

A sinkhole is a depression in the ground that has no natural external surface drainage. When it rains, all of the water stays inside the sinkhole and usually drains into the subsurface. Sinkholes are most common in areas underlain by karst terrain (limestone, carbonate rock, salt beds, and gypsum) and can occur without warning. These areas are where the types of rock below the land surface can naturally be dissolved by groundwater. When rainfall moves down through the soil, these types of rock begin to dissolve, creating underground spaces and caverns, leading to sinkholes (USGS 2019).

Land subsidence is one of the most varied forms of ground failure affecting the United States, ranging from broad regional lowering of land surfaces to local collapses. Regional lowering may aggravate the flood potential or permanently inundate an area, particularly in coastal or riverine settings. Local collapse may damage or destroy buildings, roads, and utilities (FEMA 1997; National Research Council Commission on Engineering and Technical Systems 1991). Other impacts of subsidence include, but are not limited to changes in elevation and slope of streams, canals, and drains; damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees; damage to private and public buildings; and failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems. In some coastal areas, subsidence has resulted in tides moving into low-lying areas that were once above high-tide levels (Leake 2004).

Typically, land subsidence poses a greater risk to property than to human life. The average annual damage throughout the United States from all types of subsidence is estimated to be at least $125 million. Damage consists primarily of direct structural damage and property loss and depreciation of land values. It also includes business and personal losses that accrue during periods of repair (FEMA 1997).

### Mudboils

Another, less common cause of land subsidence is a natural phenomenon known as mudboils. Mudboils are volcano-like cones of fine sand and silt that range from several inches to several feet high and from several inches to more than 30 feet in diameter. Active mudboils are dynamic ebb-and-flow features that can erupt and form a large cone in several days, then cease flowing, or they may discharge continuously for several years. Mudboils continuously discharge sediment-laden (turbid) water, pulling sediments from the subsurface, which can lead to gradual land subsidence (Kappel and McPherson, 1998; Kappel et al., 1996).

**Figure 5.4.4-2. Mudboil/Depression Area in the Tully Valley**

*Source: Kappel and McPherson, 1998*

## Location

### Landslides

The potential for landslides exists across New York State; however, 80-percent of the state has a low susceptibility of landslides. Figure 5.4.4-3 indicates that a majority of Onondaga County has low incidence of landslides. The northern portion of the county is shown as having moderate susceptibility to landsliding and low incidence of occurrence. A small area in the center of the southern portion of the county has moderate incidence.

Areas of steep slopes are typically at greatest risk for landslide occurrences. Figure 5.4.4-4 shows areas in Onondaga County with slopes greater than 15-percent. Areas of steeper slopes increase the likelihood that landslides will occur, especially during periods of heavy rain or human activity. However, the primary cause of landslides is the influence of gravity acting on weakened materials that make up a sloping area (Conners 2018; USGS 2004). The figure shows steep slope areas throughout Onondaga County, with many steep slopes located around the lakes in southwestern Onondaga County and areas in and around Tully Valley.

### Land Subsidence

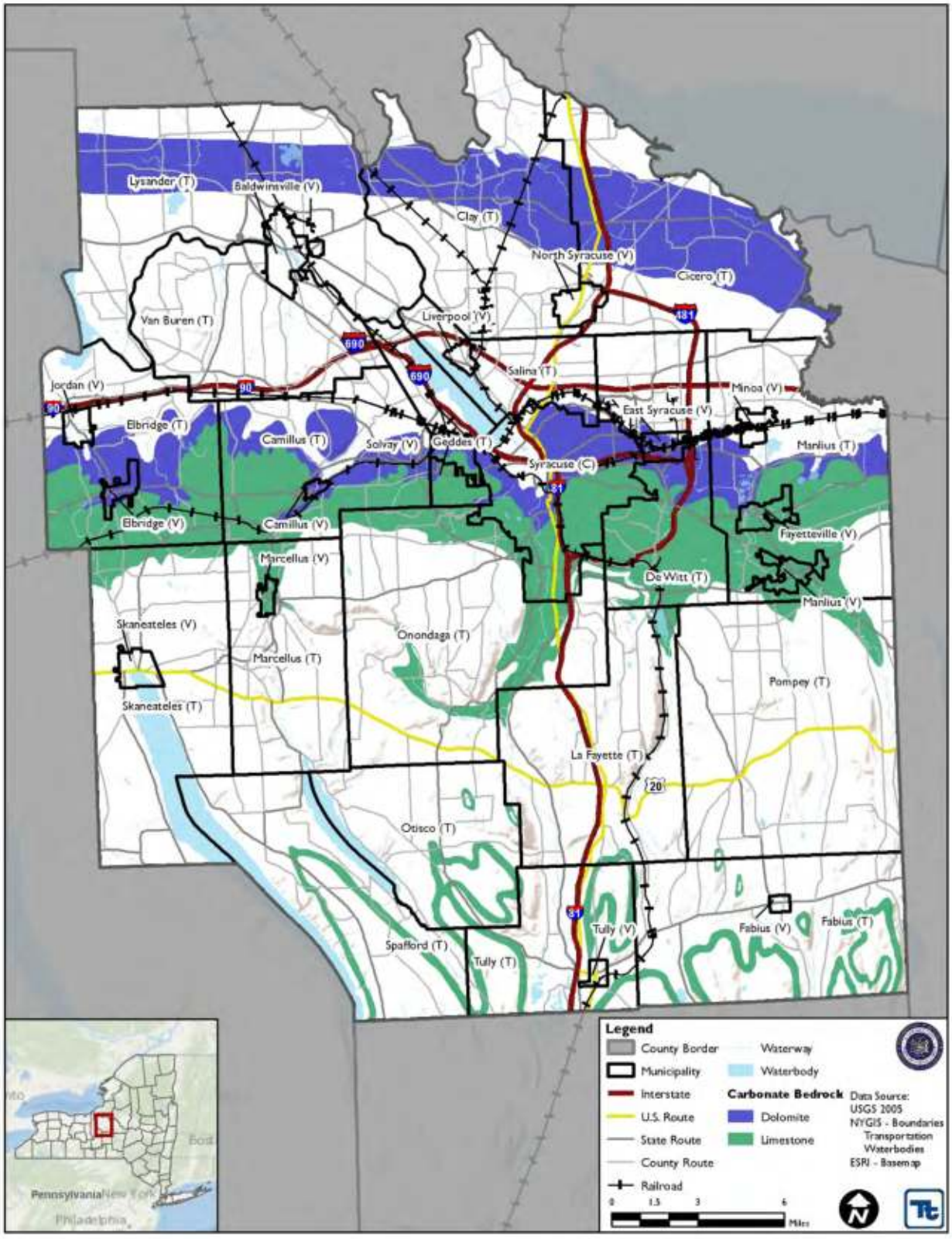
Areas underlain by carbonate bedrock are the most susceptible to land subsidence and sinkhole incidents. Areas of limestone, carbonate rock, salt beds, or rocks that can naturally be dissolved by groundwater are more prone to sinkholes. As the rock dissolves, spaces and caverns develop underground, leading to sinkholes (USGS 2018). Figure 5.4.4-5 illustrates the areas of carbonate bedrock in Onondaga County. The figure shows bands of dolomite in northern and central Onondaga County, bands of limestone in central Onondaga County, and small bands of limestone in southern Onondaga County. These areas of the county may experience more sinkholes than other parts based on the rock underlaying these parts.

**Figure 5.4.4-3. Landslide Susceptibility in Onondaga County**

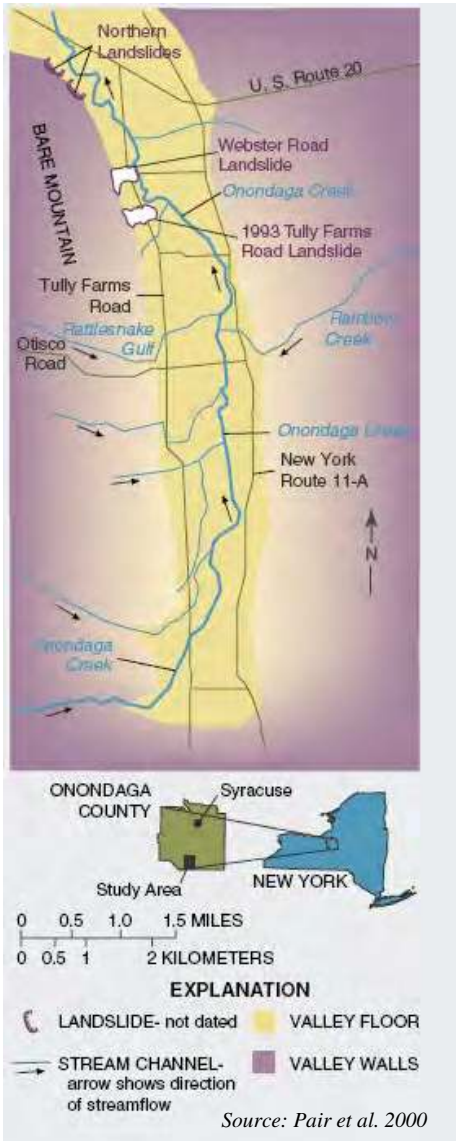

*Note: According to this figure, the northern portion of the county is located within the moderate susceptibility to landsliding with the remainder of the county having low landslide incidence. There is a small portion of the county with moderate landslide susceptibility in the southern portion of the county.*

**Figure 5.4.4-4. Steep Slope Areas in Onondaga County**

**Figure 5.4.4-5. Carbonate Bedrock Areas in Onondaga County.**



## Tully Valley



*Source: Pair et al. 2000*

Tully Valley is located in the Finger Lakes region of New York State in Onondaga County. Tully Valley is a glacially carved valley where lake sediments were deposited. It is approximately six miles long and, on average, about one mile wide along the valley floor. Onondaga Creek flows north through the valley and drains to Lake Ontario. The valley walls are forested and steep and generally consist of colluvium (weathered bedrock) and glacial till (dense soils) over bedrock. The valley floor consists of more than 400 feet of glacial lake deposits (gravel and sand grading upward to silt and clay at land surface). The valley floor terrain slopes gently (generally less than 10°) from the valley walls toward the center of the valley. At land surface the valley floor is mantled with a 60-foot-thick silt and clay unit; some of the clays within this unit are saturated and extremely soft. These materials were deposited during and after the last period of glaciation, which ended approximately 14,000 years ago. The upstream (south) end of the valley is covered by coarser sediments that form the head of the Tully (Valley Heads) Moraine. Alluvial fans emanate from the tributary valleys of Rainbow Creek and Rattlesnake Gulf, halfway up the valley and just north of Otisco Road (Kappel et al, 1996). Land use in Tully Valley is mostly agricultural and low-density residential. Brine mining (solution mining of salt) took place from 1889 to 1986 at the southern end of the valley. As a result of the former brine mining operations, the valley walls and bedrock beneath them contains fractures. Also, north of the Tully Moraine, a section of the valley floor has sunk from the salt removal that occurred beneath it (Wieczorek et al., 1998; Tamulonis, 2007; Pair et al., 2000; Onondaga Environmental Institute, Date Unknown).

Tully Valley has a landslide history dating back to 9,870 14C yr B.P. (before present). The Department of Geography at the University of Heidelberg and the USGS developed a landslide inventory ranging from 14,000 years ago to the present day based on the interpretation of aerial photographs of the Tully Valley area. This inventory indicated that 73 total landslides have occurred, of which 22-percent (16) were classified as active/recently-active (present to 200 years), 52-percent (38) fall in the category old (200 to 10,000 years), and 26-percent (19) are termed ancient (10,000 to 40,000 years) (Jäger and Wieczorek, 2001; Tamulonis, 2007).

The most recent and most documented landslide in Onondaga County and the Tully Valley area occurred on April 27, 1993 along the west wall of the Valley at the base of Bare Mountain. Debris from the landslide covered 1,500 feet of Tully Farms Road with more than 15 feet of mud. Three homes were destroyed due to this event. Most residents were away from their homes at the time, and no fatalities or serious injuries were reported (Pair et al., 2000). According to the NYSGS, this slide was the largest to have occurred in the State in more than 75 years. The location of this landslide, as well as other recent landslide events, is depicted in Figure 5.4.4-7.

The 1993 Tully Valley landslide and smaller recently-active landslides in the area, particularly along the base of Bare Mountain, have resulted in property damage, suggesting that landslides are an important hazard and potential risk within this particularly area of Onondaga County (Jäger and Wieczorek, 2001). In the aftermath of the 1993 Tully Valley landslide, residents and public officials became concerned about the potential landslide

hazards in settings similar to the Tully Valley within the county. Federal and State environmental agencies and several universities conducted many studies and investigations in the Tully Valley area to identify the cause of landslides and assess the potential for future landslides (Pair, et al., 2000). Also, the USGS and the NYSGS prepared a map of 160 square miles of southern Onondaga County showing the susceptibility to landsliding categorized as low, moderate, or high. The map has been used by the towns of Tully and LaFayette and agencies of Onondaga County. Results of investigations for landslide potential, followed by mitigation efforts before land-use development, help prevent or reduce most adverse economic consequences of landslides (USGS, 1996; Kappel and McPherson, 1998).

The Bluffs (along Bluffview) in the Town of Manlius overlooking Limestone Creek have experienced geological hazard events in the past. According to an Engineering Feasibility Study conducted in 2005, four attached condominiums along Bluffview in the Town of Manlius were constructed (before 1994) close to the edge of an approximately 80-foot high bluff overlooking Limestone Creek (The Bluffs). In May 2002, an approximate 40-foot wide area of the bluff slid into Limestone Creek carrying the ground surrounding the south-side of condominium unit 8181. The earth slope failed after a heavy rain event. According to the study, a glacial till layer (fine-grained silt, sand, gravel, cobbles and boulders) supports the floors and footings of the condominiums and is susceptible to erosion by precipitation and roof runoff. The bedrock below the soil is 'thinly bedded and fractured limestone that is susceptible to surface unraveling from weathering." The study also states that deeper large scale instability in the rock cannot be ruled out, and without repair the building's structure will eventually suffer (John P. Stopen Engineering Partnership, 2005). Figure 5.4.4-6 shows an aerial photograph of Limestone Creek and the Bluffs in Manlius on October 26, 2006.

**Figure 5.4.4-6. Aerial Photograph of Limestone Creek and The Bluffs in Manlius on October 26, 2006**

*Source: Novek, 2009*

Most incidences within Onondaga County have not been well documented. This is because they either had no immediate impact or they occurred in isolated locations with few people aware of their existence. Therefore, information on actual landslide locations within the county is limited other than the information found regarding the 1993 landslide. Although most landslide events have gone unnoticed within the county, slides of varying severity over time have changed land contours, disrupted surface-water flows, altered ground-water levels, and/or modified the quality of water that ultimately flows to Onondaga Lake (OLP, 2005-2006).

These rock types and conditions have contributed to subsidence events in the Tully Valley area of Onondaga County. Documented subsidence within the Tully Valley area has been attributed to:

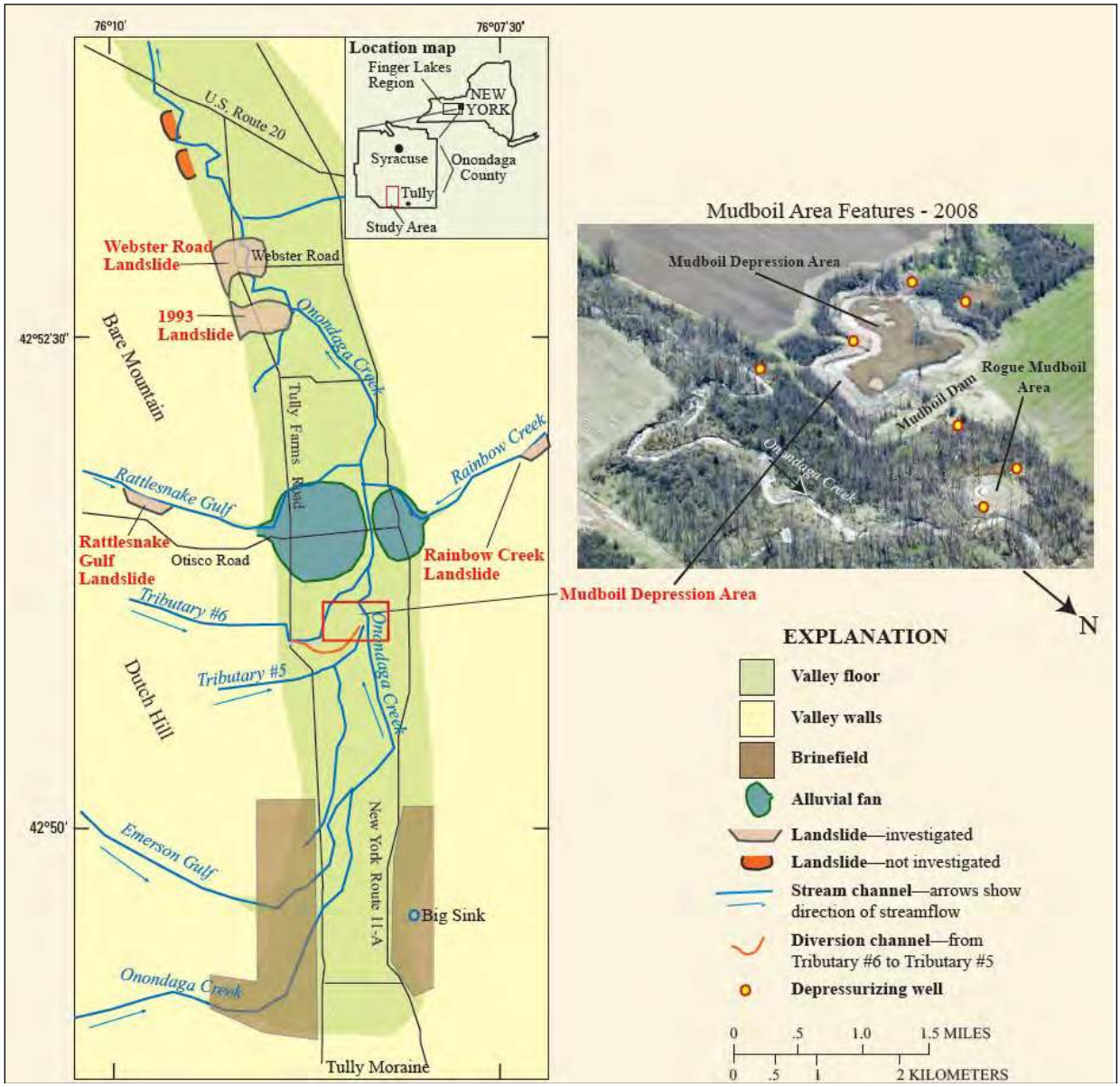
- Discharge of mudboil sediments;
- Salt-solution mining; or
- Aquifer dewatering of fine-grained deposits (Kappel, 2009).

The discharge of mudboil sediments and salt-solution mining have been the main causes of subsidence within the Tully Valley, and are further described below:

### Mudboils

Mudboils have been documented in the Tully Valley since the late 1890s and have continuously discharged sediment-laden (turbid) water into nearby Onondaga Creek since the 1950s. This discharge causes turbidity in the Creek, which is a tributary to Onondaga Lake. Mudboil activity has caused a gradual land-surface subsidence that has led to the rerouting of a major petroleum pipeline and a buried telephone cable, and caused two road bridges to collapse. Figure 5.4.4-7 illustrates the approximate location of where mudboil activity continues to occur in southern Onondaga County (Kappel, 2009).

**Figure 5.4.4-7. Geographic Features of Tully Valley**




*Source: Kappel, 2009*

Mudboil discharge within the county is driven by artesian pressure in unconsolidated sediments that are confined by a 60-foot layer of silt and red clay. This process, once begun, has been self-propagating. Artesian pressures are about 20 feet above land surface over most of the Tully Valley floor but exceed 30 feet above land surface along Onondaga Creek where Rattlesnake Gulf and Rainbow Creek enter the Tully Valley. The source of artesian pressure is recharge from the Tully (Valley Heads) Moraine at the south end of the valley, and the alluvial fans of Rattlesnake Gulf and Rainbow Creek (Kappel et al., 2009).

Mudboils have been observed in the Tully Valley for nearly 100 years. Most of the mudboils are in two areas of the Tully Valley: (1) the Onondaga Creek mudboil "corridor," which is 1,500 feet long and 300 feet wide along Onondaga Creek, south of Otisco Road, and (2) the 5-acre area of subsidence, locally known as the mudboil/depression area (MDA), just west of the southern (upstream) end of the mudboil corridor.

The earliest known mudboil in Tully Valley, reported in the Syracuse Post-Standard on October 19, 1899, was apparently localized and short-lived. From 1899 to the 1970s, the mudboils within the Onondaga Creek mudboil corridor appeared and dissipated over a span of several weeks to a few months but had no long-term effect on the water quality of Onondaga Creek and Onondaga Lake, 20 miles downstream. Active mudboils became increasingly persistent during the mid-1970s, causing turbid discharges that degraded the quality of Onondaga Creek. Before the mid-1980s, relatively fresh groundwater was discharged from the MDA. Since then, however, the discharge has been more brackish, and land subsidence (locally as much as 15 feet) has expanded outward. In June 1991, a new mudboil appeared in Onondaga Creek just upstream of the Otisco Road Bridge, and within two months the bridge collapsed. Subsidence around the 150-foot radius of this collapse area ranges from several inches at the perimeter to more than five feet at the bridge (NYSDPC, 2008). Currently, the MDA contains most of the active mudboils and contributes most of the sediment that is discharged to Onondaga Creek from this part of the valley; it also has the greatest amount of mudboil-induced land subsidence in the valley (Kappel et al., 2009).

