The Chemours Company
P.O. Box 788
Lewiston, NY 14092

(716) 221-4723t
chemours.com

March 31, 2022

Mr. Glenn May
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Dear**:** Mr. May:

**NIAGARA PLANT GROUNDWATER REMEDIATION SYSTEM**
**2021 PERIODIC REVIEW REPORT**

Enclosed please find one copy of the Groundwater Remediation System (GWRS) Periodic Review Report (PRR) for The Chemours Niagara Plant pursuant to Order on Consent No. B9-0206-87-09. This report presents a summary of the system operations and monitoring data collected in 2021. The report demonstrates compliance with remedial objectives and includes affirmation of the site institutional and engineering controls. Chemours has followed the PRR guidance provided by the NYSDEC but included the detailed discussion and analysis as Attachment 3 which is similar to previously submitted "Annual" reports.

The overall effectiveness of the GWRS and Olin Production Well has been established for many years. Hydraulic control has been maintained, such that, remedial goals continued to be achieved in 2021. Decreasing concentration trends discussed in previous annual reports continued to be recognized in the overburden and bedrock water-bearing zones during 2021. The overall decreasing trend of TVOC concentrations in the West Plant and the East Plant is significant and likely attributed to the combined effects of the GWRS and Olin Production Well achieving hydraulic control of contaminant source areas and the gradual reduction in all areas through natural attenuation.

Please contact me at (716) 221-4723 if you have any questions or comments regarding this submittal.

Sincerely,

Chemours

Paul F. Mazierski
Project Director

Enc. NIAGARA 2021 PRR (Report.hw932013.2022-03.NIA_2021_Annual_PRR.pdf)

cc: Charlotte Bethoney/NYSDOH (elec.)
Dawn Hettrick/NYSDOH (elec.)
Chemours Records Retention (elec.)

PARSONS

# GROUNDWATER REMEDIATION SYSTEM PERIODIC REVIEW REPORT - 2021

## NIAGARA PLANT
## NIAGARA FALLS, NEW YORK

*Prepared for:*

**THE CHEMOURS COMPANY FC LLC**
CORPORATE REMEDIATION GROUP

Buffalo Avenue and 26th Street
Niagara Falls, NY 14302

*Prepared by:*

**PARSONS**
40 La Riviere Drive, Suite 350
Buffalo, NY 14202

March 2022

Chemours PN 507070
Parsons PN 450328

# Table of Contents



## FIGURES



## ATTACHMENTS

# ACRONYMS

| Acronym | Definition / Description |
|---|---|
| ACO | Administrative Consent Order |
| BFBT | Blast Fractured Bedrock Trench |
| CatOx | Catalytic Oxidizer |
| COC | Chemicals of concern |
| CRG | (Chemours) Corporate Remediation Group |
| DNAPL | Dense non-aqueous phase liquid |
| DuPont | E. I. du Pont de Nemours and Company |
| FST | Falls Street Tunnel |
| GAC | Granular activated carbon |
| gpm | Gallons per minute |
| GWRS | Groundwater Remediation System |
| lbs/Mgal | Pounds per million gallons |
| µg/l | Micrograms per liter |
| NECCO | Niagara Electrochemical Company |
| NYPA | New York Power Authority |
| NYSDEC | New York State Department of Environmental Conservation |
| ºF | Degrees Fahrenheit |
| PCE | Tetrachloroethene |
| PRR | Periodic Review Report |
| QA/QC | Quality assurance/quality control |
| ROD | Record of Decision |
| RTO | Regenerative Thermal Oxidizer |
| SPDES | State Pollutant Discharge Elimination System |
| TOC | Total organic carbon |
| TVOC | Total volatile organic compounds |
| VOCs | Volatile organic compounds |
| WWTP | Wastewater Treatment Plant |

# 1.0 INTRODUCTION

## 1.1 Brief Summary of Site, Nature and Extent of Contamination, Remedial History

This Periodic Review Report (PRR) was prepared in response to a request from the New York State Department of Environmental Conservation's (NYSDEC) dated February 25, 2010. The PRR Institutional and Engineering Controls (IC/EC) Certification information (**Attachment 1**) has been revised.

Parcels that are considered in this PRR and the annual groundwater remediation system monitoring report (**Attachment 2**) are consistent with the parcels identified in the Administrative Order on Consent (ACO) No. B9-0206-87-09 (1989) and updates related to the sale certain parcels. **Figure 1** presents the site property boundaries. This report covers the 2021 calendar year. The Groundwater Remediation System 2021 Monitoring Annual Report (**Attachment 3**) is a detailed account of monitoring activities and conditions during 2021. Since much of the information provided in the annual report is similar to that recommended for the PRR, **Attachment 3** will be referred to, where appropriate, to limit duplication.

The Niagara Plant (the "Plant") is located in Niagara Falls, New York, and bordered by Buffalo Avenue to the north and the Robert Moses Parkway to the south. **Figure 1** is the site property map and a site location map is provided in **Attachment 3**. The Plant has been in continuous operation since 1896 when the Niagara Electrochemical Company (NECCO) began the manufacture of metallic sodium there. At some point in time, the R&H Chemical Company acquired NECCO. E. I. du Pont de Nemours and Company (DuPont) acquired the Plant from the R&H Chemical Company in 1930. DuPont spun off its Performance Chemicals businesses into a new entity during 2Q15, The Chemours Company FC LLC (Chemours). This includes remediation obligations at a number of properties including the Niagara Plant Site. As of July 1, 2015, Chemours now exists as a completely separate and independent company.

In 1978, DuPont searched its records to determine possible waste disposal areas within the Plant and completed a survey that detailed information on production areas, time of use, process chemistry, and waste disposal practices. In the early 1980s, NYSDEC wells were installed downgradient of the Plant along the Robert Moses Parkway. Results from these wells initiated several subsurface investigations. To date, Chemours has completed more than 60 integrated studies of subsurface contamination or related conditions. Multiple remedial events have occurred at the Plant including the groundwater pump-and-treat systems that are the subject of this PRR.

The focus of the current remedial system is the hydraulic control of contamination in the overburden and bedrock groundwater. Groundwater at the Plant contains various constituents, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. In 1989, DuPont and the NYSDEC entered into an ACO (No. B9-0206-87-09). This ACO directed DuPont to take the necessary steps to mitigate the offsite migration of contaminated groundwater. The NYSDEC issued an Interim Record of Decision (ROD) in December 1989. The ROD included use of a groundwater pump-and-treat system to serve as the groundwater remedy. The remedy was completed in 1992 and included two hydraulic control components: one for the overburden groundwater and another for the bedrock groundwater. The two components are the Groundwater Remediation System (GWRS) and the Olin Production Well described below:

- The GWRS was designed to reduce the offsite migration of contaminants from the overburden and top of bedrock by pumping groundwater from collection wells. The water is then treated in a treatment facility built as part of the remedial action.
- Groundwater in the bedrock zones in the western plant area is controlled by the Olin Production Well. Water is treated by carbon absorption prior to use as non-contact cooling water by Olin and discharged to a State Pollutant Discharge Elimination System (SPDES) permitted outfall.

Between 1992 and the present, multiple improvements have been made to the collection system including: treatment system upgrades, adding pumping wells, and installing blast fractured bedrock trenches (BFBTs) with pumping wells. Section 2.3 provides details on the post-ROD remedy improvements.

In 2019, a Purchase and Sale Agreement was executed in with 2747 Buffalo Ave., LLC to sell certain parcels of the Chemours Niagara property (formally DuPont Niagara Plant Buffalo Ave and 26th Street, Niagara Falls NY), specifically Parcel 159.16-2-5 and a newly subdivided parcel referred to as New Lot A in Parcel 159.16-1-3 (see attached **Attachment 2** of this PRR). The notification of sale was included in the 2019 PRR. Site remediation responsibilities related to Order on Consent No. B9-0206-87-09 remain with Chemours. 2747 Buffalo Ave LLC is proceeding with demolition of large former manufacturing buildings, however Chemours has no involvement in these operations.

## 1.2 Recommendations

It is recommended that Chemours continues to operate under the current pumping scheme with a combination of the BFBTs and conventional pumping wells for A-zone groundwater, Olin Production Well for bedrock zones in the west plant, and monitored natural attenuation in the east plant bedrock. It is also recommended that Chemours continue with its plan to replace existing pumping wells in the east plant and PW-18/PW-19 with a total of three BFBTs.

# 2.0 SITE OVERVIEW

The Plant site is located along the south side of Buffalo Avenue north of the Robert Moses Parkway in Niagara Falls, NY. Gill Creek intersects the Plant, and the Niagara River is to the south. The area is heavily industrialized with numerous chemical manufacturing plants and remedial sites. As stated in the ROD (issued by the NYSDEC in 1989), there are two separate operable units: overburden and bedrock. Both units are impacted with chemical of concern (COCs), primarily VOCs, SVOCs, and metals.

The basic remedial chronology and noteworthy remedial changes are provided below:

**Niagara Plant Remedial Chronological Summary**

| DATE | ACTION |
|---|---|
| 1978 | Waste management practices and waste disposal areas are evaluated. |
| 1980 – 1989 | Targeted Initial Remedial Program (B-107 Area, Gill Creek and B-310 Area, West Yard capping, Adams Avenue sewer cutoff wall). |
| Late 1982/1983 | NYSDEC wells installed along Robert Moses Parkway |
| 1983-1988 | Remedial Investigation (hydrogeologic and manmade passageways investigations, groundwater modeling) |
| 1984-1988 | Remedial Studies |
| September 1989 | Administrative Order on Consent signed |
| January 1990 | NYSDEC Record of Decision signed |
| 1990/1991 | GWRS Construction |
| October-December 1991 | GWRS startup and prove-out |
| 1992-present | Long-term operation and maintenance (O&M) of remedy |
| **Chemours Niagara Plant Noteworthy Remedy Changes** | |
| January 1, 1992 | Continuous operation of remedy begins |
| 1993 | Interceptor trench installed between Staub Road and the railroad bridge on west bank of Gill Creek and added to the GWRS (PW-36). |
| 1995 | Pumping wells PW-10, PW-18, PW-19 deepened into A-Zone top-of-bedrock |
| 1996 | Continuous acid addition and pH adjustment system added to GWRS for control of calcium carbonate scaling |
| 1996/1997 | Pumping well level control upgrade and switch to on/off operation |
| 2002-2005 | BFBTs installed in SW Plant to enhance GWRS hydraulic control |
| 2005 | Air emissions controls (catalytic oxidizer [CatOx] and scrubber) added to pretreatment system to address increased load from BFBTs |

**Niagara Plant Remedial Chronological Summary**

| | |
|---|---|
| 2007 | GWRS overhaul completed: pretreatment technology changed from steam stripping to air stripping; replacement of the CatOx with a regenerative thermal oxidizer (RTO), majority of groundwater conveyance piping system and heat trace replaced; and installation of Honeywell Experion™ Process Knowledge System (PKS) for process control and storage of operations data. |
| October 2008 | Initiation of the six-month test to assess hydraulic control of BFBTs without west header wells |
| 3Q14 – 1Q15 | Pumping well conveyance line upgrade project, including PW-36 converted to cascade program |
| July 1, 2015 | Completion of spin-off from DuPont to The Chemours Company FC LLC (Chemours) |
| 2016 | A liner was installed in the 140,000-gallon equalization (EQ) tank.<br><br>NYSDEC accepted revisions to the sampling program, such that, lower frequency parameters and wells are completed all on the same 5-year cycle. |
| 2018 | Chemours effectively completed shut down and decontamination of Reactive Metals Operations.<br><br>The RTO was replaced with a new unit. |
| 2021 | BFBT installed in East Plant, operation of BFBT began December 20, 2021. |

## 2.1 Remedial Objective

As outlined in the ROD, the interim remedial system has the following basic remedial objectives:

Plant Site Overburden

- "Create a hydraulic barrier in the overburden (A-zone) that will reduce lateral off-plant contaminant migration by pumping groundwater from a line of 22 collection wells to a new water treatment facility."
- "Install and operate a new water treatment facility to strip and condense contaminants present in groundwater. Periodically, condensed organics will be shipped off-plant as hazardous waste."

Plant Site Bedrock

- "Off-site migration of contaminants from bedrock zones in the western plant area will continue to be controlled by pumping the Olin Production Well."
- "Water from the bedrock zone is treated by carbon adsorption, prior to use by Olin as non-contact cooling water, and then it is discharged to a SPDES permitted outfall." There is an agreement between Chemours and Olin that the Olin Production Well will be operated at an average of 500 gallons per minute (gpm).

## 2.2 Post-ROD Remedy Changes

Subsequent to the 1992 Gill Creek remediation, it was determined that increased capture was appropriate between pumping well PW-35 and Gill Creek. Therefore a sheet pile wall and interceptor trench, referred to as PW-36, were installed in this area.

After approximately seven years of performance review, DuPont recommended increasing the groundwater control in the southwest plant in the vicinity of Staub Road (Southwest Plant area). After evaluating several alternate technologies, BFBTs were selected to improve hydraulic control. In BFBTs, *in-situ* detonation of explosive charges are used to create fractures in the bedrock to enhance hydraulic conductivity. These enhanced hydraulic conductivities allow for more efficient and effective groundwater collection and hydraulic control than can be achieved using conventional single point groundwater pumping wells.

In 2002, a BFBT (PW-37) was installed just north of Staub Road, southwest of Building B-130. A second BFBT (PW-39) was installed in 2004 along Staub Road just west of Gill Creek. These two new wells were put into production in 2005. During and after the implementation of these BFBTs, various hydraulic tests were completed to determine the effectiveness of capturing the plume. The BFBTs proved to be a sufficient solution to improving groundwater capture at the Plant (DuPont 2006). The improvement was significant enough that a BFBT hydraulic test was started on October 1, 2008, to test the hydraulic effectiveness of PW-37 and PW-39 without West Plant wells PW-1 through PW-14, PW-16, and PW-35. A report summarizing the results of the test was submitted to the NYSDEC in the Modified Operations Evaluation Report (MOE) (DuPont 2009).

In 2021, a BFBT was installed in the East Plant (PW-43) south of Adams Avenue and north of PW-30 and PW-32. This BFBT is 250 feet in length and was installed in a manner similar to the existing BFBTs in the West Plant. Four piezometers were installed within the trench, two on the eastern side and two on the western side of the trench. PW-43 came online December 20, 2021. This BFBT replaced pumping wells PW-28, PW-30, PW-32, and PW-34.

Results of the BFBT tests indicated an improved performance in hydraulic control. The percent captured has increased due to the BFBTs, and there is an increase in drawdown in the areas with the highest concentrations of total VOCs. The MOE (2009) report concluded that the BFBTs achieved sufficient hydraulic control without pumping from West Plant wells PW-1 through PW-14, PW-16, and PW-35. Subsequent quarterly and annual reports further support the conclusions that the BFBTs provide sufficient control. NYSDEC responded to the 2009 MOE and the comments were addressed in an updated evaluation: MOE – 2013 Update Report (Parsons, 2013). In 2Q2013 pumping well PW-35 was re-commissioned and placed online to improve hydraulic control in the area near Gill Creek. Chemours is continuing operation of PW-16, PW-18, PW-19, PW-35, PW-36, PW-37, and PW-39 for groundwater control in the West Plant area.

# 3.0 EVALUATE REMEDY PERFORMANCE EFFECTIVENESS AND PROTECTIVENESS

## 3.1 Summary

Each year, the annual report provides details and demonstration of the performance, effectiveness, and protectiveness of the Niagara Plant remedy. The overall effectiveness of the GWRS and the Olin Production Well in controlling off-site groundwater flow has been demonstrated through hydraulic head and groundwater quality monitoring during 29 years of operation. The GWRS 2021 operations are summarized below and support the remedy's performance, effectiveness, and protectiveness:

- System uptime was 97 percent for the 23 original pumping wells that are still in use.
- PW-37 uptime was 97 percent.
- PW-39 uptime was 97 percent.
- Olin Production Well system uptime was 100% percent.
- Operation of BFBT pumping wells PW-37 and PW-39 continued throughout 2021 along with a reduced number of the original 23 pumping wells, with improved capture at the Plant.
- Hydraulic control was exercised over 95 percent of the Plant area for 2021.
- Monitoring of dense non-aqueous phase liquid (DNAPL) conducted in 2021 indicated no DNAPL was present at PW-39.

The GWRS has been effective in removing chemical mass from the subsurface groundwater by providing hydraulic control. Mass removal continues to be greater than before the installation and operation of the West Plant BFBTs in 2005. In 2021, approximately 2.9 tons of organic compounds were removed from groundwater by the GWRS. There was a clear increase in mass recovery rates after the installation of the BFBTs. By comparison, an average of 1.5 tons/year was removed from 2000 to 2005.

The Olin Production Well continued with a mass removal rate within the range of historical values, but with a noted increase in 2020 and 2021. The yearly estimated mass of organic compounds removed was 1.2 tons in both 2020 and 2021 compared with an average mass removal of 0.59 tons/year from 2009 through 2019. A corollary increase in concentrations was observed in quarterly influent sampling in 4Q2019 and continued through 2021. This increase in concentrations and mass removal follows increases in upgradient C/CD monitoring wells indicating the Olin Production Well is acting as designed and capturing the migration of VOCs in this zone (see **Attachment 3** for more details).

The combined effect of the GWRS (including outfall 023) and the Olin Production Well resulted in the removal of approximately 4.2 tons of organic compounds in 2021.

## 3.2 Compliance with Remedial Objectives

Extensive water-level data collected over the 29 years of system operation have illustrated that hydraulic heads in both the A-Zone overburden and A-Zone bedrock are depressed in the vicinity of operating GWRS pumping wells. As a result, off-site groundwater flow has been reduced by hydraulic control, and COC concentrations are

decreasing as the result of groundwater control. In 2021, the hydraulic control in the A-zone overburden and bedrock was 95%. The Olin Production Well was operational 100 percent of the year at average flow rates greater than 500 gpm. Hydraulic heads in the bedrock zone confirm the hydraulic effectiveness established by pumping this well, details are provided in **Attachment 3** (2021 Annual Report). Off-site COC migration from the West Plant area is controlled, confirming that the remedial objectives established in the ACO are met.

Groundwater from the GWRS pumping wells (A-Zone wells) is treated through stripping and discharged to the City of Niagara Falls Wastewater Treatment Plant. Water from the bedrock zone is treated by carbon adsorption prior to use by Olin as non-contact cooling water and is subsequently discharged to an SPDES permitted outfall. In 2021, these activities demonstrated compliance with the remedial objectives.

# 4.0 IC/EC PLAN COMPLIANCE PLAN REPORT

The IC/EC compliance plan is integrated into the O&M Plan, as detailed in the ACO (1989) and the ROD (1990), as well as given in Box 3 and Box 4 of the NYSDEC Institutional and Engineering Control Certificate (**Attachment 1**).

Box 4 of the NYSDEC Institutional and Engineering Control Certificate provides control descriptions for each of the properties associated with the Plant, as follows:

> Chemours Niagara Plant site is fenced and has a 24 hour security. The Plant has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit. Remedial Action Consent Order (1989) signed September 22, 1989 and the Record of Decision issued December 1989.

The Plant controls remained the same in 2021 with a 24 hour security system, and a pump-and-treat system that discharges to the City of Niagara Falls POTW after pre-treatment. Therefore, the Plant remains in compliance with the site controls.

Further information regarding the IC/EC compliance is given in the O&M Compliance section of this PRR and in **Attachment 3**.

# 5.0 MONITORING PLAN REPORT

The overall monitoring plan is presented in Attachment A to the ACO (Woodward-Clyde 1989) and in the agency approved Quality Assurance Project Plan for groundwater monitoring at the Plant (DuPont 1999). The scope of the monitoring program is to document groundwater levels for evaluating hydraulic control of the pumping systems and to collect water samples (groundwater, surface water, and process) to analyze for COC concentrations.

Groundwater elevation monitoring and groundwater sampling were conducted during 2021 in accordance with the monitoring schedules presented in **Attachment 3**. Water level measurements and groundwater samples are taken to assess the effectiveness of the GWRS and Olin Production Well pumping systems in controlling groundwater flow. Approximately 180 water level locations were monitored each quarter to assess hydraulic control. Forty-eight locations were sampled for COC concentrations during 2021. **Attachment 3** provides data, discusses the monitoring program, and demonstrates compliance with the AOC monitoring scope.

Each year, Chemours submits quarterly data packages and an annual report (PRR) to the NYSDEC. In 2021, each of these documents provided updated, detailed information related to effectiveness of the remedial program (Parsons 2021b through 2021e).

# 6.0 OPERATIONS AND MAINTENANCE PLAN REPORT

The O&M plan is integrated into the operations and maintenance portion of the ACO (Woodward-Clyde 1989). The details of the O&M plan are summarized in three categories for overburden groundwater: (1) system start-up; (2) normal operations; and (3) temporary shutdowns. The system start-up applied to the early period of groundwater pumping and is therefore no longer applicable to the current system. In normal operations, “the level control will be set in each well as determined appropriate” (NYSDEC 1989). The appropriate level is dictated by achievement of the remedial goals for groundwater, which is reducing the offsite migration of COCs.

Temporary shutdowns of the overburden GWRS and the Olin Production Well are allowable under the ACO. Shutdowns of up to one week will have minimal impact, but reasonable efforts are made to limit the duration of scheduled and unscheduled downtime. Requirements in the O&M plan, including updates in 2012 (see **Attachment 3**) specify that the NYSDEC be immediately notified of periods of downtime longer than 48 hours for pumping well(s). Other scheduled and unscheduled treatment system downtime will be documented in the quarterly data packages and annual PRR reports. This minor change is justified by the GWRS equalization tank which has capacity to store several days of water from pumping well operation while treatment maintenance is performed. For bedrock groundwater, the Olin system is to operate at an average monthly flow rate of 500 gpm. Additionally, the NYSDEC is notified if there are changes in the status of the Olin system’s hydraulic control.

The system operated in compliance with the O&M plan during the period reported in this PRR. Details of the 2021 O&M activities are provided in **Attachment 3**. System uptime was 97 percent for the 23 original pumping wells that are still in use. PW-37 uptime was 97 percent, and PW-39 uptime was 97 percent. Olin Production Well system uptime was 100 percent. Operation of BFBT pumping wells PW-37 and PW-39 continued along with a reduced number of the original 23 pumping wells throughout 2021, with improved capture at the Plant. The NYSDEC was notified of all applicable changes to the site remediation system.

Each year Chemours submits quarterly data packages and an annual report to the NYSDEC. Each of these documents provides updated information related to effectiveness of the remedial program.

# 7.0 PRR CONCLUSIONS

***Conclusions***

The requirements of the Plant ACO, ROD and subsequent correspondence with the NYSDEC (NYSDEC 2005, 2008, 2011, and 2016) were met during 2021. The Plant remains an industrial use property with a 24-hour security system. There have been no significant changes in property use during 2021 that would necessitate alteration of the remedy or constitute an unacceptable risk to people or the environment. Components of the O&M plan are in compliance with the ACO as demonstrated in this PRR and in **Attachment 3**. The average up-time for the GWRS, BFBTs and Olin well was greater than 97% in 2021, and the NYSDEC was notified of systems down-times as appropriate. The Olin Production Well average rate was greater than 500 gpm in 2021. The remedial requirements are in compliance; therefore, no corrective measures are needed.

Extensive water-level and chemical data have been collected over 29 years of system operation. These data have illustrated that the remedial objectives of the Plant are being attained. Off-site groundwater flow has been reduced by hydraulic control, and COC concentrations are decreasing as the result of groundwater control. In 2021, the hydraulic control in the A-zone overburden and bedrock was approximately 95%, and the Olin Production Well continued to meet the remedial objectives in the bedrock zones. The BFBTs continue to provide sufficient control in the West Plant as outlined in the MOE report (DuPont 2009) and the MOE 2013 Update Report (Parsons, 2013).

# 8.0 REFERENCES

DuPont Corporate Remediation Group (CRG). 1999. Quality Assurance Project Plan: Groundwater Monitoring Program, DuPont Niagara Plant, Version 4.0. May 1999.

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_____. 2011. M. Hinton. Correspondence RE: Proposal for Activated Carbon Utilization Study, April 24, 2011.

Parsons 2013. Blast Fractured Bedrock Trench Modified Operations Evaluation – 2013 Update. February, 2013.

_____. 2021a. Groundwater Remediation System Periodic Review Report 2020, Chemours Niagara Plant. March 2021.

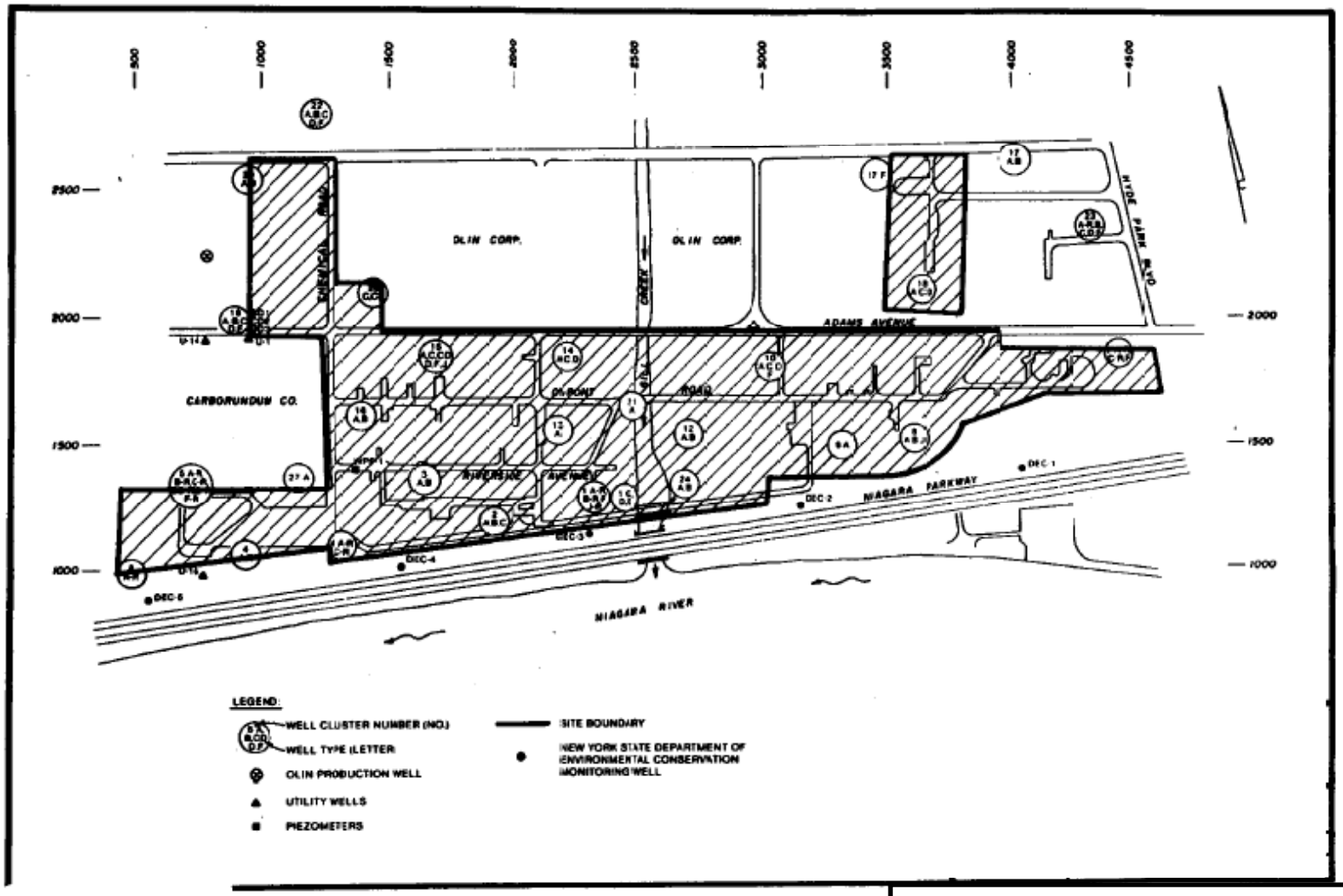
_____. 2021b. Chemours Niagara Plant Groundwater Remediation System First Quarter 2021 Data Package. May, 2021.

_____. 2021c. Chemours Niagara Plant Groundwater Remediation System Second Quarter 2021 Data Package. August, 2021.

_____. 2021d. Chemours Niagara Plant Groundwater Remediation System Third Quarter 2021 Data Package. November, 2021.

Woodward-Clyde 1989. Final Report DuPont Niagara Falls Plant Interim Remedial Program, September 1989.

# FIGURES



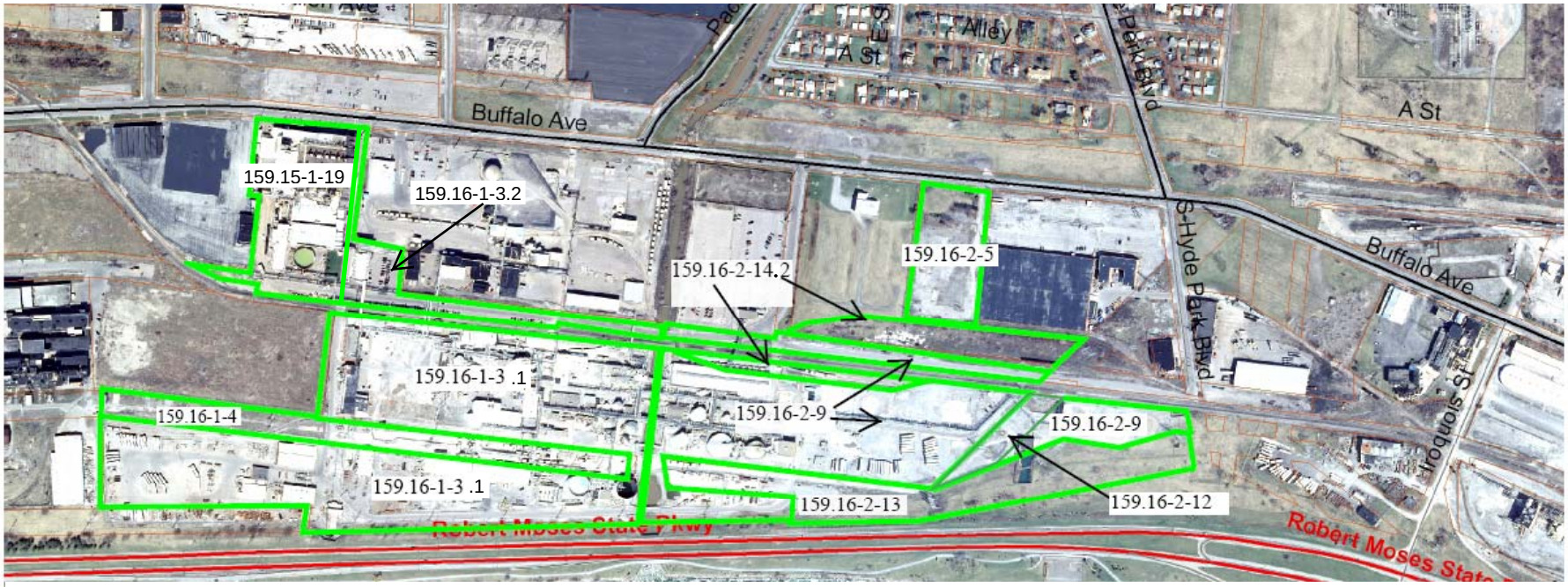

DNI 6191791

# FIGURE 1

SITE BOUNDARIES MAP
CHEMOURS NIAGARA PLANT SITE
NIAGARA FALLS, NY

Source: Administrative Order on Consent No. B9-0206-87-09 (1989)

**PARSONS**
40 La Riviere Dr., Suite 350 Buffalo, NY 14202

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NIAGARA COUNTY, NEW YORK
DEPARTMENT OF REAL PROPERTY SERVICES

| Parcel ID | Owner |
|---|---|
| 159.16-1-3 .1 | Chemours |
| 159.16-1-4 | Chemours |
| 159.16-2-5 | 2747 Buffalo Avenue LLC |
| 159.16-2-9 | Chemours |
| 159.16-2-12 | Niagara Mohawk |
| 159.16-2-13 | Chemours |
| 159.16-2-14.2 | Chemours |
| 159.16-1-3.2 | Chemours |
| 159.16-1-19 | 2747 Buffalo Avenue LLC |

Source: Niagara County Online Mapping System
http://gis2.erie.gov/GC/NiagaraCountyNY/PublicLaunchpage.aspx

# FIGURE 2

SITE PARCELS MAP
CHEMOURS NIAGARA PLANT SITE
NIAGARA FALLS, NY

PARSONS
40 La Riviere Dr., Suite 350 Buffalo, NY 14202

# ATTACHMENT 1
# INSTITUTIONAL AND ENGINEERING CONTROLS CERTIFICATION FORMS

**Enclosure 1**

**Certification Instructions**

**I. Verification of Site Details** (Box 1 and Box 2):

Answer the three questions in the Verification of Site Details Section. The Owner and/or Qualified Environmental Professional (QEP) may include handwritten changes and/or other supporting documentation, as necessary.

**II. Certification of Institutional Controls/ Engineering Controls (IC/ECs)**(Boxes 3, 4, and 5)

1.1.1. Review the listed IC/ECs, confirming that all existing controls are listed, and that all existing controls are still applicable. If there is a control that is no longer applicable the Owner / Remedial Party should petition the Department separately to request approval to remove the control.

2. In Box 5, complete certifications for all Plan components, as applicable, by checking the corresponding checkbox.

3. If you cannot certify "YES" for each Control listed in Box 3 & Box 4, sign and date the form in Box 5. Attach supporting documentation that explains why the **Certification** cannot be rendered, as well as a plan of proposed corrective measures, and an associated schedule for completing the corrective measures. Note that this **Certification** form must be submitted even if an IC or EC cannot be certified; however, the certification process will not be considered complete until corrective action is completed.

If the Department concurs with the explanation, the proposed corrective measures, and the proposed schedule, a letter authorizing the implementation of those corrective measures will be issued by the Department's Project Manager. Once the corrective measures are complete, a new Periodic Review Report (with IC/EC Certification) must be submitted within 45 days to the Department. If the Department has any questions or concerns regarding the PRR and/or completion of the IC/EC Certification, the Project Manager will contact you.

**III. IC/EC Certification by Signature (**Box 6 and Box 7**):**

If you certified "YES" for each Control, please complete and sign the IC/EC Certifications page as follows:

- For the Institutional Controls on the use of the property, the certification statement in Box 6 shall be completed and may be made by the property owner or designated representative.

- For the Engineering Controls, the certification statement in Box 7 must be completed by a Professional Engineer or Qualified Environmental Professional, as noted on the form.

**Enclosure 2**
**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION**
**Site Management Periodic Review Report Notice**
**Institutional and Engineering Controls Certification Form**

**Site Details** **Box 1**

**Site No.** **932013**

**Site Name Chemours Plant (former DuPont Plant Site)**

Site Address: Buffalo Avenue Zip Code: 14302
City/Town: Niagara Falls
County: Niagara
Site Acreage: 52.000

Reporting Period: December 31, 2020 to December 31, 2021

| | YES | NO |
|---|---|---|
| 1. Is the information above correct? | ☑ | ☐ |
| If NO, include handwritten above or on a separate sheet. | | |
| 2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period? | ☐ | ☑ |
| 3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))? | ☐ | ☑ |
| 4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period? | ☐ | ☑ |
| **If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.** | | |
| 5. Is the site currently undergoing development? | ☐ | ☑ |

**Box 2**

| | YES | NO |
|---|---|---|
| 6. Is the current site use consistent with the use(s) listed below? Commercial and Industrial | ☑ | ☐ |
| 7. Are all ICs in place and functioning as designed? | ☑ | ☐ |

**IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.**

**A Corrective Measures Work Plan must be submitted along with this form to address these issues.**

Signature of Owner, Remedial Party or Designated Representative Date

**SITE NO. 932013** **Box 3**

**Description of Institutional Controls**

| Parcel | Owner | Institutional Control |
|---|---|---|
| ~~151.~~16-1-3.2 | The Chemours Company FL LLC | O&M Plan |

Correction the parcel is 159-

Monitoring Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

| | | |
|---|---|---|
| **159.15-1-19 Lot A** | 2747 Buffalo Ave., LLC | Monitoring Plan<br>O&M Plan |

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

| | | |
|---|---|---|
| **159.16-1-3.1** | The Chemours Company FL LLC | Monitoring Plan<br>O&M Plan |

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

| | | |
|---|---|---|
| **159.16-1-4** | The Chemours Company FL LLC | Monitoring Plan<br>O&M Plan |

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

| | | |
|---|---|---|
| **159.16-2-12** | Niagara Mowhawk Power Corp. | Monitoring Plan<br>O&M Plan |

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

| | | |
|---|---|---|
| **159.16-2-13** | The Chemours Company FL LLC | Monitoring Plan<br>O&M Plan |

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

| | | |
|---|---|---|
| **159.16-2-14.2** | The Chemours Company FL LLC | |

Monitoring Plan
O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

**159.16-2-5** 2747 Buffalo Ave., LLC

O&M Plan

Monitoring Plan

Remedial Action Consent Order signed September 22, 1989 and Record of Decision issued December 1989.

**159.16-2-9** The Chemours Company FL LLC

Monitoring Plan
O&M Plan

Remedial Action Consent Order signed September 22, 1989 and the Record of Decision issued December 1989.

**Box 4**

**Description of Engineering Controls**

| Parcel | Engineering Control |
|---|---|
| **151.16-1-3.2** | Groundwater Treatment System<br>Groundwater Containment<br>Fencing/Access Control<br>Monitoring Wells |

The site is fenced and has manned 24 hour security. Site has pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

| | |
|---|---|
| **159.15-1-19 Lot A** | Groundwater Treatment System<br>Groundwater Containment<br>Fencing/Access Control<br>Monitoring Wells |

The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

| | |
|---|---|
| **159.16-1-3.1** | Groundwater Treatment System<br>Cover System<br>Groundwater Containment<br>Fencing/Access Control<br>Monitoring Wells |

The site is fenced and has manned 24 hour security. Site has pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit. The West Yard has a cover system.

| | |
|---|---|
| **159.16-1-4** | Groundwater Treatment System<br>Groundwater Containment<br>Fencing/Access Control<br>Monitoring Wells |

| Parcel | Engineering Control |
|---|---|

The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

**159.16-2-12**

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

**159.16-2-13**

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

**159.16-2-14.2**

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. The site has a pump and treat system to contain and treat groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial permit.

**159.16-2-5**

Groundwater Treatment System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and has manned 24 hour security. The has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit.

**159.16-2-9**

Groundwater Treatment System
Cover System
Groundwater Containment
Fencing/Access Control
Monitoring Wells

The site is fenced and had manned 24 hour security. The site has a pump and treat system to contain and treat contaminated groundwater. Discharge from the GWRS is to the City of Niagara Falls POTW under an industrial pretreatment permit. Note: Areas considered under the ACO(1989) are given in Figure 1. Where parcel extents are larger then the areal extent of the remedial action, the remedial controls may only apply to the area of the parcel that is within the remedial action delineation (Figure1).

**Box 5**

**Periodic Review Report (PRR) Certification Statements**

1. I certify by checking "YES" below that:

a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the Engineering Control certification;

b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and compete.

| YES | NO |
|---|---|
| ☑ | ☐ |

2. For each Engineering control listed in Box 4, I certify by checking "YES" below that all of the following statements are true:

(a) The Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

(b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

(c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

(d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

(e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

| YES | NO |
|---|---|
| ☑ | ☐ |

**IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.**

**A Corrective Measures Work Plan must be submitted along with this form to address these issues.**

Signature of Owner, Remedial Party or Designated Representative

Date

**IC CERTIFICATIONS**
**SITE NO. 932013**

**Box 6**

**SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE**

I certify that all information and statements in Boxes 1,2, and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I PAUL F MAZIERSKI at CHEMOURS CRG, PO BOX 788 LEWISTON NY 14092,
print name print business address

am certifying as CHEMOURS REMEDIATION PROJECT DIRECTOR (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

Signature of Owner, Remedial Party, or Designated Representative Rendering Certification

3/31/22
Date

## EC CERTIFICATIONS

**Box 7**

### Qualified Environmental Professional Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I James W Schuetz (print name) at 40 La Riviere Dr Suite 350, Suite 122 Buffalo NY 14202 (print business address),

am certifying as a Qualified Environmental Professional for the Chemours CRG (Owner or Remedial Party)

Signature of Qualified Environmental Professional, for the Owner or Remedial Party, Rendering Certification

Stamp (Required for PE)

3/31/2022
Date

**Enclosure 3**
**Periodic Review Report (PRR) General Guidance**

I. Executive Summary: (1/2-page or less)
   A. Provide a brief summary of site, nature and extent of contamination, and remedial history.
   B. Effectiveness of the Remedial Program - Provide overall conclusions regarding;
      1. progress made during the reporting period toward meeting the remedial objectives for the site
      2. the ultimate ability of the remedial program to achieve the remedial objectives for the site.
   C. Compliance
      1. Identify any areas of non-compliance regarding the major elements of the Site Management Plan (SMP, i.e., the Institutional/Engineering Control (IC/EC) Plan, the Monitoring Plan, and the Operation & Maintenance (O&M) Plan).
      2. Propose steps to be taken and a schedule to correct any areas of non-compliance.
   D. Recommendations
      1. recommend whether any changes to the SMP are needed
      2. recommend any changes to the frequency for submittal of PRRs (increase, decrease)
      3. recommend whether the requirements for discontinuing site management have been met.

II. Site Overview (one page or less)
   A. Describe the site location, boundaries (figure), significant features, surrounding area, and the nature and extent of contamination prior to site remediation.
   B. Describe the chronology of the main features of the remedial program for the site, the components of the selected remedy, cleanup goals, site closure criteria, and any significant changes to the selected remedy that have been made since remedy selection.

III. Evaluate Remedy Performance, Effectiveness, and Protectiveness
   Using tables, graphs, charts and bulleted text to the extent practicable, describe the effectiveness of the remedy in achieving the remedial goals for the site. Base findings, recommendations, and conclusions on objective data. Evaluations and should be presented simply and concisely.

IV. IC/EC Plan Compliance Report (if applicable)
   A. IC/EC Requirements and Compliance
      1. Describe each control, its objective, and how performance of the control is evaluated.
      2. Summarize the status of each goal (whether it is fully in place and its effectiveness).
      3. Corrective Measures: describe steps proposed to address any deficiencies in ICECs.
      4. Conclusions and recommendations for changes.
   B. IC/EC Certification
      1. The certification must be complete (even if there are IC/EC deficiencies), and certified by the appropriate party as set forth in a Department-approved certification form(s).

V. Monitoring Plan Compliance Report (if applicable)
   A. Components of the Monitoring Plan (tabular presentations preferred) - Describe the requirements of the monitoring plan by media (i.e., soil, groundwater, sediment, etc.) and by any remedial technologies being used at the site.
   B. Summary of Monitoring Completed During Reporting Period - Describe the monitoring tasks actually completed during this PRR reporting period. Tables and/or figures should be used to show all data.
   C. Comparisons with Remedial Objectives - Compare the results of all monitoring with the remedial objectives for the site. Include trend analyses where possible.
   D. Monitoring Deficiencies - Describe any ways in which monitoring did not fully comply with the monitoring plan.
   E. Conclusions and Recommendations for Changes - Provide overall conclusions regarding the monitoring completed and the resulting evaluations regarding remedial effectiveness.

VI. Operation & Maintenance (O&M) Plan Compliance Report (if applicable)
   A. Components of O&M Plan - Describe the requirements of the O&M plan including required activities, frequencies, recordkeeping, etc.
   B. Summary of O&M Completed During Reporting Period - Describe the O&M tasks actually completed

during this PRR reporting period.

C. Evaluation of Remedial Systems - Based upon the results of the O&M activities completed, evaluated the ability of each component of the remedy subject to O&M requirements to perform as designed/expected.
D. O&M Deficiencies - Identify any deficiencies in complying with the O&M plan during this PRR reporting period.
E. Conclusions and Recommendations for Improvements - Provide an overall conclusion regarding O&M for the site and identify any suggested improvements requiring changes in the O&M Plan.

VII. Overall PRR Conclusions and Recommendations

A. Compliance with SMP - For each component of the SMP (i.e., IC/EC, monitoring, O&M), summarize;
    1. whether all requirements of each plan were met during the reporting period
    2. any requirements not met
    3. proposed plans and a schedule for coming into full compliance.
B. Performance and Effectiveness of the Remedy - Based upon your evaluation of the components of the SMP, form conclusions about the performance of each component and the ability of the remedy to achieve the remedial objectives for the site.
C. Future PRR Submittals
    1. Recommend, with supporting justification, whether the frequency of the submittal of PRRs should be changed (either increased or decreased).
    2. If the requirements for site closure have been achieved, contact the Departments Project Manager for the site to determine what, if any, additional documentation is needed to support a decision to discontinue site management.

VIII. Additional Guidance

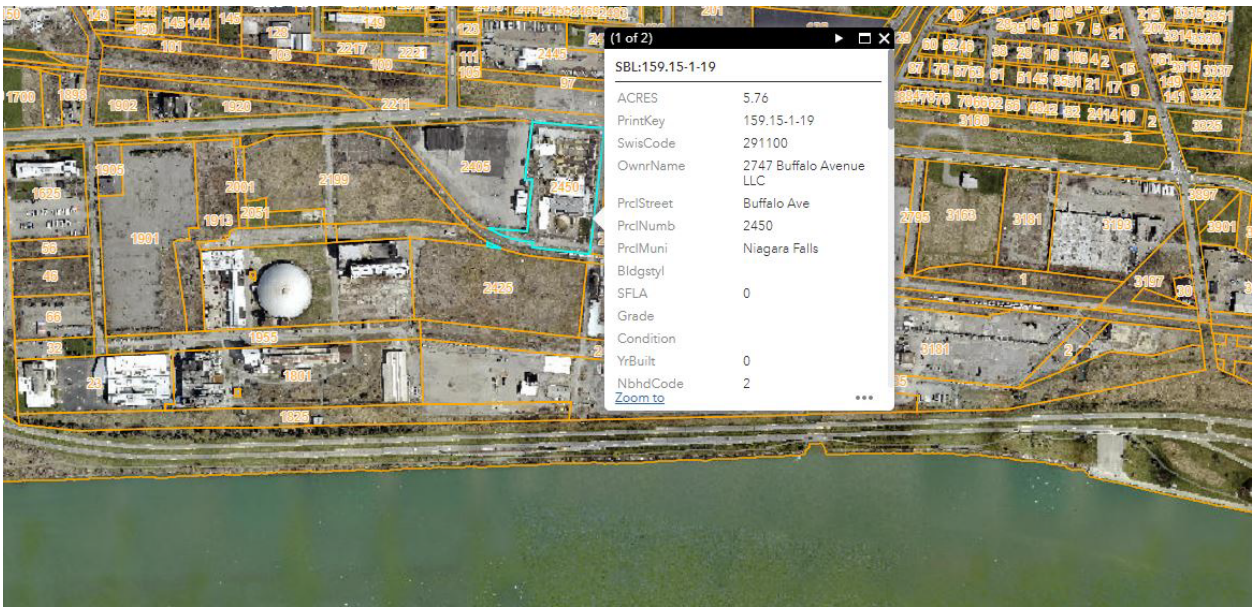
Additional guidance regarding the preparation and submittal of an acceptable PRR can be obtained from the Departments Project Manager for the site.

# ATTACHMENT 2
# NIAGARA COUNTY ON-LINE MAPPING SYSTEM
# PARCEL DETAIL REPORTS

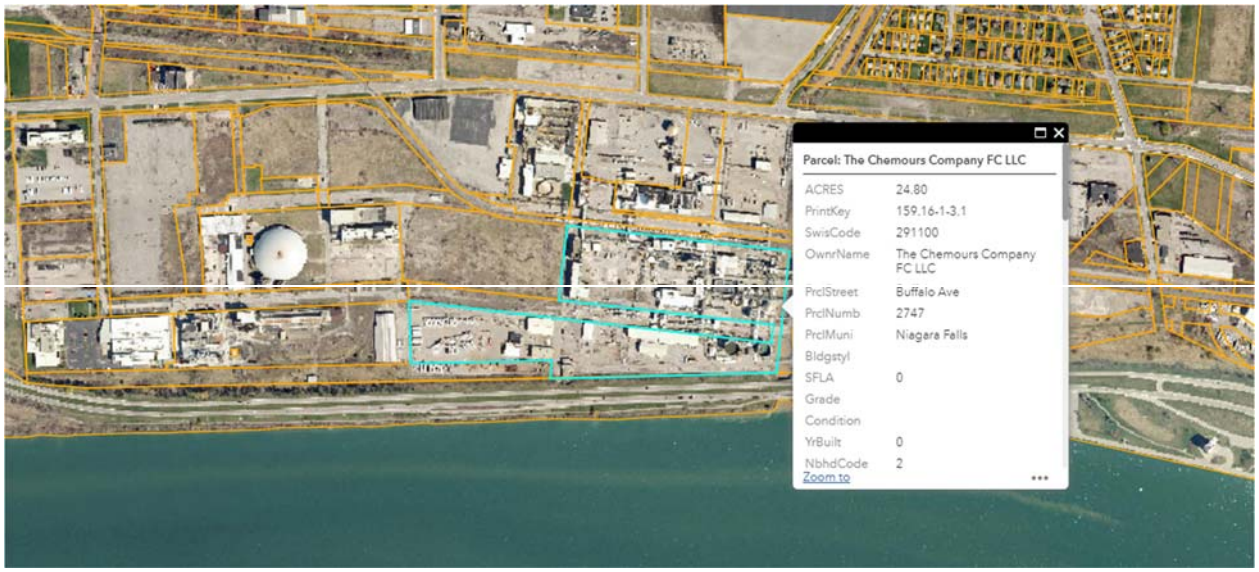
PARSONS

**2747 BUFFALO AVENUE LLC PARCEL 159.15-1-19**

2021 Chemours Annual PRR
Niagara County On-Line Mapping
System Parcel Detail Reports - 2021



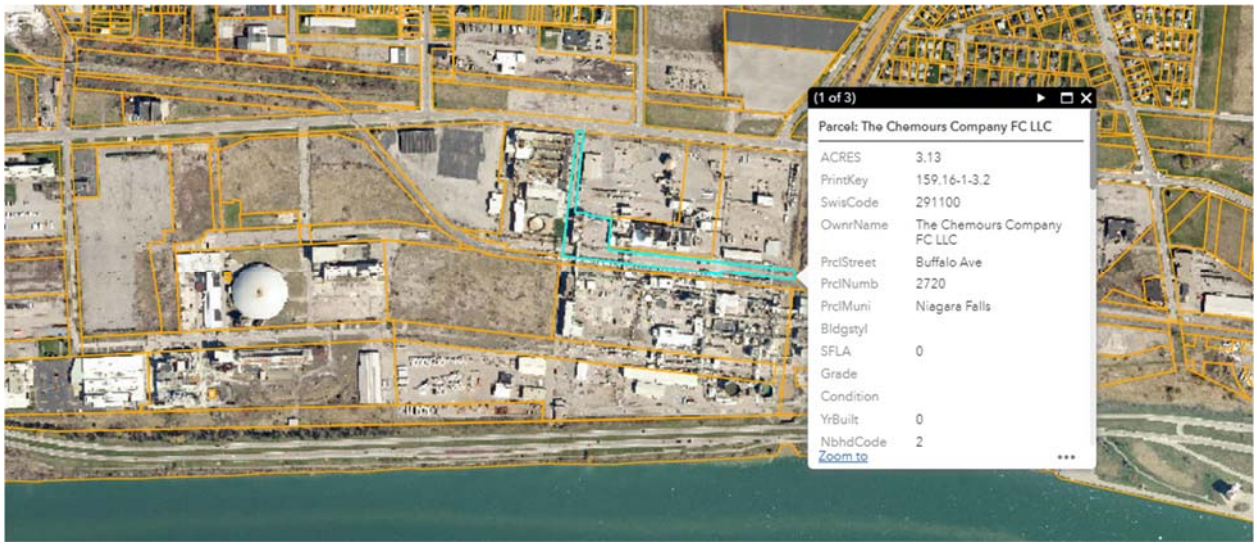

**CHEMOURS PARCEL 159.16-1-3.1**



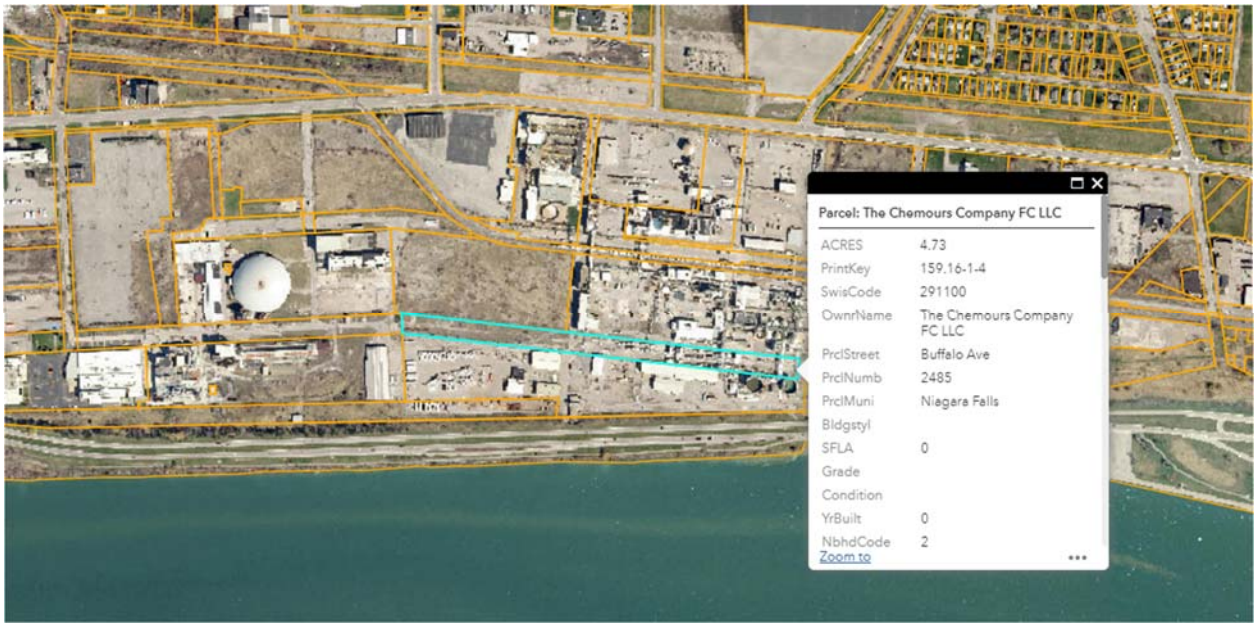

http://www.niagara.oarsystem.com/SearchOARS.aspx[niagara.oarsystem.com]

**CHEMOURS PARCEL 159.16-1-3.2**

2021 Chemours Annual PRR
Niagara County On-Line Mapping
System Parcel Detail Reports - 2021



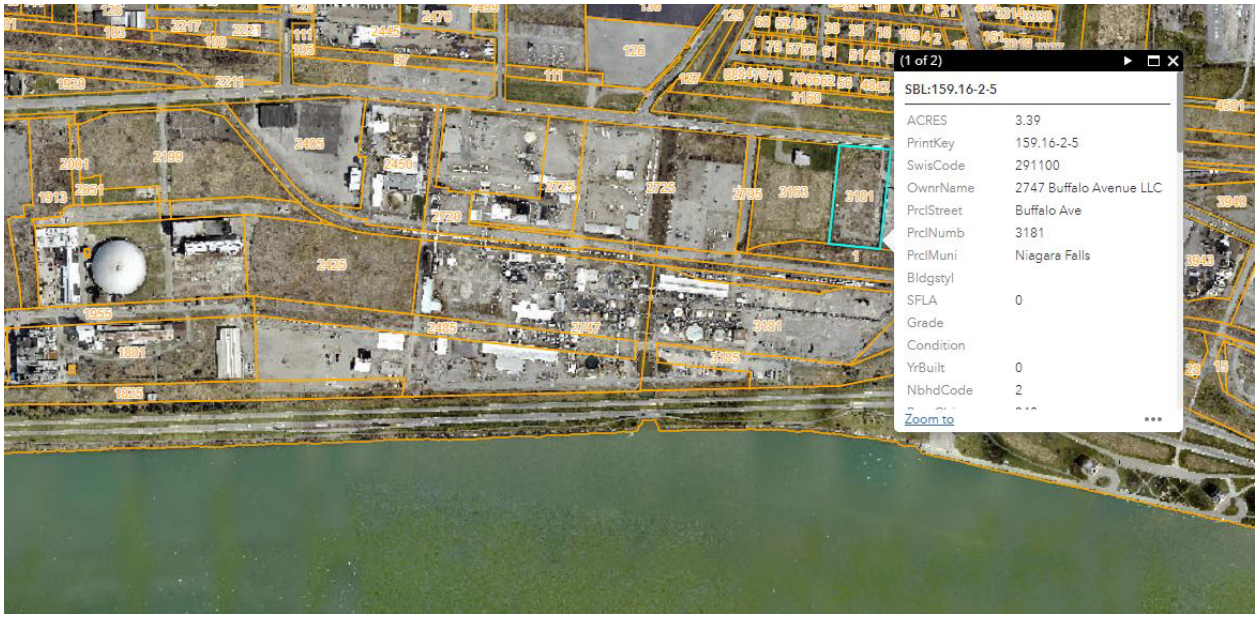

**CHEMOURS PARCEL 159.16-1-4**




http://www.niagara.oarsystem.com/SearchOARS.aspx[niagara.oarsystem.com]

**2747 BUFFALO AVENUE LLC PARCEL 159.16-2-5**

2021 Chemours Annual PRR
Niagara County On-Line Mapping
System Parcel Detail Reports - 2021

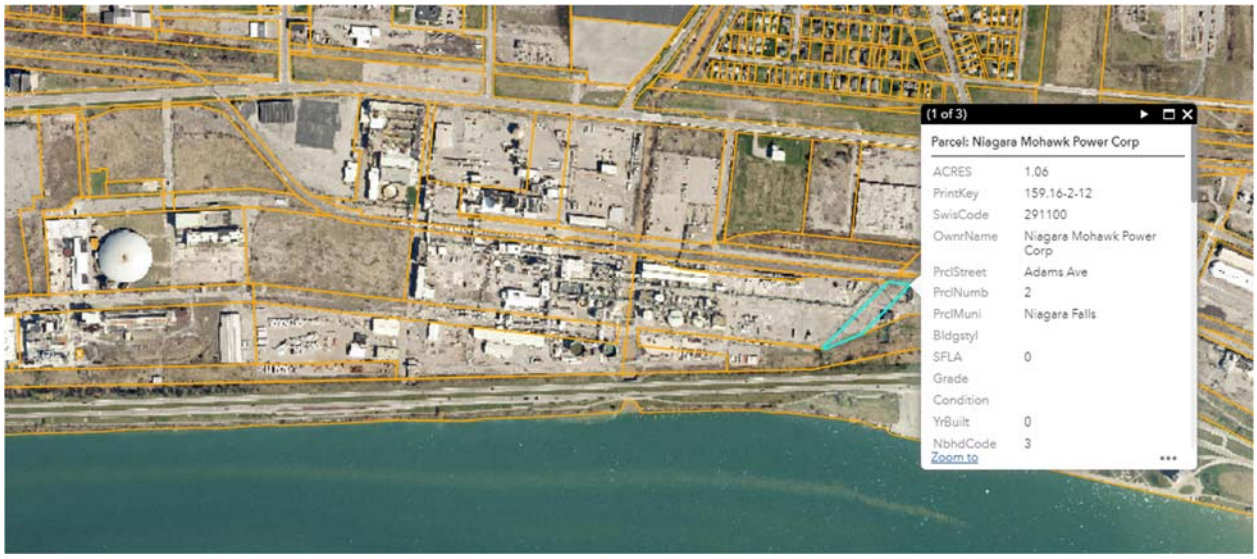



**CHEMOURS PARCEL 159.16-2-9**


http://www.niagara.oarsystem.com/SearchOARS.aspx[niagara.oarsystem.com]