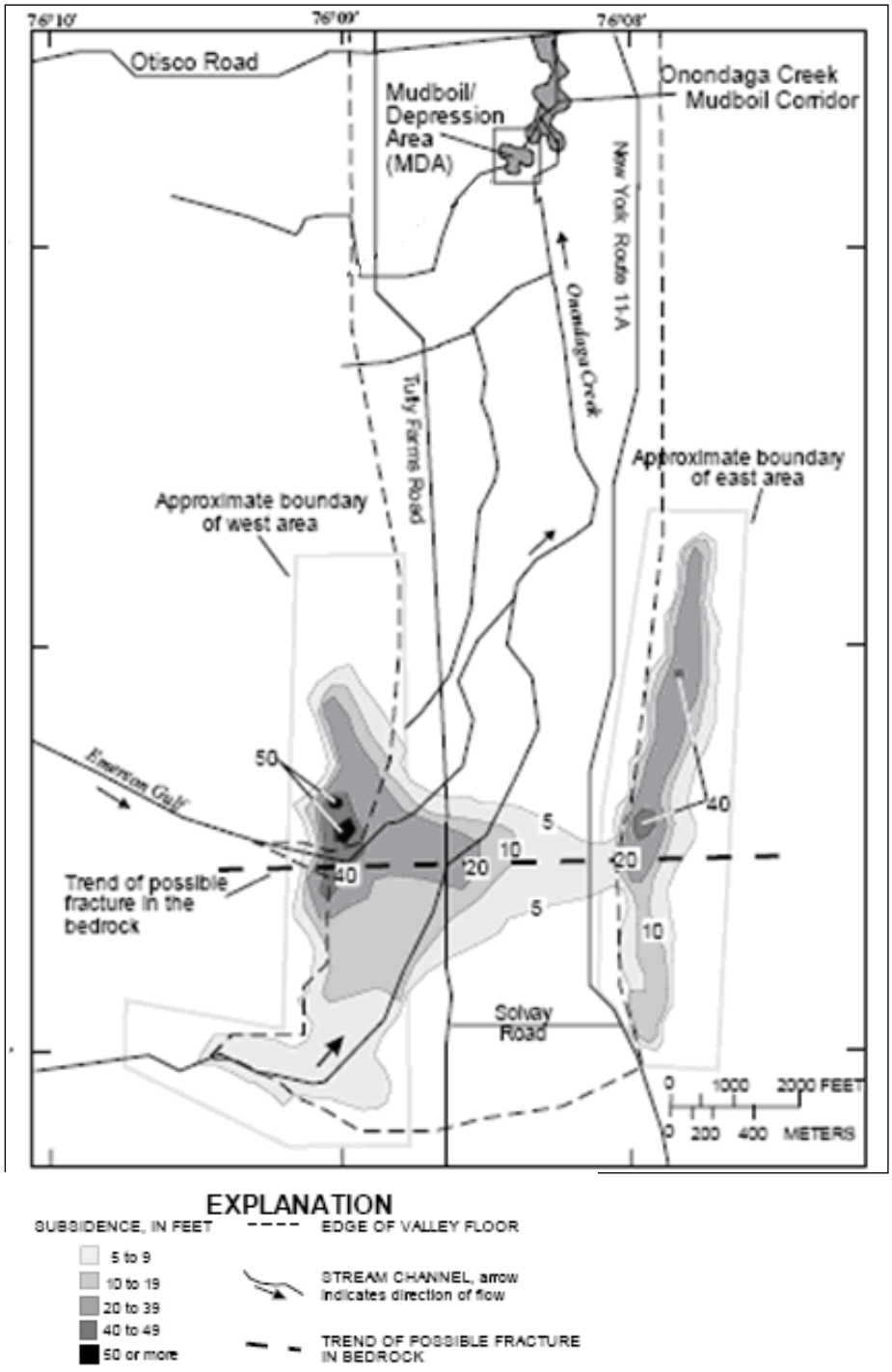
### Salt-Solution Mining

Salt-solution mining areas exist in the east and west valley walls at the south end of the Tully Valley (Figure 5.4.4-8). The east area (also known as the east brinefield area) was developed in 1889 after the discovery of a 45-foot layer of salt 1,216 feet below land surface; production continued there through the late 1950s. The west brinefield area developed in 1895 and remained in production through the late 1980s. The solution-mining operation entailed drilling wells into the salt beds and injecting freshwater from the Tully Lakes, south of the Tully Moraine, to dissolve the salt and produce saturated brine. Tully Lakes are 500 feet higher than the brine wellheads, and the elevation difference was sufficient to lift the dense, saturated brine from the wells. The brine was then discharged to a pipeline that flowed north to Syracuse, where it was used in the production of soda ash. At peak production, approximately one billion gallons of brine per year was piped to Syracuse. In 1986 the west brine field ceased most operations, and a few wells were sold to another manufacturer, who ceased all brining operations two years later. The nearly 100 years of salt-solution mining removed about 100 million tons, or 31,000 acre-feet of salt within the Tully Valley (Kappel et al., 2009).

Initial solution mining in the east brinefield area resulted in the removal of most of the 35- to 45-foot-thick salt layer at 31 wells. Early and frequent caving within the solution-mined cavities was documented, but no general surface subsidence was noted. Surface subsidence measurements did not begin in either brinefield area until the late 1950s. From 1895 through 1900, 21 solution wells were drilled in the western brinefield area and resulted in similar caving. As more wells were drilled into the deeper salt beds, other well development and pumping strategies were tried in an attempt to decrease the caving and increase brine production. By 1950, a total of 99 wells had been drilled in the eastern and western areas, 86 of which were abandoned as a result of caving, shearing of well casings, and the collapse of the overlying bedrock into solution-mined salt cavities (Kappel et al., 2009).

As early as 1943, general land subsidence and development of rock fissures along the eastern side of the east brinefield area were noted. In the late 1950s, subsequent development of several chimney-collapse areas (or rock-filled cylinders) prompted land-subsidence surveys in both brine field areas. The extent of land subsidence due to the removal of salt since 1957, when the initial survey was made, is depicted in Figure 5.4.4-8. This map indicates subsidence of 5 feet to more than 50 feet in the two brine field areas. Although subsidence outside the brinefield has not been documented, local landowners have noted bedrock fracturing upslope of the east brinefield area (Kappel et al., 2009).

**Figure 5.4.4-8. Extent and Depth of Brinefield Subsidence (1957-1993) in East and West Areas and Along a Possible Bedrock Fracture in Southern Part of Tully Valley.**




*Source: Kappel et al., 1996*

## Extent

### Landslide

To determine the extent of a landslide hazard, the affected areas need to be identified and the probability of the landslide occurring within some time period needs to be assessed. Natural variables that contribute to the overall extent of potential landslide activity in any particular area include soil properties, topographic position and slope, and historical incidence. Predicting a landslide is difficult, even under ideal conditions. As a result, the landslide hazard is often represented by landslide incidence and/or susceptibility, defined below:

- Landslide incidence is the number of landslides that have occurred in a given geographic area. High incidence means greater than 15-percent of a given area has been involved in landsliding; medium incidence means that 1.5 to 15-percent of an area has been involved; and low incidence means that less than 1.5-percent of an area has been involved. (Geological Hazards Program Date Unknown).
- Landslide susceptibility is defined as the probable degree of response of geologic formations to natural or artificial cutting, to loading of slopes, or to unusually high precipitation. It can be assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced numerous landslides in the past. Landslide susceptibility depends on slope angle and the geologic material underlying the slope. Landslide susceptibility only identifies areas potentially affected and does not imply a time frame when a landslide might occur. High, medium, and low susceptibility are delimited by the same percentages used for classifying the incidence of landsliding (Geological Hazards Program Date Unknown; OAS 1991).

### Subsidence

To determine the extent of the subsidence hazard, the affected areas need to be identified and the probability of the subsidence occurring within some time period needs to be assessed. Natural variables that contribute to the overall extent of potential subsidence activity in any particular area include soil properties, and underlaying geologic feature. Predicting subsidence is difficult, even under ideal conditions. As a result, the subsidence hazard is often represented by presence of evaporite or carbonate rock.

No two subsidence areas or sinkholes are exactly alike. Variations in size and shape, time period under which they occur (i.e. gradually or abruptly), and their proximity to development ultimately determines the magnitude of damage incurred. Based on the geologic formations underlying parts of Onondaga County, subsidence and sinkhole events may occur gradually or abruptly. Events could result in minor elevation changes or deep, gaping holes in the ground surface. Subsidence and sinkhole events can cause severe damage in urban environments, although gradual events can be addressed before significant damage occurs. Primarily, problems related to subsidence include the disruption of utility services and damages to private and public property including buildings, roads, and underground infrastructure. If long-term subsidence or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may result.

The worst-case scenario for subsidence and sinkholes in Onondaga County would be for a sinkhole to form in an urban area. A sinkhole in a city, either in a highly trafficked pedestrian area or under one of the many high traffic roadways or bridges, could potentially cause significant property damage and/or loss of life. Refer to the Vulnerability Assessment for further details on the population, general building stock, and critical facilities and infrastructure vulnerable to this hazard.

## Previous Occurrences and Losses

While numerous sources were researched during this plan update, information regarding occurrences and losses associated with geological hazard events in Onondaga County was limited. According to the 2014 New York State HMP, Onondaga County has not experienced any recent landslide or land subsidence events.

Between 1954 and 2018, FEMA issued a major disaster (DR) or emergency (EM) declaration for New York State for one geological hazard-related event. Generally, these disasters cover a wide region of the State; therefore, it may have impacted many counties. Onondaga County was included in the declaration.

**Table 5.4.4-1. FEMA DR and EM Declarations for Geological Hazard Events in Onondaga County**

| FEMA Declaration Number | Date(s) of Event | Declaration Date | Event Type | Details |
|---|---|---|---|---|
| DR-487 | October 2, 1975 | October 2, 1975 | Flood | Storms, Rain, Landslides & Flooding |

*Source: FEMA 2019*

For this plan update, landslide events that occurred in the county between 2011 and 2018 were researched. However, specific information regarding any landslide or land subsidence events was not identified. Appendix E (Supplementary Data) provides information on events that occurred prior to 2011.

## Climate Change Projections

Projecting future climate change within a specific region is challenging. Shorter-term projections are more closely tied to existing trends, rendering longer-term projections even more challenging. The further into the future a prediction extends, the more it is subject to change.

Climate change may impact storm patterns, increasing the probability of more frequent, intense storms with varying duration. Increase in global temperature could affect the snowpack and its ability to hold and store water. Warming temperatures also could increase the occurrence and duration of droughts, which would increase the probability of wildfire, reducing the vegetation that helps to support steep slopes. All of these factors would increase the probability for landslide occurrences.

## Probability of Future Events

As indicated in the 2014 New York State HMP, and given the history of landslides in the state, future landslides certainly will occur, but severity of these landslides cannot be determined. Therefore, probability of future landslides in the state is considered high; however, because documentation on landslides in Onondaga County is sparse, predicting the extent of future landslides in the county is difficult.

According to the New York State Geological Survey (NYSGS) Landslide Inventory Study to estimate probability of future landslides (based on documented historical occurrences), New York state can expect on average approximately two major landslides each year; a greater number of smaller but still significant slides, slumps, or flows each year; and at least one landslide causing a fatality once every 12 years.

Additionally, the New York State HMP notes that the nature of all forms of land subsidence and expansive soils in New York makes it difficult to determine probability of future events (frequency). As moderate to low land subsidence susceptibility does exist in Onondaga County and land subsidence has occurred in the state in the past, the state HMP suggests that, although very infrequent, land subsidence is likely to occur at some point.

Since landslides can occur as a result of many factors within Onondaga County, including past landslides and their distribution; bedrock; slope steepness or inclination, hydrologic factor and human-initiated effects; it is

extremely difficult to predict landslide hazards in absolute terms (OAS, 1991). However, a sufficient understanding of landslide processes within the county does exist through various studies and mapping sources to be able to make an estimation of landslide hazard potential. The potential increase in the risk posed by the landslide hazard can be curbed through a continued understanding and mapping of the hazards and improved capabilities to mitigate and respond to the landslide hazard (Spiker and Gori, 2000).

Regarding mudboil activity in the Tully Valley, the OLP indicates that there is no way to predict future activity of the mudboils, although it is surmised that they won't go away within the near future (OLP, Date Unknown). Since 1992, the Onondaga Lake Management Conference began remediation efforts to decrease mudboil discharge. Remediation projects have been designed to reduce artesian pressure that drives mudboil activity and decrease the discharge of sediment. Remedial efforts near the Tully Valley mudboils include:

- Diverting flow from the tributary that feeds the MDA to an adjacent tributary. The diversion of water and the impoundment of water and sediment at the MDA outflow decreased mudboil-sediment discharge to Onondaga Creek by about 80-percent.
- Installing depressurizing wells at several locations around the MDA and along Onondaga Creek to decrease the artesian pressure. Depressurizing wells installed near the collapsed Otisco Road bridge seems to have reduced sediment discharge and may have stabilized the area around the bridge; alternately, mudboil activity may have migrated away from the Tully Valley area.
- Constructing a dam and sediment-settling impoundment to detain mudboil sediment that would normally discharge to Onondaga Creek (Kappel and McPherson, 1998).

These projects are expected to slow, but not stop, mudboil activity. As a result, turbidity in Onondaga Creek will decline, as will the rate of land subsidence in the Tully Valley. Although these remedial activities may have reduced mudboil activity and land subsidence, mudboils will persist in the Tully Valley as long as the two confined aquifers have artesian pressure that will 'push' water above land surface. Further work is needed at the MDA and along Onondaga Creek to lower artesian heads and reduce the discharge of fine-grained sediments. Left unchecked, mudboil activity will persist along the creek, but most of the mudboil activity and land subsidence will be in the MDA as subsidence moves toward the Rattlesnake alluvial fan—one of the sources of artesian pressure in this area. Mudboil activity is greatest during the spring and late fall, when artesian pressures increase rapidly from seasonal recharge to the confined freshwater and brackish-water aquifers. The gradual increase in brackish-water discharge at the MDA may continue as the hydraulic connection between the lower to the upper aquifer develops over time (Kappel et al., 1996; Kappel and McPherson, 1998).

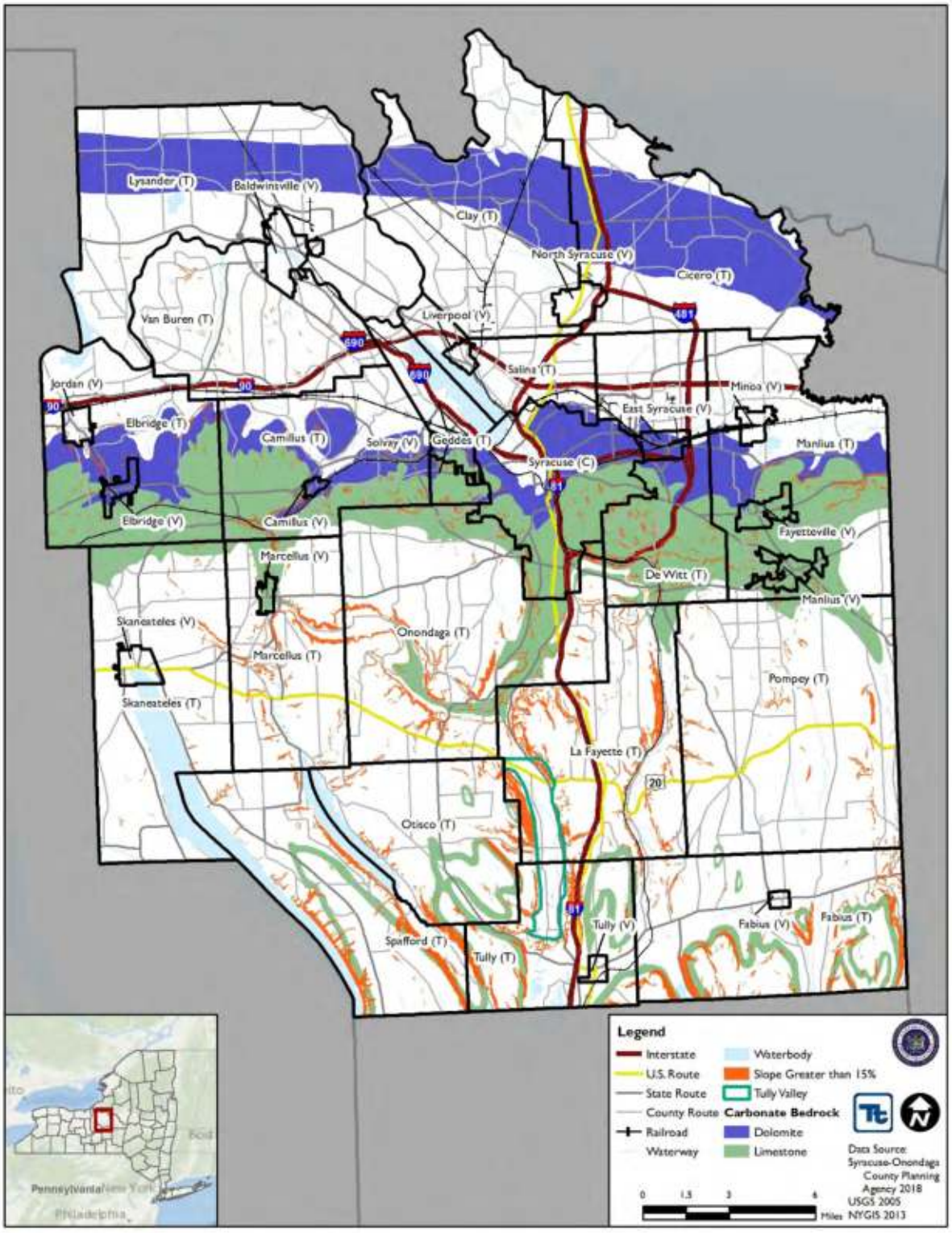
In Section 5.3, identified hazards of concern for Onondaga County were ranked according to various parameters. Probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Partnership, probability of occurrence of landslides and subsidence in Onondaga County is considered *occasional* (between 10 and 100% annual probability of a hazard event occurring).

### 5.4.4.2 VULNERABILITY ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable to the identified hazard. For this analysis, the hazard area is defined as areas of slopes greater than 15 percent, carbonate bedrock (limestone and dolomite), and Tully Valley. This approximate hazard area encompasses landslide susceptible areas, vulnerable bedrock types, historic ground failure sites, and more localized hazard areas including the mudboil depression area, Onondaga Creek mudboil corridor and extent of brinefield subsidence in Tully Valley.

Figure 5.4.4-9 depicts the geological hazard areas in Onondaga County. The following text provides an analysis of potential impacts of geological hazards on Onondaga County.

**Figure 5.4.4-9. Geological Hazard Areas in Onondaga County**



## Impact on Life, Health and Safety

Overall, a landslide or other geologic hazard event would be an isolated incidence and impact the populations within the immediate area of the incident. Specifically, the population located downslope of the landslide hazard areas are particularly vulnerable to this hazard. In addition to causing damages to residential buildings and displacing residents, landslides and subsidence events can block off or damage major roadways and inhibit travel for emergency responders or populations trying to evacuate the area. Mudboils in Onondaga Creek and its tributaries increase the turbidity of the waterways and can impact usage of these waterways for communities downstream within and outside Tully Valley that use them for recreation, fishing, etc.

Table 5.4.4-2 displays the populations located on steep slopes and in Tully Valley by municipality. Countywide, there are 6,039 people located on areas of steep slopes, and 210 people residing in Tully Valley. The City of Syracuse has the greatest total number of people located on areas of steep slopes (1,582), while the Village of Camillus has the greatest percentage of its population located on areas of steep slopes (23.2 percent). The City of Syracuse also has the greatest total number of people located on areas underlain by carbonate bedrock (137,317), while several communities have 100 percent exposure of their populations; these communities are the Villages of Camillus, Elbridge, Fayetteville, Manlius, and Marcellus. Tully Valley is located in the Towns of LaFayette and Tully, so only populations in these towns will be directly impacted by the geological hazard events in the valley. The Town of LaFayette has a greater total number of people and percentage of people located in Tully Valley than the Town of Tully.