**NIAGARA MOHAWK POWER CORP PARCEL 159.16-2-12**

2021 Chemours Annual PRR
Niagara County On-Line Mapping
System Parcel Detail Reports - 2021

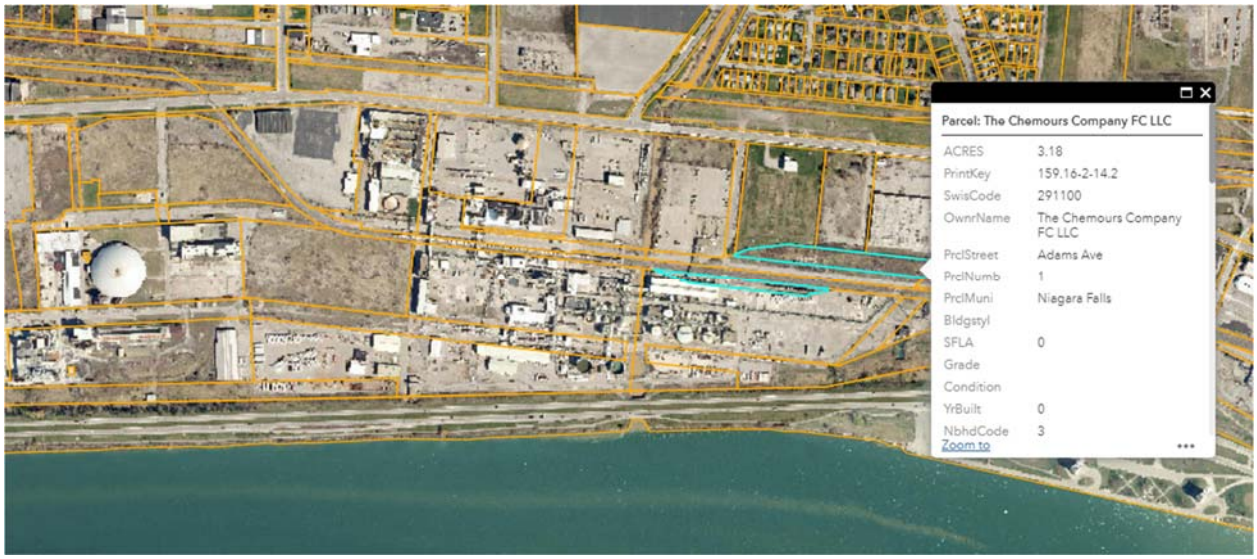



**CHEMOURS PARCEL 159.16-2-13**


http://www.niagara.oarsystem.com/SearchOARS.aspx[niagara.oarsystem.com]

**NIAGARA MOHAWK POWER CORP PARCEL 159.16-2-14.2**

2021 Chemours Annual PRR
Niagara County On-Line Mapping
System Parcel Detail Reports - 2021




http://www.niagara.oarsystem.com/SearchOARS.aspx[niagara.oarsystem.com]

# ATTACHMENT 3
# GROUNDWATER REMEDIATION SYSTEM
# 2021 ANNUAL MONITORING REPORT

PARSONS

PARSONS

# Groundwater Remediation System 2021 Annual Monitoring Report

## Chemours Niagara Plant
## Niagara Falls, New York

*Prepared for:*

**THE CHEMOURS COMPANY FC LLC**
CORPORATE REMEDIATION GROUP

Buffalo Avenue and 26th Street
Niagara Falls, New York 14302

*Prepared by:*

PARSONS
40 La Riviere Drive, Suite 350
Buffalo, NY 14202

March 2022

Chemours PN 507070
Parsons PN 450326

# TABLE OF CONTENTS

## TABLES



## FIGURES



## APPENDICES

# ACRONYMS

| Acronym | Definition / Description |
|---|---|
| 4Q21 | Fourth quarter of 2021 |
| ACO | Administrative Consent Order |
| BFBT | Blast Fractured Bedrock Trench |
| CatOx | Catalytic oxidizer |
| CRG | Corporate Remediation Group |
| DCE | Dichloroethene |
| DNAPL | Dense non-aqueous phase liquid |
| DuPont | E. I. du Pont de Nemours and Company |
| FST | Falls Street Tunnel |
| GAC | Granular activated carbon |
| GWRS | Groundwater Remediation System |
| μg/l | Micrograms per liter |
| MNA | Monitored natural attenuation |
| MOE | (BFBT) Modified Operations Evaluation |
| NYPA | New York Power Authority |
| NYSDEC | New York State Department of Environmental Conservation |
| PCE | Tetrachloroethene |
| QA/QC | Quality assurance/quality control |
| RTO | Regenerative Thermal Oxidizer |
| TCE | Trichloroethene |
| THT | Tetrahydrothiophene |
| TVOC | Total volatile organic compounds |
| VC | Vinyl chloride |
| VOCs | Volatile organic compounds |
| WWTP | (City of Niagara Falls) Wastewater Treatment Plant |

# EXECUTIVE SUMMARY

This report summarizes system operation and groundwater monitoring data collected during 2021 at the Chemours Niagara Plant (the Plant) for the Groundwater Remediation System (GWRS) and Olin Production Well. This report was prepared in accordance with the Interim Remediation Program for the Plant pursuant to an Administrative Consent Order (ACO) with the New York State Department of Environmental Conservation, Index Number B9-0206-87-09.

The Niagara GWRS and the Olin Production Well continued to operate per the requirements of the above-referenced ACO during 2021. Approximately 4.2 tons of volatile organic compounds (VOCs) were removed and treated by GWRS.

GWRS uptime during 2021 was 97 percent for the original 23 pumping wells remaining, 97 percent for pumping well PW-37, and 97 percent for pumping well PW-39. No unscheduled treatment system shutdowns and one scheduled treatment system shutdown greater than 24 hours occurred during 2021. On July 26 the system was shut down for annual scheduled maintenance, and was restarted on August 2, with a total system downtime of 169.5 hours. During this scheduled shutdown, the annual inspections and maintenance of the equalization tank, caustic scrubber, and regenerative thermal oxidizer (RTO) was completed. Additionally, planned upgrades to the caustic scrubber system piping and required NFPA-86 code maintenance to the RTO were completed. All pumping wells were placed back online once the planned inspections and maintenance were completed. By making use of the 120,000-gallon working capacity of the equalization tank, pumping well downtime was minimized.

There were no unscheduled or scheduled pumping well shutdowns greater than 48 hours in 2021.

The quantitative evaluation of the GWRS hydraulic effectiveness presented in this report illustrates that inward gradients occur in approximately 95 percent of the entire Plant where total VOCs concentrations are observed in the A-Zone overburden and A-Zone bedrock.

The 2021 monitoring data reinforce the conclusions drawn during the BFBT Modified Operations Evaluations (MOE) provided in 2009 and updated in 2013. Since implementation of the modified operations, the West Plant pumping system has operated at more efficient pumping rates using fewer pumping wells, increased mass removal, and achieved equivalent or better hydraulic control. These results demonstrate the improved hydraulic effectiveness of BFBT pumping wells PW-37 and PW-39.

After evaluation and redevelopment of well 3A, it was determined that the well was not screened to a proper depth compared to other wells monitoring the same zone. A new well (WPT-26) was properly installed adjacent to well 3A on September 1, 2021. The monitoring well was developed after installation by over pumping. The well has been surveyed and added to the list for quarterly water level monitoring.

To improve capture in the East Plant, a BFBT was installed to replace vertical pumping wells in September and October 2021. The pumping well was installed near the center of the trench and two piezometers were placed in the trench in the east end and two were placed in the west end. The BFBT was installed along a 250-foot alignment. Boreholes along the alignment were drilled at 5-foot spacings, to a depth of five feet below the top of bedrock. Explosive charges were placed at the bottom of each borehole and filled to the surface with angular stemming stone to direct the blast energy laterally. Between each borehole an in-line blasting delay was used to create a controlled sequential blast and blast vibration monitoring was conducted during blasting. After completion of the BFBT, a new pumping well (PW-43) was installed. Piping PW-43 to the treatment system, electrical connections, controls wiring, and head works were

completed. PW-43 was placed online December 20 and remained online the remainder of 2021. Consistent with all other pumping wells, PW-43 program logic and operation is controlled by the Honeywell Experion™ PKS process control system. While PW-43 continues to operate, final adjustments to head level within the well will be completed in 1Q22. Operation of PW-43 and the BFBT replaces operation of vertical wells PW-28, PW-30, PW-32, and PW-34.

While the overall hydraulic effectiveness of the GWRS and Olin Production Well systems have been established for many years, decreasing concentration trends also demonstrate the systems' effectiveness. Analytical results depict gradually reducing total VOC (TVOC) concentrations in the A-Zone overburden, A-Zone bedrock, and deeper bedrock water-bearing zones (B- through F-Zones). Declining TVOC concentrations are also attributed to gradual contaminant reduction through attenuation processes such as dispersion and biologic/abiotic degradation. The plant-wide groundwater chemistry in the deeper bedrock zones (D- and F-Zones) is dominated by degradation compounds. This indicates that source materials are naturally attenuating.

As approved by the NYSDEC in March of 2019, groundwater samples were collected using passive diffusion bags (PDBs). Sampling methods using PDBs are considered representative of the aquifer chemistry while the previously used methods (purge and sample) are considered to be possibly biased low; therefore, sampling results for samples collected with the PDBs are expected to be similar or slightly higher than the previous sampling method. Comparing historic analytical results to results from 2019 through 2021 showed that the new sampling method provides results that fit the trend of the historic results, although a few exceptions were identified.

Data from 2000 through 2021 continue to indicate that intrinsic bioremediation and natural attenuation of chlorinated hydrocarbon constituents in the East Plant area are actively maintaining either stable or shrinking bedrock groundwater plumes. Because no groundwater users are located in Niagara Falls between the Plant and the presumed discharge point for any plume (Falls Street Tunnel/New York Power Authority conduit drain), it is recommended that continued monitoring of natural attenuation in East Plant bedrock is appropriate. The frequency of the monitoring for specific monitored natural attenuation parameters (inorganic parameters, dissolved gases, total organic carbon, and alkalinity) will remain at once every five years (next monitored in 2023), concurrent with a detailed data evaluation to verify conditions have not changed. VOC data and field parameters will still be collected annually to monitor plume distribution and VOC attenuation.

As documented in the 2019 Periodic Review Report and the 60 day advanced notice form filed with NYSDEC, a Purchase and Sale Agreement was executed on March 31, 2019 with 2747 Buffalo Ave., LLC which sold certain parcels of the Chemours Niagara property (formally DuPont Niagara Plant Buffalo Ave and 26th Street, Niagara Falls NY), specifically Parcel 159.16-2-5 and a newly subdivided parcel referred to as New Lot A in Parcel 159.16-1-3. Site remediation responsibilities related to Order on Consent no. B9-0206-87-09 remain with Chemours.

# 1.0 INTRODUCTION

This report summarizes 2021 system operation and groundwater monitoring data for the Chemours Company FC LLC (Chemours) Niagara Plant (the Plant) Groundwater Remediation System (GWRS) and Olin Production Well system. System performance and remedial effectiveness are also evaluated. This report was prepared in accordance with the Interim Remediation Program for the Plant pursuant to an Administrative Consent Order (ACO) with the New York State Department of Environmental Conservation (NYSDEC), Index Number B9-0206-87-09. The Plant location is shown in **Figure 1-1**.

Details of the 2021 system operations data were previously submitted to the NYSDEC in quarterly data packages (Parsons 2021b, 2021c, and 2021d). The fourth quarter 2021 (4Q21) data package is included in the Periodic Review Report (PRR) as **Attachment 4**, of which this Annual Report is **Attachment 3**.

Operational data for 2021 are summarized in Section 2.0. System performance monitoring data are presented and system effectiveness is discussed in Section 3.0. Conclusions and recommendations are presented in Section 4.0. References cited in this report are provided in Section 5.0.

A Purchase and Sale Agreement was executed in 2019 with 2747 Buffalo Ave., LLC to sell certain parcels of the Chemours Niagara property (formally DuPont Niagara Plant Buffalo Ave and 26$^{th}$ Street, Niagara Falls NY), specifically Parcel 159.16-2-5 and a newly subdivided parcel referred to as New Lot A in Parcel 159.16-1-3. Site remediation responsibilities related to Order on Consent no. B9-0206-87-09 will remain with Chemours. Attachment 2 of the 2019 PRR provided the previously issued notification of sale.

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# 2.0 GWRS OPERATIONS AND IMPROVEMENTS SUMMARY FOR 2021

During 2021, the GWRS collected and pre-treated 9.91 million gallons of groundwater prior to discharge to the City of Niagara Falls Wastewater Treatment Plant (WWTP). The quantity of organics removed from groundwater in 2021 continues to be greater than the removal observed prior to the installation and start-up of the West Plant Blast Fractured Bedrock Trenches (BFBTs) in 2005 (**Figure 2-1**). Operations data from 1992 through 2021 are summarized in **Table 2-1**.

Niagara Plant GWRS uptime (**Table 2-1**) includes calculated uptime for the original 23 pumping wells and BFBT pumping wells PW-37 and PW-39. Uptime is calculated based on recorded water levels within each of the original pumping wells as they operate in an "on/off" sequence to maintain a consistent well level. Uptime for pumping wells PW-37 and PW-39 is calculated using data derived from in-line flow meters and continuous groundwater elevation tracking. Each BFBT well is determined to be in operation when flow is demonstrated, and dynamic level setpoints are achieved. This method of calculating pumping well uptime represents operational conditions and provides a consistent indicator of the hydrogeological effectiveness of the pumping operation. According to this uptime determination, 2021 uptime was 97 percent for the original 23 pumping wells still in operation, 97 percent for pumping well PW-37, and 97 percent for pumping well PW-39.

An assessment of the hydraulic effectiveness of operating the BFBTs was completed in 2009. Details were submitted to the NYSDEC (DuPont Corporate Remediation Group [CRG] 2009) with recommendations to continue operating the system using the BFBT pumping wells which continue to reduce the number of the aging original 23 pumping wells. Comments on this report were received from the NYSDEC in July 2012, and DuPont submitted a revised and updated Modified Operation Evaluation (MOE) Report on February 27, 2013. The updated report included data generated since the report was initially submitted and lines of evidence beyond those that were included in the initial report. Pumping wells continue to operate under the MOE conditions and with effective capture.

Details of system operations data for the first three quarters of 2021 were provided to NYSDEC in the quarterly data packages (Parsons 2021b, 2021c, and 2021d), and the fourth quarter is provided in the PRR **Attachment 4**. Quarterly performance details for the GWRS, Olin Production Well, and Plant Outfall 023 during 2021 are summarized in the table below.

| Operational Statistics | 1Q21[+] | 2Q21[+] | 3Q21[+] | 4Q21[+] | 2021 Total[+] |
|---|---|---|---|---|---|
| **GWRS** | | | | | |
| Original 23 Pumping Wells Uptime | 99.9% | 100% | 92.9% | 96.4% | **97.3%** |
| PW-37 Uptime | 99.7% | 99.9% | 90.1 % | 99.3% | **97.2%** |
| PW-39 Uptime | 99.7% | 99.9% | 92.0% | 98.4% | **97.5%** |
| Total Gallons Pumped (millions) | 2.33 | 1.91 | 2.70 | 2.97 | **9.91** |
| Estimated Pounds of Organics Removed from Groundwater* | 1,428 | 1,110 | 1,559 | 1,749 | **5,846** |

| Operational Statistics | 1Q21+ | 2Q21+ | 3Q21+ | 4Q21+ | 2021 Total+ |
|---|---|---|---|---|---|
| **GWRS** | | | | | |
| Number of Unscheduled System Shutdowns > 24 hours | 0 | 0 | 0 | 0 | **0** |
| Number of Scheduled System Shutdowns > 24 hours | 0 | 0 | 1 | 0 | **1** |
| Pump Replacements | 0 | 1 | 0 | 0 | **1** |
| Pump Repairs Requiring > 48 Hours | 0 | 0 | 0 | 0 | **0** |
| **Olin System** | | | | | |
| Pumping System Uptime | 100.0% | 100.0% | 100.0% | 100.0% | **100.0%** |
| Estimated Pounds of Organics Treated | 641.5 | 580.2 | 427.6 | 660.3 | **2,355** |
| **Outfall 023** | | | | | |
| Estimated Pounds of Organics Treated | 52 | 49 | 47 | 52 | **200** |
| **Total Estimated Pounds of Organics Removed / Treated** | 2,122 | 1,739 | 2,079 | 2,461 | **8,401** |

+Excludes shutdown of wells PW-1 thru PW-12, PW-14 since 4Q08.
* Based on quarterly influent/effluent analyses.

In addition to the high uptimes discussed above, approximately 8,401 pounds (4.2 tons) of organic compounds were removed and treated during 2021. The annual total organics treated by the system (combined GWRS, Olin system, and Outfall 023) are shown **Figure 2-1**. The time series plot demonstrates the total removed organics between 1992 and 2021. Key observations are made:

- From 1992 to 2004, the annual mass removed decreased over time. This is typical of groundwater treatment systems as they are known to eventually reach asymptotical recovery levels.
- The mass removal rate significantly increased after 2004-2005 when the two West Plant BFBTs were being brought online. This demonstrates that the BFBTs are extracting more mass of volatile organic compounds (VOCs) than pumping from the west header wells was able to accomplish. The increase in mass has been sustained since the installation, indicating the BFBTs continue to be more effective at mass removal than the west header wells alone. There was no decrease in mass removal rates associated with turning west header wells off during the MOE.

These observations demonstrate the capture improvement of the West Plant BFBTs and the effectiveness of the GWRS.

## 2.1 System Shutdowns

Due to the ample capacity of the GWRS equalization tank, there were no unscheduled treatment system shutdowns in 2021 that were greater than 24 hours. There was one scheduled treatment system shutdown in the third quarter of 2021. On July 26 the system was shut down for annual scheduled maintenance, and was restarted on August 2, with a total system downtime of 169.5 hours. During this shutdown, the annual inspections and maintenance of the equalization tank, caustic scrubber, and regenerative thermal oxidizer (RTO) was completed. Additionally, planned upgrades to

caustic scrubber system piping and required NFPA-86 code maintenance to the RTO were completed. All pumping wells were placed back online once the planned inspections and maintenance were completed. By making use of the 120,000-gallon working capacity of the equalization tank, pumping well downtime was minimized. There were no scheduled or unscheduled pumping well shutdowns greater than 48 hours in 2021.

As appropriate, scheduled and unscheduled shutdowns were reported to the NYSDEC via email and documented in the quarterly data packages.

## 2.2 Air Emissions

Air emissions from the GWRS originate from two sources: (1) the stack downstream of the pre-treatment and Regenerative Thermal Oxidizer (RTO) systems, and (2) emissions vented during filling of the GWRS Equalization Tank. Activities associated with these two emission points are summarized below.

### 2.2.1 Regenerative Thermal Oxidizer

As described in correspondence between NYSDEC and DuPont (NYDEC 2008), the Catalytic Oxidizer System (CatOx) was replaced with the RTO in August 2008. The RTO destruction removal efficiencies are similar or better than those of the CatOx, with much greater uptime and without the expensive catalyst issues. As mentioned above the RTO installed in 2008 had reached the end of its useful life and was replaced in 2018.

The new RTO was designed (Adwest Corp) and constructed (Amherst Stainless Fabrication Co.) as a replacement in-kind for the existing unit with a number of operations-based improvements. The new RTO was installed in 1Q18 and 2Q18 and began operation on April 19, 2018.

### 2.2.2 Air Emission Contingency Plan

Groundwater pumped from the BFBTs led to increased VOC chemical loading to the GWRS pre-treatment system. Air emission modeling to assess substantive compliance with applicable New York State regulations required the installation of an off-gas treatment technology following the on-set of pumping from the BFBTs. The original modeling effort was conducted when the GWRS used steam stripping as the technology to remove VOCs from groundwater and a CatOx for off-gas treatment. In 2005, the NYSDEC requested that a contingency plan be prepared to allow continued pumping from select GWRS pumping wells even when the CatOx unit was not operational (NYSDEC 2005). The RTO replaced the CatOx in 2008, and the Air Emission Contingency Plan remained the same. Based on chemical loading to the pre-treatment system, implementing the contingency plan requires the shutdown of PW-37 to ensure that long-term air emission guidelines are achieved.

At no time during 2021 was the system operated in contingency mode.

### 2.2.3 Equalization Tank Vent

The equalization tank serves as the initial collection point for groundwater prior to pre-treatment. This tank is vented to the atmosphere through two 200-pound carbon canisters connected in series (Emission Point 88002). The following table summarizes dates for the lead carbon canister replacements during 2021:

| Date of Change-Out |
|---|
| 3/15/21 |
| 6/16/21 |
| 9/16/21 |
| 12/9/21 |

The quarterly canister replacement schedule was based on the pilot test completed from 2011 to 2013.

## 2.3 Pumping Wells

The following pump replacement occurred during 2021:

| **Pump Replacements** | | |
|---|---|---|
| **Pumping Well** | **Replacements** | **Quarter of Replacement** |
| PW-39 | 1 | 2Q21 |
| **Total** | **1** | |

## 2.4 Olin Production Well and Carbon Vessels

The Olin Production Well treatment system maintained 100% uptime during 2021. The pumping well was operated at an average monthly flow rate of greater than 500 gallons per minute.

Groundwater pumped from the production well is treated in six carbon vessels, each of which contains 20,000 pounds of granular activated carbon (GAC). The vessels in the system are separated into two banks of three vessels each, all in a parallel operational mode. The groundwater is treated through one bank at a time (that is, only three vessels are used in parallel). This allows carbon in the unused vessels to be removed and replaced, ready to be placed online within an hour if necessary. Twelve carbon vessel change-outs (four banks) were completed during 2021.

The discharge from the Olin Production Well treatment system is used as non-contact cooling water in Olin Corporation's industrial process. A summary of when the changed carbon was placed online is shown below.

| Olin Carbon Vessel Dates Placed On-line | |
|---|---|
| V-2, -3, -4 | 2/11/21 |
| V-5, -6, -7 | 5/26/21 |
| V-2, -3, -4 | 8/20/21 |
| V-5, -6, -7 | 10/22/22 |

## 2.5 Monitoring Well Abandonment

Chemours submitted a proposal to abandon five monitoring wells at cluster 22 to the NYSDEC April 17, 2021. Well cluster 22 was located north of Buffalo Avenue in a parking area. NYSDEC approved the proposal by email on May 26, 2021. Well abandonment and decommissioning of cluster 22 was completed by grouting in place in accordance with NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy. The work was completed between August 23 and August 26, 2021. The work was completed under supervision of a Parsons geologist and the field activities were documented. During decommissioning, worker's breathing zone was monitored with a photoionization detector and a 4-gas meter. Well abandonment records have been included in **Appendix A**.

In lieu of collecting water levels at the 22 cluster, water levels will be collected from Olin wells OBA-1B and OBA-1C. Annual groundwater analytical samples will also be collected from OBA-1B and OBA-1C. The Olin well cluster 1 is located south of Buffalo Avenue and approximately 250 feet southeast of well cluster 22.

## 2.6 Monitoring Well Installation

After redevelopment and review of historical boring logs of well 3A, it was determined that the well is monitoring hydraulic head of the A-zone Overburden and not the A-Zone Bedrock. Therefore, 3A was assigned to A-zone Overburden potentiometric surface analyses and a new well (WPT-26) was installed adjacent to well 3A for A-Zone Top of Rock. On September 1, 2021 WPT-26 was installed and subsequentially developed. The well has been surveyed and added to the list for water level monitoring. During well drilling and installation, worker's breathing zone was monitored with a photoionization detector and a 4-gas meter. A boring log including well construction has been included in **Appendix A**.

## 2.7 East Plant BFBT Installation

To improve capture in the East Plant, a BFBT was installed to replace vertical pumping wells between September 27 and October 22, 2021. Installation of the BFBT was completed by Maine Drilling and Blasting (MD&B) and Nothnagle Enterprises. Parsons and AECOM provided project oversight for Chemours, to ensure that the work was conducted safely and in accordance with the project specifications. MD&B prepared a site-specific Blasting Plan that addressed all aspects of the work, including:

- Identification of the licensed blasting contractor;

- Handling, storage, and inventorying of explosives both outside and inside the plant property;
- Requirements and components of pre-and post-blast monitoring;
- Details of the proposed trench construction sequence, borings, charge size, and blasting sequence;
- Calculations of the anticipated peak velocity and air blast overpressure, in compliance with project specified limits;
- Proposed blast warning alarms and sounds;
- Plant road closing requirements;
- Any additional safety precautions to be implemented.

A pre-blast survey was conducted to determine background vibrations in the area utilities. Vibration monitoring was also conducted during blasting as specified in the Blasting Plan.

Utility clearance included reviewing Plant records of subsurface utilities, using a private subsurface utility locator using geophysics including ground penetrating radar, and requiring that MD&B contact the New York State One-Call system.

The BFBT was installed along a 250-foot alignment. Boreholes along the alignment were drilled at 5-foot spacings, to a depth of five feet below the top of bedrock. Explosive charges were placed at the bottom of each borehole and filled to the surface with angular stemming stone to direct the blast energy laterally and minimize upward blast force. Between each borehole (explosive charge), an in-line blasting delay will be used to create a controlled sequential blast. Blast vibration monitoring was conducted using an Instantel Blastmate Series III vibration monitor. The unit is equipped with a triaxial geophone that measures vibrations in three orthogonal directions (longitudinal, transverse, and vertical) when oriented correctly in the direction of the blast. Geophones were located near equipment, buildings, or other structures that are identified on the drawings. Measurements collected using the blast monitoring equipment will be used to document compliance with specified requirements, to provide a basis for any revisions needed to the Blasting Plan, and to aid in the development of a Blasting Plan for future installations.

After completion of the BFBT, a new pumping well (PW-43) was installed in approximately the middle of the trench. Construction of the pumping well is patterned from wells PW-37 and PW-39 with 3 foot stainless steel sump, 10 inch diameter (0.10 inch) slotted screen, Morie "O" well pack sand to at least 2 above the top of screen, minimum 2 feet of bentonite seal, and bentonite/Portland cement grout to surface. Four 2-inch diameter piezometers were installed at the ends of each trench (within the trench) similar to West Plant BFBT piezometers. Two piezometers were installed in the A-Zone overburden and two were installed in the A-zone bedrock. Piezometer specifications will be similar to previous EPT and EPO series piezometers.

Investigation-derived wastes such as drill/blast cuttings, used personal protective equipment (PPE), and decontamination water were managed in accordance with the Chemours Waste Management Plan. Drill cuttings were managed by

temporarily staging the material at the boring locations on pallets covered with polyethylene sheeting. At the end of the workday, the cuttings were covered with polyethylene sheeting and secured. Drill/blast cuttings were transported to a waste containment area by the drilling contractor. Chemours disposed of drill/blast cuttings in accordance with the site waste management plan. Wastewater generated from equipment decontamination were containerized in a temporary 20,000-gal frac tank staged at the drilling contractor's decontamination area, then treated on-site through GWRS

Nothnagle provided a high-pressure steam cleaner and associated hoses for decontamination of drilling equipment and tools. Drill rods, drill bits, temporary casings and other equipment was decontaminated at the end of the project prior to demobilization. Decontamination was conducted at an existing temporary decontamination pad. Decontamination water was transferred to the Niagara Plant groundwater treatment facility.

After the BFBT and pumping well and piezometers were installed, AECOM completed pump installation into the pumping well. Piping the new BFBT pumping well to the treatment system, electrical connections, controls wiring, and head works were also completed by AECOM and their contractors. The BFBT well (PW-43) was placed online December 20 and remained online the remainder of 2021. Consistent with all other pumping wells, PW-43 program logic and operation is controlled by the Honeywell Experion™ PKS process control system. While PW-43 continues to operate, final adjustments to head level within the well will be completed in 1Q22. Operation of PW-43 and the BFBT replaces operation of vertical wells PW-28, PW-30, PW-32, and PW-34.

# 3.0 SYSTEM PERFORMANCE MONITORING

Water-level measurements and groundwater sampling are conducted to assess the effectiveness of the GWRS and Olin Production Well pumping systems in controlling groundwater flow. The 2021 groundwater elevation monitoring and chemistry sampling was conducted at locations in accordance with the monitoring schedules presented in **Tables 3-1 and 3-2**, respectively. Chemical monitoring analytical parameters are presented in **Table 3-3**. The groundwater monitoring well, pumping well, and piezometer plan is depicted on **Figure 3-1**. The first 5-year monitoring event per the revised sampling program accepted by NYSDEC (December 9, 2016), was completed in 2018. The next 5-year monitoring event is scheduled for 2023. In 2021, annual sampling was completed per the revised sampling program.

## 3.1 Groundwater Elevations Monitoring

Routine groundwater elevation measurements are the basis for determining the extent of physical control of groundwater flow in the overburden and bedrock flow zones. Water levels are measured quarterly and are used to generate potentiometric surface contour maps that show the aerial extent of hydraulic control. The data presentation facilitates determining both the spatial and temporal extents of hydraulic control for the Niagara Plant in all water-bearing zones of concern.

Quarterly groundwater-level measurements collected for the first three quarters of 2021 were included in the quarterly data packages submitted to NYSDEC (Parsons 2021b, 2021c, and 2021d). Water level measurements from 4Q21 are included in the 2021 PRR as **Attachment 4**.

### 3.1.1 Potentiometric Surface Maps

This section discusses the potentiometric surface maps presented in the quarterly data packages as related to volatile organic compound (TVOC) isoconcentration maps. These maps are used to understand groundwater flow patterns at the Plant and the GWRS effectiveness to contain Plant groundwater.

#### *A-Zone Overburden and A-Zone Bedrock*

Water level monitoring data collected in the A-Zone Overburden and A-Zone Bedrock during all four quarters of 2021 were consistent with previous reporting periods. Hydraulic heads in both zones were depressed in the vicinity of operating pumping wells. This confirmed that an inward gradient has been maintained along a majority of the Plant property, and off-site groundwater flow has decreased during the operation of the GWRS (see Figures 1 and 2 in 2021 quarterly data packages). Hydraulic control is discussed in greater detail in Section 3.1.2 below.

A-Zone TVOC isoconcentration contours for 4Q21 have been superimposed over potentiometric surface contours for the A-Zone overburden and A-Zone bedrock (November 4, 2021) and are presented in **Figures 3-2 and 3-3**, respectively. Groundwater potentiometric surface and TVOC concentration contour maps illustrate the impact of the GWRS and its effectiveness in reducing off-site migration of chemical constituents. **Figures 3-2 and 3-3** both illustrate that the hydraulic cones-of-depression associated with GWRS pumping wells coincide with areas of moderate and high TVOC concentrations. Additionally, both figures illustrate the improved effectiveness of the GWRS with the addition of the two West Plant BFBTs as indicated by the geographic

alignment of the areas of highest TVOC concentrations and the location of the BFBTs. This is supported by **Figure 2-1** which demonstrates an increase in mass removal after installation and operation of the BFBTs.

In the West Plant, inward gradients have developed toward the BFBT pumping wells (PW-37 and PW-39), toward the line of pumping wells PW-16, PW-18, and PW-19, and also toward PW-35, which was brought back online in 2Q13. In the East Plant, inward gradients have developed in the line of pumping wells from PW-20 (just east of Gill Creek) to PW-34 (in the eastern portion of the Plant). Potentiometric surface maps indicate that hydraulic control is achieved in a majority of the Plant. Hydraulic control is discussed in greater detail in Section 3.1.2.

***Bedrock Water-Bearing Zone***

Flow patterns remain similar to previous years in the East Plant B-Zone and lower zones. The B-Zone hydraulic gradients are generally to the north toward the groundwater pumping system located at the Solvent Chemical site (immediately north of EPO-6 and EPO-7) and the Falls Street Tunnel (FST), which is located approximately 1,400 feet north of the Plant. In the absence of active pumping, the dominant B-Zone flow gradients would be generally to the north. These gradients would be consistent with the fact that the Buffalo Avenue Sewer and FST act as horizontal drains to the upper bedrock. Pumping from PW-39 induces a groundwater capture zone in the southeast section of the West Plant, providing groundwater capture in this area.

In general, hydraulic heads and gradients in the C/CD- and F-Zones are also similar to those measured on previous dates. Groundwater flow in the C/CD-Zone is generally to the northwest toward the Olin Production Well in the West Plant and north/northeast in the East Plant toward the intersection of the FST and the New York Power Authority (NYPA) conduits (FST/NYPA Intersection). Groundwater flow in the D-Zone exhibited similar trends as those observed in previous reporting periods, with flow generally toward the north and northwest. Groundwater elevations in the F-Zone are similar to those observed in previous reporting periods, with the direction of groundwater flow north to northwest in the West Plant and north to northeast in the East Plant, toward the FST/NYPA Intersection.

### 3.1.2 Hydraulic Control

**Figure 3-4** depicts the total area of the Plant where the hydraulic effectiveness evaluation was conducted. The far eastern portion of the Plant (former Power House area), the West Yard, and Sodium Shop were not included in area calculations because the GWRS was not specifically designed to provide hydraulic control in these areas. Potentiometric surface contour maps for the A-Zone overburden and A-Zone bedrock illustrating the areas of hydraulic control for each quarter in 2021 are presented in **Figures 3-5** through **3-12**. Results of the hydraulic effectiveness evaluations for 2021 are summarized in **Table 3-4**. Overall, there are slight changes in capture from year to year, sometimes increasing, sometimes decreasing, but generally in the 1 to 2% range. The percent capture changes are likely due to subtle differences in the flow field and likely do not indicate a meaningful difference. The most notable changes are increases due to BFBTs in the West Plant and increases in the East Plant after 2006. Changes will continue to be tracked over time to identify trends.

The A-zone overall (overburden and bedrock) percentage of West Plant effectiveness was 94 percent, which was similar to the previous 8 years. This capture percentage is

near the higher end of the typical capture effectiveness from 2000 to 2005 prior to installation of the BFBTs, which ranged from 88 to 91 percent. As discussed in the MOE, capture areas were maintained along downgradient edges of the property, with the exception of a small area west of 16A towards 5AR where TVOC concentrations have decreased to approximately 150 microgram per liter (µg/L) TVOCs or less in the A-Zone (16A was 177.6 µg/L in 2021 and well 5AR averaged 122 µg/L from 2013 to 2018 [will be sampled again in 2023]). The capture in this area appears to be sensitive to well 3A which had relatively higher head in 2021, therefore it was inspected and was redeveloped in 2021. Well 3A was determined to be screened more shallow compared to other wells screened in the same zone and therefore a new well was installed in the area. Well WPT-26 was installed in 3Q21. Well installation was discussed in greater detail in Section 2.6. The result of more appropriately assigning 3A and WPT-26 to overburden and top of rock (respectively) was elimination of a false mound in the top of rock zone and improved depiction of West Plant capture.

The East Plant overall effectiveness percentage was 96 percent for 2021. This is similar to the average value from 2011 through 2020 and is higher than the pre-2006 average of 91 percent.

The Plant-wide hydraulic effectiveness estimate for 2021 was 95 percent, which is slightly above estimates for 2006 through 2020 (91 to 94 percent). These effectiveness estimates represent a continuation of improved capture percentage when compared to those reported in 2005 and before (a combined average of 92 percent). The continued improvement is attributed to the BFBT remedy enhancement and the re-commissioning of PW-35 in the West Plant area.

### 3.1.3 West Plant Hydraulic Control - Modified Operation Evaluation

Testing of the hydraulic effectiveness of BFBT wells PW-37 and PW-39 operating without West Plant wells PW-1 through PW-14, PW-16 and PW-35 began on October 1, 2008, and ran for six months under what was termed Modified Operation Evaluation (MOE). A report summarizing the results of the test was submitted to the NYSDEC in 2009 (DuPont CRG 2009). Results of the BFBT tests indicate improved performance in hydraulic control. The capture effectiveness and efficiency has increased due to the BFBTs, and there is an increase in drawdown in the areas with the highest concentrations of total VOCs (see **Figures 3-2 and 3-3** and discussion above). The NYSDEC comments on the MOE report were received July 24, 2012, and DuPont submitted a revised MOE on February 27, 2013. The updated MOE report included data through 2013 as well as additional lines of evidence. The revised BFBT pumping configuration will continue to be used and monitored.

## 3.2 Groundwater Chemistry Monitoring

Groundwater sampling was conducted during 2021 in accordance with the monitoring schedule summarized in **Table 3-2**. Analytical parameters are summarized in **Table 3-3**. Analytical results for the 2021 annual sampling event are included in **Appendix B**. **Appendix B** also contains analytical results for the Gill Creek surface water sampling event. In accordance with the sampling program modifications implemented in 2006, 2011, and 2016, the following particulars to the sampling program were followed, in addition to the typical annual samples:

- In accordance with the five-year frequency, active pumping wells were not sampled in 2021. These wells will next be sampled in 2023. Inactive west header

pumping wells (PW-1, PW-3, PW-4, PW-6, PW-8, PW-9, PW-10, PW-11, PW-12, and PW-14) were not sampled (as described in correspondence from DuPont to NYSDEC dated June 15, 2011).

- Wells 6AR and 27A were not sampled in 2021. Wells 6AR and 27A are on a five-year sampling schedule and the next sampling event for these wells will occur in 2023.

Dissolved barium was not analyzed in samples from wells 5AR and 21A. Dissolved barium analysis in samples from 5AR and 21A is on a five-year sampling schedule and will next be completed in 2023. As approved by the NYSDEC in March of 2019, groundwater samples were collected using passive diffusion bags (PDBs). PDBs are installed in the screened zone or adjacent to the fracture in the case of bedrock wells and left in the well for a minimum of two weeks. The PDBs are then withdrawn and used to fill the required sample bottles. Sampling methods using PDBs are considered representative of the aquifer chemistry while the previously used methods (purge and sample) are considered to be possibly biased low; therefore, sampling results for samples collected with the PDBs are expected to be similar or slightly higher than the previous sampling method.

Comparing historic analytical results to results from 2019 through 2021 showed that the new sampling method provides results that fit the trend of the historic results. A few exceptions were identified, that cannot be attributed to other mechanisms. Wells 1AR3 (2019 and 2020), 10D (2019 through 2021), 25D (2019 through 2021), 17F (2020 and 2021), and 25F (2019 through 2021) had results higher than recent years.

Analytical data were reviewed in accordance with quality assurance/quality control (QA/QC) procedures described in the Niagara Plant Quality Assurance Project Plan (Woodward-Clyde Diamond 1999).

### 3.2.1 A-Zone Overburden and A-Zone Bedrock Results

A-Zone groundwater analytical results for 2021 are consistent with past monitoring results, with the highest TVOC concentrations observed mainly in three areas, two of which are located in the southern West Plant:

- Immediately west of Gill Creek near monitoring well 14A
- South of the Olin brine storage tanks (well 1AR3)
- East Plant well location 8A

The distribution of groundwater chemistry concentrations for the A-Zone overburden and A-Zone bedrock are shown in **Figures 3-2 and 3-3**, respectively. A summary of the 2021 TVOC results by zone from monitoring well sampling is presented below. Groundwater chemistry trends for all monitored zones are discussed in Section 3.3.

### 3.2.2 Chemical Mass Removal

As a consequence of providing hydraulic control, the GWRS has been effective in removing chemical mass from groundwater. Mass removal continues to be greater than before the installation and operation of the BFBTs in 2005 (BFBTs, PW-16, PW-18, PW-19, PW-35 and PW-36 in the West Plant). In 2021, the GWRS removed approximately 5,846 pounds (2.9 tons) of organic compounds from groundwater.

The Olin Production Well continued with a mass removal rate within the range of historical values, but with a noted increase in late 2019 and through 2021. The yearly estimated mass of organic compounds removed was 1.2 tons in 2021 compared with an average mass removal of 0.59 tons/year from 2009 – 2019. A corollary increase in concentrations was observed in quarterly influent sampling in 4Q2019 and continued through 2021. This increase in concentrations and mass removal follows increases in upgradient C/CD monitoring wells indicating the Olin Deep well is acting as designed and capturing the migration of VOCs in this zone (see **Attachment 3** for more details).

The combined effect of the GWRS and the Olin Production Well resulted in the removal and treatment of approximately 8,401 pounds (4.2 tons) of organic compounds in 2021 (including Outfall 023). An estimated 139.3 tons of organic compounds have been collected and treated since the GWRS began continuous operation in 1992. **Figure 2-1** depicts the of mass removal over time as a percent of total. The increase in mass removal rates decreased during the 1990's after initial start-up, but then significantly increased in 2006 likely due to startup of the West Plant BFBTs. This improved performance has been maintained from 2006 to 2021.

## 3.3 Groundwater Elevation and Chemistry Trends

An analysis of short-term and long-term groundwater chemistry trends has been completed to assess the effectiveness of the GWRS in reducing organic compound concentrations in groundwater through pumping for source control. This analysis used TVOC concentration data from monitoring wells and addressed trends in the A-Zone overburden, A-Zone bedrock, and bedrock water-bearing zones (i.e., B- through F-Zones). The evaluation also serves to identify locations where TVOC concentrations exhibit significant changes (generally, changes greater than an order of magnitude). TVOC concentration versus time plots for A-Zone overburden, A-Zone bedrock, and bedrock B- through F-Zone monitoring wells are presented in **Appendix C**.

Operation of the Olin Production Well and GWRS to control groundwater, supplemented by natural attenuation mechanisms, has resulted in an overall trend of declining TVOC concentrations in the overburden / top-of-bedrock, and bedrock fracture zones. In general, the West Plant, where the highest TVOC concentrations have historically been reported, exhibits the greatest decline in TVOC concentrations. This is consistent with the fact that operation of the Olin Production Well results in the direct hydraulic control in bedrock fractures zones beneath this area of the Plant. Natural attenuation processes also demonstrate that conditions remain favorable for natural attenuation of chlorinated hydrocarbons.

### 3.3.1 A-Zone Overburden and A-Zone Bedrock

The overall hydraulic effectiveness of the GWRS to gradually reduce TVOC concentrations in groundwater has been established for many years via the evaluation of TVOC concentration trends. While monitoring points exhibit some degree of scatter in TVOC concentration data over time, there is an overall trend of decreasing TVOC concentrations in A-Zone monitoring wells. Long-term TVOC concentrations have decreased in 14 of the 17 well locations in direct response to GWRS operation. These declines in TVOC concentrations indicate effective hydraulic control created by the GWRS over the 29 years of operation and source material depletion through dispersive and biodegradation processes. The hydraulic control remedy enhancement in the southern West Plant continues to show its effectiveness in removing chemical mass.

The greatest TVOC decline over time has occurred at southern West Plant well 28A (immediately south of BFBT PW-37) where TVOC concentrations have steadily decreased from 1,865,000 μg/l in 2000 to 5,130 μg/l in 2021 (**Appendix C**). TVOC Concentrations have been below 10,000 μg/l since 2012. A similar declining TVOC trend is evident at nearby offsite well DEC-4R as shown in the TVOC trend plot for this well (**Appendix C**). Since activation of the BFBTs, the rate of decline in DEC-4R has appeared to increase, indicating an improved performance as a result of the BFBTs.

At well DEC-3R (south of PW-39 BFBT), sample results demonstrate significant variability in TVOC; however, the 2021 concentration of 43,000 μg/l is appreciably lower than 1992 levels (greater than 2,000,000 μg/l), and the trend is decreasing. The concentrations in on-site well 1AR3 (northeast of DEC-3R and PW-39) (426,000 μg/l in 2021) had shown an increasing trend between 2010 and 2015 but significantly decrease in 2016 (50,900 μg/L) and again in 2017 (102.4 μg/L). TVOCs increased in 2018, 2019, and 2020 (compared to 2016 and 2017) but dropped in 2021 (426,000 μg/L) to lower than the last three years and in the range that is typical for this location. Well 2A, which is between the two West Plant BFBTs, has had TVOCs declining since 2004 when concentrations were 25,790 μg/l to between 583 μg/l and 7,400 μg/l the last twelve years. Well 3A (4.8 μg/l in 2021), which is north of PW-37, has had TVOC concentrations decline from in the 1,000's μg/l to being less than about 30 μg/l since 2009.

West Plant well 16A has shown a decreasing trend in TVOC concentrations over time, starting out over 10,000 μg/l in the early 90's to under 1,000 μg/l the last 7 years and under 200 μg/l the last three years. The 2019 through 2021 TVOC results show an even greater decline in concentration when compared to the steady decline observed between the early 1990's and 2018. Other West Plant wells 13A and 14A have also demonstrated decreasing TVOC concentrations over time. In 2019 at West Plant well 15A a significantly higher result (36,800 μg/l) was found but in 2020 and 2021 (4,180 and 4,550 μg/l, respectively) it appears that TVOC concentrations have returned to levels within the TVOC concentration range found before the 2019 spike.

Significant historical TVOC decreases have been observed in East Plant wells 8A and 9AR where TVOC concentrations are mainly attributed to the presence of THT. TVOC concentrations at these locations have been stable over the last 10 years and indicate an overall declining trend with time. At 9AR in 2021, the TVOC result of 34.6 μg/l was the lowest at this location since 2011.

TVOC concentrations at well 18A in 2021 (335.3 μg/l) decreased from the 2020 concentration (694.2 μg/l) and is typical of the concentrations observed between 2017 to 2019. The 2020 result was less than the single year increases that were observed in 2007 (4,190 μg/l), 2012 (2,920 μg/l), and 2016 (3,000 μg/l). THT and related compounds were the only VOCs detected at well 18A in 2021. THT and related compounds chlorobenzene were the predominate compounds detected at 17A in 2021. Concentrations at 17A have demonstrated a downward trend since 2000.

East Plant well 24A is near Gill Creek. TVOC concentrations at this location had been under 10,000 μg/l between 2013 and 2019 after observing a slight spike in 2012 of 79,500 μg/l and higher previous concentrations of up to 141,200 in 1992. The 2020 concentration of 15,508 μg/l was higher than the TVOC concentrations observed between 2013 and 2019 but lower than many of the previously observed concentrations.

In 2021, TVOC concentrations at 24A (1,498 μg/l) returned to levels consistent with those observed between 2013 and 2019.

Well 20AR was not sampled between 1994 and 2017 due to a lack of water in the well. In 2017 through 2021, adequate water was available to be sampled and the historically lowest TVOC concentration at 20AR was observed in 2020 (2.5 μg/l). In 2021, TVOC concentrations rose slightly from the prior year (4.2 μg/l ) but remained within the recent range. Between 2017 and 2021 TVOC concentrations ranged from 2.5 μg/l to 6.2 μg/l compared to prior to 1994 when TVOC concentrations at 20AR were as high as 69 μg/l.

At well 21A (near Gill Creek in the West Plant) 2021 TVOCs were below the analytical detection limits. TVOC concentrations at 21A show a decreasing trend and have been as high as 18,680 μg/l and were below 100 μg/l the previous eight years and less than 10 μg/l the last four out of five years.

### 3.3.2 Bedrock Water-Bearing Zones

***B-Zone Bedrock***

B-Zone monitoring wells 1BR, 3B, 5BR, 8B, 14B, 20B, 24B, 25B, 29B, and 30B continue to show a steady decline or stable TVOC concentrations. Decreases at well location 8B and other East Plant bedrock wells are attributed to natural attenuation processes as described in detail in Section 3.3.3. From an overall perspective, long-term TVOC concentration decreases have been observed at 8 of the 10 B-Zone wells in the annual monitoring program.

In the West Yard, near the western edge of the West Plant, TVOC concentrations in well 5BR were greater than 10,000 μg/l in the early to mid-1990s, but decreased during the remediation. The concentrations have been near and/or below 100 μg/l for the last fifteen years and less than 15 μg/l the nine of the last ten years. Between 2018 and 2021 TVOC concentrations at well 5BR decreased to between 5.4 and 11.4 μg/l, after concentrations increased to 110 μg/l in 2017. In 2016, the lowest concentration was observed to date (2.4 μg/l), representing a four orders of magnitude decline in concentration.

Well 20B, in the northwestern corner of the West Plant, has shown TVOCs decline from over 10,000 μg/l in 1998 to less than 2,500 μg/l over the last six years and the lowest TVOC concentration to date was observed in 2020 (1,000 μg/l) and again in 2021 (671 μg/l). West Plant well 14B has maintained consistent TVOC concentrations between 335,000 μg/l and 500,000 μg/l between 2003 and 2018. The TVOC result at well 14B in 2019 (653,000 μg/l) was the highest observed at this location but the 2020 and 2021 results (502,000 and 558,000 μg/l, respectively) were closer to the TVOC concentrations observed between 2003 and 2018. Well 1BR in the southern part of the West Plant near Gill Creek, has demonstrated a declining trend in TVOCs with the last fifteen years below 175,000 μg/l while TVOCs previously have been as high as over 600,000 μg/l. Well 3B is north of PW-37 in the West Plant and has demonstrated declining TVOCs from approximately year 2000. TVOC concentrations have been as high as 7,490,000 μg/l in 2002 and have been under 2,000,000 μg/l since that time. In 2021, the concentration at 3B was 20,500 μg/l. This represents a two orders of magnitude drop in TVOCs. West Plant well 29B has dropped from over 5,500 μg/l in 2002 to the lowest TVOC concentrations observed at this location in 2021 (142 μg/l).

The most notable historical decrease in the East Plant is apparent at well location 8B, where TVOC concentrations are dominated by the presence of THT. Historical concentrations have exceeded 500,000 μg/l but have been less than 20,000 μg/l since 2009. Well 25B in the northern East Plant had TVOC concentrations in the early 2000's between 4,000 μg/l and 9,000 μg/l which declined to between 40 μg/l and 300 μg/l from 2006 to 2011. A spike was encountered in 2012 (26,940 μg/l) with TVOCs declining after this date. In 2019 and 2020 the lowest TVOC concentrations to date at 25B, 11.7 μg/l and not detected, respectively were found. In 2021, the TVOC concentration was 385.1 μg/l which is consistent with TVOC concentrations found prior to 2019. TVOCs at 25B have been dominantly THT and related compounds. East Plant well 24B which is near Gill Creek, tied the lowest concentration found at this location with the 2018 result. Both 2018 and 2021 were below the detection limits for TVOCs. TVOC concentrations at other locations remained below historical with typical fluctuations. East Plant well 30B had a TVOC concentration of 58,519 μg/l in 2021, 57,000 μg/l of which was THT.

### *C/CD-Zone Bedrock*

An analysis of historical groundwater chemistry trends in the C/CD-Zone indicates an overall decline in TVOC concentrations, particularly in the East Plant. Some recent exceptions to this were observed and are noted below.

Well 25C/CD has shown a decreasing trend over time, but has shown some anomalously high readings. The TVOC concentration spiked in 2012 at 25C/CD (14,500 μg/l) but declined to below 3,000 μg/l between 2016 and 2018, with the lowest TVOC concentration observed at 25C/CD occurring in 2016 (1,198 μg/l). Another spike (10,650 μg/l) was observed in 2019 and again in 2020 (15,760 μg/l). The TVOC concentration in 2021 (4,193 μg/l) returned to within the historic range. Despite the spikes in concentrations identified, an overall decreasing trend in TVOC concentrations has been maintained. Future monitoring will be used to help identify the reason for the difference.

Well 12C/CD is in the East Plant near Gill Creek and indicates a highly variable range and a decreasing trend overall. The 2016 TVOC concentration of 11,990 μg/l and the 2017 TVOC concentration of 8,300 μg/l represent the lowest TVOC concentrations observed at this location two years in a row. The 2019 TVOC concentration encountered a slight spike at 129,200 μg/l but remained within the historic range. The 2020 result of 92,800 μg/l and the 2021 result of 80,600 μg/l were less than the 2019 result but remains above the 2016 through 2018 results. Downgradient well 18C continues to show a decreasing trend of TVOC concentrations. TVOC concentrations in 2021 at 18C (13,670 μg/l) consisted mainly of THT and vinyl chloride. Well 22C has been sampled on the annual schedule but was abandon in 2021. The intention was to sample Olin well OBA1-C however it was inadvertently not sampled. OBA1-C will begin annual sampling in 2023.

Long-term TVOC reductions in West Plant can be attributed to the effectiveness of the Olin Production Well in achieving hydraulic control in the West Plant and the gradual removal of chemical constituents via natural attenuation processes throughout the Plant.

TVOC increases at West Plant wells 15CD, 19CD1 and 26CD were noted over the past recent years. At 15CD TVOCs increased from approximately 10,000 μg/l to greater than 200,000 μg/l starting in approximately 2014. Similar observations have occurred more recently at 19CD1 and 26CD (higher by approximately an order of magnitude in 2019 through 2021). Each of these wells are located immediately upgradient from the Olin Deep well, where higher influent concentrations were also observed (as described

above). Given the sequence of these increases and the upgradient location of the monitoring wells relative to Olin Deep Well, it can be concluded that these increases are related to long term plume migration in the C/CD zone towards and captured by Olin Deep Well. Sampling in future years will help evaluate this plume migration.

Between 2019 and 2021, TVOCs at 15CD decreased from 2018 to between 240,000 μg/l and 269,000 μg/l. Well 4CR (west of PW-37) has historically shown a wide range of TVOC concentrations and has shown a potential and slight increasing trend over the years, however between 2018 and 2021 the concentrations were similar to those observed in 1992. In 2021, the TVOC concentration at 4CR (3,170 μg/l) was the lowest since 2003. Flow in in this area has been demonstrated to flow towards the Olin pumping well and is therefore within the capture zone.

***D-Zone Bedrock***

For years the TVOC data from the D-Zone wells have demonstrated declining or stabilizing TVOC indicating the plume is captured and/or retracting in this zone. Concentrations in 2021 support these observations. Chemistry results from 2000 to 2021 are dominated by degradation product such as DCE and VC which demonstrates the active natural attenuation in the D-Zone.

At East Plant well 18D, TVOC results have varied between approximately 25 µg/l and 550 µg/l and the overall trend is rather flat. The 2017 TVOC concentration at 18D was 27.9 µg/l, the lowest since 2003 and between 2016 and 2018 concentrations have been very similar with TVOC concentrations between 27.9 and 31.0 µg/l. Between 2019 and 2021 (between 330.2 µg/l and 348.0 μg/l) a slight increase was encountered but TVOCs were still within historic levels. TVOCs at this location have historically included DCE, THT, and VC, however, only DCE and VC were identified in 2017 and 2018. THT and related compounds were identified in between 2019 and 2021, along with DCE and VC.

***F-Zone Bedrock***

F-Zone wells show a dominant downward trend in TVOC concentrations at all four wells in the annual program (**Appendix C**). This decreasing trend in the F-Zone is evident at well 15F which remains elevated at 188.9 μg/l but is lower than the 43,110 µg/l found in 1992. Well 15F is in the West Plant and has concentrations of mainly VC, benzene, DCE, and TCE, which have declined over time.

This general trend of declining TVOC concentrations in both the West and East Plants may be attributed to hydraulic control of the West Plant bedrock created by the Olin Production Well. Declining TVOC concentrations are also attributed to gradual contaminant reduction through attenuation processes such as dispersion, biodegradation and, potentially, abiotic degradation. The presence of degradation compounds, indicating attenuation of source materials, dominate groundwater chemistry plant-wide in the deeper bedrock zones (both the D- and the F-Zones).

### 3.3.3 East Plant Bedrock Monitoring

As described in the 2000, 2004, 2008, 2013, and 2018 annual reports, results of the monitored natural attenuation (MNA) assessment are strongly indicative of continued constituent attenuation through biodegradation and natural dispersive mechanisms in all the East Plant bedrock water-bearing zones. Stable or declining concentrations are a clear indication that any constituent plume is either stable or shrinking in size. Both geochemical and biological data provide sufficient evidence to support active intrinsic

bioremediation in the various fracture zones. The next full MNA sampling and analysis is scheduled for 2023.

## 3.4 Dense Non-Aqueous Phase Liquid (DNAPL) Monitoring

Weekly observations are made at pumping well PW-39 and are completed as part of routine maintenance inspections. DNAPL was last observed at PW-39 on November 9, 2006.

## 3.5 Gill Creek Surface Water Monitoring

Samples are collected from two locations in Gill Creek as shown in **Figure 3-1** (sample locations SW-1 and SW-2). The surface water samples collected during the annual well sampling events were analyzed for full list indicator parameters (see **Table 3-3**).

Sample SW-1, collected upstream of the Niagara Plant at the Adams Avenue Bridge had three pesticide detections (alpha-BHC at 0.29 µg/l, beta-BHC at 0.076 µg/l, and delta-BHC at 0.065 µg/l), and all volatile and semi-volatile organic compounds and PCB compounds were below detection limits. Downstream sample SW-2 has a reported TVOC concentration of 317.3 µg/l which included PCE at 110.0 µg/l, TCE at 100.0 µg/l, DCE at 67.4 µg/l, VC at 3.9 µg/l, and 1,1,2,2-tetrachloroethane at 36 µg/l. Two pesticides were identified (alpha-BHC at 0.26 µg/l and beta-BHC at 0.093 µg/l). No semi-volatile organic compounds or PCBs were found. These results are consistent with the results from previous sampling events.

A review of the SW-2 data between 2000 and 2021 shows that the TVOC concentrations have been fluctuating between 1 µg/l and 179 µg/l. In 2021 the result at SW-2 was higher (317.3 µg/l). Future years will be evaluated to determine if TVOCs are increasing in Gill Creek or if this is an anomalous result.

# 4.0 CONCLUSIONS

## 4.1 GWRS Effectiveness

The overall effectiveness of the GWRS in controlling off-site groundwater flow has been demonstrated through hydraulic head and groundwater quality monitoring during 30 years of operation. The 2021 GWRS operations are summarized as follows:

- System uptime was 97.3 percent for the 23 original pumping wells that are still in use.
- A BFBT was installed in the East Plant, per the accepted work plan, in the Fall of 2021 and the new pumping well PW-43 was activated on December 20, 2021. The pumping well was being tested for effectiveness during the end of 2021. Initial results demonstrate significant connectivity in the BFBT and ability to capture the targeted East Plant area.
- PW-37 uptime was 97.2 percent.
- PW-39 uptime was 97.5 percent.
- Olin Production Well system uptime was 100 percent.
- Operation of BFBT pumping wells PW-37 and PW-39 continued throughout 2021, along with a reduced number of the original 23 pumping wells.
- Continued improvements to the reliability of the pumping and pretreatment systems, including RTO replacement in 2018, has continued through 2021.
- Hydraulic control in A-Zone Overburden and the A-Zone Bedrock was exercised over 95 percent of the Plant's area for 2021.
- Approximately 4.2 tons of organic compounds were removed and treated during 2021. This includes the GWRS (2.9 tons), Olin system (1.2 tons), and outfall 023 (0.1 tons).
- DNAPL monitoring conducted in 2021 indicated no DNAPL was present at PW-39.

Extensive water-level data collected over 30 years of system operation have illustrated that hydraulic heads in both the A-Zone overburden and A-Zone bedrock are depressed in the vicinity of operating GWRS pumping wells. The resulting inward flow gradient that has developed in most areas of the Plant has decreased off-site groundwater flow. A quantitative evaluation of GWRS hydraulic effectiveness (first developed in 1995) indicates that groundwater capture was observed in approximately 95 percent of the entire Plant in 2021 (A-Zone overburden and bedrock, East and West Plant). Furthermore, in the West Plant (where a majority of contaminants are observed) groundwater capture was established in the A-Zone for approximately 94 percent of the area. Areas outside the capture in the West Plant are isolated to areas where concentrations are considerably lower than the remainder of the site. These results are similar or slightly improved relative to hydraulic effectiveness evaluation findings presented in historic reports prior to operation of the BFBTs. As such, these most recent findings reinforce the conclusions of the BFBT MOE (DuPont CRG 2009), the BFBT MOE – 2013 Update (Parsons, 2013).