### Table 5.4.4-2. Estimated Population Exposed to Geologic Hazards in Onondaga County

| Municipality | Total Population (U.S. Census 2010) | Steep Slopes | | Carbonate Bedrock | | Tully Valley | |
|---|---|---|---|---|---|---|---|
| | | Population Exposed | % of Total | Population Exposed | % of Total | Population Exposed | % of Total |
| Baldwinsville (V) | 7,378 | 0 | 0.0% | - | - | - | - |
| Camillus (T) | 22,954 | 1,166 | 5.1% | 20,401 | 88.9% | - | - |
| Camillus (V) | 1,213 | 282 | 23.2% | 1,213 | 100.0% | - | - |
| Cicero (T) | 29,641 | 0 | 0.0% | 17,743 | 59.9% | - | - |
| Clay (T) | 53,397 | 0 | 0.0% | 9,239 | 17.3% | - | - |
| DeWitt (T) | 22,754 | 456 | 2.0% | 16,040 | 70.5% | - | - |
| East Syracuse (V) | 3,084 | 0 | 0.0% | 2,765 | 89.7% | - | - |
| Elbridge (T) | 3,496 | 20 | 0.6% | 2,584 | 73.9% | - | - |
| Elbridge (V) | 1,058 | 0 | 0.0% | 1,058 | 100.0% | - | - |
| Fabius (T) | 1,612 | 81 | 5.0% | 176 | 10.9% | - | - |
| Fabius (V) | 352 | 0 | 0.0% | - | - | - | - |
| Fayetteville (V) | 4,373 | 0 | 0.0% | 4,373 | 100.0% | - | - |
| Geddes (T) | 10,534 | 121 | 1.1% | 7,405 | 70.3% | - | - |
| Jordon (V) | 1,368 | 84 | 6.1% | 0 | 0.0% | - | - |
| LaFayette (T) | 4,952 | 341 | 6.9% | 154 | 3.1% | 188 | 3.8% |
| Liverpool (V) | 2,347 | 0 | 0.0% | - | - | - | - |
| Lysander (T) | 17,175 | 9 | 0.1% | 4,909 | 28.6% | - | - |
| Manlius (T) | 19,844 | 258 | 1.3% | 15,392 | 77.6% | - | - |
| Manlius (V) | 4,704 | 0 | 0.0% | 4,704 | 100.0% | - | - |
| Marcellus (T) | 4,397 | 116 | 2.6% | 996 | 22.7% | - | - |
| Marcellus (V) | 1,813 | 0 | 0.0% | 1,813 | 100.0% | - | - |

| Municipality | Total Population (U.S. Census 2010) | Steep Slopes | | Carbonate Bedrock | | Tully Valley | |
|---|---|---|---|---|---|---|---|
| | | Population Exposed | % of Total | Population Exposed | % of Total | Population Exposed | % of Total |
| Minoa (V) | 3,449 | 0 | 0.0% | 0 | 0.0% | - | - |
| North Syracuse (V) | 6,800 | 0 | 0.0% | - | - | - | - |
| Onondaga (T) | 23,101 | 941 | 4.1% | 7,815 | 33.8% | - | - |
| Onondaga Nation Territory | 468 | 0 | 0.0% | 249 | 53.2% | - | - |
| Otisco (T) | 2,541 | 84 | 3.3% | 421 | 16.6% | - | - |
| Pompey (T) | 7,080 | 84 | 1.2% | 786 | 11.1% | - | - |
| Salina (T) | 31,363 | 0 | 0.0% | 2,099 | 6.7% | - | - |
| Skaneateles (T) | 4,669 | 2 | 0.0% | 584 | 12.5% | - | - |
| Skaneateles (V) | 2,540 | 0 | 0.0% | - | - | - | - |
| Solvay (V) | 6,584 | 136 | 2.1% | 6,554 | 99.5% | - | - |
| Spafford (T) | 1,686 | 133 | 7.9% | 171 | 10.1% | - | - |
| Syracuse (C) | 145,170 | 1,582 | 1.1% | 137,317 | 94.6% | - | - |
| Tully (T) | 1,865 | 7 | 0.4% | 450 | 24.1% | 22 | 1.2% |
| Tully (V) | 873 | 0 | 0.0% | - | - | - | - |
| Van Buren (T) | 10,391 | 136 | 1.3% | - | - | - | - |
| **Onondaga County** | **467,026** | **6,039** | **1.3%** | **267,411** | **57.3%** | **210** | **0.0%** |

*Source: United States Census 2010; Syracuse-Onondaga County Planning Agency, 2018*
*Note: The hazard area boundaries were overlaid on the U.S. Census block; the blocks with their centroids within hazard areas were totaled for each municipality.*

Socially vulnerable populations (e.g., the elderly and low-income populations) are particularly vulnerable to a hazard event. Within the steep slopes hazard area, there are approximately 721 people over the age of 65 and 864 people considered low income populations. There are approximately 36,251 people over the age of 65 and 59,590 people considered low income populations located in areas underlain by carbonate bedrock. As for populations within Tully Valley, there are approximately 22 people over the age 65 and 17 people considered low income populations; all 17 people considered low income populations reside in the Town of LaFayette.

## Impact on General Building Stock

Landslides and other geologic hazards have the potential to destabilize the foundation of structures, which may result in monetary losses to businesses and residents. As seen along Limestone Creek and the Bluffs in Manlius, geological hazard events can expose the underlying bedrock adjacent to structures, which can erode and threaten the structural integrity and safety of the structure above. Table 5.4.4-3 summarizes the exposed building stock to the steep slope hazard areas by municipality, Table 5.4.4-4 summarizes the exposed building stock on carbonate bedrock by municipality, and Table 5.4.4-5 summarizes the exposed building stock located in Tully Valley. There are 977 buildings located on areas of steep slopes countywide. The Town of Spafford has the greatest number of buildings and greatest percentage of buildings located on areas of steep slopes (216 – 9.6 percent). The Town of LaFayette has over five times as many buildings located in Tully Valley than the Town of Tully: 376 buildings and 71 buildings, respectively.

## Table 5.4.4-3. Estimated Number of Buildings and Replacement Cost Values Located on Steep Slopes

| Municipality | Total Number of Buildings | Total Replacement Cost Value (Structure and Contents) | Number of Buildings | | Replacement Cost Value | |
|---|---|---|---|---|---|---|
| | | | Number Exposed | % of Total | Value Exposed | % of Total |
| Baldwinsville (V) | 3,321 | $1,504,827,309 | 0 | 0.0% | $0 | 0.0% |
| Camillus (T) | 11,611 | $4,945,293,987 | 83 | 0.7% | $22,345,937 | 0.5% |
| Camillus (V) | 490 | $182,330,235 | 23 | 4.7% | $5,268,144 | 2.9% |
| Cicero (T) | 15,558 | $7,104,912,499 | 0 | 0.0% | $0 | 0.0% |
| Clay (T) | 22,004 | $13,377,871,396 | 0 | 0.0% | $0 | 0.0% |
| DeWitt (T) | 11,191 | $11,163,898,629 | 117 | 1.0% | $57,222,067 | 0.5% |
| East Syracuse (V) | 1,662 | $901,239,284 | 0 | 0.0% | $0 | 0.0% |
| Elbridge (T) | 3,020 | $1,214,372,973 | 9 | 0.3% | $2,871,765 | 0.2% |
| Elbridge (V) | 654 | $243,606,959 | 0 | 0.0% | $0 | 0.0% |
| Fabius (T) | 1,717 | $873,582,692 | 21 | 1.2% | $4,879,171 | 0.6% |
| Fabius (V) | 245 | $100,916,840 | 0 | 0.0% | $0 | 0.0% |
| Fayetteville (V) | 1,999 | $1,065,416,400 | 6 | 0.3% | $1,785,290 | 0.2% |
| Geddes (T) | 6,048 | $3,940,020,462 | 11 | 0.2% | $5,285,303 | 0.1% |
| Jordon (V) | 754 | $324,416,761 | 4 | 0.5% | $444,328 | 0.1% |
| LaFayette (T) | 3,742 | $1,385,373,038 | 42 | 1.1% | $10,381,063 | 0.7% |
| Liverpool (V) | 1,379 | $585,988,259 | 0 | 0.0% | $0 | 0.0% |
| Lysander (T) | 9,513 | $5,511,947,365 | 0 | 0.0% | $0 | 0.0% |
| Manlius (T) | 10,101 | $5,931,420,911 | 54 | 0.5% | $27,094,458 | 0.5% |
| Manlius (V) | 1,724 | $1,225,609,003 | 20 | 1.2% | $10,917,591 | 0.9% |
| Marcellus (T) | 3,442 | $1,592,818,810 | 25 | 0.7% | $21,041,710 | 1.3% |
| Marcellus (V) | 790 | $446,005,634 | 1 | 0.1% | $975,958 | 0.2% |
| Minoa (V) | 1,579 | $677,670,815 | 0 | 0.0% | $0 | 0.0% |
| North Syracuse (V) | 3,297 | $1,347,498,685 | 0 | 0.0% | $0 | 0.0% |
| Onondaga (T) | 11,826 | $5,889,094,715 | 66 | 0.6% | $22,266,738 | 0.4% |
| Onondaga Nation Territory | 638 | $182,143,705 | 12 | 1.9% | $1,833,035 | 1.0% |
| Otisco (T) | 2,567 | $1,070,059,196 | 38 | 1.5% | $12,843,437 | 1.2% |
| Pompey (T) | 5,096 | $2,547,562,317 | 19 | 0.4% | $10,455,724 | 0.4% |
| Salina (T) | 14,486 | $8,140,248,129 | 0 | 0.0% | $0 | 0.0% |
| Skaneateles (T) | 4,439 | $2,334,223,245 | 53 | 1.2% | $16,156,332 | 0.7% |
| Skaneateles (V) | 1,583 | $871,003,682 | 0 | 0.0% | $0 | 0.0% |
| Solvay (V) | 3,003 | $1,402,099,960 | 31 | 1.0% | $7,623,149 | 0.5% |
| Spafford (T) | 2,302 | $826,800,666 | 216 | 9.4% | $54,622,855 | 6.6% |
| Syracuse (C) | 51,837 | $25,010,023,305 | 101 | 0.2% | $420,100,260 | 1.7% |
| Tully (T) | 1,585 | $882,534,759 | 15 | 0.9% | $4,257,258 | 0.5% |
| Tully (V) | 511 | $314,789,328 | 0 | 0.0% | $0 | 0.0% |
| Van Buren (T) | 5,971 | $3,347,767,581 | 10 | 0.2% | $1,611,843 | 0.0% |
| **Onondaga County** | **221,685** | **$118,465,389,533** | **977** | **0.4%** | **$722,283,415** | **0.6%** |

*Source: Syracuse-Onondaga County Planning Agency, 2018*

### Table 5.4.4-4. Estimated Number of Buildings and Replacement Cost Values Located on Carbonate Bedrock

| Municipality | Total Number of Buildings | Total Replacement Cost Value (Structure and Contents) | Number of Buildings | | Replacement Cost Value | |
|---|---|---|---|---|---|---|
| | | | Number Exposed | % of Total | Value Exposed | % of Total |
| Baldwinsville (V) | 3,321 | $1,504,827,309 | - | - | - | - |
| Camillus (T) | 11,611 | $4,945,293,987 | 9,626 | 82.9% | $4,240,114,083 | 85.7% |
| Camillus (V) | 490 | $182,330,235 | 490 | 100.0% | $182,330,235 | 100.0% |
| Cicero (T) | 15,558 | $7,104,912,499 | 8,343 | 53.6% | $3,592,944,422 | 50.6% |
| Clay (T) | 22,004 | $13,377,871,396 | 4,419 | 20.1% | $2,458,151,596 | 18.4% |
| DeWitt (T) | 11,191 | $11,163,898,629 | 7,141 | 63.8% | $5,047,475,498 | 45.2% |
| East Syracuse (V) | 1,662 | $901,239,284 | 1,553 | 93.4% | $861,884,033 | 95.6% |
| Elbridge (T) | 3,020 | $1,214,372,973 | 1,884 | 62.4% | $836,791,105 | 68.9% |
| Elbridge (V) | 654 | $243,606,959 | 654 | 100.0% | $243,606,959 | 100.0% |
| Fabius (T) | 1,717 | $873,582,692 | 64 | 3.7% | $21,163,533 | 2.4% |
| Fabius (V) | 245 | $100,916,840 | - | - | - | - |
| Fayetteville (V) | 1,999 | $1,065,416,400 | 1,999 | 100.0% | $1,065,416,400 | 100.0% |
| Geddes (T) | 6,048 | $3,940,020,462 | 3,908 | 64.6% | $1,634,343,774 | 41.5% |
| Jordon (V) | 754 | $324,416,761 | 36 | 4.8% | $16,425,048 | 5.1% |
| LaFayette (T) | 3,742 | $1,385,373,038 | 294 | 7.9% | $107,056,428 | 7.7% |
| Liverpool (V) | 1,379 | $585,988,259 | - | - | - | - |
| Lysander (T) | 9,513 | $5,511,947,365 | 2,086 | 21.9% | $947,776,742 | 17.2% |
| Manlius (T) | 10,101 | $5,931,420,911 | 7,062 | 69.9% | $4,505,835,693 | 76.0% |
| Manlius (V) | 1,724 | $1,225,609,003 | 1,724 | 100.0% | $1,225,609,003 | 100.0% |
| Marcellus (T) | 3,442 | $1,592,818,810 | 642 | 18.7% | $281,016,425 | 17.6% |
| Marcellus (V) | 790 | $446,005,634 | 725 | 91.8% | $421,369,774 | 94.5% |
| Minoa (V) | 1,579 | $677,670,815 | 0 | 0.0% | $0 | 0.0% |
| North Syracuse (V) | 3,297 | $1,347,498,685 | - | - | - | - |
| Onondaga (T) | 11,826 | $5,889,094,715 | 3,677 | 31.1% | $1,828,848,086 | 31.1% |
| Onondaga Nation Territory | 638 | $182,143,705 | 327 | 51.3% | $103,159,023 | 56.6% |
| Otisco (T) | 2,567 | $1,070,059,196 | 292 | 11.4% | $112,021,736 | 10.5% |
| Pompey (T) | 5,096 | $2,547,562,317 | 590 | 11.6% | $316,959,045 | 12.4% |
| Salina (T) | 14,486 | $8,140,248,129 | 1,297 | 9.0% | $453,785,278 | 5.6% |
| Skaneateles (T) | 4,439 | $2,334,223,245 | 486 | 10.9% | $219,872,649 | 9.4% |
| Skaneateles (V) | 1,583 | $871,003,682 | - | - | - | - |
| Solvay (V) | 3,003 | $1,402,099,960 | 2,992 | 99.6% | $1,398,007,506 | 99.7% |
| Spafford (T) | 2,302 | $826,800,666 | 144 | 6.3% | $47,411,824 | 5.7% |
| Syracuse (C) | 51,837 | $25,010,023,305 | 49,432 | 95.4% | $21,177,063,222 | 84.7% |
| Tully (T) | 1,585 | $882,534,759 | 304 | 19.2% | $119,909,583 | 13.6% |
| Tully (V) | 511 | $314,789,328 | - | - | - | - |
| Van Buren (T) | 5,971 | $3,347,767,581 | - | - | - | - |
| **Onondaga County:** | **221,685** | **$118,465,389,533** | **112,191** | **50.6%** | **$53,466,348,702** | **45.1%** |

*Source: Syracuse-Onondaga County Planning Agency, 2018*

**Table 5.4.4-5. Estimated Number of Buildings and Replacement Cost Values Located in Tully Valley**

| Municipality | Total Number of Buildings | Total Replacement Cost Value (Structure and Contents) | Number of Buildings | | Replacement Cost Value | |
|---|---|---|---|---|---|---|
| | | | Number Exposed | % of Total | Value Exposed | % of Total |
| LaFayette (T) | 3,670 | $1,385,373,038 | 376 | 10.0% | $120,910,777 | 8.7% |
| Tully (T) | 1,553 | $882,534,759 | 71 | 4.5% | $40,295,130 | 4.6% |
| **Onondaga County:** | **221,685** | **$118,465,389,533** | **447** | **0.2%** | **$161,205,907** | **0.1%** |

*Source: Syracuse-Onondaga County Planning Agency, 2018*

## Impact on Critical Facilities

In addition to critical facilities, a significant amount of infrastructure can be exposed to mass movements of geological material:

- *Roads*—Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation. This can result in economic losses for businesses.
- *Bridges*—Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or significantly weaken the soil supporting them, making them hazardous for use.
- *Power Lines*—Power lines are generally elevated above steep slopes; but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.
- *Rail Lines* – Similar to roads, rail lines are important for response and recovery operations after a disaster. Landslides can block travel along the rail lines, which would become especially troublesome, because it would not be as easy to detour a rail line as it is on a local road or highway. Many residents rely on public transport to get to work around the county and into Philadelphia and New York City, and a landslide event could prevent travel to and from work.

Several other types of infrastructure may also be exposed to landslides and other geologic hazards, including water and sewer infrastructure. At this time all critical facilities, infrastructure, and transportation corridors located within the hazard areas are considered vulnerable until more information becomes available. Figure 5.4.4-10 displays the critical facilities located on areas of steep slopes. Overall there are 14 critical facilities located on areas of steep slopes, with chemical storage facilities being the most exposed with four. Figure 5.4.4-11 displays the critical facilities located on areas underlain by carbonate rock. There are 1,482 critical facilities exposed to the carbonate hazard area; chemical storage facilities have the most facilities exposed with 521, followed by day care facilities with 277 exposed. There are three critical facilities located in Tully Valley; all the facilities are in the Town of LaFayette. Two of these facilities are wells and the other facility is a fire station.

**Figure 5.4.4-10. Estimated Number of Critical Facilities Located on Steep Slopes**

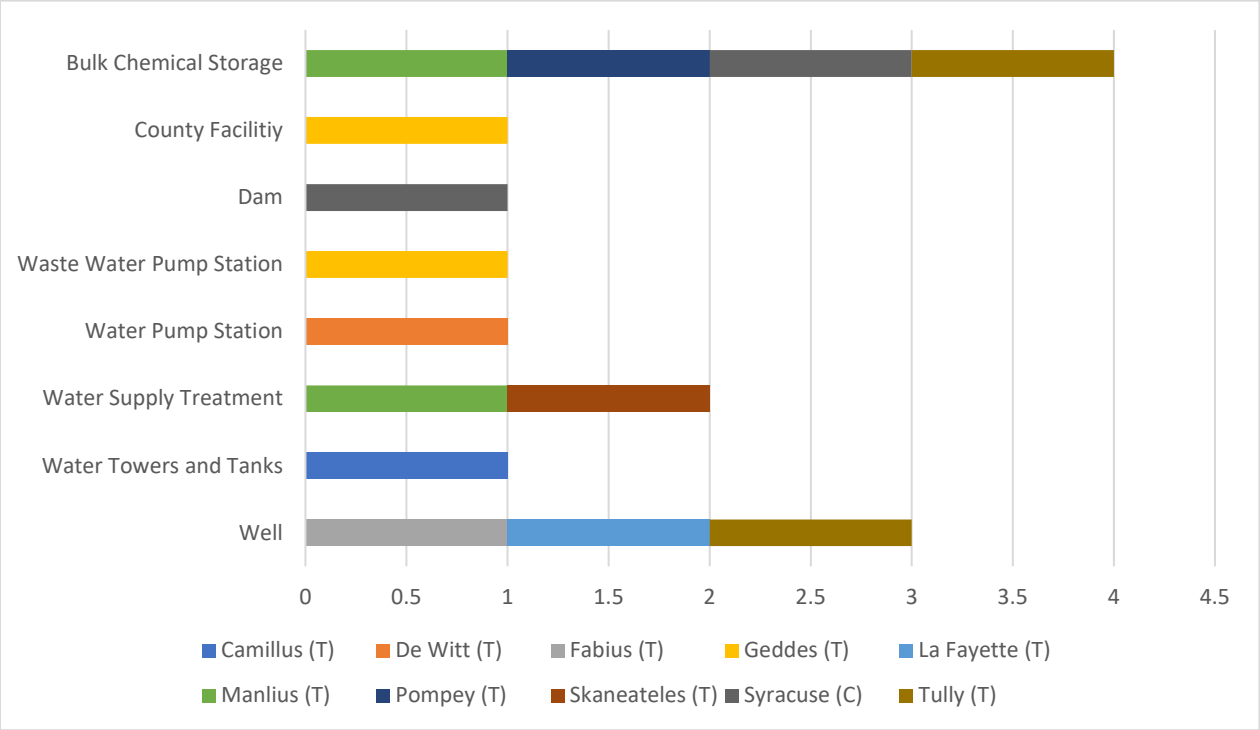
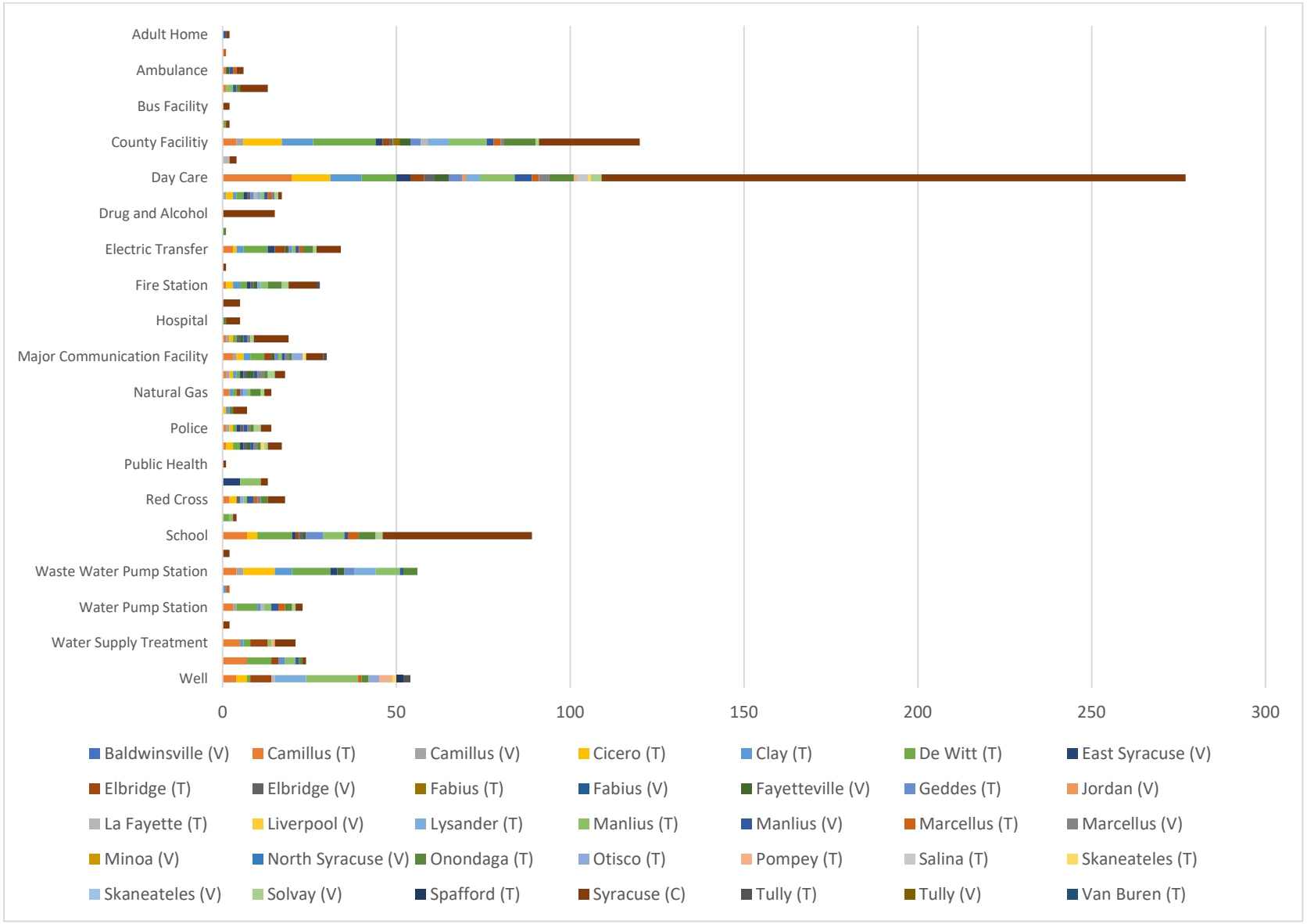


**Figure 5.4.4-11. Estimated Number of Critical Facilities Located on Carbonate Bedrock**



## Impact on the Economy

The impact of geologic hazards on the economy and estimated dollar losses are difficult to measure. As stated earlier, landslides and other geological hazards can impose direct and indirect impacts on society. Direct costs include the actual damage sustained by buildings, property and infrastructure. Indirect costs, such as clean-up costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity are difficult to measure. Additionally, geological hazards threaten transportation corridors, fuel and energy conduits and communication lines (USGS, 2003). Estimated potential damages to general building stock can be quantified as discussed above. For the purposes of this analysis, general building stock damages are discussed further. They also can damage rivers or streams, potentially harming water quality, fisheries, and spawning habitat.