An estimated 139.3 tons of organic compounds have been removed and treated as part of the Plant's remediation efforts since the GWRS began continuous operation in 1992.

The estimated 4.2 tons of organic compounds removed and treated as part of the Plant's remediation efforts during 2021 equates to 3.0 percent of the total estimated organic compounds removed from groundwater since the system began operating.

As approved by the NYSDEC in March 2019, groundwater samples were collected using passive diffusion bags (PDBs). Sampling methods using PDBs are considered representative of the aquifer chemistry while the previously used methods (purge and sample) are considered to be possibly biased low. Comparing historic TVOC analytical results to results between 2019 and 2021 showed that the new sampling method provides results that fit the trend of the historic results. A few exceptions were identified in 2021. Wells 10D, 17F, and 25F had results higher than recent years which may be related to the PDBs. Furthermore 16A was trending lower than expected.

West Plant increases at 15CD, 19CD1, and 26CD were noted over the past recent years but appear to be related to long term migration of TVOC towards and captured by the Olin Deep Well.

## 4.2 East Plant Bedrock MNA

Prior evaluations have provided strong evidence that natural attenuation and intrinsic bioremediation are occurring in the subsurface and are a primary mechanism for removal of chlorinated hydrocarbons in the East Plant bedrock. Data were collected annually from 2001 through 2004 to monitor MNA progress in the East Plant bedrock and to confirm continued intrinsic bioremediation of the chlorinated hydrocarbon plume areas. Consistent with U.S. Environmental Protection Agency guidance, a five-year review of the data was completed following collection of the 2008, 2013, and 2018 annual data. The review provided herein, using data collected in 2021, confirmed that MNA processes, including intrinsic bioremediation of the chlorinated hydrocarbons, is still actively removing plume mass from the fractured bedrock system in the East Plant. Stable or declining concentrations indicate that any constituent plume is either stable or is shrinking in size. Both geochemical and biological data provide sufficient evidence to support active intrinsic bioremediation in the various fracture zones.

There are no groundwater users located between the Plant and the presumed discharge point (FST/NYPA conduit drain) for any potential offsite plume. Therefore the periodic monitoring of natural attenuation parameters in East Plant bedrock is the appropriate course of action. MNA parameters are next scheduled to be monitored in 2023. VOC data and field parameters will still be collected annually to monitor plume distribution and VOC attenuation.

## 4.3 DNAPL Monitoring

The observation of DNAPL in pumping well PW-39 in April 2006 prompted a monitoring and recovery program. Approximately 118 gallons of DNAPL were removed from well PW-39 in 2006. Monitoring at nearby well locations completed in 2006 indicate that the DNAPL was limited to well PW-39. The last observation and recovery at PW-39 occurred on November 9, 2006. Based on the monitoring results compiled to date, DuPont proposed routine monitoring limited to pumping well PW-39 beginning in 2Q08. The frequency of DNAPL assessments will be determined by the monitoring results and is currently completed weekly. No DNAPL was found in PW-39 in 2021.

# 5.0 REFERENCES

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# TABLES

**Table 2-1**
**Historical System Operations Summary**
**Chemours Niagara Plant**

| OPERATIONS STATISTIC | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***GWRS*** | | | | | | | | | | | | | | | |
| 23 Original Wells Uptime | 75% | 76% | 89% | 93% | 96% | 97% | 90% | 71% | 78% | 86% | 91% | 79% | 79% | 64% | 75% |
| PW-37 Uptime | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| PW-39 Uptime | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Total Gallons Pumped (millions) | NR | 12.4 | 16.4 | 17.3 | 15.1 | 15.8 | 10.8 | 11.2 | 12.3 | 11.6 | 14.1 | 14.0 | 12.8 | 12.3 | 22.1 |
| Estimated pounds of Organics Treated* | 10,350 | 7,220 | 7,320 | 7,840 | 9,437 | 6,463 | 7,000 | 3,382 | 3,025 | 3,224 | 3,848 | 2,820 | 2,645 | 2,237 | 11,589 |
| Number of unscheduled system shutdowns | 10 | 5 | 2 | 3 | 0 | 0 | 2 | 7 | 8 | 3 | 3 | 1 | 4 | 6 | 4 |
| Number of scheduled system shutdowns | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 |
| Pump Replacements | 26 | 63 | 43 | 40 | 21 | 11 | 7 | 6 | 16 | 13 | 22 | 14 | 17 | 24 | 17 |
| Pump Repairs Requiring > 48 Hours | NR | NR | 4 | 3 | 9 | 13 | 3 | 1 | 3 | 10 | 25 | 4 | 11 | 38 | 25 |
| ***OLIN SYSTEM*** | | | | | | | | | | | | | | | |
| Pumping System Uptime | NR | NR | 99.0% | 98.7% | 99.0% | 99.5% | 98.7% | 89.6% | 99.7% | 100% | 99.5% | 100% | 99% | 100% | 100% |
| Estimated Pounds of Organics Treated | 5,470 | 3,580 | 3,527 | 2,378 | 2,240 | 1,887 | 1,392 | 1,696 | 1,214 | 1,185 | 1,374 | 1,124 | 1,042 | 1,066 | 1,096 |
| ***OUTFALL 023*** | | | | | | | | | | | | | | | |
| Estimated Pounds of Organics Treated | 2,055 | 2,417 | 1,672 | 899 | 850 | 542 | 569 | 1,529 | 376 | 406 | 1,091 | 379 | 370 | 405 | 531 |
| ***TOTAL Organics All Sources*** | | | | | | | | | | | | | | | |
| Estimated Pounds of Organics Treated | 17,875 | 13,217 | 12,519 | 11,117 | 12,527 | 8,892 | 8,961 | 6,607 | 4,615 | 4,815 | 6,313 | 4,323 | 4,057 | 3,708 | 13,216 |

NA: Not applicable.
NR: Not recorded in the past quarterly or annual reports.

* Includes estimated quantity of organics/water mixture shipped in 3Q98.

** The calculated uptime for the original 23 wells excludes wells repaced by BFBTs.

**Table 2-1**
**Historical System Operations Summary**
**Chemours Niagara Plant**

| OPERATIONS STATISTIC | 2007 | 2008** | 2009** | 2010** | 2011** | 2012** | 2013** | 2014** | 2015** | 2016** | 2017** | 2018** | 2019** | 2020** | 2021** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***GWRS*** | | | | | | | | | | | | | | | |
| 23 Original Wells Uptime | 75% | 98% | 100% | 99% | 96% | 100% | 99% | 96% | 98% | 93% | 97% | 96% | 95% | 95% | 97% |
| PW-37 Uptime | 12% | 32% | 92% | 100% | 93% | 99% | 100% | 97% | 98% | 89% | 96% | 93% | 98% | 96% | 97% |
| PW-39 Uptime | 66% | 93% | 99% | 100% | 93% | 98% | 94% | 97% | 98% | 92% | 91% | 75% | 98% | 97% | 97% |
| Total Gallons Pumped (millions) | 13.3 | 9.5 | 11.8 | 9.1 | 10.7 | 11.9 | 13.4 | 12.3 | 11.9 | 10.1 | 16.5 | 10.6 | 12.9 | 9.5 | 9.9 |
| Estimated pounds of Organics Treated* | 8,678 | 7,932 | 12,128 | 7,854 | 9,004 | 8,254 | 9,416 | 8,567 | 7,995 | 6,629 | 10,815 | 5,794 | 5,635 | 5,689 | 5,846 |
| Number of unscheduled system shutdowns | 3 | 0 | 0 | 1 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of scheduled system shutdowns | 3 | 1 | 1 | 1 | 1 | 3 | 3 | 5 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| Pump Replacements | 5 | 10 | 11 | 7 | 3 | 3 | 3 | 3 | 3 | 5 | 4 | 3 | 6 | 4 | 1 |
| Pump Repairs Requiring > 48 Hours | 23 | 11 | 4 | 2 | 0 | 1 | 5 | 10 | 2 | 2 | 6 | 1 | 6 | 1 | 0 |
| ***OLIN SYSTEM*** | | | | | | | | | | | | | | | |
| Pumping System Uptime | 99.9% | 100% | 100% | 99.8% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 98.8% | 99.9% | 100.0% |
| Estimated Pounds of Organics Treated | 1,068 | 1,257 | 1,222 | 1,167 | 1,386 | 1,137 | 1,043 | 1,269 | 1,197 | 1,152 | 1,245 | 947 | 1,363 | 2,347 | 2,355 |
| ***OUTFALL 023*** | | | | | | | | | | | | | | | |
| Estimated Pounds of Organics Treated | 326 | 544 | 699 | 224 | 355 | 303 | 337 | 355 | 241 | 398 | 570 | 498 | 191 | 126 | 200 |
| ***TOTAL Organics All Sources*** | | | | | | | | | | | | | | | |
| Estimated Pounds of Organics Treated | 10,072 | 9,733 | 14,049 | 9,245 | 10,745 | 9,695 | 10,796 | 10,191 | 9,433 | 8,179 | 12,630 | 7,239 | 7,189 | 8,162 | 8,401 |

NA: Not applicable.
NR: Not recorded in the past quarterly or annual reports.

* Includes estimated quantity of organics/water mixture shipped in 3Q98.

** The calculated uptime for the original 23 wells excludes wells repaced by BFBTs.

**Table 3-1**
**Quarterly Groundwater Level Monitoring Locations**
**Chemours Niagara Plant**

| Monitoring Points |
|---|
| ***Piezometers***<br><br>WPPO-1, WPPT-2, WPPO-3R, WPPT-4, WPPT-5, EPPT-1, EPPT-2, EPPT-3, WPO-1R, WPT-1R, WPO-2, WPT-2, WPO-3R, WPT-3R, WPO-4, WPT-4, WPO-5, WPT-5, WPO-6, WPT-6, WPO-7, WPT-7, WPO-8, WPT-8, WPO-9, WPT-9R, WPO-10, WPT-10, WPO-11, WPT-11, WPO-12, WPT-12, WPO-13, WPO-14, WPO-15, WPO-16, WPO-17, WPT-17, WPO-18, WPT-18, WPO-19, WPT-19, WPO-20, WPT-20, WPO-21, WPT-21, WPO-22, WPT-22, WPO-23, WPT-23, WPO-24, WPT-24, WPO-25, WPT-25, EPO-1, EPT-1, EPO-2, EPT-2, EPO-3, EPT-3, EPO-4 EPT-4, EPO-5, EPT-5, EPO-6, EPT-6, EPO-7, EPT-7, EPO-8, EPT-8, EPO-9, EPT-9 |
| ***Pumping wells***<br>PW-1, PW-3, PW-4, PW-6, PW-8, PW-9, PW-10, PW-11, PW-12, PW-14, PW-16, PW-18, PW-19, PW-20, PW-22, PW-24, PW-26, PW-28, PW-30, PW-32, PW-34, PW-35, PW-36, PW-37, PW-38, PW-39, TPW-01 |
| ***Utility wells***<br>U-1, U-14, U-16 |
| ***Monitoring wells (A-Zone )***<br>1AR3, 2A, 3A, 4AR, 5AR, 6AR, 7AR2, 8A, 9AR, 10A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 19A, 20AR, 21A, 23AR, 24A, 27A, 28A |
| ***Monitoring wells (B-Zone)***<br>1BR, 2B, 3B, 5BR, 8B, 12B, 14B*, 16B, 19B, 20B, 23B, 24B, 25B, 29B, 30B, BW-01 |
| ***Monitoring wells (C/CD-Zone)***<br>1C, 2C, 4CR, 5CDR, 5CR, 7CR, 10C, 10CR, 12C/CD, 14C, 15C, 15CD, 17B, 18C, 19C, 19CD1, 19CD2, 23C, 25C/CD, 26C, 26CD |
| ***Monitoring wells (D-Zone)***<br>1D, 5DR, 10D, 14D, 15D, 18D, 19D, 23D, 25D |
| ***Monitoring wells (F-Zone once every five years)***<br>1F, 5FR, 7FR, 10F, 15F, 17F, 23F, 25F |
| ***DEC wells***<br>DEC-3R, DEC-4R, DEC-5 |
| ***Olin monitoring wells***<br>OBA-10A, OBA-24A, OBA-24B, OBA-25A, OBA-25B, OBA-26A, OBA-26B, OBA-1B, OBA-1C |
| ***Gill Creek Stilling Wells***<br>GC-1, GC-2 ** |

* Well added to hydraulic monitoring program in 1Q02.
** Gill Creek stilling well GC-2 installed in 2006.

**Table 3-2**
**Groundwater Quality Monitoring Schedule**
**Chemours Niagara Plant**

| Monitoring Point | Sampling Frequency[1] |
|---|---|
| ***Olin GAC influent & effluent*** | Quarterly[2] |
| ***GWRS treatment influent & effluent*** | Quarterly[2] |
| ***Pumping wells*** [3]<br>PW-16, PW-18, PW-19, PW-20, PW-22, PW-24, PW-26, PW-28, PW-30, PW-32, PW-34, PW-35, PW-36, PW-37, PW-39 | Every five years (next is 2023) |
| ***Utility wells***<br>U-1 | Annual |
| ***Outfall***<br>023 | Quarterly |
| ***Monitoring wells (A-Zone wells)***<br>1AR3, 2A, 3A, 6AR, 8A, 9AR, 13A, 14A, 15A, 16A, 17A, 18A, 20AR[5], 21A, 24A, 27A, 28A | Annual |
| ***Monitoring wells (A-Zone wells)***<br>4AR, 5AR, 7AR[4], 10A, 12A, 19A, 23AR | Every five years[5] (next in 2023) |
| ***Monitoring wells (B-Zone wells)***<br>1BR, 3B, 5BR, 8B, 14B, 20B, 24B, 25B, 29B, 30B | Annual |
| ***Monitoring wells (B-Zone wells)***<br>2B, 12B, 16B, 19B, 23B | Every five years[5] (next in 2023) |
| ***Monitoring wells (C/CD-Zone wells)***<br>1C, 2C, 4CR, 12 C/CD, 15CD, 18C, 19CD1, 25C/CD, 26CD | Annual |
| ***Monitoring wells (C/CD-Zone wells)***<br>5CDR, 7CR, 17B, 23C | Every five years[5] (next in 2023) |
| ***Monitoring wells (D-Zone wells)***<br>1D, 10D, 14D, 18D, 25D | Annual |
| ***Monitoring wells (D-Zone wells)***<br>5DR, 15D, 19D, 23D | Every five years[5] (next in 2023) |
| ***Monitoring wells ( F-Zone wells)***<br>15F, 17F, 23F, 25F | Annual |
| ***Monitoring wells ( F-Zone wells)***<br>1F, 5FR, 7FR, 10F | Every five years[5] (next in 2023) |
| ***DEC wells***<br>DEC-3R, DEC-4R | Annual |
| ***DEC wells***<br>DEC-5 | Every five years[5] (next in 2023) |

[1] All analyses for refined indicator parameters except as noted below.

[2] Samples to be analyzed for the refined indicator parameter list once during any given quarterly sampling event. Samples collected during the remaining quarterly events are analyzed for field parameters and volatile organics. See Table 3-3 for analytical parameters.

[3] In active pumping wells: PW-1, PW-3, PW-4, PW-6, PW-8, PW-9, PW-10, PW-11, PW-12, PW-14 are removed from the program, last sampling was 2011 (corresondance dated June 15, 2011)

[4] Well 7AR replaced in 2008.

[5]Per NYSDEC electronic response July 7, 2008 and letter dated December 8, 2016.

# Table 3-3
# Chemical Analysis Parameter List
# Chemours Niagara Plant

| Volatiles | Inorganics and Other Parameters |
|---|---|
| Benzene | |
| Carbon tetrachloride | Total cyanide[1] |
| Chlorobenzene | Soluble barium[2] |
| Chloroform | pH[3] |
| Chloromethane | Temperature[3] |
| 1,2-dichlorobenzene | Specific conductivity[3] |
| 1,4-dichlorobenzene | |
| 1,4-dichlorobutane | **Base/Neutrals[1]** |
| 1,1-dichloroethane | bis(2-ethylhexyl)phthalate |
| 1,1-dichloroethene | Naphthalene |
| trans-1,2-dichloroethene | Hexachlorobutadiene |
| cis-1,2-dichloroethene | Hexachloroethane |
| Methylene chloride | |
| 1,1,2,2-tetrachloroethane | **Pesticides/PCBs[1]** |
| Tetrachloroethene | alpha-BHC |
| Tetrahydrothiophene | beta-BHC |
| Toluene | delta-BHC |
| 1,1,1-trichloroethane | gamma-BHC |
| 1,1,2-trichloroethane | PCB-1016 |
| Trichloroethene | PCB-1221 |
| Vinyl chloride | PCB-1232 |
| | PCB-1242 |
| | PCB-1248 |
| | PCB-1254 |
| | PCB-1260 |

[1] Analyses required once per year for these parameters on select samples for the quaterly sampling program.

[2] With approval from NYSDEC, dissolved barium analysis for the annual event was modified in 2006. Sampling will continue at wells 5AR (5-year schedule) and 21A (annual schedule) for soluble barium analysis.

[3] Field measurement

**Table 3-4**
**2021 Hydraulic Effectiveness Evaluation Results**
**A-Zone Overburden and A-Zone Bedrock**
**Chemours Niagara Plant**

| Aquifer Zone | WEST PLANT | | EAST PLANT | | ENTIRE PLANT | |
|---|---|---|---|---|---|---|
| | Area Hydraulically Controlled ($ft^2$) | Percent Captured | Area Hydraulically Controlled ($ft^2$) | Percent Captured | Area Hydraulically Controlled ($ft^2$) | Percent Captured |
| A-Zone overburden, 1Q21 | 1,047,901 | 92% | 926,022 | 99% | 1,973,922 | 95% |
| A-Zone bedrock, 1Q21 | 1,087,784 | 95% | 871,823 | 93% | 1,959,607 | 94% |
| A-Zone overburden, 2Q21 | 1,013,529 | 89% | 928,845 | 99% | 1,942,374 | 93% |
| A-Zone bedrock, 2Q21 | 1,140,014 | 100% | 867,959 | 93% | 2,007,974 | 97% |
| A-Zone overburden, 3Q21 | 972,783 | 85% | 928,845 | 99% | 1,901,628 | 91% |
| A-Zone bedrock, 3Q21 | 1,139,358 | 100% | 903,371 | 96% | 2,042,728 | 98% |
| A-Zone overburden, 4Q21 | 1,051,871 | 92% | 924,509 | 99% | 1,976,380 | 95% |
| A-Zone bedrock, 4Q21 | 1,138,025 | 100% | 857,742 | 92% | 1,995,767 | 96% |
| A-Zone overburden average | 89% | | 99% | | 94% | |
| A-Zone bedrock average | 99% | | 93% | | 96% | |
| **A-Zone average** | **94%** | | **96%** | | **95%** | |

**Based on Total Areas Below**

| | | |
|---|---|---|
| Area of West Plant | 1,141,732 | sq ft. |
| Area of East Plant | 937,140 | sq ft. |
| Total Plant Area | 2,078,871 | sq ft. |

**Table 3-5**
**Historical Hydraulic Effectiveness Evaluation Results**
**Chemours Niagara Plant**

| Year | West Plant | | East Plant | | Entire Plant | |
|---|---|---|---|---|---|---|
| | A-Zone Overburden | A-Zone Bedrock | A-Zone Overburden | A-Zone Bedrock | A-Zone Overburden | A-Zone Bedrock |
| 1997 | 95% | 95% | 82% | 93% | 89% | 94% |
| 1998 | 95% | 95% | 84% | 93% | 90% | 94% |
| 1999 | 91% | 96% | 85% | 92% | 88% | 94% |
| 2000 | 87% | 91% | 96% | 95% | 91% | 93% |
| 2001 | 89% | 92% | 94% | 96% | 90% | 93% |
| 2002 | 87% | 89% | 92% | 92% | 89% | 90% |
| 2003 | 88% | 88% | 92% | 90% | 90% | 89% |
| 2004 | 88% | 89% | 92% | 89% | 89% | 89% |
| 2005 | 88% | 89% | 92% | 89% | 90% | 89% |
| Pre-2006 Average | 90% | 92% | 90% | 92% | 90% | 92% |
| 2006 | 94% | 96% | 91% | 89% | 93% | 93% |
| 2007[1] | 94% | 97% | 90% | 92% | 92% | 95% |
| 2008 | 93% | 92% | 96% | 94% | 94% | 93% |
| 2009 | 93% | 91% | 100% | 91% | 96% | 91% |
| 2010 | 89% | 94% | 99% | 96% | 94% | 95% |
| 2011 | 89% | 93% | 98% | 96% | 93% | 94% |
| 2012[2] | 94% | 93% | 98% | 93% | 96% | 93% |
| 2013 | 89% | 97% | 99% | 92% | 94% | 94% |
| 2014 | 88% | 97% | 99% | 90% | 93% | 94% |
| 2015 | 91% | 95% | 98% | 91% | 94% | 94% |
| 2016 | 87% | 93% | 99% | 97% | 92% | 95% |
| 2017 | 90% | 97% | 100% | 97% | 95% | 97% |
| 2018 | 90% | 94% | 99% | 92% | 94% | 93% |
| 2019 | 89% | 92% | 99% | 91% | 93% | 92% |
| 2020 | 91% | 83% | 99% | 95% | 94% | 88% |
| 2021 | 89% | 99% | 99% | 93% | 94% | 96% |

Notes:

1) Averages from 2007 do not include 4Q07 data. Reduced uptime in October, including a system shutdown related to the GWRS modification construction that extended into 2008, resulted in the 4Q07 monitoring event not being completed.

2) Average from 2012 excluded 1Q12 which was biased low due to anomalous flow patterns

# FIGURES



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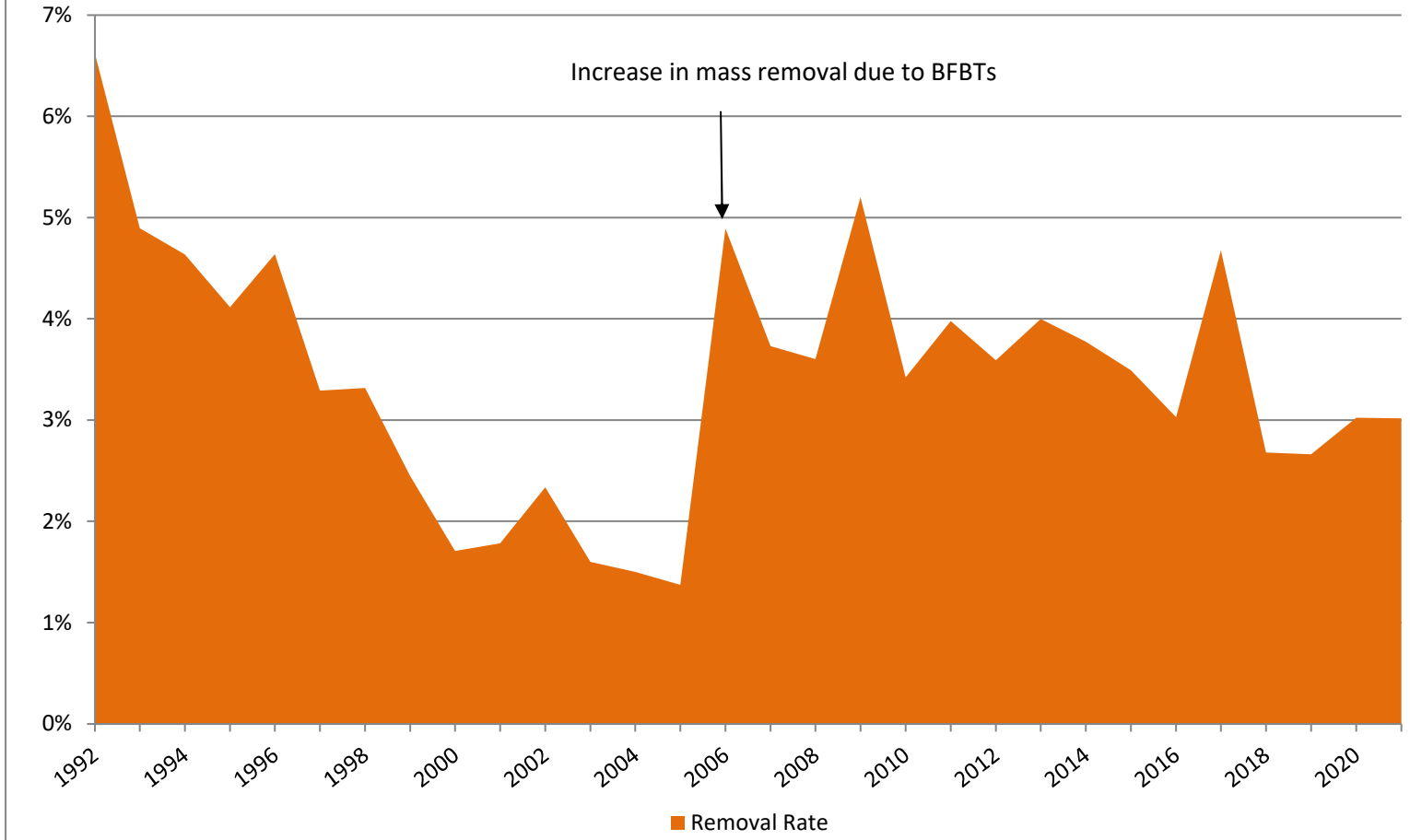
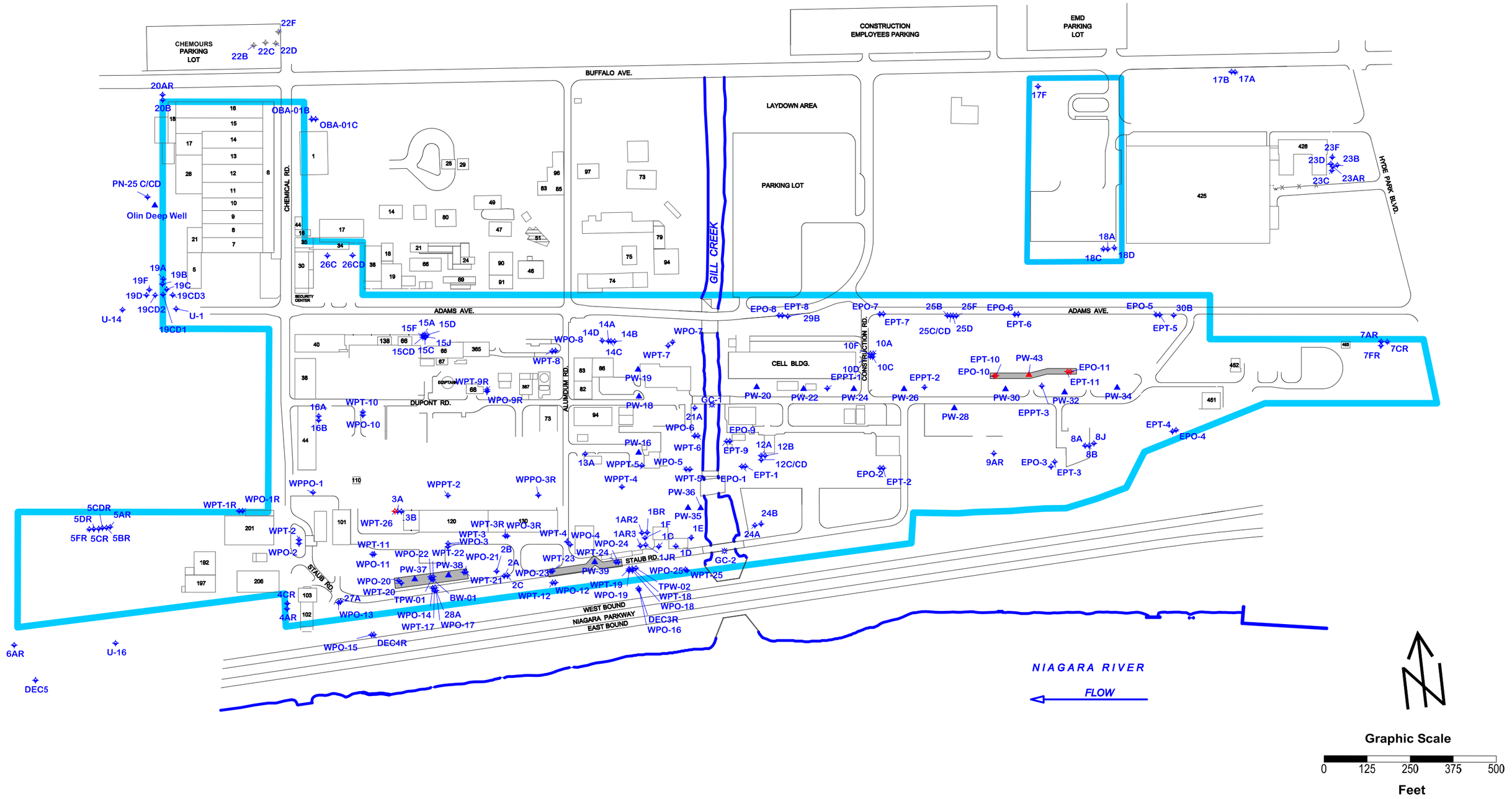
| Project Manager: EAF | Date: 02-22-12 |
| | |
| Job number: 445356.02023 | |

# FIGURE 1-1
# SITE LOCATION MAP
# NIAGARA PLANT
# NIAGARA FALLS, NY

DuPont/Niagara/hydrogeo/mapping/Site_location_map.srf

# Figure 2-1
# Annual Organics Treated as Percent of Total Removed to Date



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| Project Manager: EAF | Date: 3/11/2022 |
| | |
| Job number: 452825.03000 | |