Direct building losses are the estimated costs to repair or replace the damage caused to the building. The estimated replacement value of general building stock located in landslide susceptible areas is nearly $32 billion. This estimate represents 47% of the total building stock value inventory in the county. These dollar value losses to the county's total building inventory replacement value would impact Onondaga County's tax base and the local economy.

Landslides and other geologic hazards can cause several types of secondary effects, such as blocking access to roads, which can isolate residents and businesses and delay commercial, public, and private transportation. This could result in economic losses for businesses. I-81, I-481, I-690, NY-5, NY-41, NY-80, NY-91, NY-92, NY-173, NY-174, NY-175, NY-257, NY-290, NY-370, NY-635, NY-695, NY-11A, NY-931F, US-11, and US-20 intersect areas of steep slopes around the county. I-81, I-481, I-690, NY-5, NY-31, NY-41, NY-48, NY-80, NY-91, NY-92, NY-173, NY-174, NY-175, NY-257, NY-290, NY-297, NY-298, NY-317, NY-321, NY-370, NY-481, NY-598, NY-635, NY-695, NY-11A, NY-930P, NY-931F, and US-11 traverse areas underlain by carbonate bedrock. NY-11A traverses Tully Valley from north to south along the eastern border, running along the east brinefield in southern Tully Valley; US-20 traverses Tully Valley from east to west through the northern region of the valley. Refer to Figure 5.4.4-9 for locations of major roadways in the county within hazard areas.

## Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the county can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The county considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

### Projected Development

Several communities have ordinances and land use laws protecting against development on steep slopes, so future growth and development will not have a direct impact on the county's vulnerability to landslides. However, any developments at or near the base of steep slopes may be at risk to losses from a landslide. Although areas of steep slopes are most at risk for landslides, landslides are still possible on lesser slopes, and future developments are not completely free of risk.

Any areas of growth could be affected by geologic hazards if the growth areas are within identified hazard areas. Each municipality identified areas of recent development and proposed development in their community. Developments that could be located using an address or Parcel ID were geocoded and overlain with the geologic

hazard areas to determine vulnerability. There is one recent development in the Town of Manlius located on steep slopes, and one proposed development located on steep slopes in the Town of Skaneateles. There are 27 recent and proposed developments located on areas underlain by carbonate bedrock. Of these 27 developments, 22 are recent developments and 5 are proposed developments. The Village of Fayetteville has the most developments exposed with 3 recent and 2 proposed developments located in areas underlain by carbonate bedrock. The Specific areas of development are indicated in tabular form in the jurisdictional annexes in Volume II, Section 9 of this plan update.

### Projected Changes in Population

According to population projections from the Cornell Program on Applied Demographics, Onondaga County will experience a slight population decrease through 2040 (less than 10,000 people in total by 2040). Population change is not expected to have a measurable effect on the overall vulnerability of the county's population over time. As discussed in *Long Range Transportation Plan 2050: Moving Towards a Greater Syracuse*, the population of Syracuse has decreased as the other municipalities in the county have seen an increase, which has led to an increased reliance on motor vehicles to travel around the county (Syracuse Metropolitan Transportation Council, 2015). If this trend continues, the population that remains in the county will move into areas reliant on the county's major highways, many of which are vulnerable to landslide and other geological hazard events.

### Climate Change

A direct impact of climate change on landslides is difficult to determine. Multiple secondary effects of climate change have the potential to increase the likelihood of geological hazard events. Warming temperatures resulting in wildfires would reduce vegetative cover along steep slopes and destabilize the soils due to destruction of the root system; increased intensity of rainfall events would increase saturation of soils on steep slopes. Under these future conditions, the county's assets located on or at the base of these steep slopes will have an increased risk to landslides. Roadways and other transportation infrastructure located in these areas will also be at an increased risk of closure, which would impact the county's risk as described above.

Higher temperatures and the possibility of more intense, less frequent summer rainfall may lead to changes in water resource availability. The projection in the increase of average temperatures may lead to an increase in the frequency of droughts. In some karst areas, sinkhole activity intensifies and increases during periods of drought. With an increase in drought periods, the number of sinkholes can increase (Linares et al. 2016). Additionally, sinkholes can result from changes to the water balance of an area including over-withdrawal of groundwater, diverting surface water from a large area and concentrating it in a single point, artificially creating ponds of surface water, and drilling new water wells. These actions can also serve to accelerate the natural processes of bedrock degradation, which can have a direct impact on sinkhole creation.

## Change of Vulnerability

Due to differences in the hazard data used to assess the County's vulnerability, a direct comparison between plan vulnerability assessment results could not be conducted to determine whether there has been a change over time. This plan update looked to use specific and localized areas of concern. Steep slopes around the county were used to delineate the landslide hazard area, rather than the more generalized USGS landslide incidence/susceptibility spatial layer. Tully Valley was identified as the primary area at risk for additional geologic hazards in the county and was used as a hazard area for the analysis. Areas underlain by carbonate bedrock were used to assess the County's vulnerability to subsidence and sinkhole events.

Overall, the vulnerability assessment presented provides a more accurate assessment of Onondaga County's risk to geologic hazards. Onondaga County and its municipalities continue to be vulnerable. Mitigation measures undertaken by each jurisdiction are described in the jurisdictional annexes in Section 9 of this HMP.

## Identified Issues

Identified issues associated with geological hazards in Onondaga County include the following:

- Mapping and assessment of landslide and land subsidence hazards are constantly evolving. As new data and science become available, assessments of geological hazard risk should be reevaluated.
- The impact of climate change on geological hazards is uncertain. If climate change impacts atmospheric conditions, then exposure to landslides and land subsidence risks are likely to increase.
- Landslides may cause negative environmental consequences, including water quality degradation.

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# The impact of droughts and climate change on sinkhole occurrence. A case study from the evaporite karst of the Fluvia Valley, NE Spain

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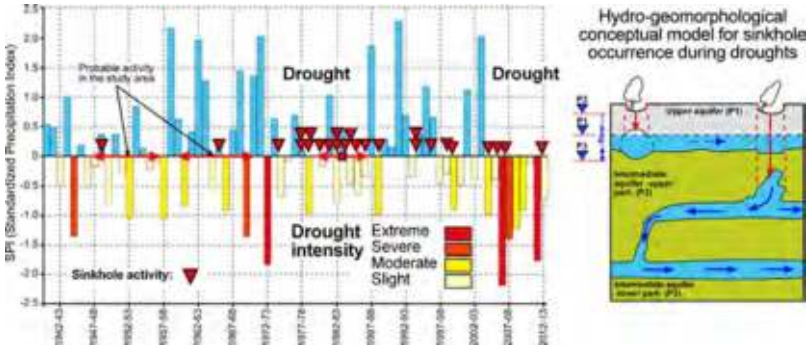
## HIGHLIGHTS

- Sinkhole inventory reveals good chronological correlation with drought periods.
- Environmental-related hydrodynamic changes play a main role on subsidence.
- Sinkhole hazard probably will intensify in a future due to the climate change.

## GRAPHICAL ABSTRACT

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## ABSTRACT

This work introduces the concept that sinkhole frequency in some karst settings increases during drought periods. This conception is tested in a sector of the Fluvia River valley in NE Spain, where subsidence phenomena is related to the karstification of folded Eocene evaporite formations. In the discharge areas, the evaporites behave as confined aquifers affected by hypogene karstification caused by aggressive artesian flows coming form an underlying carbonate aquifer. A sinkhole inventory with chronological data has been constructed, revealing temporal clusters. Those clusters show a good correlation with drought periods, as revealed by precipitation, river discharge and piezometric data. This temporal association is particularly obvious for the last and current drought starting in 1998, which is the most intense of the record period (1940–present). Climatic projections based on recent studies foresee an intensification of the droughts in this sector of NE Spain, which could be accompanied by the enhancement of the sinkhole hazard and the associated risks.



## 1. Introduction

The development of subsidence sinkholes in karst terrains involves the simultaneous or sequential operation of two processes: subsurface dissolution and the internal erosion and/or gravitational deformation of the overlying material (Gutiérrez et al., 2014; Gutiérrez, 2016).

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0048-9697/

Groundwater plays a major role in the development of both processes, as the agent responsible for the dissolution, and as a first order factor that determines ground instability. In fact, recent reviews reveal that a great proportion of the recent sinkholes have been induced by anthropogenic changes in the hydrogeological systems (Waltham et al., 2008; Gutiérrez, 2016). Consequently, a sound knowledge on the short- and long-term dynamics of the hydrogeological systems is essential for sinkhole hazard assessment (e.g., Lamont-Black et al., 2005; Yechieli et al., 2006; Acero et al., 2015; Parise et al., 2015).

This work is focused on the potential relationships between natural hydrological changes, namely droughts and the associated declines in the piezometric level of karst aquifers, and the development of collapse sinkholes. There are a large number of papers that document the impact of human-induced water table declines on sinkhole occurrence. The groundwater level drops conductive to sinkhole formation are mainly related to aquifer over-exploitation (e.g., Newton, 1984a,b; Dogan and Yilmaz, 2011; Aurit et al., 2013; Taheri et al., 2015; Youssef et al., 2016) and dewatering for mining (e.g., Li and Zhou, 1999; Sprynskyy et al., 2009). However, the impact of climate-related hydrological changes on sinkhole hazard has been barely explored, largely due to the lack of long records of hydro-climatic data, and especially representative sinkhole inventories including chronological information.

In the Spanish Pyrenean region the statistical climatic projections foresee an increase in the mean temperature and a decrease in the average monthly precipitation (10–25% for 2021–2050 with respect to 1971–2000) (Barrera-Escoda et al., 2014; Gonçalves et al., 2014). According to these authors, most probably the frequency and intensity of droughts will increase in the near future. Studies based on paleoclimatic data suggest the same trend (Cook et al., 2016). Climate change in the region may involve a wide range of environmental problems of biological and physical nature reviewed by Calbó et al. (2010).

This work proposes that the intensification of droughts may be accompanied by an increase in the sinkhole hazard and introduces an additional geohydrological impact associated with the current human-induced climate change: enhanced sinkhole activity during droughts. This would be an innovative geomorphic effect with detrimental consequences of climate change, whose potential impact remains unexplored. Previous investigations analyse the impact of the human-induced temperature increase on the geochemistry of carbonate aquifers by enhanced incorporation of $CO_2$ from soils and dissolution (e.g., Jeannina et al., 2016). Nonetheless, to our knowledge, this is the first time that this type of geomorphic change has been explored in relation to climate change. This potential trend should be taken in consideration in sinkhole hazard analyses performed in regions where an intensification of the droughts is expected. In those areas the use of spatial-temporal frequencies of sinkholes based on historical records may significantly lead to underestimated hazard values.

## 2. Geological setting and hydrogeology

The study area is located in the middle reach of the E-W-oriented Fluvia River valley, NE Spain. From the geological perspective, it is situated astride two major geological units related to the development of the Alpine Pyrenean orogene. These are the Cadi Unit of the South Pyrenean Zone to the north, and the Ebro Cenozoic Basin to the south, both separated by the south-verging Vallfogona Thrust (Fig. 1A, C). The bedrock consists of an Eocene succession >3 km thick including carbonate, evaporite and detrital formations that record the evolution of the Southeastern Pyrenean Foreland basin; i.e., transition from marine to continental conditions and the partial incorporation of the basin fill into the thrust sheets (Puigdefàbregas et al., 1986; Mató et al., 1996; Martínez et al., 2000; Carrillo et al., 2014) (Fig. 1B, C). These formations are affected by two main groups of tectonic structures (Fig. 1): (1) Paleogene folds and thrusts with a dominant *E*-W trend related to the development of the Pyrenean orogene. These include the Vallfogona Thrust, which is the sole thrust of the Cadi Unit (Clavell et al., 1988) (Fig. 1C) and roughly controls the course of the Fluvia valley (Fig. 1A). (2) Neogene normal faults superimposed to the contractional structures with NNW-SSE and NW-SE trends. These post-orogenic structures include the east-dipping Camos-Celra Fault on the east edge of the study area, which controls the western margin of the Emporda Neogene Graben (Saula et al., 1994) (Fig. 1B). A more detailed description of the geology of the area can be found in Gutiérrez et al. (2016).

In the middle reach of the Fluvia valley the Eocene bedrock is extensively covered by Late Pliocene and Quaternary deposits, including mantled pediments, fluvial terraces and tufaceous limestones (Fig. 1B). These surficial formations mainly occur in the areas underlain by the less resistant evaporite rocks. Both the alluvial deposits and the lacustrine tufas locally fill basins >70 m deep generated by dissolution-induced synsedimentary subsidence, and typically show abundant gravitational deformation and paleosinkholes. Additional information of the morpho-stratigraphic sequence, including a detailed geomorphological map, was presented by Gutiérrez et al. (2016).

In the south-eastern sector of the study area there is a major groundwater discharge area associated with the so-called Banyoles-Besalu lake basin (Julià, 1980; Sanz, 1981) (Fig. 1A). The majority of the lake deposits related to modern and Plio-Quaternary lacustrine environments are concentrated in this area (Fig. 1B). The good spatial correlation between the distribution of lacustrine deposits and the evaporite bedrock, as well as the presence of paleolakes and present-day lakes associated with collapse sinkholes reveal the instrumental role played by dissolution-induced subsidence phenomena in the development of the Banyoles-Besalu lake basin (e.g., Julià, 1980; Gutiérrez et al., 2016). In fact, the 2 km long Banyoles Lake is associated with multiple coalesced sinkholes related to the interstratal karstification of evaporites by upward groundwater flow derived from an underlying carbonate aquifer (e.g., Brusi et al., 1992; Canals et al., 1990).

The catchment of the Fluvia River has a Mediterranean climate, with subalpine features in the mountainous sectors, mainly located in the northern headwaters (Alta Garrotxa; Fig. 1). The mean annual precipitation varies from 630 mm to 1165 mm and there are clearly differentiated humid (spring, autumn) and dry (summer and winter) seasons. The average annual temperature is around 15.5 °C in the valley, and lower than 9 °C in the northern mountains (ACA, 2014). According to Sanz (1981), the actual evapotranspiration ranges between 58% and 80% of the precipitation. During the period 1940–2008, the average actual evapotranspiration in the Fluvia drainage basin reached 680 mm, which is the highest value estimated for the catchments of the area (ACA, 2014).

South of the Vallfogona Thrust, in the southern sector of the Fluvia River basin, the stratigraphy of the Eocene bedrock and its structure determines the presence of a hydrogeological system comprising two hydraulically connected karstic aquifers mostly confined by low-permeability sediments (Sanz, 1981; Bach et al., 1986) (Fig. 1A, C). This aquifer system has a minimum estimated volume of ca. $60 \times 10^6$ $m^3$. The lower karst aquifer (Lower aquifer) corresponds to the Eocene limestones of the Penya and Girona formations. This hydrostratigraphic unit is around 200 m thick in the middle reach of the Fluvia valley and wedges out towards to south to <100 m (Fig. 1C). The overlying aquifer unit (Intermediate aquifer) includes two main evaporite units (Serrat Evaporites and Beuda Gypsum) (Carrillo et al., 2014). The Intermediate aquifer reaches a thickness of around 400 m in the middle reach of the Fluvia valley and wedges out progressively towards the south (Fig. 1C). Due to its particular stratigraphy, this aquifer behaves as a complex multilayer system comprised by several units with very different hydraulic conductivities. The horizontal and vertical connectivity between the different units is largely controlled by the fracture system and karstic conduits, both intraformational and transtratal.

The Alta Garrotxa massif in the northern sector of the Fluvia catchment, dominated by limestone outcrops, is the main recharge area of the karstic system (Fig. 1C). Stable isotope data ($^{18}O$) (Sanz et al., 1982) and tests carried out with chemical tracers (Vidal-Pardal, 1957)

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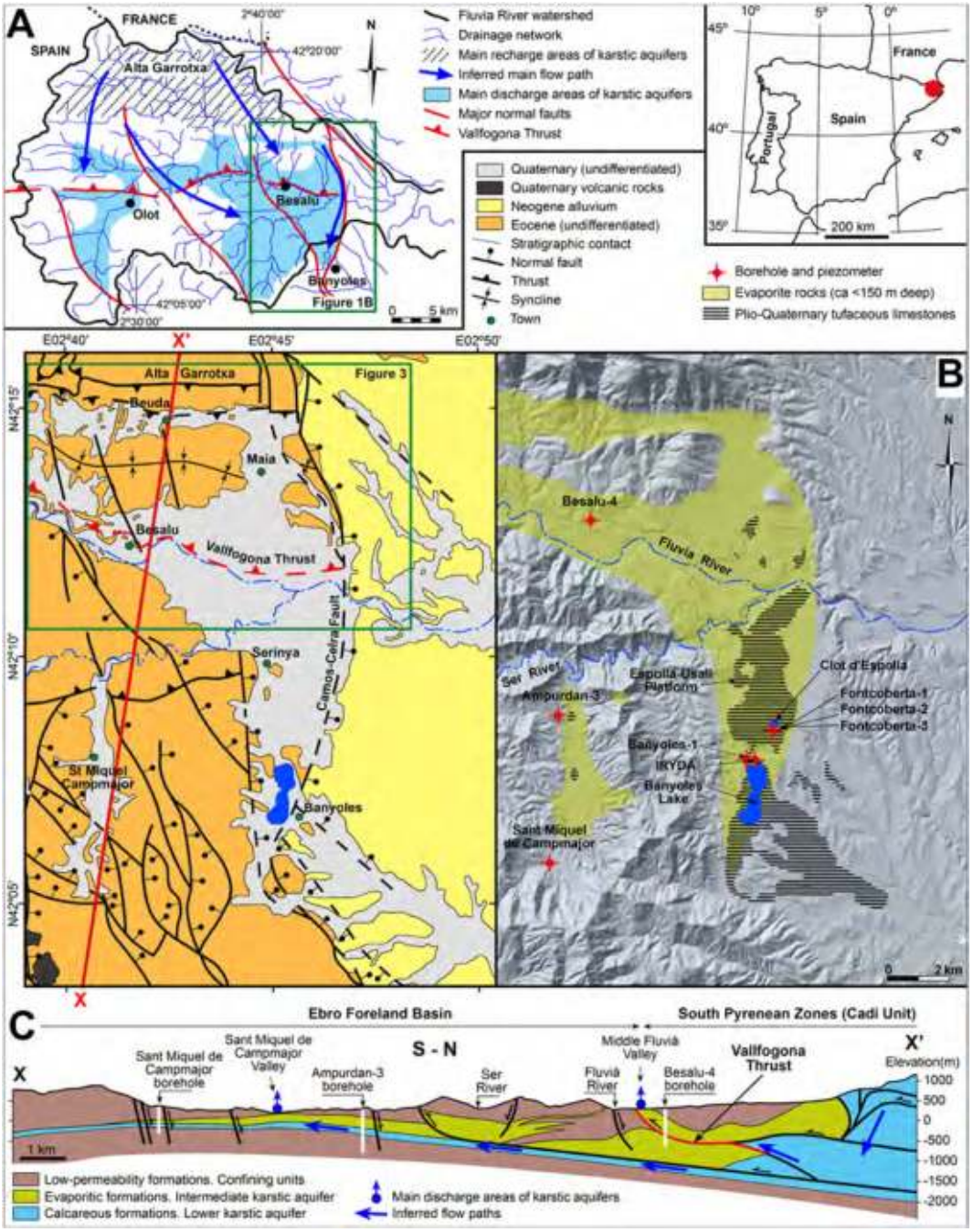


**Fig. 1.** Geological and hydrogeological setting of the study area (from Mató et al., 1996 and Martínez et al., 2000). (A) Synthetic hydrogeological sketch of the Fluvia watershed indicating the main groundwater flow paths and the most relevant structures that control them. (B) Simplified geological map of the study area and shaded relief model showing the distribution of evaporite bedrock and Plio-Quaternary tufaceous sediments deposited in paleolakes fed by groundwater discharge. (C) Simplified hydrogeological cross-section showing the geometrical relationships of the main hydrostratigraphic units.

indicate that the majority of the infiltration occurs through outcrops of the karstified Penya Fm. The main discharge areas of the aquifer correspond to the Espolla-Usall Platform (215 m a.s.l.), the Sant Miquel de Campmajor valley (200 m a.s.l.), the Banyoles Lake basin (155 m a.s.l.), and the middle reach of the Fluvia valley (155 m a.s.l.) (Sanz, 1981), where artesian springs are common (Fig. 1). The average discharge in the first zone is around 5 $hm^3$/yr, and reaches 12 $hm^3$/yr in Banyoles Lake (IGME, 1986). Probably, there is also unrecognised groundwater discharge through Quaternary fluvio-lacustrine deposits in valleys close to Olot town (Fig. 1A). Some of the springs behave as trop-pleins functioning only during periods of high piezometric levels (e.g., Clot d'Espolla) (Sanz and Trilla, 1982).

The groundwater that flows through the Lower aquifer has a relatively low ionic content as is close to equilibrium with respect to calcite (Sanz, 1981). In the discharge areas, when this water flows upwards through the overlying aquifer (intermediate evaporite aquifer), it rapidly causes the karstification of the evaporites and increases its mineralization. This can be considered as a hypogene karst system in the sense of Klimchouk (2009), whereby the water responsible for the karstification flows upward from an underlying aquifer. Other authors like Palmer (2007) restrict that term to situations where the chemical aggressiveness of the waters is produced below the surface (e.g., incorporation of deep-sourced gases like $CO_2$ or $H_2S$). According to Bischoff et al. (1994), the presence of dolomitic units within the

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intermediate aquifer contributes to slightly accelerate gypsum dissolution due to dedolomitization reactions that deplete the concentration of dissolved calcium. The connection between the Lower and Intermediate aquifers is most probably facilitated by the presence of carbonate units intercalated within the evaporitic formations, as revealed by deep-borehole data (Carrillo et al., 2014), and tectonic faults.

The groundwater flow has a relatively rapid circulation. The tritium ($^3$H) content in the groundwater of the lower aquifer reveals a residence time between 11 and 18 months (Sanz and Trilla, 1982). The lag time between heavy rainfall episodes in the recharge areas and the associated increases in the flow rate at the most distal springs is generally around three months (Sanz, 1981). The hydraulic parameters of the system are poorly known. The scarce data available indicate that the confined karstic aquifers in limestone and evaporites have high hydraulic conductivity (>100 m/day) and storage coefficients between 0.1 and 0.2 (ACA, 2006). The productivity of the wells change rapidly according to the seasonal fluctuations of the piezomentric levels, suggesting a rapid emptying of the tertiary porosity related to large karst conduits (Sanz, 1981). The surficial formations generally have lower permeability (1–10 m/day) and production rates.

## 3. Methodology

The construction of a detailed sinkhole inventory has been focused in the surroundings of Maia village, on the northern margin of the Fluvia valley and in the footwall of the Camos-Celra Fault. In this area the folded Eocene evaporitic bedrock is extensively covered by Quaternary gravelly pediments and terraces, as well as Plio-Quaternary tufaceous limestones deposited in a paleolake. The selection of this zone was based on the following criteria: (1) This is one of the sectors of the middle reach of the Fluvia valley with higher sinkhole density (Gutiérrez et al., 2016). (2) A considerable number of sinkholes have been formed or reactivated during the last 25 years. (3) Land use, mostly agriculture and forestry, has barely changed over the last decades. Irrigation systems were implemented in some localized areas during a few years, but the hydrological conditions have been governed by natural processes. (4) The area is located close to one of the main discharge areas of the aquifer system (Fig. 1B). Commonly, the discharge of deep groundwater flows from confined aquifers produces piezometric domes that experience significant head variations controlled by the temporal patterns of the recharge (e.g., Linares et al., 2010). Consequently, these zones are particularly favourable for exploring the effects related to piezometric changes.

Initially, we produced a preliminary cartographic inventory of sinkholes and zones with probable subsidence signs through the interpretation of aerial photographs, orthoimages and topographic maps from different dates and with variable scales (Table 1). This inexpensive approach, widely used in other sinkhole areas, allows bracketing the age of the sinkholes formed or reactivated after the oldest image with sufficient resolution and reconstruct the evolution of active sinkholes (e.g., Gutiérrez et al., 2008a, 2011; Festa et al., 2012; Iovine et al., 2016). Subsequently, the inventory was completed and refined by means of field work, including: (1) direct inspection of the mapped sinkholes and acquisition of specific data (e.g., morphometry, signs of instability, relative age); (2) detailed reconnaissance of the areas with a higher density of subsidence signs in order to pinpoint the location of small sinkholes, depressions masked by dense vegetation and paleosinkholes exposed in outcrops; (3) interviews with local people to gather information on the spatial and temporal distribution of known and unrecognised sinkholes (e.g., sinkholes filled soon after their formation).

Once the sinkhole inventory was completed, we analysed the temporal series of piezometric data in order to study the impact of the hydrological changes on the subsidence phenomena. We used the piezometric records of five boreholes (IRYDA, Banyoles-1, and the multiple piezometer Fontcoberta-1, -2, and -3) located in the main discharge zone of the aquifer, around 4 km south of the sinkhole area and considered to be representative of the hydraulic conditions of the aquifers at different depths (Figs. 1B, 2). Groundwater withdrawal in the area is rather low and only affects the groundwater level of the surficial aquifer at a local scale. The piezometric levels in the lower aquifers are controlled by the recharge related to precipitation episodes. The available reports indicate that these aquifers have an exploitation index of 0.07–0.1, which is the lowest of the Catalan region (ACA, 2014). The available groundwater resources in dry (70.1 hm$^3$/yr) and average hydrological years (93.4 hm$^3$/yr) are much higher than the average exploitation volume (6.81 hm$^3$/yr). Moreover, according to the official inventories of groundwater exploitation points, our study area (Maia piedmont) is the one with the lowest number of pumping sites (ACA, 2006).

The characteristics of the borings and the data were provided by the Agencia Catalana de l'Aigua (ACA) and downloaded from Global Aquifer Control (http://gac.cloudapp.net/aca). The 445 m deep IRYDA borehole provides the oldest piezometric data, between 1985 and 2011. The screen is situated between 190 m and 441 m depth, and consequently records average hydraulic conditions in the Lower carbonate aquifer and in the lower part of the Intermediate evaporite aquifer (Fig. 2). In November 2011 it was replaced by Banyoles-1 piezometer due to failure. Since 2009, the multiple piezometer Fontcoberta-1, -2 and -3, located close to the Clot d'Espolla temporary spring, monitor the base of the surficial aquifer (38–53 m depth), as well as the upper (150–159 m depth) and lower sections (220–232 m depth) of the Intermediate evaporite aquifer (Fig. 2). Moreover, we have analysed the precipitation records (Servei Meteorologic de Catalunya, www.meteo.cat) in order to identify the drought periods, assess their severity, and analyse their relationships with the piezometric records and the occurrence of sinkholes.

**Table 1**
Characteristics and date of the images and maps used for the construction of the sinkhole inventory.

| Type | Date | Scale/resolution |
|---|---|---|
| Greyscale aerial photograph | 1946 | ≈1:43,000 |
| Greyscale aerial photograph | 1956 | ≈1:32,000 |
| Greyscale aerial photograph | 1971 | 1:18,000 |
| Greyscale aerial photograph | 1974 | 1:18,000 |
| Greyscale aerial photograph | 1980 | 1:18,000 |
| Greyscale aerial photograph | 1988 | 1:18,000 |
| Color aerial photograph | 2002 | 1:22,000 |
| Color aerial photograph | 2006 | 1:22,000 |
| Color aerial photograph | 2010 | 1:22,000 |
| Greyscale orthoimage | 1946 | 100 cm/px |
| Greyscale orthoimage | 1956 | 50 cm/px |
| Greyscale orthoimage | 1987 | 50 cm/px |
| Color orthoimage | 1993 | 2.5 m/px |
| Greyscale orthoimage | 1996 | 50 cm/px |
| Color orthoimage | 2002 | 50 cm/px |
| Color orthoimage | 2004 | 50 cm/px |
| Color orthoimage | 2005 | 50 cm/px |
| Color orthoimage | 2008 | 50 cm/px |
| Color orthoimage | 2009 | 25 cm/px |
| Color orthoimage | 2010 | 25 cm/px |
| Color orthoimage | 2011 | 25 cm/px |
| Color orthoimage | 2012 | 50 cm/px |
| Color orthoimage | 2013 | 50 cm/px |
| Color orthoimage | 2014 | 50 cm/px |
| Topographic map | 1936–39 | 1:50,000 |
| Topographic map | 1958 | 1:50,000 |
| Topographic map | 1969 | 1:50,000 |
| Topographic map | 1982 | 1:50,000 |
| Topographic map | 1988 | 1:25,000 |
| Topographic map | 2006 | 1:5000 |
| Topographic map | 2014 | 1:5000 |

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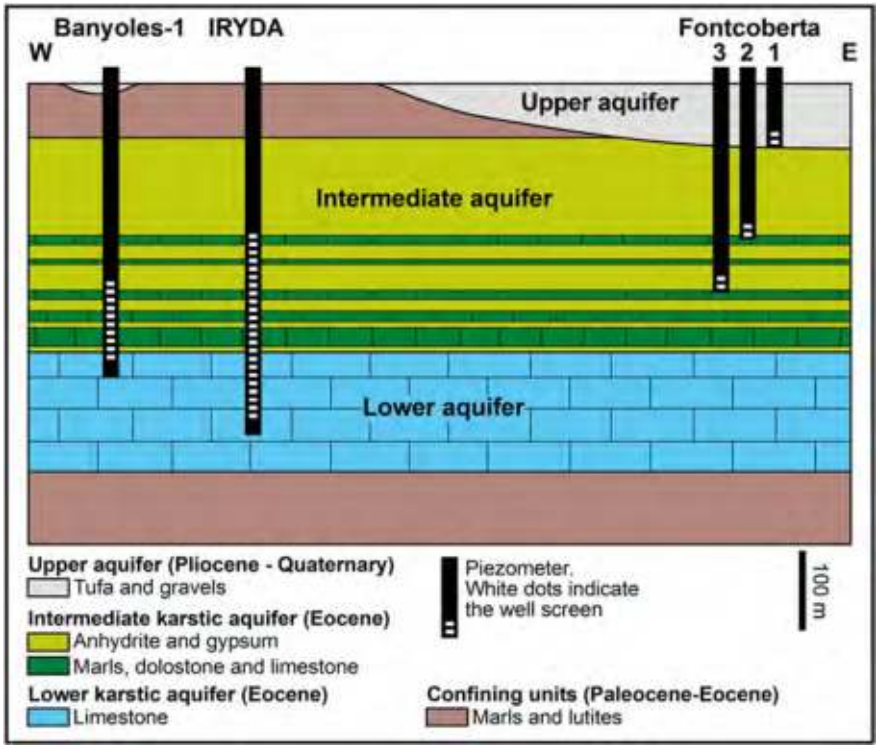


**Fig. 2.** Sketch showing the hydrogeological units investigated by boreholes and piezometers. The information on the subsurface stratigraphy is largely based on borehole logs and the geological cross-sections of Martínez et al. (2000). The characteristics of the borings were provided by the ACA (Agencia Catalana de l'Aigua).

## 4. Subsidence processes and landforms in the study area

### *4.1. Paleosinkholes*

In a previous work on the evaporite karst in the middle reach of the Fluvia River valley, Gutiérrez et al. (2016) documented a wide variety of dissolution-induced paleosubsidence structures. They recorded the whole spectrum of subsidence mechanisms, including sagging, collapse, suffusion, and combinations of them. Moreover, subsidence may affect to the evaporitic bedrock, non-soluble caprocks and the alluvial cover. The distribution of the paleosinkholes identified between Besalu town area and the Camos-Celra Fault are shown in Fig. 3. These karst-related gravitational structures provide useful insight into the subsidence mechanisms involved in the development of sinkholes and the spatial distribution of the areas underlain by karstified evaporites.

In the Maia area, where the outcrops are mainly restricted to limited artificial excavations, we have identified paleosinkholes in two sectors (Fig. 4). (1) Incarcal quarry: Here, deformed Late Pliocene-Early Pleistocene lacustrine calcisiltites and calcirudites are cross-cut by cylindrical collapse structures 5–30 m across. These paleosinkholes are filled by fossil-rich Early Pleistocene greenish grey clays deposited in relatively deep sinkhole ponds (Galobart and Agustí, 2003; Ros-Montoya et al., 2010). These are caprock collapse paleosinkholes related to the interstratal karstification of evaporites, probably recording an old groundwater discharge area (Gutiérrez et al., 2016). (2) Puig Gras: In the cuttings of the N-260 road and in nearby areas there are several paleosinkholes affecting the Eocene sandstones and marls of the Coubet Fm., which constitutes the confining unit of the Intermediate evaporite aquifer. These poorly exposed subsidence structures are 35–60 m across and consist of chaotically brecciated caprock juxtaposed on both sides and with subvertical contacts against laterally continuous strata of Coubet Fm., with a general 25NE dip. Locally, the upper part of the foundered material includes rounded gravels derived from alluvial levels initially located at higher elevation.

The depth of the karstification responsible for the paleosinkholes in Maia area is unknown, although some of the subsidence structures are rooted at depths higher than 20 m. In Besalu area there are large dissolution-induced basins filled by Quaternary alluvial gravels > 100 m thick. Also in this sector, cave studies indicate the presence of collapse chimneys (breccia pipes) >50 m high that penetrate through thick caprock (Gutiérrez et al., 2016). Moreover, electrical resistivity surveys carried out across a large caprock collapse sinkhole in the vicinity Serinya, south of the study area, reveal collapse structures >100 m deep (Zarroca et al., 2016).

### *4.2. Sinkholes*

In the investigated area, covering 18.1 km$^2$, a total of 58 sinkholes have been inventoried (Fig. 4). The ascribed typology, the main morphometric parameters and their age are compiled in Table 2. This cannot be considered as a complete inventory, since is not feasible to map all the sinkholes, especially the small ones, but should be a representative sample of the sinkholes developed in the area. Thus, the available data indicate a minimum density of 3.2 sinkholes/km$^2$, and a minimum area affected by subsidence of 168,351 m$^2$, which represents 0.93% of the study area. These are higher values than those estimated for the middle reach of the Fluvia valley in a previous work (1.1 sinkholes/km$^2$ and 0.56% of the area affected by sinkholes; Gutiérrez et al., 2016).

The sinkhole typology has been ascribed on the basis of the morphological features and following the classification proposed by Gutiérrez et al. (2008b) and Gutiérrez (2016). This genetic classification describes sinkholes according to the material affected by subsidence (cover, bedrock and caprock) and the subsidence mechanisms (collapse, sagging and suffosion). Obviously, the reliability of the typological ascription on the basis of the morphological features decreases with the age of

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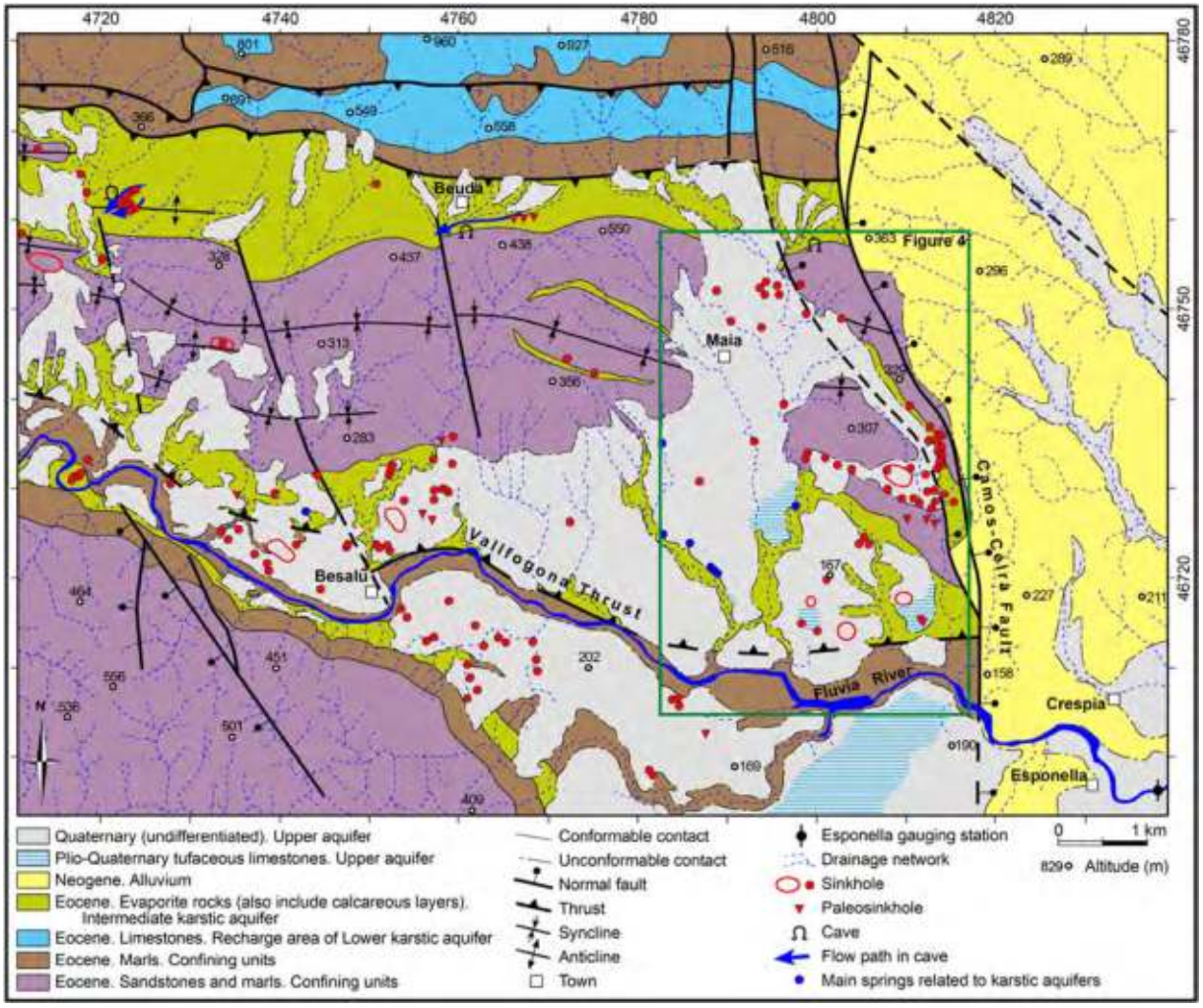


**Fig. 3.** Map showing the main geological, geomorphological and hydrogeological features of the eastern sector of the middle reach of the Fluvia Valley. The geological and geomorphological data are derived from Martínez et al. (2000) and Gutiérrez et al. (2016), respectively.

the sinkholes due to the higher impact of the degradation processes (i.e., erosion on the edges and deposition in the bottom), especially for the sinkholes mapped with the 1946 aerial photographs, which are the oldest images with the lowest resolution. Essentially, the large diffuse-edged and pan-shaped basins have been interpreted as sagging sinkholes, whereas the well- and funnel-shaped depressions ascribed to the collapse category. The occurrence of cover suffosion sinkholes is very unlikely since most of the cover deposits have a considerable degree of cementation. According to our classification, a great proportion of sinkholes have been formed by collapse (78%), and around 12% and 10% by sagging and a combination of both processes, respectively. Around 10% of the sinkholes affect caprocks (Coubet Fm. and Plio-Quaternary tufaceous limestones), 24% evaporitic bedrock, and 66% cover deposits. The latter may also affect concealed bedrock or caprock.

Sinkhole dimensions cover a broad range. The largest sagging depression is 323 m long and around 61,694 $m^2$ in area, whereas the smallest collapse is 0.9 m across. The average area of the sagging sinkholes and collapse sinkholes are 11,400 $m^2$ and 450 $m^2$, respectively. The average depth of the sinkholes is 2.5 m and reaches a maximum of 6 m. These parameters represent minimum subsidence values, since sinkholes tend to reduce their depth through time by natural and anthropogenic deposition.

Regarding the spatial distribution, the mapped sinkholes show a high concentration north of Puig Gras, associated with an outcrop of Eocene evaporites (Beuda Gypsum) and next to the Camos-Celra Fault. Most probably, the intense karstification in this sector is related to higher permeability and lower mechanical strength of the evaporites caused by tectonic faulting. Sinkholes on outcrops of sandstones and marls of the Coubet Fm. tend to occur close to the lower contact of this unit, where the caprock reaches a limited thickness.

### 4.3. Temporal occurrence of sinkholes

The age of the sinkholes has been constrained with a variable degree of accuracy using the available topographic maps, aerial photographs, orthoimages and the data gathered during our field surveys (Fig. 4, Table 2). A limitation of the chronological data of the sinkhole inventory is the lack of a precise age for a substantial part of the subsidence events: (1) 5 sinkholes out of 58 lack chronological data; (2) a maximum age (pre–1946 or pre–1956) is assigned to 36 (ca. 60%); (3) the timing of 11 sinkholes is constrained with bracketing ages that may cover a span as large as 24 years, although in most cases lower than 3 years; and (4) the date at month or year level is only known for 6 sinkholes. Therefore, the sinkholes have been grouped into different age ranges (pre–1956, 1956–1987, 1988–1997, 1998–2015).