## LEGEND

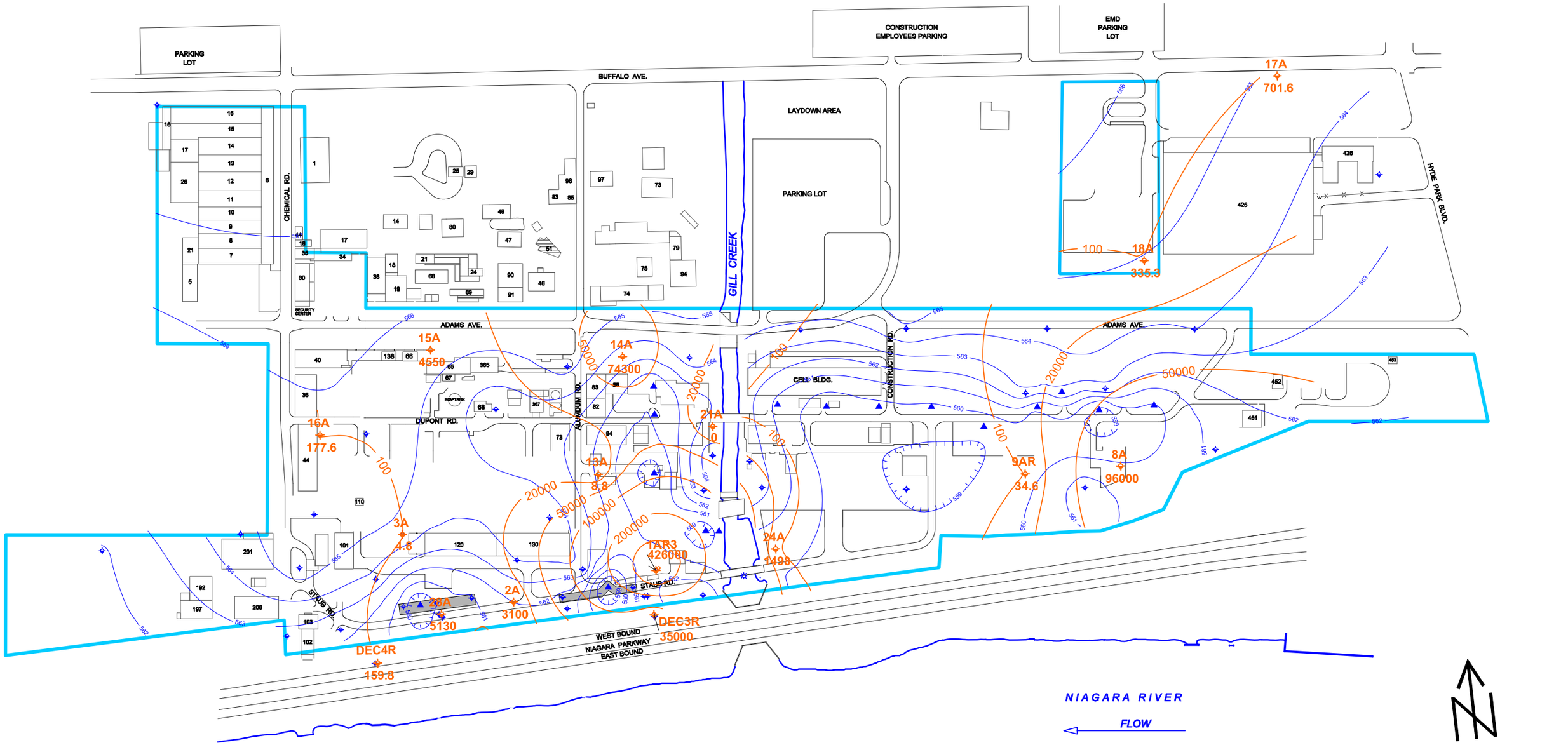
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 WELL ID
- MONITORING WELL
- PUMPING WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- WELL INSTALLED IN 2021
- WELL DECOMMISSIONED IN 2021
- BLAST FRACTURED BEDROCK TRENCH

# FIGURE 3-1
# GROUNDWATER MONITORING WELL, PUMPING WELL AND PIEZOMETER PLAN
# NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont/Niagara/NiaPlant/Hydrogeo/Well Network/Niagara Surfer Basemap/Niagara Surfer Basemap 2022.srf





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| Project Manager: EAF | Date: 2/9/2022 |
| | |
| Job number: 452825.03000 | |

## LEGEND

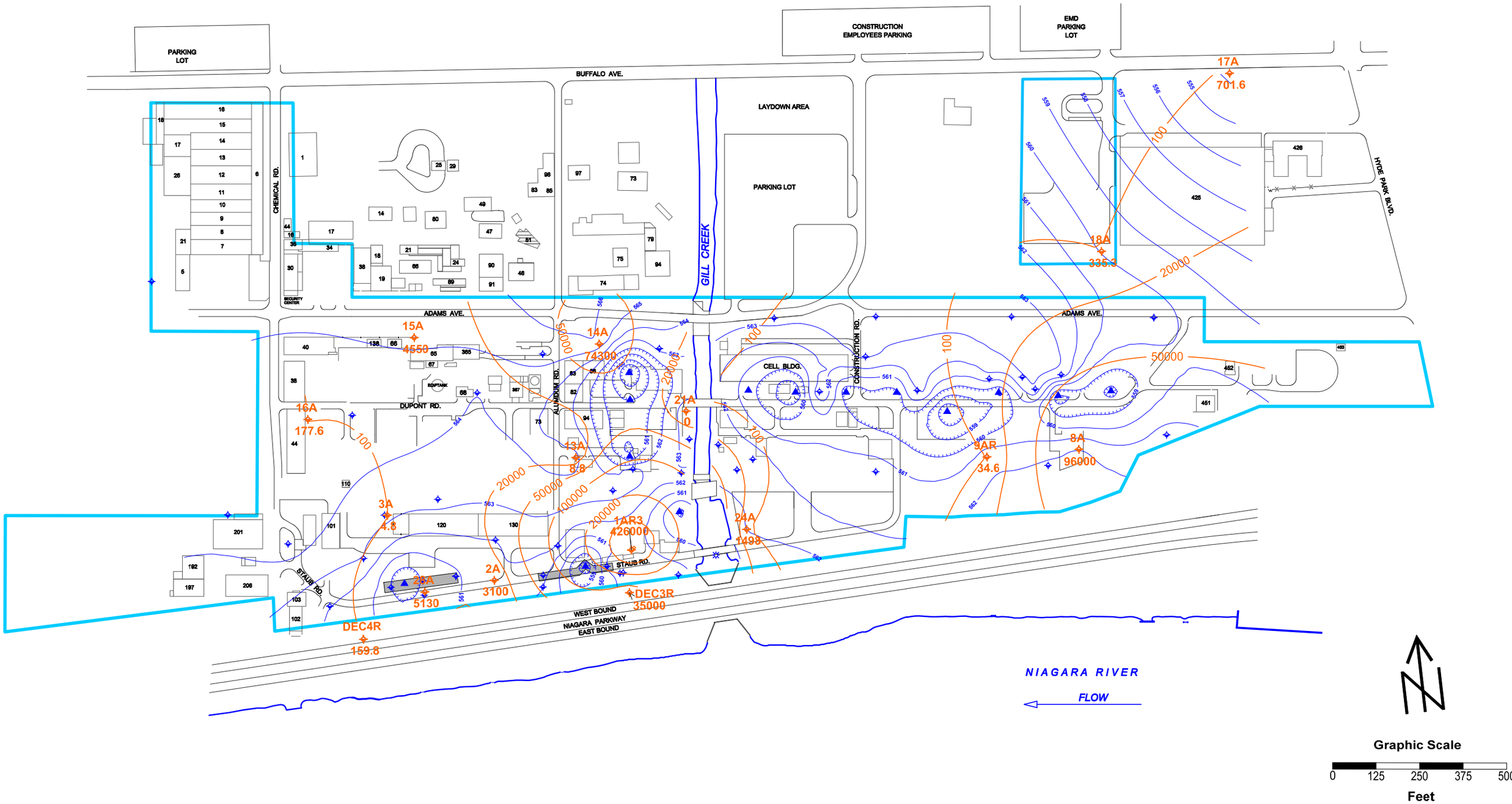
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- 563 GROUNDWATER CONTOUR ELEVATION

## CHEMOURS WELLS

- 1AR3 WELL ID
- WELL/PIEZOMETER - TVOC SAMPLE
- WELL/PIEZOMETER - WATER LEVEL
- PUMPING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- TVOC ISOCONCENTRATION CONTOUR (ug/L)
- GROUNDWATER CONTOUR DEPRESSION
- 100000 TVOC CONTOUR CONCENTRATION (ug/L)

**FIGURE 3-2**
**COMBINED POTENTIOMETRIC SURFACE MAP**
**AND TOTAL VOLATILE ORGANIC ISOCONCENTRATION MAP**
**A-ZONE OVERBURDEN - 4Q2021**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021_Annual Report/2021 Annual TVOC OBPZ New.srf





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| | |
| Job number: 452825.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- 563 — GROUNDWATER CONTOUR ELEVATION

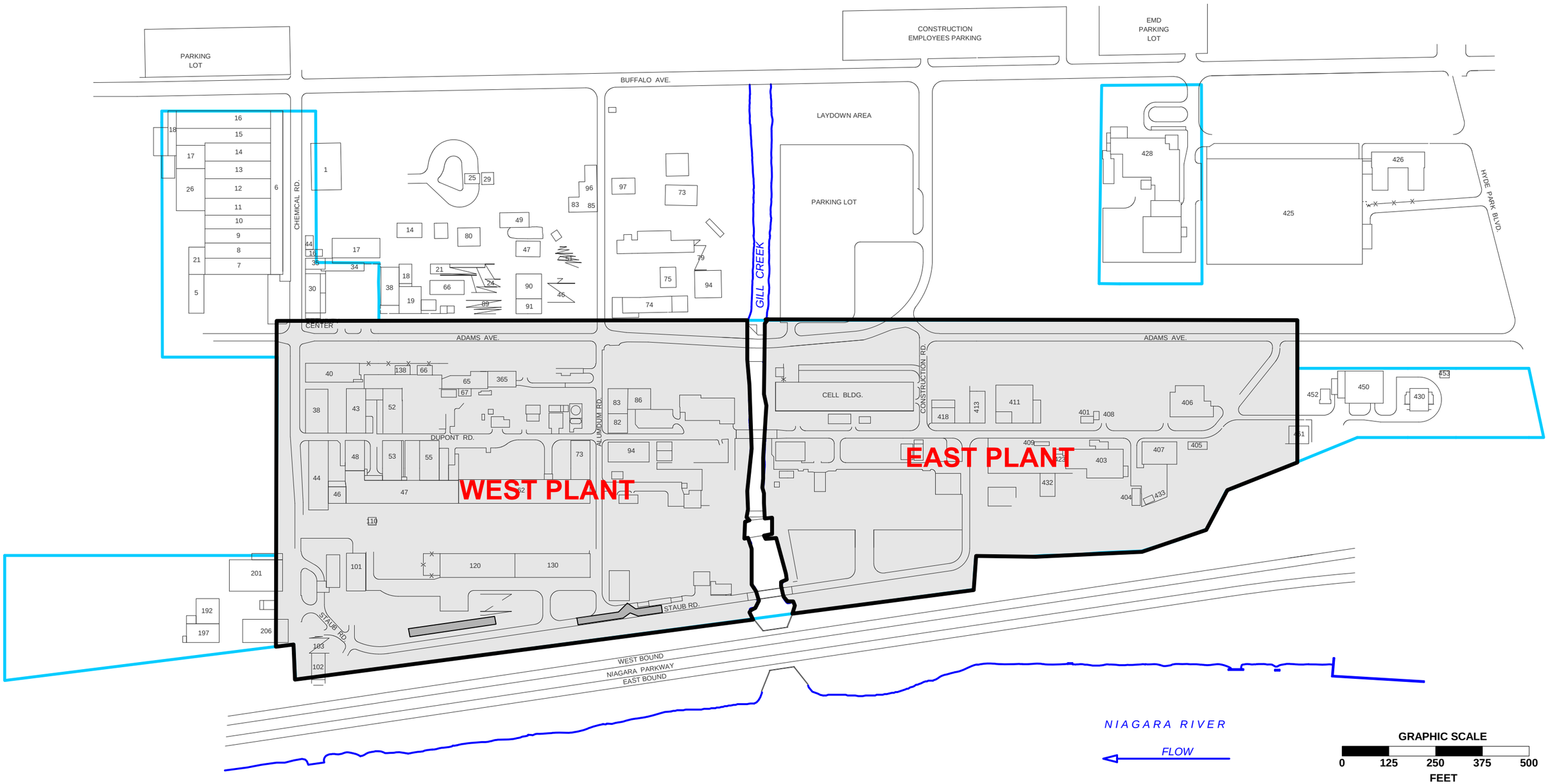
## CHEMOURS WELLS

- 1AR3 — WELL ID
- WELL/PIEZOMETER - TVOC SAMPLE
- WELL/PIEZOMETER - WATER LEVEL
- PUMPING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

- BLAST FRACTURED BEDROCK TRENCH
- TVOC ISOCONCENTRATION CONTOUR (ug/L)
- GROUNDWATER CONTOUR DEPRESSION
- 100000 — TVOC CONTOUR CONCENTRATION (ug/L)

# FIGURE 3-3
# COMBINED POTENTIOMETRIC SURFACE MAP AND TOTAL VOLATILE ORGANIC ISOCONCENTRATION MAP A-ZONE BEDROCK - 4Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021_Annual Report/2021 Annual TVOC BRPZ New.srf





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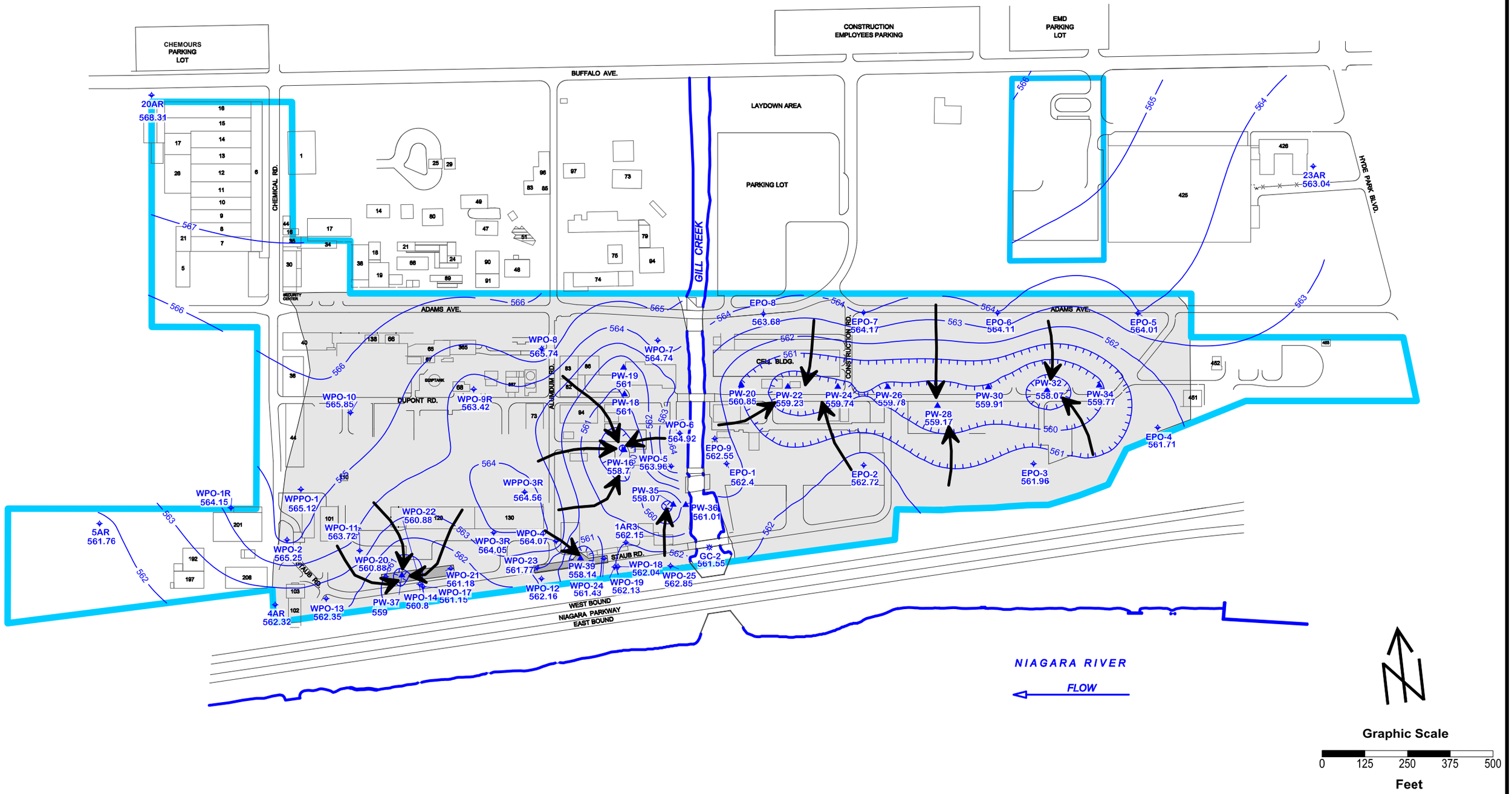
| Project Manager: EAF | Date: 03-07-14 |
| | Date: |
| Job number: 445357.02023 | |

**LEGEND**

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER
- BLAST FRACTURED BEDROCK TRENCH
- AREA OF HYDRAULIC EVALUATION

# FIGURE 3-4
## Area of Niagara Plant Where Hydraulic Effectiveness Evaluation is Conducted
## Chemours Niagara Plant, Niagara Falls, NY

2007-03-01 Basemap.srf




## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

Graphic Scale

0 125 250 375 500

Feet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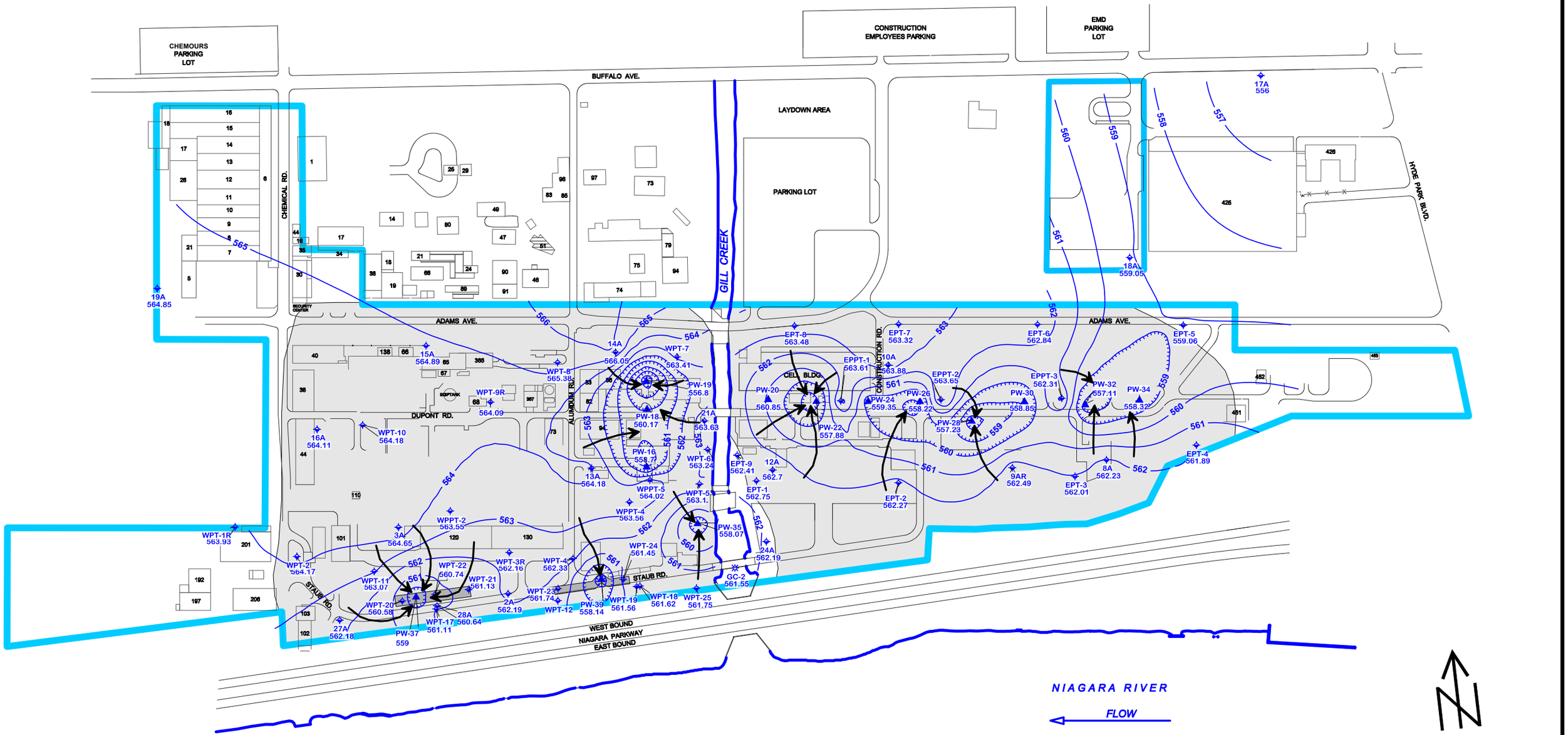
| | |
| Job number: 452457.03000 | |

# FIGURE 3-5
# POTENTIOMETRIC SURFACE MAP
# A-ZONE OVERBURDEN - 1Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY




Note:
Well WPT-12 was dry on March 10, 2021.

Graphic Scale
0 125 250 375 500
Feet

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| | |
| Job number: 452457.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

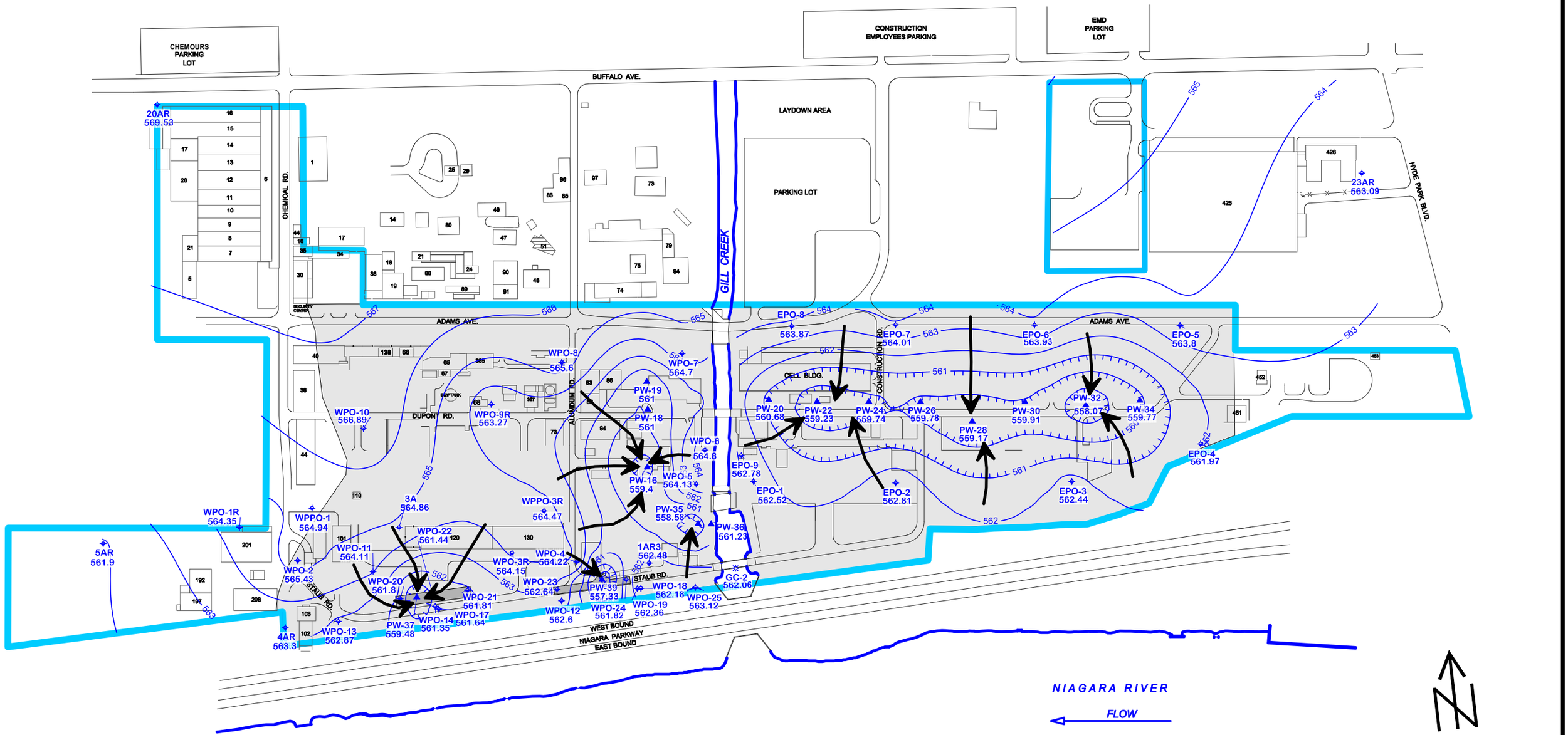
## CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

# FIGURE 3-6
# POTENTIOMETRIC SURFACE MAP
# A-ZONE BEDROCK - 1Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-03-10 NIA Contour Tool/2021-03-10-BRPZ.srf




Graphic Scale

0 125 250 375 500

Feet

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION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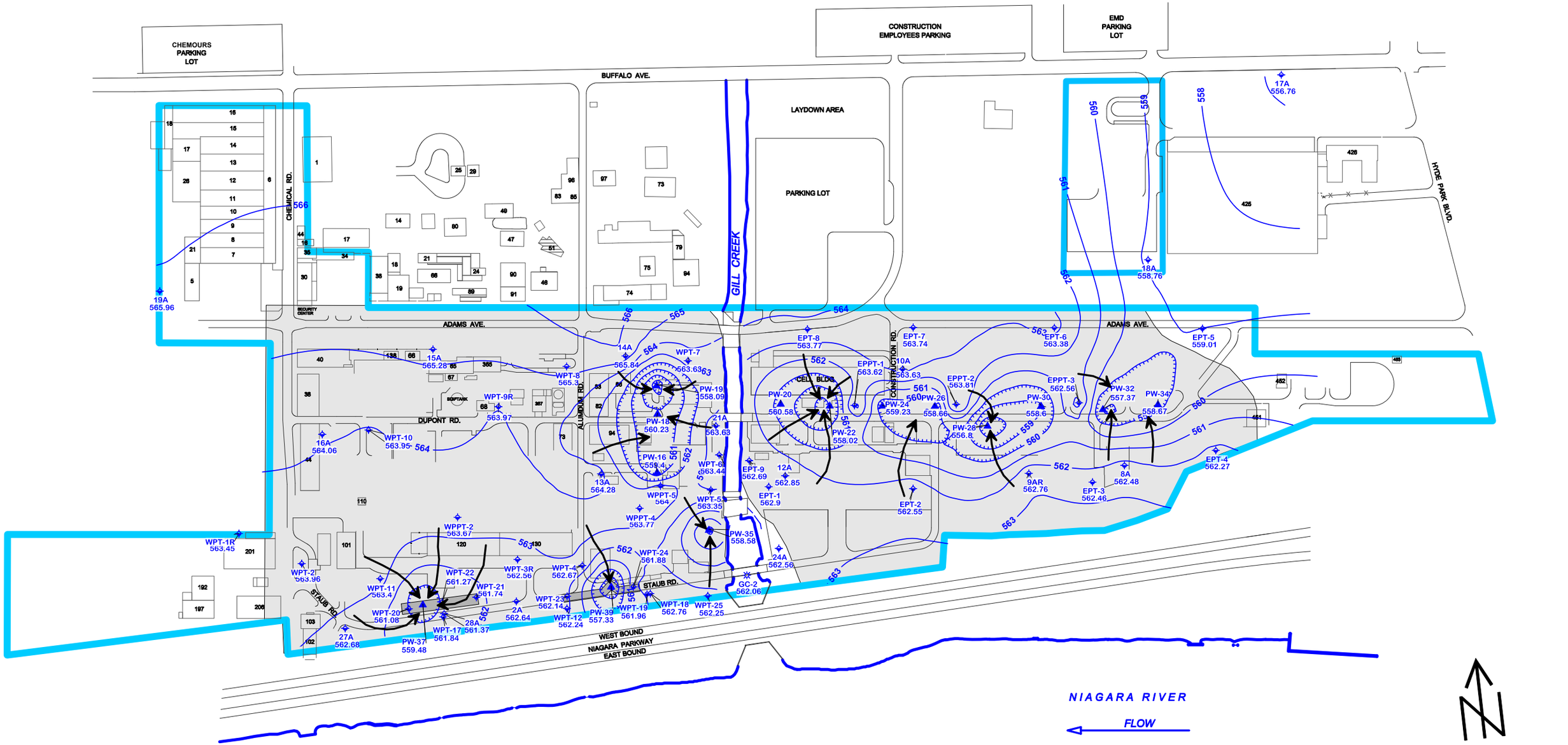
| | |
| Job number: 452457.03000 | |

# FIGURE 3-7
# POTENTIOMETRIC SURFACE MAP
# A-ZONE OVERBURDEN - 2Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

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| Project Manager: EAF | Date: 2/9/22 |
| | |
| Job number: 452457.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