Sinkholes formed before 1956. The aerial photographs taken in 1956–57 (American flight B) are the oldest images with good

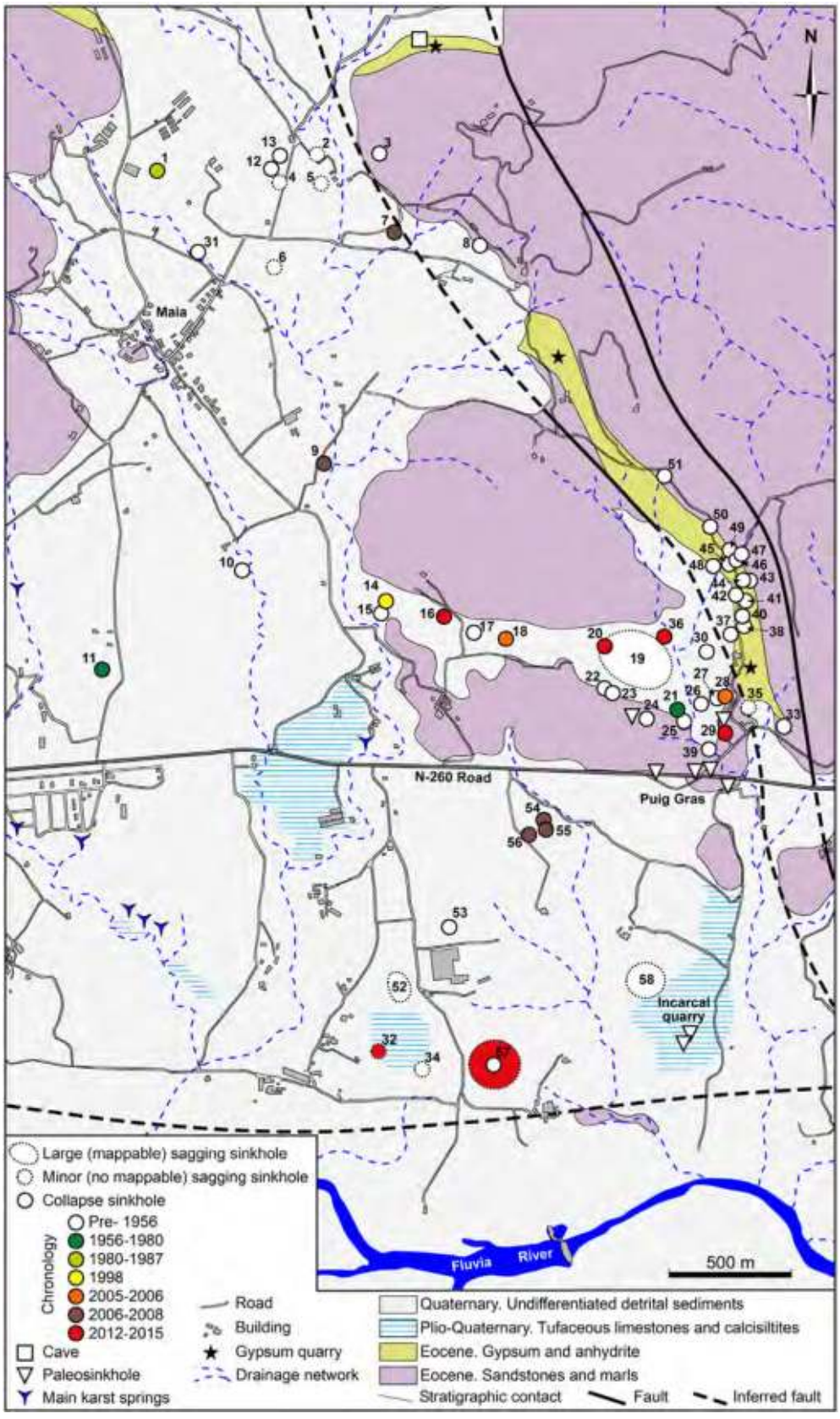


**Fig. 4.** Map showing the spatial and temporal distribution of the inventoried sinkholes in Maia area.

resolution. They were acquired when the extent and density of the tree cover was much lower, and consequently allow identifying sinkholes that are nowadays masked by vegetation, but recognisable by field work. In these photographs we have identified 41 sinkholes out of the 58 sinkholes of the inventory. The aerial photographs taken in 1946 (American flight A) show 18 of those sinkholes, but the resolution of

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**Table 2**
Summary table of the sinkhole inventory indicating the ascribed typology, morphometric parameters and chronological data.

| Sinkhole | Type | Length-width or diameter (m) | Depth (m) | Area ($m^2$) | Age of formation/last observed activity/ |
|---|---|---|---|---|---|
| 1 | Cover collapse | 12 | 2.0 | 113 | 1980–1987 |
| 2 | Cover sagging-collapse | 27 | 1.0 | 573 | Pre–1956 |
| 3 | Caprock collapse | 8 | 3.0 | 50 | Pre–1946 |
| 4 | Cover sagging | 34–24 | 1.5 | 623 | Pre–1956 |
| 5 | Cover sagging-collapse | 60–55 | 1.0 | 3100 | Pre–1956 |
| 6 | Cover sagging-collapse | 43–36 | 1.5 | 988 | Pre–1956 |
| 7 | Cover collapse | 5 | 1.0 | 20 | 2006–2008 |
| 8 | Cover and caprock collapse | 31–18 | 5.0 | 359 | Pre–1946 |
| 9 | Cover collapse | 10 | 1.0 | 79 | 2006–2008 |
| 10 | Cover collapse | 45–28 | 5.0 | 1050 | Pre–1946 |
| 11 | Cover collapse | 31–22 | 2.2 | 1513 | 1956–1974 |
| 12 | Cover collapse | 16 | ? | 201 | Pre–1946 |
| 13 | Cover collapse | 17 | ? | 227 | Pre–1946 |
| 14 | Cover collapse | 25–22 | 5.0 | 380 | November 1998 |
| 15 | Cover collapse | 60–42 | 4.0 | 2043 | Pre–1946 |
| 16 | Cover collapse | 3 | 1.0 | 7 | 2012–2014 |
| 17 | Cover collapse | 10 | ? | 78 | Pre–1956 |
| 18 | Cover collapse | 10–9 | 4.0 | 63 | 2005–2006 |
| 19 | Cover sagging | 323–249 | 5.0 | 61,694 | Pre–1946 |
| 20 | Cover collapse | 1.5 | 1.0 | 2 | 2012–2014 |
| 21 | Cover collapse | 4 | 1.0 | 13 | 1956–1980 |
| 22 | Cover collapse | 16 | ? | 201 | Pre–1946 |
| 23 | Cover collapse | 13 | ? | 133 | Pre–1946 |
| 24 | Caprock collapse | 1.5 | 1.0 | 2 | Pre–1956 |
| 25 | Caprock collapse | 35–33 | 3.0 | 907 | Pre–1946 |
| 26 | Cover collapse | 10–8 | 2.0 | 64 | Pre–1946 |
| 27 | Cover collapse | 22 | 1.0 | 380 | Pre–1956 |
| 28 | Cover sagging-collapse | 126–69 | 1.5 | 7504 | Pre–1956/2006/ |
| 29 | Caprock collapse | 58–40 | 5.0 | 1848 | Pre–1946/2014 |
| 30 | Cover collapse | 10 | 2.0 | 78 | Pre–1946 |
| 31 | Cover collapse | 35–32 | 5.0 | 3525 | Pre–1946 |
| 32 | Cover sagging | 69–42 | 1.5 | 2495 | Pre–1956/2014/ |
| 33 | Bedrock collapse | 84–59 | 5.0 | 4504 | Pre–1946 |
| 34 | Cover sagging | 57 | 2.0 | 2552 | Pre–1956 |
| 35 | Cover sagging | 55–32 | 2.0 | 1654 | Pre–1946 |
| 36 | Cover collapse | 0.9 | 1.5 | 0.6 | October 2015 |
| 37 | Cover collapse | 16 | 2.0 | 201 | Pre–1946 |
| 38 | Bedrock collapse | 12 | 2.0 | 113 | Pre–1956 |
| 39 | Caprock collapse | 20 | 5.0 | 314 | Pre–1956 |
| 40 | Bedrock collapse | 15–10 | 3.0 | 139 | Pre–1956 |
| 41 | Bedrock collapse | 24–21 | 5.0 | 599 | Pre–1956 |
| 42 | Bedrock collapse | 2.5 | 0.5 | 5 | Pre–1956 |
| 43 | Bedrock collapse | 8 | 2.0 | 50 | Pre–1956 |
| 44 | Bedrock collapse | 15–13 | 3.0 | 141 | Pre–1956 |
| 45 | Bedrock collapse | 20–11 | 4.0 | 194 | ? |
| 46 | Bedrock collapse | 6 | 3.0 | 28 | ? |
| 47 | Bedrock collapse | 8 | 3.0 | 50 | ? |
| 48 | Bedrock collapse | 5 | 2.5 | 20 | Pre–1956 |
| 49 | Bedrock collapse | 8 | 3.0 | 50 | ? |
| 50 | Bedrock collapse | 15–14 | 3.0 | 145 | Pre–1956 |
| 51 | Bedrock collapse | 3 | 1.0 | 7 | ? |
| 52 | Cover sagging | 122–105 | 1.0 | 9624 | Pre–1956 |
| 53 | Cover sagging-collapse | 76 | 0.5 | 4536 | Pre–1956 |
| 54 | Cover collapse | 10 | ? | 78 | 2006–2008 |
| 55 | Cover collapse | 6 | ? | 28 | 2006–2008 |
| 56 | Cover collapse | 13 | ? | 133 | 2006–2008 |
| 57 | Cover sagging-collapse | 165–162 | 6.0 | 21,382 | Pre–1946/2014 |
| 58 | Cover sagging | 254–150 | 2.0 | 31,491 | Pre–1956 |
| | Average | 38–30 | 2 | 2903 | |
| | Total | | | 168,350 | |

the images is much lower. Moreover, the 1:50,000 scale topographic maps produced before or during that period (1936–39, 1958) do not depict any of the sinkholes. According to our data, four of the sinkholes already existing in 1956 have experienced reactivations, indicating that subsidence is still active in those depressions. This is the case of cover sagging and collapse sinkhole 57 (Figs 4 and 5A). This subcircular sinkhole around 165 m in diameter can be recognised in the 1946 and 1956 photographs and shows a nested collapse 20 m across with a pond. In the 1980 images the collapse has a diameter of 36 m and shows a more fresh appearance. In 2014 this active sinkhole caused the opening of cracks in the track located on its western margin. The nearby cover sagging sinkhole 32 has also experienced recent activity according to the land owner. The other two sinkholes formed before 1956 and with evidence of subsequent reactivation are located close to the Camos-Celra Fault. In 2006, a collapse 1.5 m across occurred in the floor of the cover sagging sinkhole 28. To the south, the caprock collapse sinkhole 29, around 5 m deep and 58 m across, caused settlement on a track in 2013 and 2014.

Sinkholes formed between 1956 and 1987 (Fig. 5B). During this time interval, in addition to the growth of the nested collapse in sinkhole 57, we have detected the occurrence of three sinkholes. The cover collapse sinkhole 11 north of Maia is expressed as a ponded collapse 31 m across in aerial photographs from 1974. The cover collapse sinkholes 21 and 1, around 4 and 12 m across are first identified in images taken in 1980 and 1987, respectively.

Sinkholes formed between 1988 and 1997. No sinkhole occurrence has been documented in the study are during this period. Nonetheless, there are reports of sinkhole events formed within this time span in other sectors of the Fluvia valley, notably four damaging collapses in the Grup del Mont suburb of Besalu, occurred between 1988 and 1996 (Gutiérrez et al., 2016).

Sinkholes formed between 1998 and 2015. This is the period with the highest frequency of sinkholes, with a total of 11 subsidence events, yielding a spatial-temporal probability of 0.03 sinkholes/$km^2$/yr. The cover collapse sinkhole 14, locally known as Forat de Can Cademont, appeared on November 11, 1998 (Barberà, 1998) (Fig. 5C). Three months after its formation, this subcircular sinkhole with overhanging walls was 8.5 m deep. The floor was inundated by phreatic water of the surficial aquifer, and its diameter was 12.5 m and 14.5 m at the surface and in the bottom, respectively (Barberà, 1998; Miret et al., 1999). This depression is depicted in the Topographic Map of Catalunya at 1:5000 scale (sheet Maià de Montcal 257-7-6) produced with aerial photographs taken in 2000. In December 2009 the sinkhole had degraded margins inclined around 45°, the diameter had grown to 22 m long and the dry floor was 5.5 m deep. In 2014 the depression was 25 m long and 4 m deep. The comparison of multiple aerial photographs available in the viewer of the Institut Cartogràfic de Catalunya (Table 1) indicate that the sinkhole experienced continuous morphological changes between 1998 and 2006, involving the degradation of the scarped margins, the areal growth of the depression and its partial fill. From 2008, the sinkhole shows a state of morphological equilibrium and continuous vegetation growth. A collapse sinkhole 10 m across occurred 530 m to the east of the previous sinkhole between April 2005 and June 2006 (sinkhole 18). In 2006, a collapse was reported within sagging sinkhole 28. In addition, at least 5 collapse sinkholes occurred between 2006 and 2008 in the study area. Three of them (sinkholes 54, 55, 56) are between 6 and 13 m in diameter and are filled by anthropogenic deposits. Collapse sinkholes 9 and 7 were 10 m and 5 m in diameter, respectively, and are partially filled. Three small collapses have been formed between 2012 and 2015 (sinkholes 16, 20 and 36). The floor of sinkhole 29, developed before 1946, was reactivated in 2013–14 and sinkholes 57 and 32 showed signs of active sagging.

## 5. Drought episodes and hydrodynamics

In NE Spain, the most severe droughts documented during the last 100 years occurred during the following periods: 1910–15, 1922–23,

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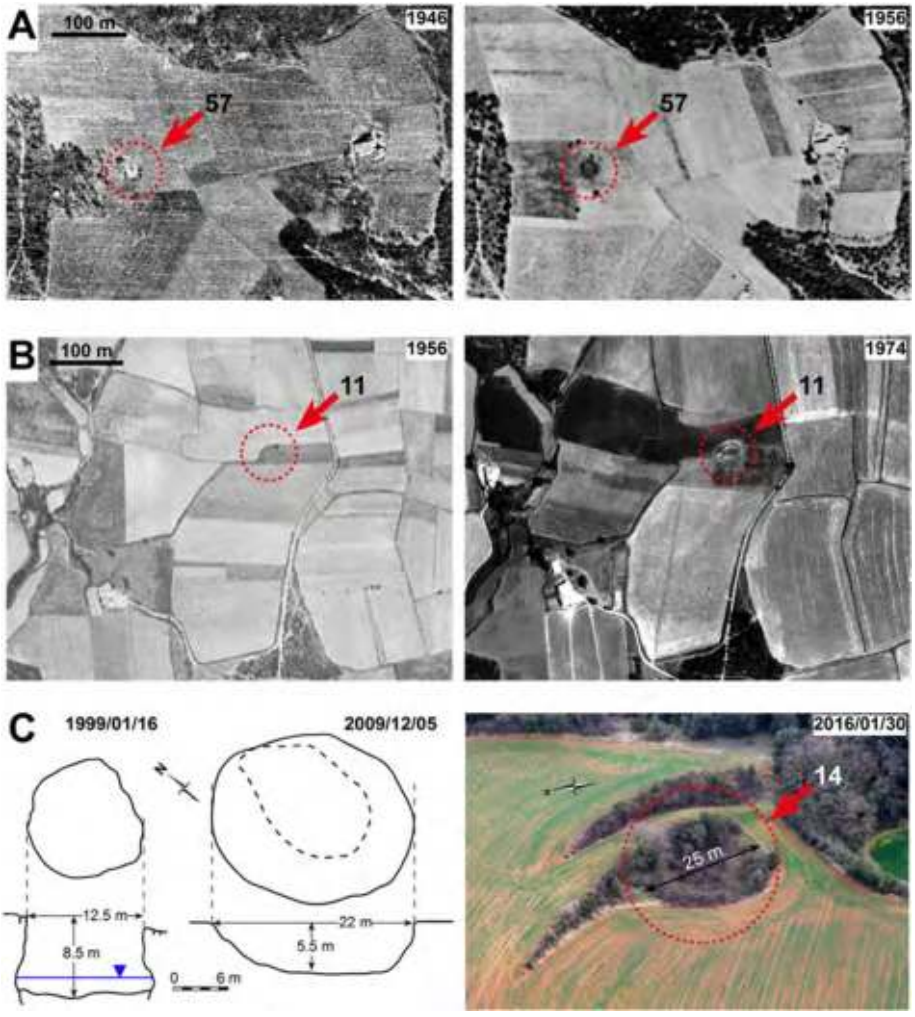


**Fig. 5.** Examples of sinkholes with documented activity in the study area. (A) Aerial photographs from 1945 and 1957 showing the enlargement of sinkhole 57. (B) Sinkhole 11, dry in 1956 and ponded in 1974. (C) Morphological evolution of sinkhole 14 (Forat de Can Cademont) between 1999 and 2009 and oblique aerial photograph taken in 2016.

1944–50, 1973, 1985–86, 1988–89, 1999–2003, and 2005–present (ACA, 2007a, 2007b; Altava-Ortiz et al., 2008; Barrera-Escoda, 2008). One of the most intense, which affected the whole Iberian Peninsula, was the 1944–50 drought, including the driest hydrological year of the 20th century (October 1944–September 1945). The hydrological year 1972–73 was also a severe drought period, which mainly affected the headwaters of the drainage basins. A long drought started in 1999 and extends up to the present time, with the exception of 2001 and 2004. This period, and especially the time interval 2004–2008, is the driest in our study area since 1916 (Barrera-Escoda, 2008).

The temporal distribution and intensity of the drought periods in the Fluvia River catchment can be analysed using the discharge and precipitation data available since 1940 (Fig. 6). In this work we have used the climatic data gathered in the Plan de Gestión de Distrito de Cuenca Fluvial de Cataluña 2016–2012 (ACA, 2014), which includes the records of 157 meteorological stations of the Spanish Agency of Meteorology. The historic precipitation data has been analysed using the Standardized Precipitation Index (SPI), which allows the identification of droughts and assessing their probability (McKee et al., 1993). This index has been used in previous works to analyse sinkhole development in other regions (Iovine et al., 2016). The calculation of the SPI involves a two-step process: (1) historical rainfall data is fitted to a cumulative probability gamma function; (2) the gamma function is transformed into a standard normal variable Z with a mean of 0 and a standard deviation of 1. Thus, the SPI is a representation of the number of standard deviations of a precipitation value from the mean of the considered period. Negative values indicate a precipitation lower than the average, potentially attributable to droughts with an associated probability. Negative values indicate relatively humid periods. The SPI values calculated for the time interval 1940–2013 indicate that the last and current drought is the most severe one, both in terms of intensity and duration (Fig. 6B). The drought started in the hydrological year 1998–99 and includes the year with lowest SPI of the record; −2.19 in 2006–07 (ACA, 2014). An anomalous feature of this drought is that it includes a 9-years-long interval from 2005 to 2013 with continuous negative SPI values. The average annual discharge of the Fluvia River recorded at Esponella Gauging Station (Fig. 3) shows a good match with the SPI. The lowest mean discharge values (<2 $m^3/s$) occur within the current drought, well below the average of 7.1 $m^3/s$ since 1912–13 (Fig. 6A).

Piezometric data from deep aquifers also reflect the exceptional nature of this drought period, showing the lowest values of the record. The data from the IRYDA borehole, spanning from 1985 to 2011, is representative of the hydraulic head in the Lower carbonate aquifer and the Intermediate evaporite aquifer (Fig. 7A). It should be noted that the location of the screen does not enable monitoring the

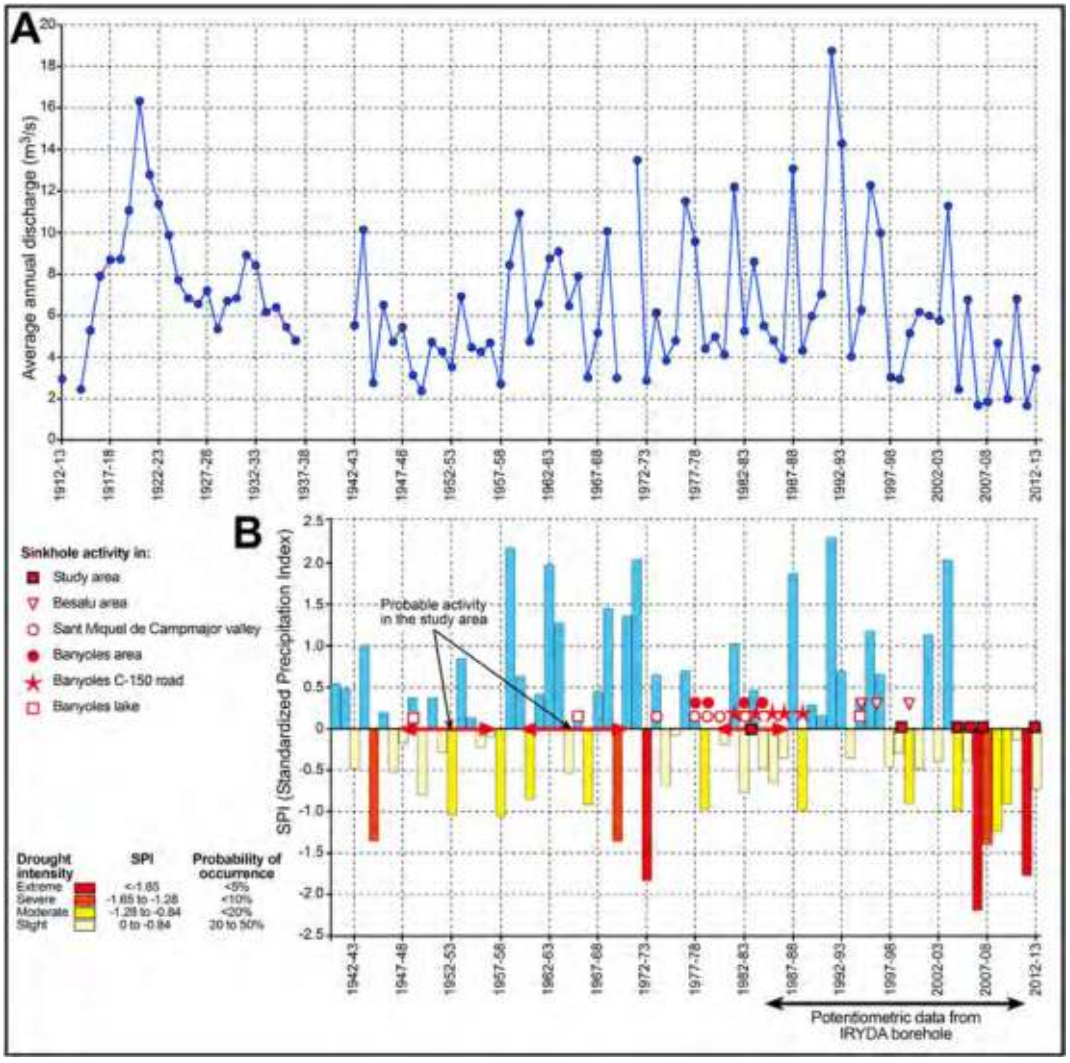


**Fig. 6.** (A) Average annual discharge of the Fluvia River at Esponella gauging station (see location in Fig. 3). Data provided by the Agencia Catalana de l'Aigua (ACA). The lack of data between 1937 and 1942 is related to the Spanish Civil War and the flood of 1940, 1941 and 1942. (B) Standarized Precipitation Index (SPI) of the hydrologic years 1940–41 to 2012–13 in the Fluvia River basin and droughts classified into four intensity degrees with their associated probability. The temporal distribution of the sinkhole events documented in the study area and in other nearby sectors is shown with different symbols.

possible differences between the water heads of the Lower carbonate aquifer and the Intermediate evaporite multilayer aquifer. The limited precipitation in the northern headwaters of the basin, which is the main recharge area of the aquifer (Alta Garrotxa), results in a general decreasing trend since 1997, with a marked drop in 2005. The deep karst aquifers in Olot area, within the Fluvia watershed and 20 km to the W, show a similar behaviour (Bach et al., 2012).