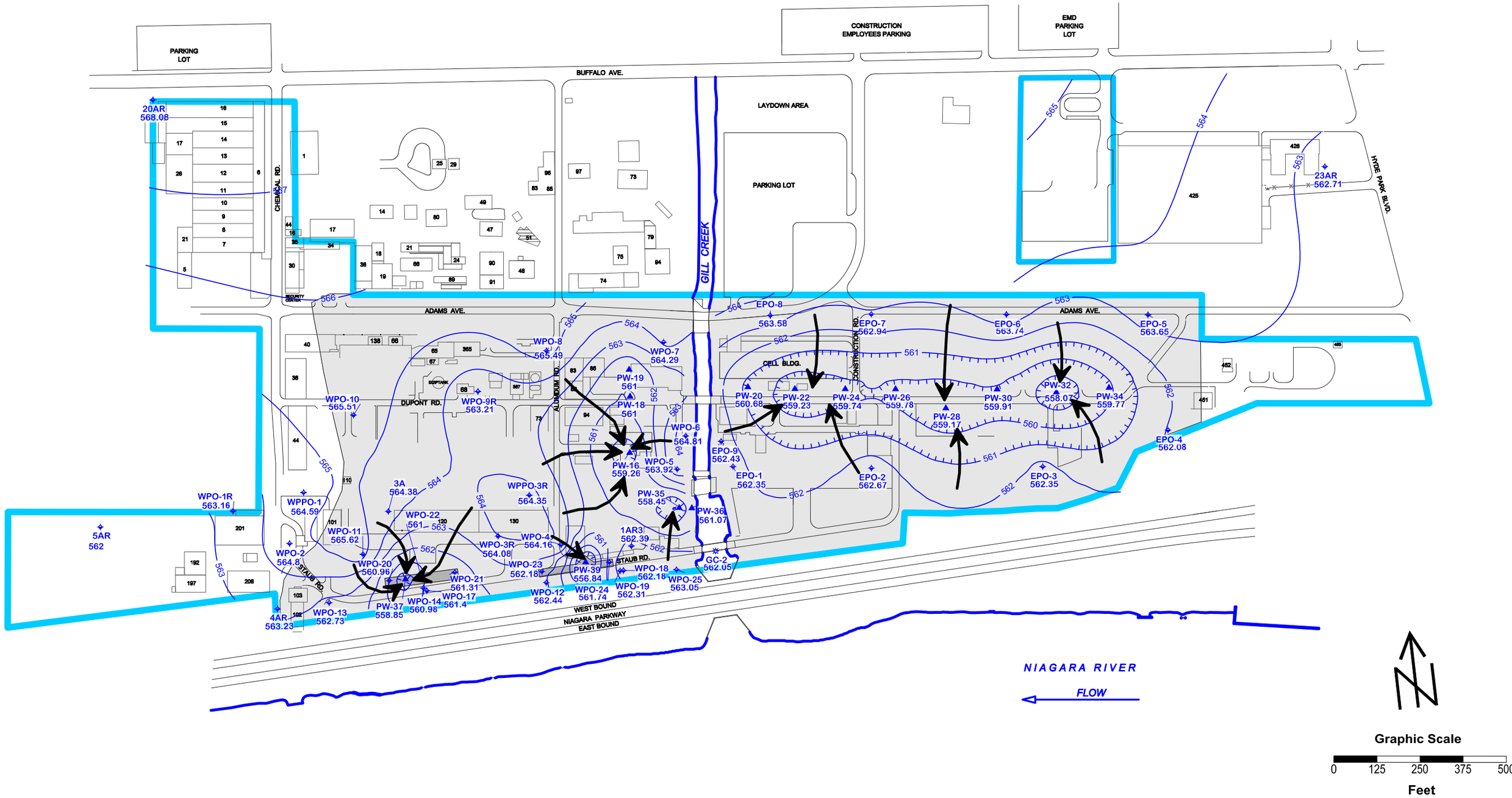
## CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

# FIGURE 3-8
# POTENTIOMETRIC SURFACE MAP
# A-ZONE BEDROCK - 2Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-06-03 NIA Contour Tool/2021-06-03-BRPZ.srf





**PARSONS**
40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730


| | |
|---|---|
| Created by: RBP | Date: 2/8/22 |
| Checked by: JWS | Date: 2/9/22 |
| Project Manager: EAF | Date: 2/9/22 |
| | |
| Job number: 452457.03000 | |

## LEGEND

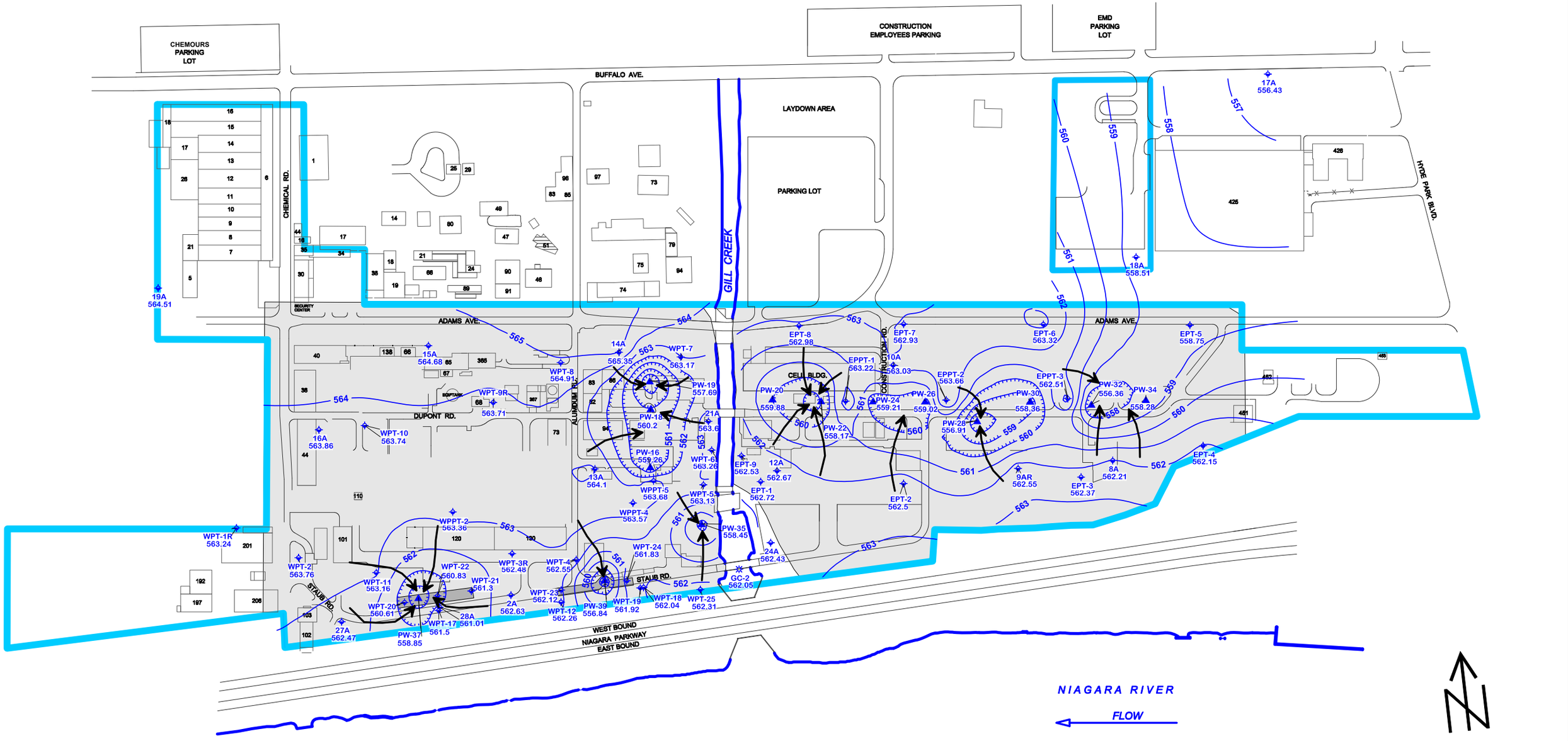
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

# FIGURE 3-9
# POTENTIOMETRIC SURFACE MAP
# A-ZONE OVERBURDEN - 3Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY





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| | |
| Job number: 452457.03000 | |

## LEGEND

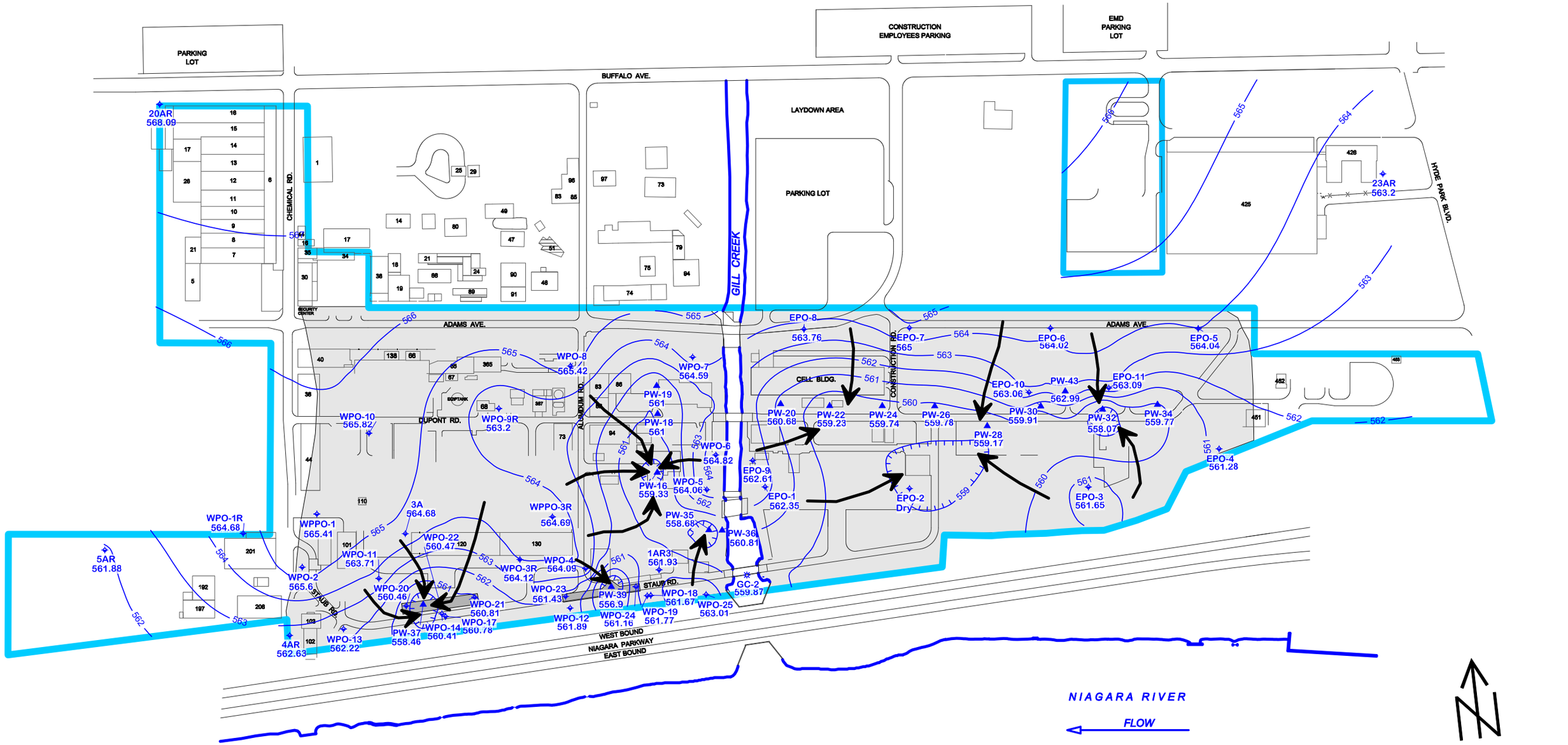
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

# FIGURE 3-10
# POTENTIOMETRIC SURFACE MAP
# A-ZONE BEDROCK - 3Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-08-18 NIA Contour Tool/2021-08-18-BRPZ.srf




Note:
Well EPO-2 was dry on November 4, 2021.

Graphic Scale
0 125 250 375 500
Feet


**PARSONS**
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Buffalo, NY 14202
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| | |
|---|---|
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| | |
| Job number: 452457.03000 | |

**LEGEND**

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

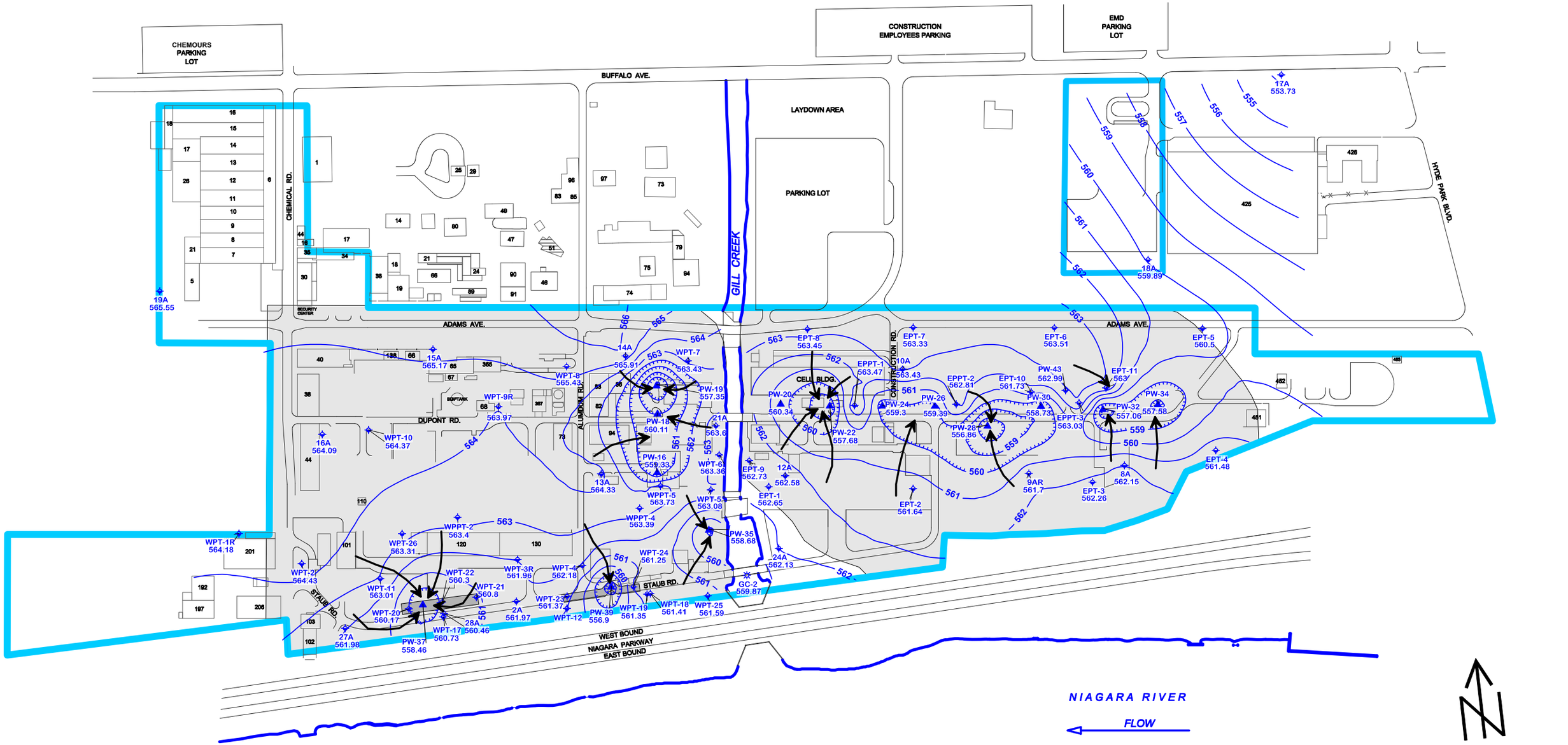
**CHEMOURS WELLS**

- 1AR3 — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION

- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

**FIGURE 3-11**
**POTENTIOMETRIC SURFACE MAP**
**A-ZONE OVERBURDEN - 4Q2021**
**CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY**

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-OBPZ.srf





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40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730


| | |
|---|---|
| Created by: RBP | Date: 2/8/22 |
| Checked by: JWS | Date: 2/9/22 |
| Project Manager: EAF | Date: 2/9/22 |
| | |
| Job number: 452457.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

# FIGURE 3-12
# POTENTIOMETRIC SURFACE MAP
# A-ZONE BEDROCK - 4Q2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-BRPZ.srf

# APPENDIX A
# WELL ABANDONMENT AND BORING LOGS

## DRILLING SUMMARY

**Geologist:**
Tayler Schweigel

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

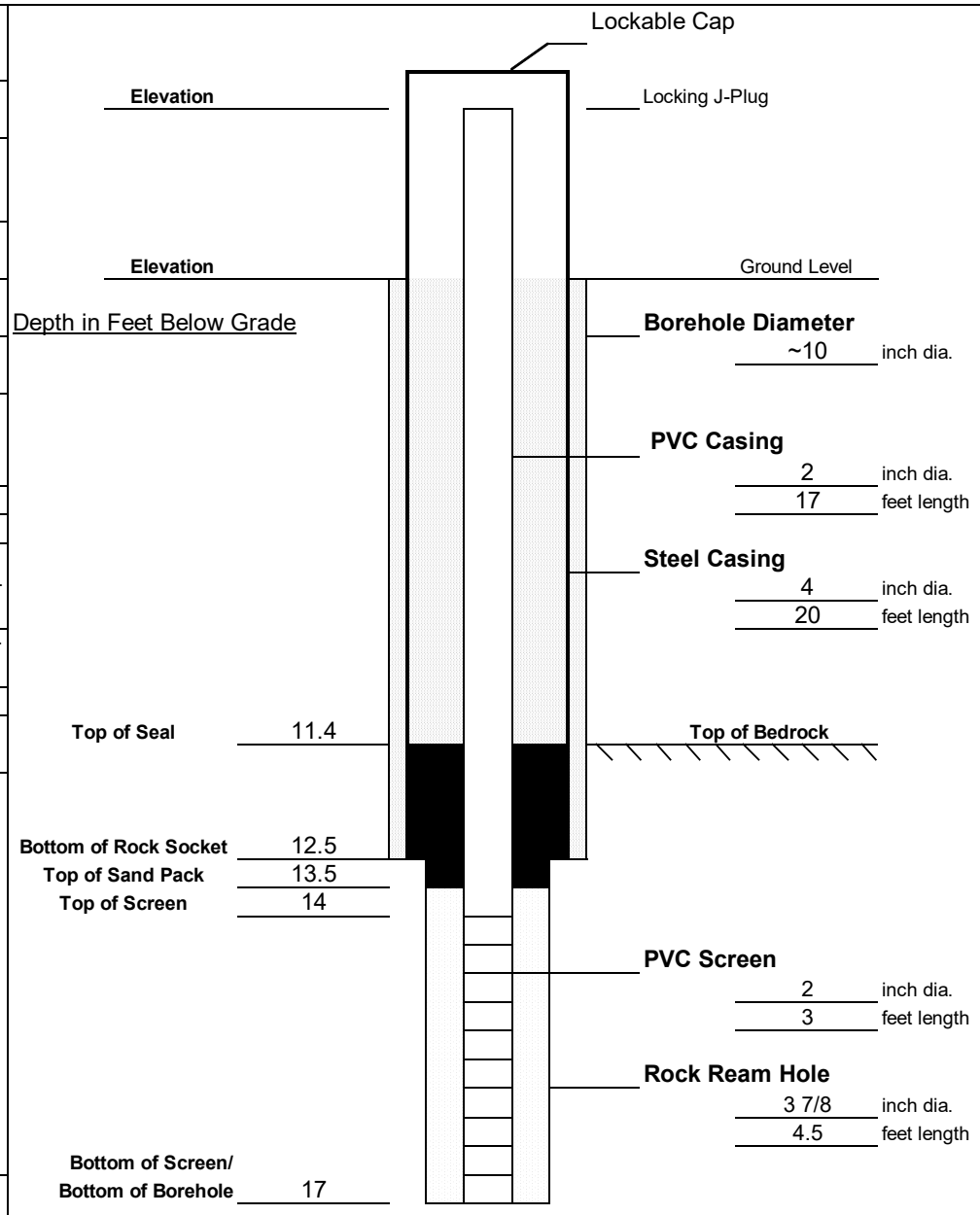
**Rig Make/Model:**
CME-85

**Date:**
9/1/2021

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| 0-3" | Asphalt |
| 3"-8' | Moist, medium dense, brown Silt, some f-c Sand, little Clay. |
| 8-11.5' | Wet medium dense Silt and f-c Gravel, little f-c Sand. |
| 11.5' | Top of rock |
| 11.5-17' | Gray angular cuttings Lockport Dolomite |

## WELL DESIGN




| *CASING MATERIAL* | *SCREEN MATERIAL* | *FILTER MATERIAL* |
|---|---|---|
| **Surface:** Stick up | **Type:** Schedule 40 PVC | **Type:** Morie "O" well sand<br>**Setting:** 13.5-17' |
| **Monitor:** PVC | **Slot Size:** 0.020" | ***SEAL MATERIAL***<br>**Type 1:** Bentonite chips<br>**Setting:** 13.5-11.4' |

***COMMENTS:***

***LEGEND***

- Cement Grout
- Bentonite Seal
- Sand Pack

| | | |
|---|---|---|
| **Client: Chemours** | **Location: Niagara West Plant** | **Project No.: 452457.07001** |
| ***Parsons*** | **BEDROCK PIEZOMETER CONSTRUCTION DETAILS** | **Well Number: WPT-26** |

## DRILLING SUMMARY

**Geologist:**
Tayler Schweigel

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

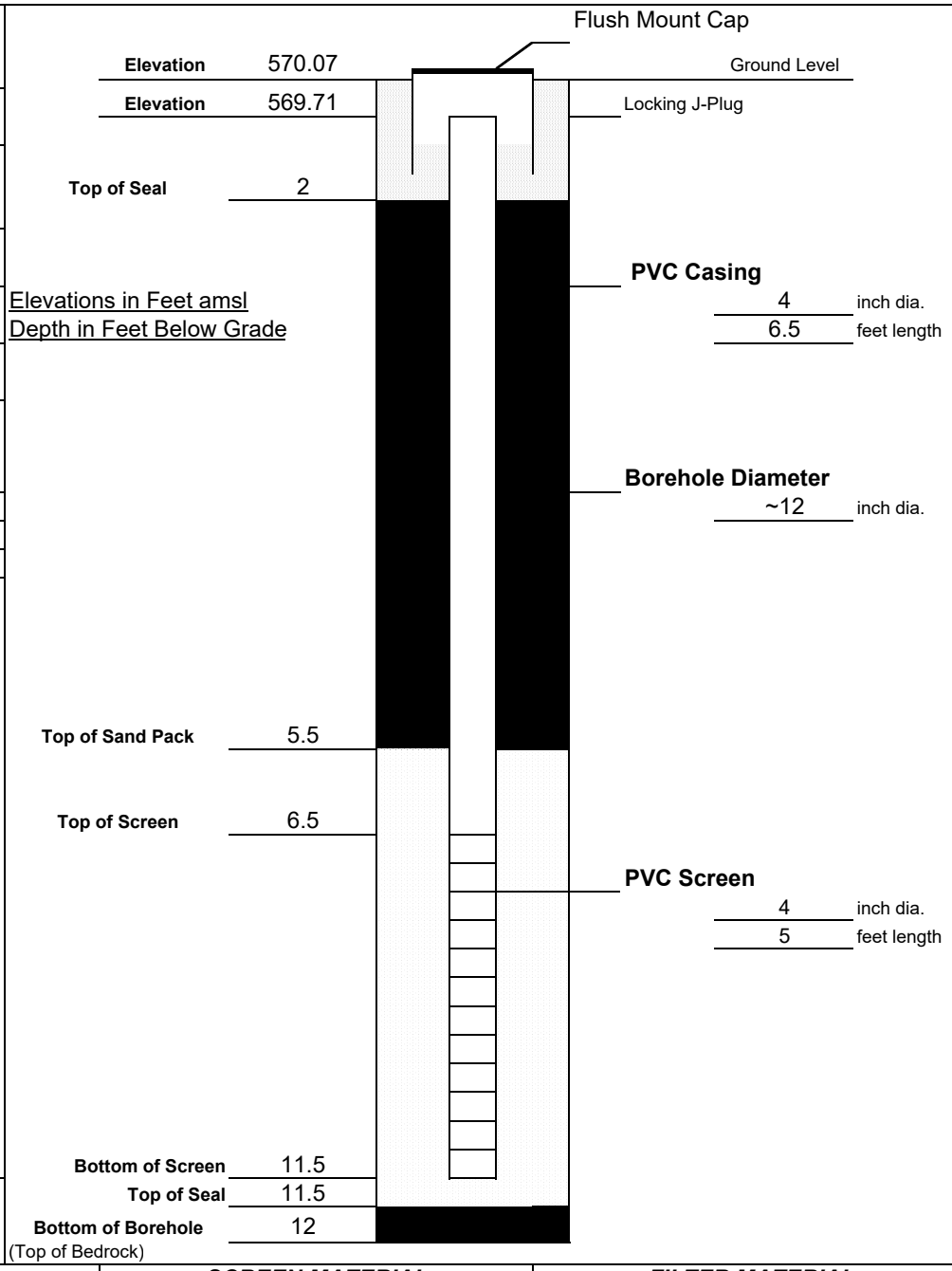
**Rig Make/Model:**
CME-85

**Date:**
10/18/2021

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| | |
| 0-12' | Fill |

## WELL DESIGN




### *CASING MATERIAL*

**Surface:** Flush Mount Road Box

**Monitor:** PVC

### *SCREEN MATERIAL*

**Type:** Schedule 40 PVC

**Slot Size:** 0.020"

### *FILTER MATERIAL*

**Type:** FilPro WG#0 sand
**Setting:** 5.5-11.5'

### *SEAL MATERIAL*

**Type 1:** Bentonite chips
**Setting:** 2-5.5'
**Type 1:**
**Setting:**

***COMMENTS:***

### *LEGEND*

Concrete

Bentonite Seal

Sand Pack

**Client: Chemours**

**Location: Niagara East Plant**

**Project No.: 452681.03050**

***Parsons***

**OVERBURDEN PIEZOMETER CONSTRUCTION DETAILS**

**Well Number: EPO-10**

## DRILLING SUMMARY

**Geologist:**
Tayler Schweigel

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

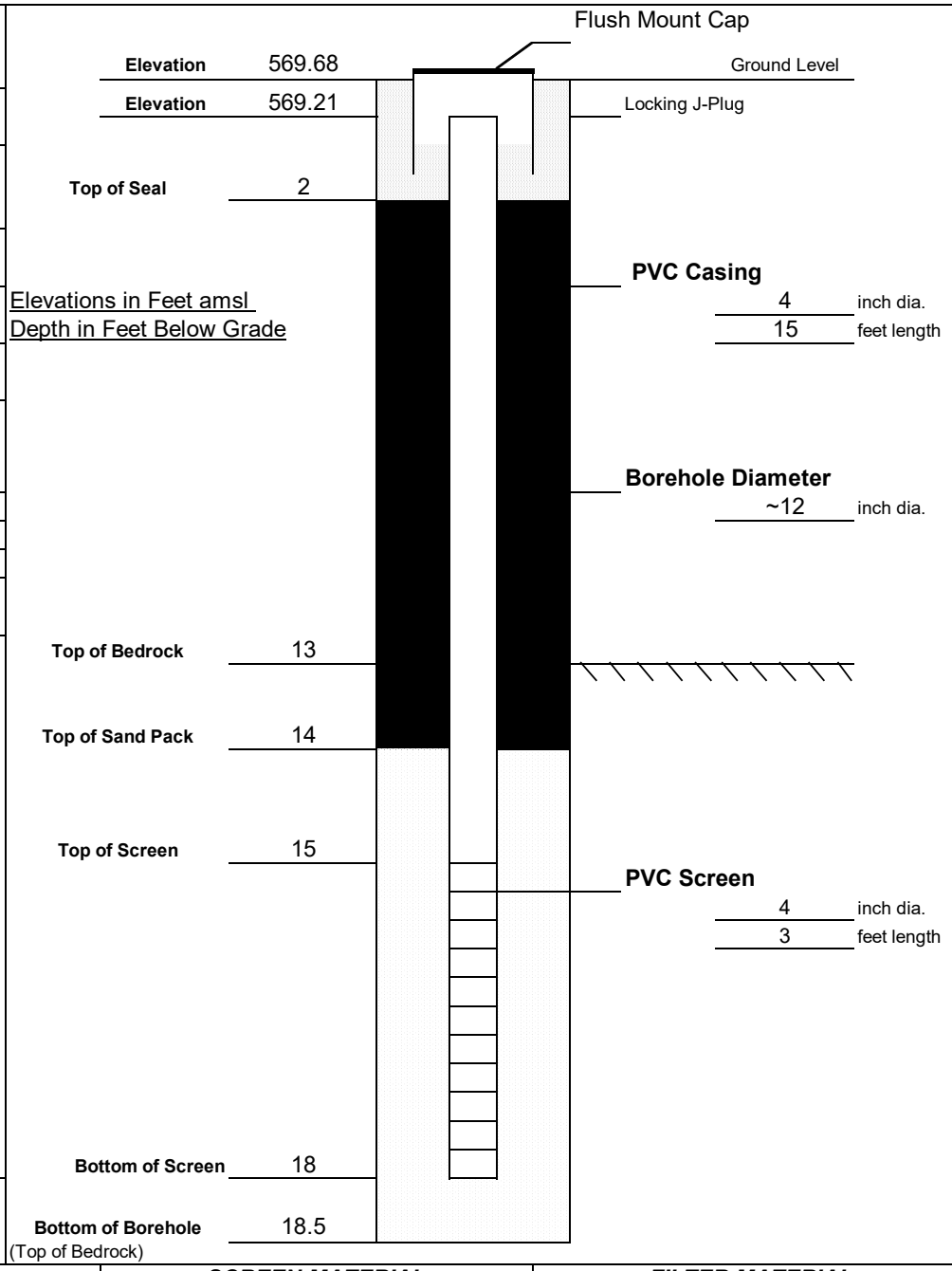
**Rig Make/Model:**
CME-85

**Date:**
10/18/2021

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| | |
| 0-13' | Fill |
| 13'18.5 | Blasted rock (Lockport Dolomite) |