## 6. Discussion

The constructed sinkhole inventory including chronological data allows the recognition of temporal clusters of collapse events, especially the period spanning from 1998 to 2015. The SPI values calculated for the time interval 1940–2013 show a good correlation between the drought periods and those with higher frequency of sinkhole occurrence (Fig. 6). The last and current drought period, including a historical maximum in 2007–2008 (Fig. 6), coincides with a significant intensification of the subsidence phenomena in the area (Fig. 8).

The lowering of the water table in the surficial aquifers (e.g., Quaternary alluvium) may significantly affect the stability of the cavities whose roofs are located within the oscillation zone. Such water table drops cause an increase in the effective weight of the cavity roofs (loss of buoyant support), may favour internal erosion processes by the replacement of slow phreatic flow by more rapid downward percolation, and may reduce the mechanical strength of the deposits by desiccation and contraction (e.g., Lamoreaux and Newton, 1986; Gutiérrez, 2016 and references therein). Additionally, our observations suggest that other mechanisms, relating to the subsurface hydrodynamics, may be also playing a role in the subsidence processes.

The piezometric record of IRYDA borehole (1985–2011) supports the concept that sinkholes in the area occur preferably during prolonged periods of low hydraulic head in the deep aquifers. In contrast, sinkhole activity is very limited when the piezometric levels are high (Fig. 7A). This is also supported by the data from Banyoles-1 borehole (2011–2015), although the timing of the subsidence events for that period is not tightly constrained (Fig. 7B).

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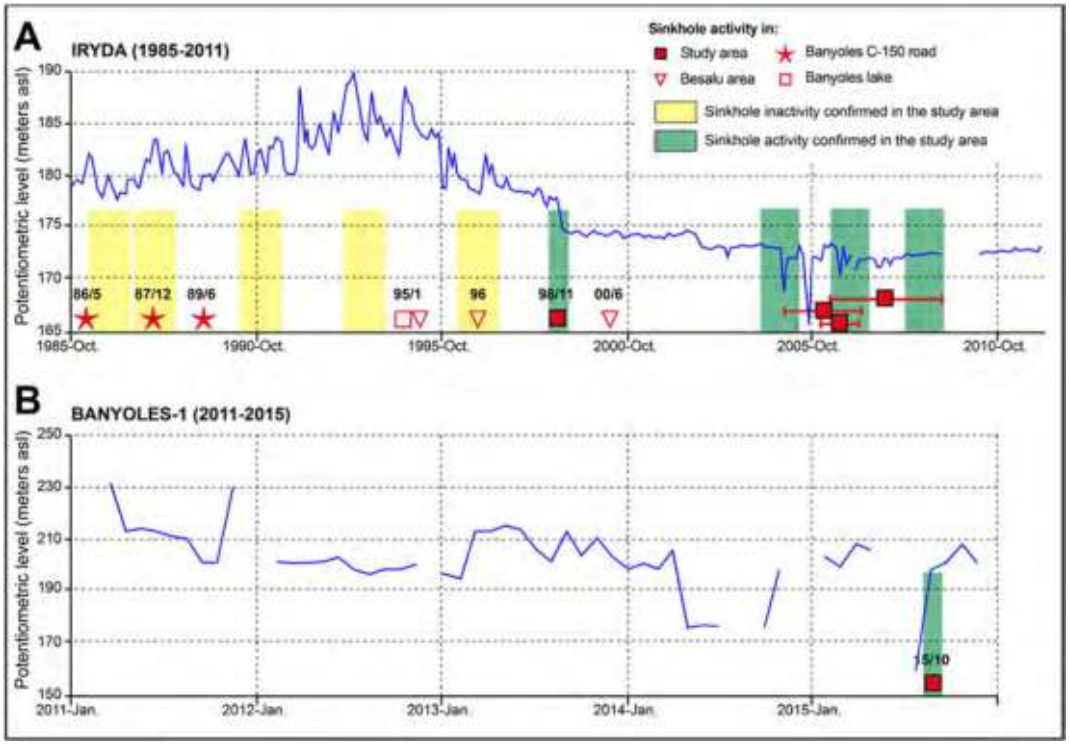


**Fig. 7.** Comparison between the piezometric records of IRYDA and Banyoles-1 boreholes and the periods of sinkhole formation and inactivity documented in the study area and surrounding areas.

This temporal pattern is also observed in other discharge areas of the hydrogeological system and during different periods. In Sant Miquel de Campmajor valley (see location in Fig. 1B) historical data indicate that sinkholes tend to form during drought periods. This is the case of the collapse events documented in 1732, 1817, 1872, 1880, 1908 and 1910 (Sanz, 1981; Abellán, 2010). In the surroundings of Banyoles Lake, and especially in the western sector of the lacustrine basin, the data provided by Sanz (1981) and Brusi et al. (1987, 1990) for the period 1974–1989 also support the correlation between droughts and sinkholes (Fig. 6B). Moreover, the sole collapse sinkholes documented in the Sant Miquel de Campmajor valley in the 20th Century occurred within that time period. Sanz (1981), in his pioneering hydrogeological work, proposed that decreases in the hydraulic head within phreatic caves could be a major triggering factor for the development of collapse sinkholes in the region.

The comparison of the time series recorded in the multiple piezometer of Fontcoberta since 2008 allows recognising the hydrodynamic relationships among the different aquifers during wet and drought periods (Figs. 2 and 9). During significant recharge periods, the hydraulic head in the upper part of the evaporite aquifer (P2) is lower than that of the underlying lower part of the evaporite aquifer (P3) and the overlying Upper aquifer associated with the surficial formations (P1). This fact shows that the recharge of the system occurs mainly through the Upper aquifer (P1) and the Lower aquifer (Eocene limestones), which is hydraulically connected with the lower part of the Intermediate evaporite aquifer (P3). Assuming a poor hydraulic connectivity between the surficial aquifer (P1) and the upper part of the Intermediate aquifer (P2) (Fig. 2), during wet periods, P2 is recharged by upward groundwater flows from P3 (I on Fig. 9B). Conversely, during drought periods like between November 2009 and February 2010, the highest hydraulic head is recorded in P2. This hydraulic gradient causes the discharge of P2 towards P3. We propose that, during the depressurization of P2, some sectors of the caves systems may suffer also an increase of the effective weight of the roofs. It should be noted that the potentiometric amplitude during the observation period reaches 20 m of water column, which is equivalent to a hydrostatic pressure variation of ca. 200 kPa.

Accordingly, our results suggest that the alternation of wet periods and severe droughts periods plays a key role in the temporal patterns of sinkhole development. On the one hand, the stability of the roofs of cavities that have propagated close to the surface are very sensitive to the water table variations of the Upper aquifer. On the other hand, the heterogeneous hydraulic response of the different units during drought periods may cause the depressurization of the upper part of the Intermediate aquifer. This situation may also lead to readjustments in the stress state of cave systems located at higher depth, facilitating the formation of collapse events.

The potential impact of drought periods on the development of collapse events should be also taken into account for the paleoenviromental interpretation of mass movement processes recorded in karstic lakes. A significant proportion of the lakes selected in Spain for paleoclimatic investigations are associated with collapse basins related to evaporite dissolution, whose origin and evolution are largely governed by the groundwater: Montcortés Lake (e.g., Corella et al., 2011; Gutiérrez et al., 2012), Estanya Lake (e.g., Morellón et al., 2009), Arreo Lake (e.g., Corella et al., 2013), Banyoles Lake (e.g., Sanz, 1981; Colomer et al., 2006). According to Valero-Garcés et al. (2014), the gravitational facies (mass movements) are more frequent in the lake basins with steep margins and high depth/surface ratio, mostly corresponding to collapse sinkholes. The gravitational facies identified in the deposits of Banyoles Lake are mainly ascribed to hydrogeological changes in the feeding confined aquifer (Höbig et al., 2012; Morellón et al., 2014). Höbig et al. (2012) described four mass-movement events; one constrained at 20–35 ka and three occurred within the age range 42–54 ka. The youngest event might be correlative with an arid period in the Pyrenees between 22 ka and 18 ka (González-Sampériz et al., 2006), which caused a drop in the level of the Isona karstic lakes (Pellicer et al., 2016). The other three events took place during the

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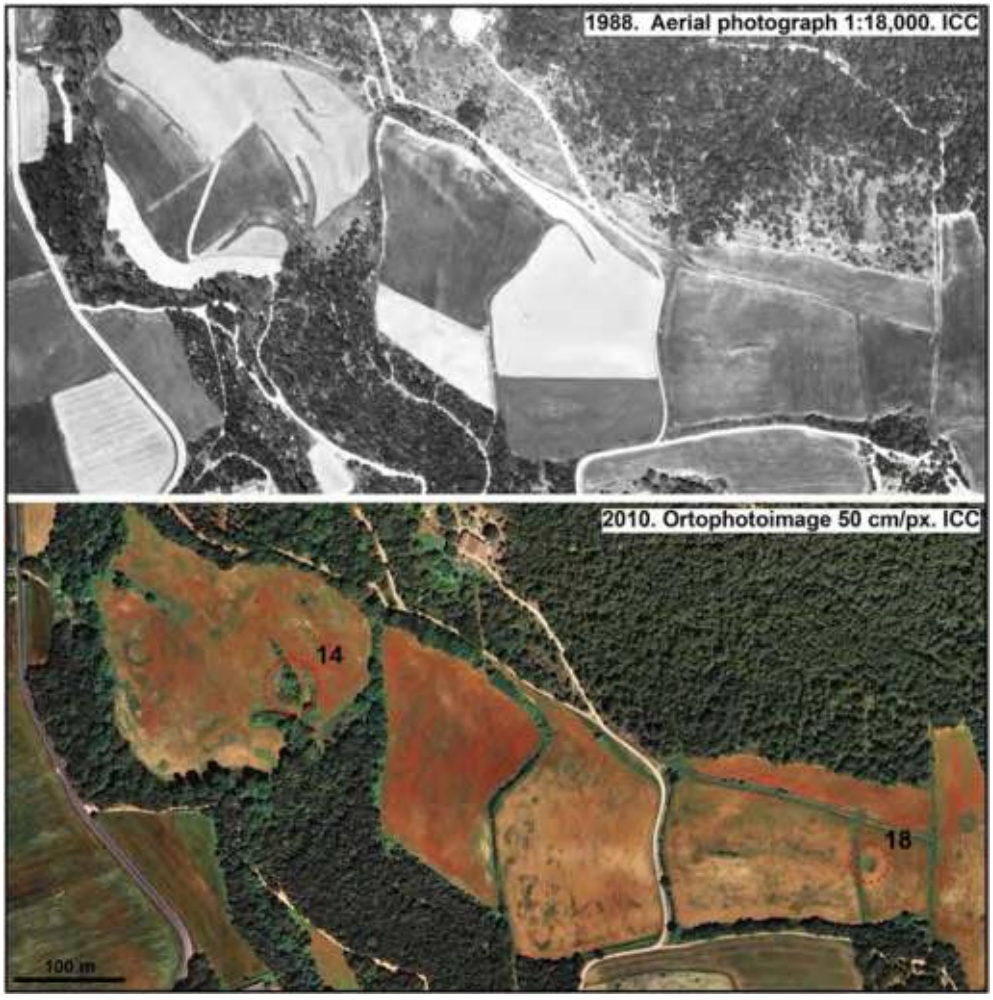


**Fig. 8.** Airborne images from 1988 and 2010 illustrating the geomorphic effects of the last drought period (1998–present) in the vicinity of Can Cademont within the study area. The lower image shows sinkholes 14 and 18, formed in November 1998 and in 2005–2006.

most arid phase recorded in northern Spain in the last glacial cycle, situated between 40 and 43 ka and 57 ka, in the transition between MIS 3 and MIS 4 (Moreno et al., 2012). Moreover, Morellón et al. (2014) recognise 17 homogenite layers in the recent sedimentary record of Banyoles Lake (last 7.6 ka) ascribed to fluidization processes and ascending turbiditic flows from the deeper sinkholes induced by increased groundwater discharge (Serra et al., 2002, 2005; Soler et al., 2009; Morellón et al., 2014). These data suggest that dry conditions enhance collapse activity in the bottom of Banyoles Lake, causing the oversteepening of the adjacent slopes and the development of subaqueous mass movements, whereas wet, high-recharge periods tend to be recorded by homogenites.

## 7. Conclusions

This work, carried out in a Mediterranean area with a confined evaporite aquifer and hypogene karstification, reveals that sinkhole activity is intensified during drought periods, which are expected to increase in the future according to the climatic projections. This is an innovative and unexplored geomorphic effect with potential detrimental consequences of the current anthropogenic climate change. This factor should be taken into account in sinkhole hazard assessments that generally assume that the spatial-temporal frequency of sinkholes in the future will be steady and similar to that documented in the past.

In the context of the Mediterranean realm where the study area is located, the predicted progressive increase in the duration and intensity of the drought periods associated with the climate change (Cook et al., 2016) may result in an intensification of the sinkhole hazard in karst areas. Within this situation in which resilience and adaptation to the new adverse conditions is of prime importance, it is highly advisable to identify the most susceptible areas, analyse the potential impact of climate change on sinkhole hazard, and design mitigation measure to reduce the associated risks. The results of this work suggest that karst areas underlain by highly soluble evaporites that function as confined aquifers are particularly sensitive to changes in the precipitation pattern. It would be desirable to conduct similar investigations in other areas in order to assess whether this finding can be generalized.

The observed correlation between drought periods and temporal clusters of sinkholes should be also considered in the paleoenvironmental interpretation of gravitational events (e.g. subaqueous landslides, sinkholes) recorded in the deposits of karstic lakes associated with collapse sinkholes. Those events are commonly attributed to periods of higher groundwater discharge and more humid conditions (e.g. Morellón et al., 2014), but could be also related to drought periods (e.g., Pellicer et al., 2016).

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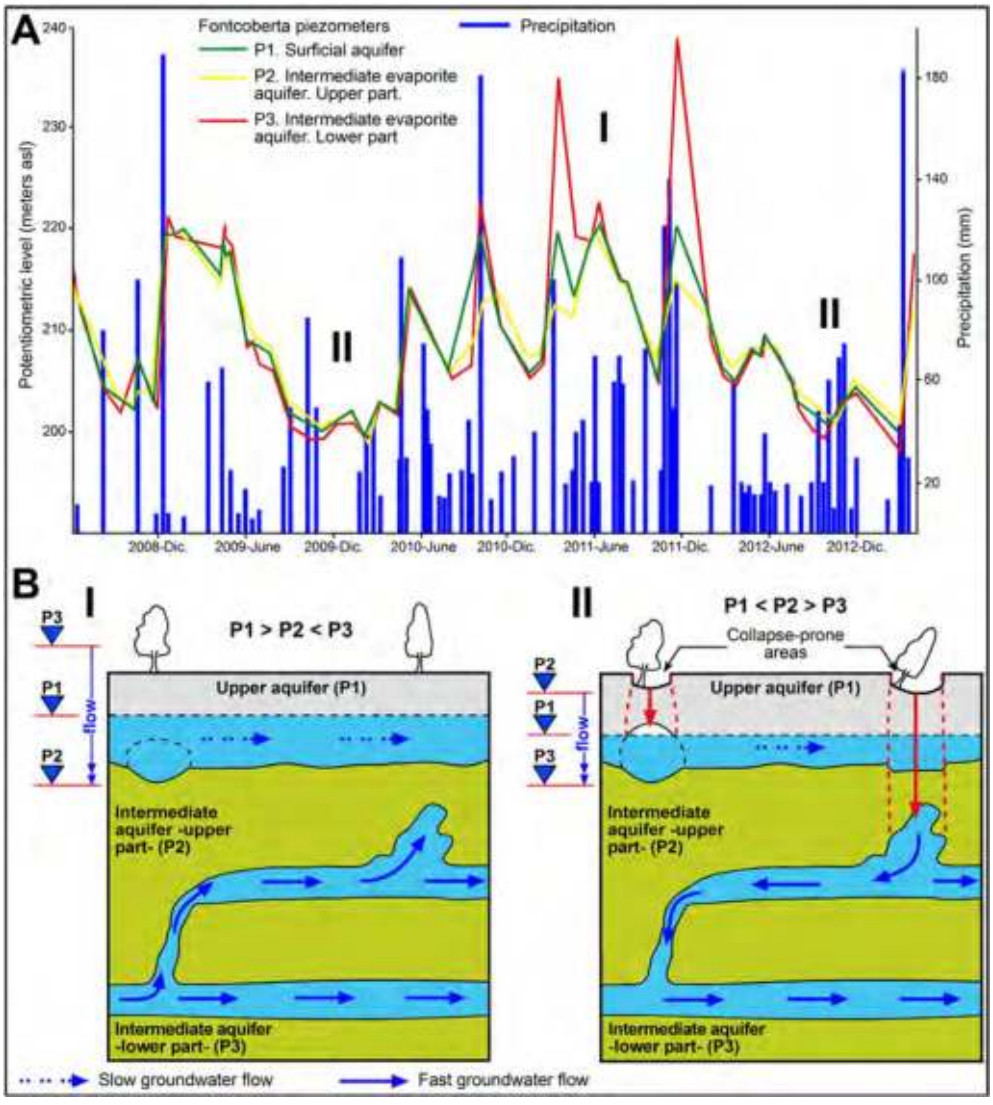


**Fig. 9.** (A) Piezometric time series of the period 2008–2013 recorded by the multiple piezometer Fontcobeta-1, -2, and -3, and precipitation data from the Alta Garrotxa meteorological station. (B) Conceptual model showing the hydrogeological relationships described in the text, inspired by the diagrams proposed by Klimchouk (2000, 2009) for explaining hypogenic development of caves. The figure illustrates the variation of the groundwater flow pattern related to the alternation between drought-to-wet (I) and wet-to-drought (II) stages.

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| From: | dec.sm.Comments.Micron2025 |
| To: | dec.sm.Comments.OakOrchard2025 |
| Subject: | FW: Micron WWTP |
| Date: | Friday, December 19, 2025 12:27:54 PM |

**From:** Sri Narsipur <narsipur@yahoo.com>
**Sent:** Friday, December 19, 2025 7:10 AM
**To:** dec.sm.Comments.Micron2025 <Comments.Micron2025@dec.ny.gov>
**Subject:** Micron WWTP



Dear DEC,

I am concerned about the request for the NYSDEC to issue a permit related to the development of an Oak Orchard Waste Treatment Plant in Clay by Micron. The impact of this on the community and environment is enormous and deserves careful consideration. I request an extension of the comment period to allow further consideration before a potentially destructive project sneaks by in the interest of profit by a distant company. Please delay by 90 days.

Sincerely,

Sriram Narsipur, MD
Syracuse, NY

MR. GREENWOOD: I think we have a quorum here. We have enough attendees logged on that we should probably begin. Good afternoon, everybody. My name is David Greenwood. I'm an administrative law judge with the New York State Department of Environmental Conservation Office of Hearings and Mediation Services.

I've been assigned to conduct public comment hearing sessions concerning an application filed by Onondaga County requesting a renewal and modification to the Oak Orchard Wastewater Treatment Plant State Pollution Discharge Elimination System permit. That's SPDES for short. And the permit is New York No. 0030317.

The treatment plant discharges treated municipal wastewater to the Oneida River, a class B water. The permit modifications include an increase in the average design flow, surface discharge at full build out via modification and improvement of the municipal treatment train and construction of a new industrial treatment train.

The application also proposes the construction of a new wastewater/reclaimed water conveyance corridor to provide Micron New York Semiconductor Manufacturing LLC with water for cooling and ultrapure water for production and sanitary uses. Upgrades to the municipal treatment train and construction of the other treatment train and conveyance corridor will together permanently impact approximately 4.5 acres of

wetlands and 3.29 acres to associated 100-foot adjacent areas. Onondaga County and RES Environmental Operating Company, LLC propose to restore and enhance wetlands on one property in Onondaga County and one property in Oswego County to compensate for the loss of wetlands resulting from the proposed project.

Additionally, Onondaga County has applied to DEC for a Clean Water Act section 401 water quality certification and associated U.S. Army Corps of Engineers section 404 permit. The DEC also requested and received information regarding the project's consistency with the Climate Leadership and Community Protection Act.

With respect to the new industrial treatment train, the water conveyance, and wetland mitigation, the proposal is subject to review under the State Environmental Quality Review Act (SEQRA) and the National Environmental Policy Act (NEPA).

This project is a Type I action for SEQR and a SEQR lead agency was coordinated. On June 25th, 2025, the Onondaga County Industrial Development Agency, as a joint lead agency with the Creating Helpful Incentives to Produce Semiconductors (CHIPS) program office created by the US Department of Commerce, accepted the draft environmental impact statement for public review and comment.

With respect to the municipal treatment train upgrades, the proposed project is subject to review under SEQR, and the

lead agency was Onondaga County. This project is a Type I action for SEQR, and a SEQR lead agency was coordinated. A negative declaration for that is on file.

The purpose of today's hearing is to provide members of the public with the opportunity to comment about the surface discharge, municipal SPDES, freshwater wetlands, and water quality certification draft permits. There's a link on DEC's website that leads to the Onondaga County website, where a complete copy of the permit applications can be found. Please note, as I said before, that if you encounter any technical difficulties, you may call 518-402-8005, and members of the Bureau of Public Outreach at DEC will help you get sorted out.

On November 12th, 2025, department staff published a combined notice of complete application, a notice of public comment period, and a notice of public comment hearing in the Environmental Notice Bulletin. As provided in the combined notice, written comments may be filed by e-mail and by regular mail until 5 p.m. on December 23rd, 2025. Please note that written and oral comments are given equal weight. If you would like to submit written comments, send them to Trendon Choe, regional permit administrator, New York State DEC Region 7 Office at 5786 Widewaters Parkway in Syracuse, New York. The zip is 13214. Or you can e-mail your comments to comments.oakorchard2025@dec.ny.gov. As previously stated, written comments are due by 5 p.m. on December 23rd, 2025.

Speakers are encouraged to submit any lengthy statements in writing and to provide only a summary of their comments today. There are roughly 20, 25 people who have registered to attend the hearing and just a handful of people who have registered to speak. Note, all participants have been muted upon entry to the hearing, and your line will be unmuted when it's your turn to comment. To avoid feedback, please ensure that you're only using one audio input. Again, if you encounter any technical problems, you can call 518-402-8005.

I will call the name of each person, including any elected officials, who pre-registered to speak. After I call your name, you will be unmuted and you may present your statement. If you are a call-in attendee, please press *3 on your phone so that we know which line to unmute. You should hear a prompt to alert you that you have been unmuted. Please remember that if you have your device on mute, you will have to unmute it before you begin speaking. Please speak slowly and clearly so that we are able to properly record your statement.

And I'm going refresh my attendees, and the first person who registered to speak is John Przpiora. And I apologize if I mispronounced your name. So, John, can you raise your hand and press that button on the lower right? And then we'll unmute you.

MR. PRZPIORA: Thank you very much for the opportunity to

speak. I'm presuming you can hear me?

MR. GREENWOOD: We can hear you.

MR. PRZPIORA: And so my name is John Przpiora. I'm a resident of Syracuse New York. The DEC has released these three permits related to the Oak Orchard Wastewater Plant in addition to the air quality -- the Title 5 permit for micron -- all of which must, you know, carefully be considered in a very short period of time in the middle of December, a time which makes it difficult for the public to engage because people are traveling or otherwise preoccupied with family and other community events in celebration of the holidays.

An extension is therefore requested, you know, at a minimum to the extent the regulations allow which I believe means delaying the close of comments to perhaps maybe the third week in January, which is better but still not nearly enough time given the complexity of the issue and the plethora of documents and pages of documentation related to this permit action. Including two SEQR reviews, the draft SPDES permit alone is 143 pages. There are nearly 20 supporting documents, including lengthy engineering reports, totaling -- one account was like 1,425 pages. Commenters must unload, you know, a huge number of megabytes of material from Onondaga County's website. You know, three to six months of additional time for the public to review this material, I think, is definitely warranted.

And I would suggest that during this period of extra time that the DEC and the applicant hold public information meetings open to the public so the public can be allowed to ask questions and gain, you know, additional information and understanding about just what this permit will be sanctioning.

Given the little time to review these materials, I've only brief, substantive comments to offer at this time. First, there is inadequate testing for PFAS, which seems to be limited to just four times per year, and the testing is limited to only 40 compounds. There's no quantitative limits imposed on any of the 40 compounds tested. Rather, its only -- action levels are set for those and, you know, for two compounds, PFOA and PFOS -- P-F-O-S. Yet neither, I'm told, are currently used in the semiconductor industry.

The SPDES permit needs to be revised to adequately monitor and eliminate the discharge of PFAS to our waterways, including Lake Ontario, which are already impacted by PFAS. Lake Ontario provides drinking water for over 8 million people in the US and Canada. Testing for 40 PFAS compounds is simply inadequate because there are reportedly hundreds, if not thousands, used in the semiconductor manufacturing process. Therefore, I urge the DEC to require the applicant to regularly test at least weekly for total organic fluorine in the effluent from the industrial wastewater treatment plant. Monthly testing should be required for the 40 PFAS compounds

in method 1633 supplemented by the non-targeted PFAS analysis to identify unlisted compounds found in semiconductor waste.

I would suggest that the department investigate what Minnesota has done. Reportedly, they have developed robust monitoring strategies for a 3M plant at Cottage Grove.

I also want to know more about how biosolids from the plant will impact the environment, including how will PFAS be eliminated from these waste residuals? What is required to ensure PFAS is destroyed?

Just a couple more points. The SEQR review and subsequent negative declaration for the sanitary wastewater treatment plant upgrade failed to consider, in my opinion -- failed to consider, estimate, or disclose the growth-inducing aspects of the Oak Orchard upgrades and the subsequent, implications and impacts of that newly allowed growth in the plant service area.

The next point I'd like to make about that sanitary plant is that the 411-page environmental assessment form, the PDF that was issued by the county, contains very little information about the proposed expansion and upgrade of Oak Orchard, except for a very perplexing, last appended technical memo on air permitting strategy for the wastewater treatment plant upgrade, which includes information about the conceptual design for the industrial wastewater plant upgrade. I was perplexed by this attachment since the EAF issued by the

applicant is for the municipal plant, not the industrial plant. And while this air permitting technical memo implies that an air permit will be needed for the wastewater plant, there is yet to be seen an application for the air permit. And yet, the SPDES permit is proceeding. I'd like an explanation for this, and if an air permit is needed, why is the SPDES permit being processed independently?

If nothing else, this confusion illustrates the mazelike nature of the documents and proceedings related to this permit and justifies the need for additional time and healthy doses of public information opportunities about this plant upgrade prior to the issuance of any permits.

And my final point, the volumetric capacity of the proposed plant upgrade is also a bit confusing. According to the FEIS, the industrial wastewater plant would be designed to accommodate a total of maximum industrial wastewater discharge volume of 42 MGD. Yet, the draft SPDES permit will allow a discharge to Oneida River to be 14.3 MGD for sanitary and 16.5 MGD for industrial wastewater, totaling 30.8 million gallons a day. While two other outfalls for reuse water are intended to be sent back to Micron, the capacity is undefined as far as I can tell. And whether such a reuse will actually be accomplished seems to be uncertain. I'd like to see clarification of all allowable inflows and outflows at this wastewater treatment plant and the industrial wastewater

treatment plant. And I thank you very much for the time to offer these comments.

MR. GREENWOOD: Thank you very much for your comment, sir. With regard to the length of the comment period, I am aware that DEC has -- is aware that there was a request to extend the comment period. If that were to happen, it would be noticed in the ENB. I have no idea whether or not that is going to happen though.

The next person who registered to speak is Donald Hughes. Donald, if you could press the raise your hand button? And if you are a call-in attendee, please press *3 on your phone so that we know which line to unmute. You're unmuted. Please leave your comment.

MR. HUGHES: All right. Am I -- can you hear me?

MR. GREENWOOD: We can hear you.

MR. HUGHES: Okay. Great. So who am I addressing, first off?

MR. GREENWOOD: I am David Greenwood. I'm an administrative law judge here at DEC, and I've been assigned to conduct this public hearing. So you are making public comments on this proposed modification to the Oak Orchard Wastewater Treatment Plant SPDES permit and other permits. And the DEC will collect these comments and then write a response to the comments.

MR. HUGHES: I understand. But, I mean, who else?

There's Andrea Litton (phonetic), Craig Pettinger --

MR. GREENWOOD: Those people are on DEC staff. They are members of the communications team, and there -- the other attendees at the hearing can also hear you.

MR. HUGHES: And the other attendees --

MR. GREENWOOD: Are members of the public who have registered to either attend or to attend and speak at the public hearing.

MR. HUGHES: Okay. Is there a listing of those folks?

MR. GREENWOOD: No, there's not.

MR. HUGHES: Is there a reason that's being hidden?

MR. GREENWOOD: It is not being hidden. It's just not how our system works. It's not how Webex works.

MR. HUGHES: Well, it's essentially the same thing. It's not visible. All right. Well, let me proceed here. My name is Don Hughes, and I live in Syracuse, New York. And I have no idea if you can see me, if my video is on.

MR. GREENWOOD: My video's the only video that's on right now, sir.

MR. HUGHES: I see. Okay. So I've been living in Syracuse for 35 years -- parent, two children, grandparent, activists working with the Sierra Club. And I want to reiterate a lot of the points made by John regarding the need to extend the comment period. And I would ask, when -- I mean we're rapidly approaching that deadline. When will that

decision be made?

MR. GREENWOOD: I do not have any additional information about that.

MR. HUGHES: Okay. Well, in view of the length of the materials, the lengthiness, the highly technical nature, the fact that it is the holiday season, we're in the middle of Hanukkah, we're pproaching Christmas, we just had Thanksgiving -- all those factors should be considered in giving people a break and allowing more time for, reviewing these materials. There's a lot of interest in this wastewater treatment plant, as there has been for the air permit, but I think more for the wastewater treatment plant. Because it is the -- excuse me -- the CHIPS office, which was mentioned previously as one of the applicants -- or the deciders on the EIS has said in their written documents that wastewater represents the primary pathway for PFAS -- that's the per- and polyfluoroalkyl substances -- to get from the semiconductor industry into the environment. And so I want to highlight the importance of controlling PFAS. And that's mainly what I'm going to speak substantively about. PFAS represents -- oh, let me ask you this: Would it be possible to show a diagram with you -- to share that?

MR. GREENWOOD: I don't believe so, but if you want to put something like that in a written comment, I'm sure it will be addressed. Just so you know, this isn't really supposed to

be a question-and-answer period. Normally, we just take comments and --

MR. HUGHES: Yeah. No, I'm just -- this is -- it's unusual for me to participate in an online thing like this where we can't really see each other. Okay. So, I want to state categorically that the permit conditions, as they pertain to PFAS, are just woefully inadequate. I would make the comment that, you know, PFAS have been identified as persistent, as indestructible -- that's why they're called forever compounds -- and highly toxic. That's why we're worried about them. Some people have said that we should be treating PFAS as a five-alarm fire because they are pervasive in our bodies and they are toxic. The study just came out looking at mothers and infants in New Hampshire, and it linked exposure to elevated PFAS to low birth weights and to increased infant mortality.

So this permit identifies two PFAS, two types -- PFOA and PFOS. That's the perfluorooctanoic acid and the perfluorooctanesulfonic acid. And those two compounds have been given target levels. They're not even limits; they're just kind of triggers. But those two compounds are not used by the semiconductor industry. Micron has said they don't use them in their EIS. They have shifted to shorter chain compounds. And so we are completely missing the boat here in terms of measuring and controlling the variety of PFAS that is

actually discharged by the semiconductor industry.

The diagram that I was going to show you shows -- kind of -- it's a pie chart, and it shows this tiny sliver that is those two compounds. A slightly bigger sliver that represents what you're going to pick up with the prescribed analysis, which is method 1633, is 40 compounds. But there's a giant slice of what actually comes out of a semiconductor plant because they buy products with hundreds of PFAS and then those compounds are further transformed into a whole mélange, if you will, of compounds. These things need to be tightly regulated. That is the most important job of this industrial waste for a treatment plant that is to be built at Oak Orchard.

So I would comment that, as John said, we need to look at more inclusive methods to measure the PFAS. And overall, we need to destroy the PFAS. And what that means is not merely concentrating them. I mean I'm glad to see that there's high technology being used to treat the wastewater, including ion exchange and reverse osmosis. But then once you have filtered out the PFAS, you need to run that stuff -- you need that waste stream not just concentrated. You need to run it through a high technology process such as hydro alkaline thermal treatment.

There's a variety of technologies, and that'll be in written comments. But these technologies have been developed.

The semiconductor industry is working on this stuff, and that's what needs to be used here. I think the fundamental problem here is that the consultants that have designed this plant were given -- they were given some instructions from Micron which basically said don't worry about PFAS. Let's see if I can read you that quote here. Just a moment.

MR. GREENWOOD: I don't want to cut you off. At this point (inaudible) written content.

MR. HUGHES: Well, anyway, yeah. I'm sorry for the delay, but let me just say that it -- the -- what Micron told the consultants was the levels of PFAS and mercury that we're going to be thrown at you is you can handle it; your biological treatment can remove it. But biological treatment doesn't remove it is the problem.

And so, the gist of my comments is that you need to -- the department needs to impose much more strict monitoring and control on the PFAS, not only what comes out the effluent pipe into the river but also what gets put into the waste solids that have to be taken offsite and disposed of. Thank you.

MR. GREENWOOD: Okay. Thank you very much for your public comment. I appreciate it. We have gone through all the people who registered to speak. Is there anyone else who is in attendance who would like -- wishes to make a statement? If so, please raise your hand by pressing the graphic along the bottom edge of your screen. It looks like a little hand.

If you are a telephone caller, please press *3 on your phone line so we know which line to unmute. And I'll give you a moment to consider. Anybody that we want to hear from today? Okay. No one else is raising their hand.

Before we adjourn, I will repeat the mailing address and the e-mail address for submitting written comments. The deadline for written comments is 5 p.m. on December 23rd, 2025. By regular mail, send written comments about Micron's proposed projects -- send them to Trendon Choe, regional permit administrator, New York state DEC Region 7 Office at 5786 Widewaters Parkway in Syracuse, New York. The zip code is 13214.

And again, e-mailed comments are to comments.oakorchard2025@dec.ny.gov. And as previously stated, written comments are due by 5 p.m. on December 23rd, 2025. We will have one more public hearing on this matter at 6 p.m. tomorrow evening. It will also be on Webex. I will be conducting it. So if people would like to attend that one as well, feel free at 6 p.m. tomorrow evening. We are adjourned. We can end the recording. And thank you everyone for attendance tonight, and have a good evening.

(HEARING CONCLUDED)

**C E R T I F I C A T I O N**

I, Lisa Schmit, certify that the foregoing transcript of the Oak Orchard Wastewater Treatment Plant Public Hearing was prepared using single-track electronic transcription equipment and is a true and accurate record of the proceeding.

Signature: Lisa Schmit

A T SERVICES OF CENTRAL NEW YORK, INC.
P.O. Box 215, Eastwood Station
Syracuse, New York 13206-0215

Date: March 4, 2026

MR. GREENWOOD: Okay. Thank you. Good evening. My name is David Greenwood, and I am an administrative law judge with the New York State Department of Environmental Conservation Office of Hearings and Mediation Services.

I have been assigned to conduct public comment hearing sessions concerning an application filed by Onondaga County requesting a renewal and modification to the Oak Orchard Wastewater Treatment Plant State Pollution Discharge Elimination System (SPEDES) permit, New York No. 0030317.

The treatment plant discharges treated municipal wastewater to the Oneida River, a class B water. The permit modifications include an increase in average design flow, surface discharge at full build out via modification and improvement of the municipal treatment train and construction of a new industrial treatment train.

The application also proposes the construction of a new wastewater/reclaimed water conveyance corridor to provide Micron New York Semiconductor Manufacturing LLC with water for cooling and ultrapure water for production and sanitary uses. Upgrades to the municipal treatment train and construction of the industrial treatment train and corridor will together permanently impact approximately 4.5 acres of wetlands and 3.29 acres to associated 100-foot adjacent areas. Onondaga County and RES Environmental Operating Company, LLC propose to restore and enhance wetlands on one property in Onondaga

County and one property in Oswego County to compensate for the loss of wetlands resulting from the proposed project.

Additionally, Onondaga County has applied to DEC for a Clean Water Act section 401 water quality certification and associated U.S. Army Corps of Engineers section 404 permit. The DEC also requested and received information regarding the project's consistency with the Climate Leadership and Community Protection Act.

With respect to the new industrial treatment train, the water conveyance, and the wetland mitigation, the proposal is subject to review under the State Environmental Quality Review Act (SEQRA) and the National Environmental Policy Act (NEPA).

This project is a Type I action for SEQR and a SEQR lead agency was coordinated. On June 25th, 2025, the Onondaga County Industrial Development Agency, as joint lead agency with the Creating Helpful Incentives to Produce Semiconductors (CHIPS) program office created by the US Department of Commerce, accepted the draft environmental impact statement for public review and comment.

With respect to the municipal treatment train upgrades, the proposed project is subject to review under SEQRA, and the lead agency was Onondaga County. This project is a Type I action for SEQR, and a SEQR lead agency was coordinated. A negative declaration is on file for that.

The purpose of today's hearing is to provide members of

the public with the opportunity to comment about the surface discharge, municipal SPDES, freshwater wetlands, and water quality certification draft permits. There is a link on DEC's website that leads to Onondaga County's website, where a complete copy of the permit applications can be found. Please note that if you encounter technical difficulties, you may call 518-402-8005, and members of the Bureau of Public Outreach will help you.

On November 12th, 2025, department staff published a combined notice of complete application, a notice of public comment period, and a notice of public comment hearing in the Environmental Notice Bulletin. As provided in the combined notice, written comments may be filed by e-mail and by regular mail until 5 p.m. on December 23rd, 2025. Please note that written and oral comments are given equal weight. If you would like to submit written comments, please send them to Trendon Choe, regional permit administrator, New York State DEC Region 7 Office at 5786 Widewaters Parkway in Syracuse, New York. The zip code is 13214. Or you can e-mail comments to comments.oakorchard2025@dec.ny.gov. And that comment list will come up on the panels that you should be able to see. As previously stated, written comments are due by 5 p.m. on December 23rd, 2025.

Speakers are encouraged to submit lengthy statements in writing and provide only a summary of their comments today.

We have only had -- we have not had anybody who registered to speak tonight, although we have had a number of people registered to attend the hearing. All participants have been muted upon entry to the hearing, and your line will be unmuted when it's your turn to comment. To avoid feedback, please ensure that you are only using one audio input. Again, if you encounter a technical problems during the hearing, please call 518-402-8005.

If you're a call-in attendee, please press *3 on your phone so that we know which line to unmute. You should hear a prompt to alert you that you have been unmuted. Please remember that if you have your device on mute, you will have to unmute the device before you begin speaking.

I'm going to ask if anybody online would like to make a public comment on this matter today? It doesn't matter whether or not you registered to make a comment. If you are interested in making a comment, that's fine. We can take one, and you would press the little hand signal on the middle right of the bottom of your screen. And if you're a call-in user, please press *3 on your phone.

Okay. I'm not seeing anybody raise their hand. So what we normally do in these circumstances is we leave the hearing record open for about a half an hour. That would be until 6:30. So what I'm going to do is I'm going to close the record now. We're going to leave the call running. I'm going

to stop the recording. And then at 6:20, we'll come back on. We'll ask if anybody has joined to see if they want to make a comment. And we'll stop the recording again if we don't have anybody, and then we'll do it one more time at 6:30. So, we can stop the recording, Stephanie, but we're going to leave the call up and running until 6:20 when I'll come back on the line, okay?

(BREAK OFF THE RECORD)

MR. GREENWOOD: Okay. Can we begin recording again? Thank you very much. Hi, folks. We are holding a public comment hearing for the Oak Orchard Wastewater Treatment Plant SPDES permit in the Town of Clay in Onondaga County. We began the hearing at 6:00, and we're just keeping the record open for a half an hour in order to ensure that we can collect any public comments that there are. If anybody who is on the call would like to make a public comment, please press the raise your hand button which is at the bottom of the Webex screen. And if you're a call-in user, please press *3 on your phone so we know which line to unmute. You should hear a prompt to alert you that you've been unmuted, and you can give your comment then.

We did not have anybody who preregistered to make a comment tonight so I'm not anticipating that we have any, but if we do, please feel free to raise your hand. And if you're having any technical problems and you want some help, you can

call 518-402-8005, and people at DEC's communications office will help you get connected so that you can make your comment. Not seeing anybody, we're going to leave the record open for another 10 minutes. And at 6:30, I'll come back on and we'll open -- we'll begin the recording one more time and close the hearing at that point. So, Stephanie, you can pause the recording. And I'll see everybody again at 6:30.

(BREAK OFF THE RECORD)

MR. GREENWOOD: Thank you. This is the public hearing for the application by Onondaga County for renewal and modification to the Oak Orchard Wastewater Treatment Plant SPDES permit in the Town of Clay, Onondaga County. We're here to take public comments on the permits at issue.

And I'm going to ask one more time if anybody would like to make a public comment. Please press the raise your hand button at the bottom of your screen. And if you're a call-in user, please press *3 on your phone, and that way we will know which line to unmute.

I didn't see anybody new come on as an attendee so I think it's unlikely that we're going to have anybody else try to make a public comment here. So before we adjourn, I will repeat the mailing address and the e-mail address for submitting written comments. By regular mail, send written comments about Micron's proposed projects -- send them to -- pardon me -- about the county's proposed changes to the

wastewater treatment plant -- send them to Trendon Choe, regional permit administrator, New York state DEC Region 7 Office at 5786 Widewaters Parkway, Syracuse, New York. And the zip code is 13214. Or by e-mail to comments.oakorchard2025@dec.ny.gov. As previously stated, written comments are due by 5 p.m. on December 23rd, 2025.

I have not seen anybody else raise their hand or try to log in to make a public comment so at this time, the public hearing is closed, and we are adjourned. Good evening, everybody. I hope you have a great night. Thank you all.

(HEARING CONCLUDED)

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