## WELL DESIGN




### *CASING MATERIAL*

**Surface:** Flush Mount Road Box

**Monitor:** PVC

### *SCREEN MATERIAL*

**Type:** Schedule 40 PVC

**Slot Size:** 0.020"

### *FILTER MATERIAL*

**Type:** FilPro WG#0 sand
**Setting:** 14-18.5'

### *SEAL MATERIAL*

**Type 1:** Bentonite chips
**Setting:** 2-14'
**Type 1:**
**Setting:**

***COMMENTS:***

### *LEGEND*

- Concrete
- Bentonite Seal
- Sand Pack

| | | |
|---|---|---|
| **Client: Chemours** | **Location: Niagara East Plant** | **Project No.: 452681.03050** |
| ***Parsons*** | **TRENCH PIEZOMETER CONSTRUCTION DETAILS** | **Well Number: EPT-10** |

## DRILLING SUMMARY

**Geologist:**
Robert Piurek

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

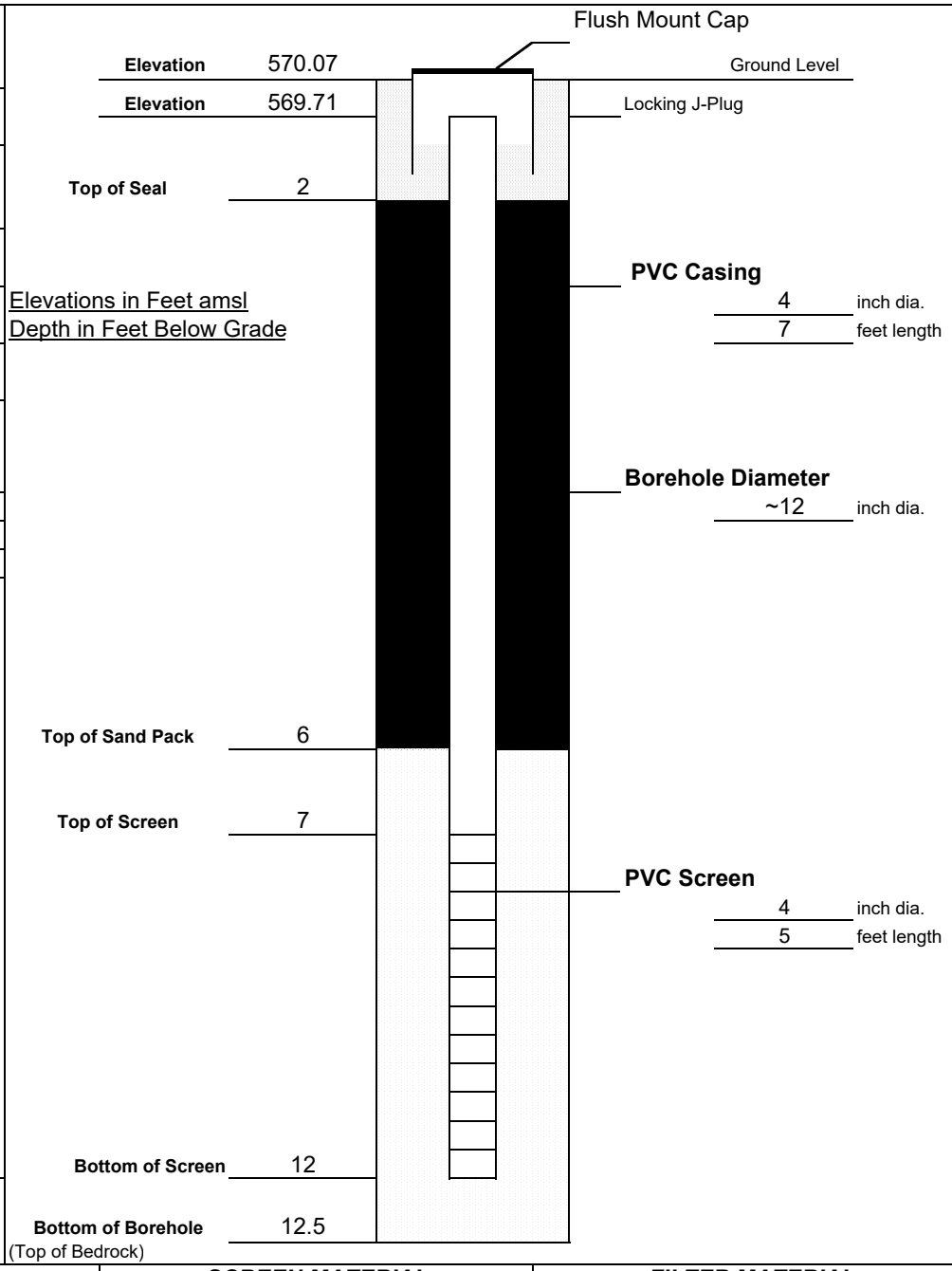
**Rig Make/Model:**
CME-85

**Date:**
10/15/2021

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| | |
| 0-12.5' | Fill |

## WELL DESIGN




### *CASING MATERIAL*

**Surface:** Flush Mount Road Box

**Monitor:** PVC

### *SCREEN MATERIAL*

**Type:** Schedule 40 PVC

**Slot Size:** 0.020"

### *FILTER MATERIAL*

**Type:** FilPro WG#0 sand
**Setting:** 6-12'

### *SEAL MATERIAL*

**Type 1:** Bentonite chips
**Setting:** 2-6'
**Type 1:**
**Setting:**

***COMMENTS:***

### *LEGEND*

Concrete

Bentonite Seal

Sand Pack

| | | |
|---|---|---|
| **Client: Chemours** | **Location: Niagara East Plant** | **Project No.: 452681.03050** |
| ***Parsons*** | **OVERBURDEN PIEZOMETER CONSTRUCTION DETAILS** | **Well Number: EPO-11** |

## DRILLING SUMMARY

**Geologist:**
Tayler Schweigel

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

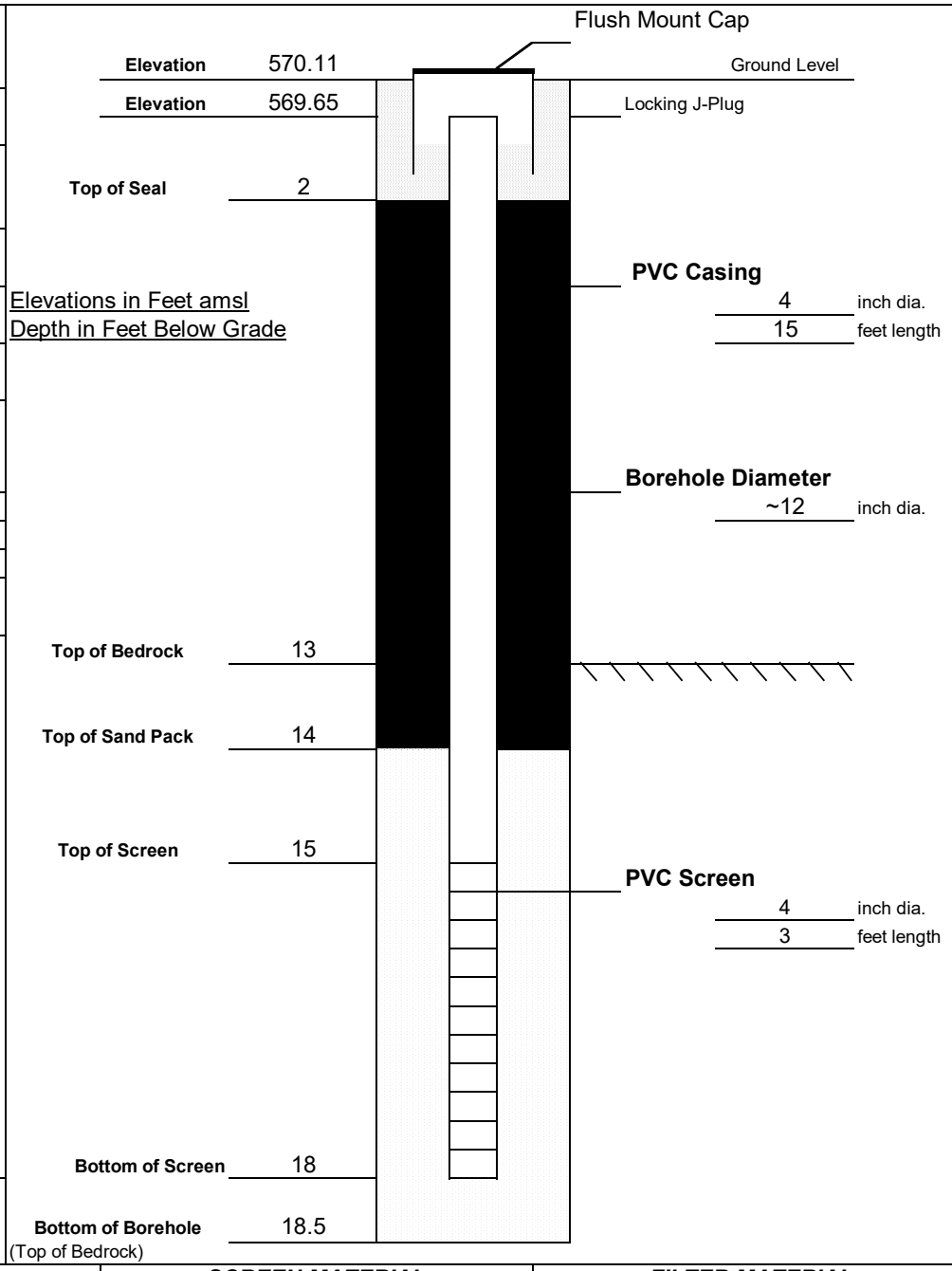
**Rig Make/Model:**
CME-85

**Date:**
10/14/2021

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| | |
| 0-13' | Fill |
| 13'18.5 | Blasted rock (Lockport Dolomite) |

## WELL DESIGN




### *CASING MATERIAL*

**Surface:** Flush Mount Road Box

**Monitor:** PVC

### *SCREEN MATERIAL*

**Type:** Schedule 40 PVC

**Slot Size:** 0.020"

### *FILTER MATERIAL*

**Type:** FilPro WG#0 sand
**Setting:** 14-18.5'

### *SEAL MATERIAL*

**Type 1:** Bentonite chips
**Setting:** 2-14'
**Type 1:**
**Setting:**

***COMMENTS:***

### *LEGEND*

- Concrete
- Bentonite Seal
- Sand Pack

| | | |
|---|---|---|
| **Client: Chemours** | **Location: Niagara East Plant** | **Project No.: 452681.03050** |
| ***Parsons*** | **TRENCH PIEZOMETER CONSTRUCTION DETAILS** | **Well Number: EPT-11** |

## DRILLING SUMMARY

**Geologist:**
Tayler Schweigel

**Drilling Company:**
Nothnagle Drilling Co.

**Driller:**
Steve Loranty

**Rig Make/Model:**
CME-85

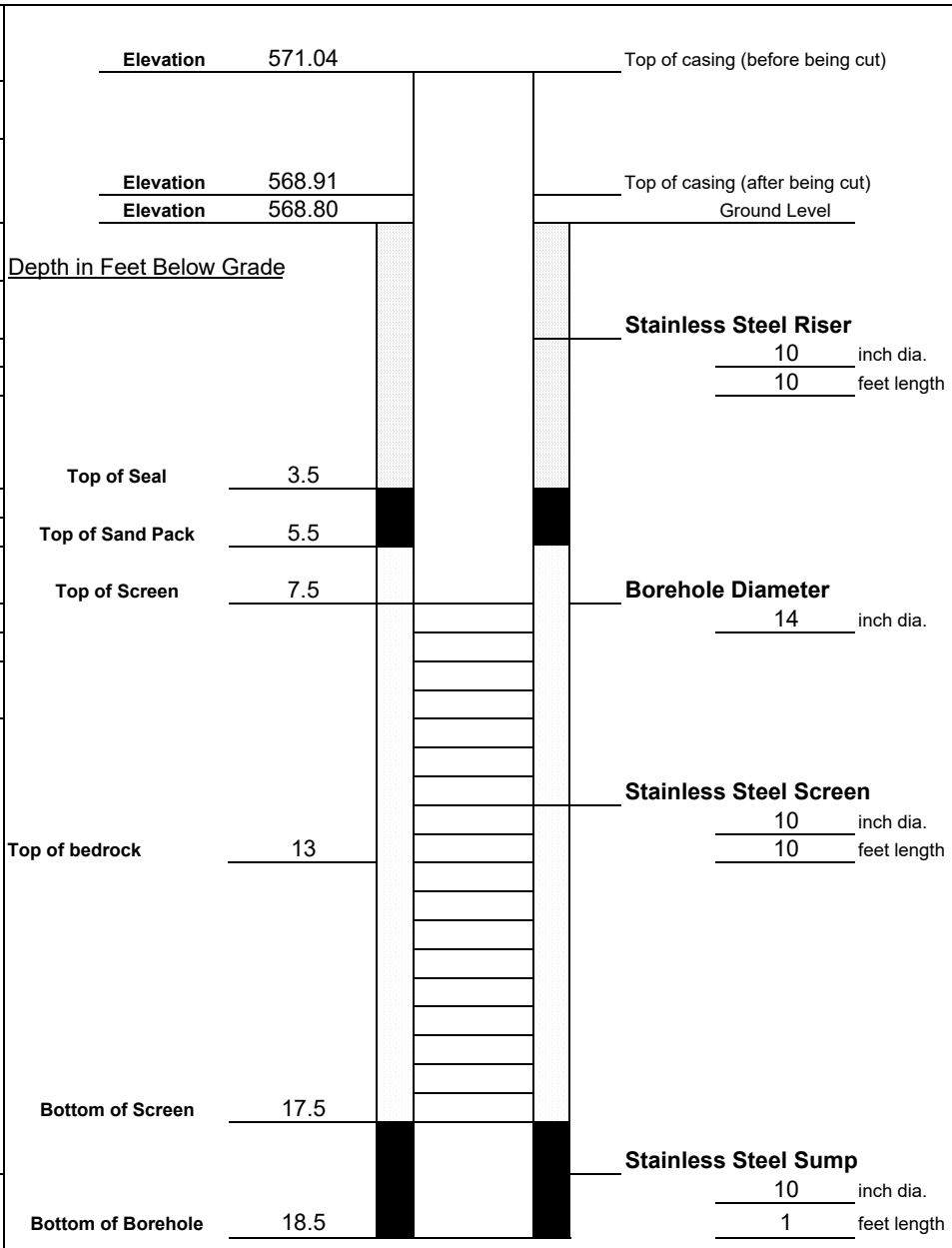
**Start Date:** 10/21/2021

**End Date:** 10/22/2021

## GEOLOGIC LOG

| Depth(ft.) | Description |
|---|---|
| | |
| 0-10' | Mostly loose fill, some concrete |
| 10-11' | Concrete |
| 13' | Top of rock |
| 13-18.5' | Blasted rock (Lockport Dolomite) |

## WELL DESIGN




### *CASING MATERIAL*

**Surface:** Stainless Steel stick-up

**Monitor:** Type 306 Stainless Steel Sch 40

10-inch Diameter

### *SCREEN MATERIAL*

**Type:** Type 306 Stainless Steel 10-inch diameter

**Slot Size:** 0.020"

### *FILTER MATERIAL*

**Type:** Morie "O" well sand

**Setting:** 5.5-18.5

### *SEAL MATERIAL*

**Type 1:** Bentonite chips

**Setting:** 3.5-5.5

**COMMENTS:**

Hole was drilled to 19.0 ft, but filled in to 15 ft bgs. Air lift was used to clear to hole to 18.5 ft.

Well was constructed as a stick-up but cut closer to ground level when pump was installed. Both elevations are shown in the figure.

### *ROCK CORING*

Cored Interval: None

Core Diameter: None

Reamed Diameter: 14"

### *LEGEND*

Concrete

Bentonite Seal

Sand Pack

**Client:** Chemours

**Location:** Niagara East Plant

**Project No.:** 452681.03050

***Parsons***

**EXTRACTION WELL CONSTRUCTION DETAILS**

**Well Number:** PW-43

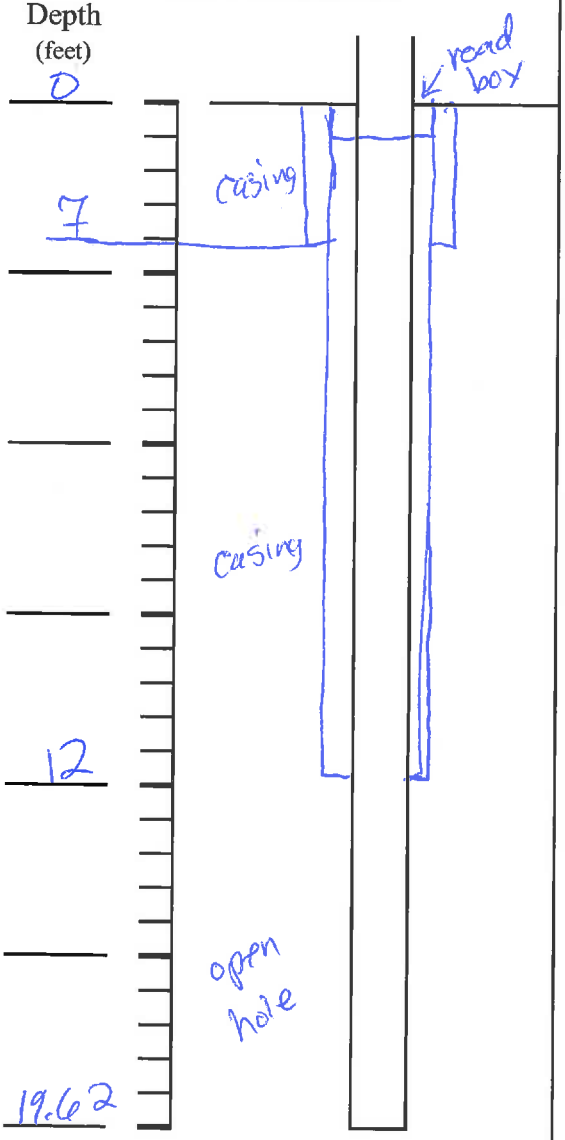
FIGURE 3
# WELL DECOMMISSIONING RECORD

| | |
|---|---|
| Site Name: Niagara Plant | Well I.D.: 22B |
| Site Location: Niagara Falls, NY | Driller: Steve Loranty |
| Drilling Co.: Nothnagle | Inspector: |
| | Date: 8/23/21 – 8/26/21 |

## DECOMMISSIONING DATA
(Fill in all that apply)

| | |
|---|---|
| **OVERDRILLING** | |
| Interval Drilled | N/A |
| Drilling Method(s) | |
| Borehole Dia. (in.) | |
| Temporary Casing Installed? (y/n) | |
| Depth temporary casing installed | |
| Casing type/dia. (in.) | |
| Method of installing | |
| **CASING PULLING** | |
| Method employed | N/A |
| Casing retrieved (feet) | |
| Casing type/dia. (in) | |
| **CASING PERFORATING** | |
| Equipment used | N/A |
| Number of perforations/foot | |
| Size of perforations | |
| Interval perforated | |
| **GROUTING** | |
| Interval grouted (FBLS) | 0.5 – 19.62 |
| # of batches prepared | 3.5 |
| For each batch record: | |
| Quantity of water used (gal.) | 27 |
| Quantity of cement used (lbs.) | 3.5x94=329 |
| Cement type | Type I |
| Quantity of bentonite used (lbs.) | 13.5 |
| Quantity of calcium chloride used (lbs.) | — |
| Volume of grout prepared (gal.) | ~42 |
| Volume of grout used (gal.) | 42 |

## WELL SCHEMATIC*




COMMENTS:
casing left in hole. road box removed. concrete for 0–0.5 ft BLS. Wells were stage grouted

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 3

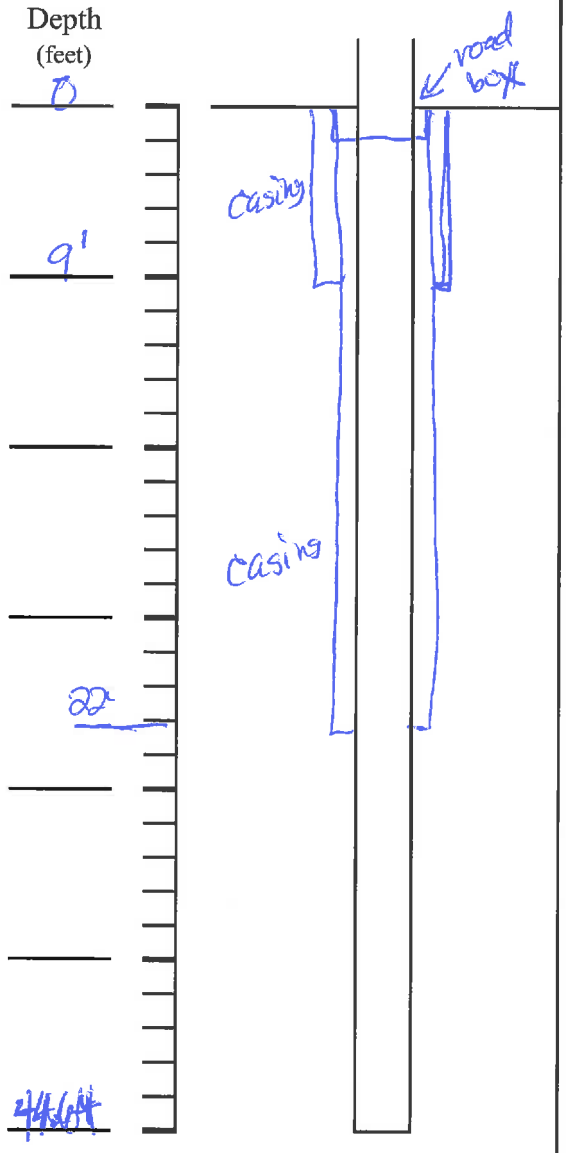
# WELL DECOMMISSIONING RECORD

| | |
|---|---|
| Site Name: Niagara Plant | Well I.D.: 22C |
| Site Location: Niagara Falls, NY | Driller: Steve Loranty |
| Drilling Co.: Nothnagle | Inspector: |
| | Date: 8/23/21 – 8/26/21 |

## DECOMMISSIONING DATA
(Fill in all that apply)

| | |
|---|---|
| **OVERDRILLING** | |
| Interval Drilled | |
| Drilling Method(s) | N/A |
| Borehole Dia. (in.) | |
| Temporary Casing Installed? (y/n) | |
| Depth temporary casing installed | |
| Casing type/dia. (in.) | |
| Method of installing | |
| **CASING PULLING** | |
| Method employed | |
| Casing retrieved (feet) | N/A |
| Casing type/dia. (in) | |
| **CASING PERFORATING** | |
| Equipment used | |
| Number of perforations/foot | N/A |
| Size of perforations | |
| Interval perforated | |
| **GROUTING** | |
| Interval grouted (FBLS) | 0.5-44.64 |
| # of batches prepared | 2.5 |
| For each batch record: | |
| Quantity of water used (gal.) | 20 |
| Quantity of cement used (lbs.) | 2.5×94=235 |
| Cement type | Type I |
| Quantity of bentonite used (lbs.) | ~~30~~ 10 |
| Quantity of calcium chloride used (lbs.) | — |
| Volume of grout prepared (gal.) | ~31 |
| Volume of grout used (gal.) | 31 |

## WELL SCHEMATIC*




COMMENTS:

casing left in hole. road box removed. concrete 0-0.5 ft BLS. wells were staye grouted.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 3

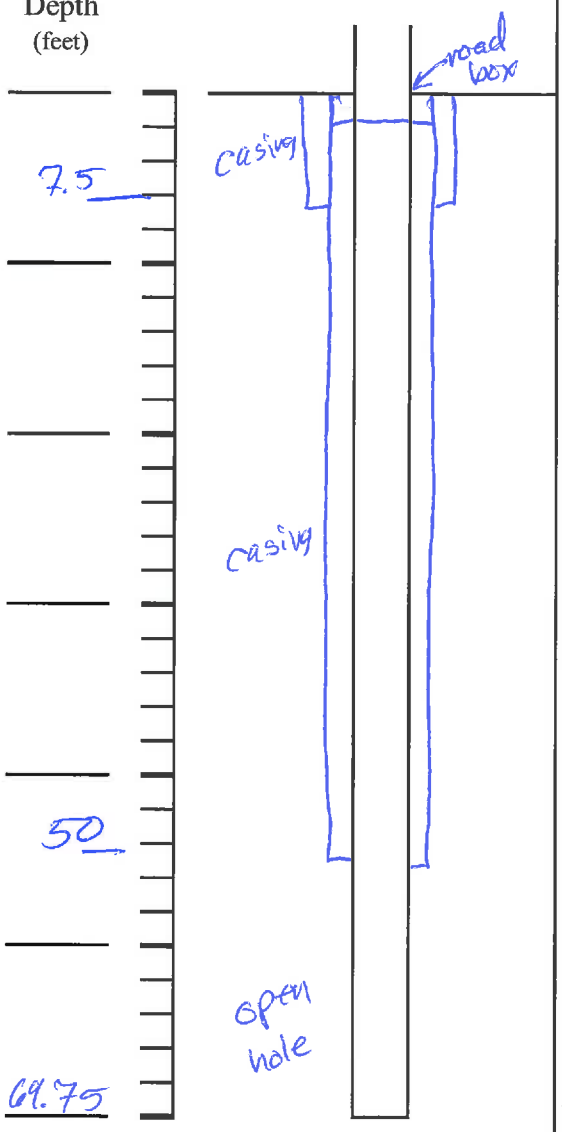
# WELL DECOMMISSIONING RECORD

| | |
|---|---|
| Site Name: Niagara Plant | Well I.D.: 22D |
| Site Location: Niagara Falls, NY | Driller: Steve Loranty |
| Drilling Co.: Nothnagle | Inspector: |
| | Date: 8/23/21 - 8/26/21 |

## DECOMMISSIONING DATA
(Fill in all that apply)

| | |
|---|---|
| **OVERDRILLING** | |
| Interval Drilled | N/A |
| Drilling Method(s) | |
| Borehole Dia. (in.) | |
| Temporary Casing Installed? (y/n) | |
| Depth temporary casing installed | |
| Casing type/dia. (in.) | |
| Method of installing | |
| **CASING PULLING** | |
| Method employed | N/A |
| Casing retrieved (feet) | |
| Casing type/dia. (in) | |
| **CASING PERFORATING** | |
| Equipment used | N/A |
| Number of perforations/foot | |
| Size of perforations | |
| Interval perforated | |
| **GROUTING** | |
| Interval grouted (FBLS) | 0.5-69.75 |
| # of batches prepared | 5 |
| For each batch record: | |
| Quantity of water used (gal.) | 40 |
| Quantity of cement used (lbs.) | 5x94=470 |
| Cement type | Type I |
| Quantity of bentonite used (lbs.) | 20 |
| Quantity of calcium chloride used (lbs.) | — |
| Volume of grout prepared (gal.) | ~61 |
| Volume of grout used (gal.) | 61 |

## WELL SCHEMATIC*




COMMENTS:

Casing left in hole. road box removed. Concrete 0-0.5 ft BLS, wells were stage grouted.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

FIGURE 3

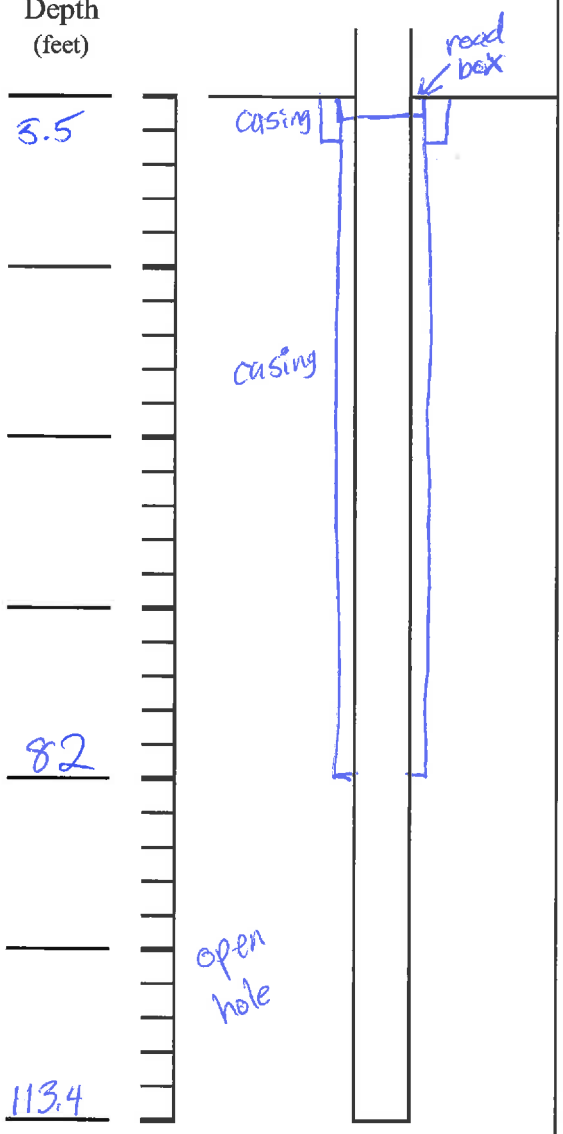
# WELL DECOMMISSIONING RECORD

| | |
|---|---|
| Site Name: Niagara Plant | Well I.D.: 22 F |
| Site Location: Niagara Falls NY | Driller: Steve Lorantz |
| Drilling Co.: Nothnagle | Inspector: |
| | Date: 8/23/21 – 8/26/21 |

## DECOMMISSIONING DATA
(Fill in all that apply)

| | |
|---|---|
| **OVERDRILLING** | |
| Interval Drilled | N/A |
| Drilling Method(s) | |
| Borehole Dia. (in.) | |
| Temporary Casing Installed? (y/n) | |
| Depth temporary casing installed | |
| Casing type/dia. (in.) | |
| Method of installing | |
| **CASING PULLING** | |
| Method employed | N/A |
| Casing retrieved (feet) | |
| Casing type/dia. (in) | |
| **CASING PERFORATING** | |
| Equipment used | |
| Number of perforations/foot | N/A |
| Size of perforations | |
| Interval perforated | |
| **GROUTING** | |
| Interval grouted (FBLS) | 0.5–113.4 |
| # of batches prepared | 8 |
| For each batch record: | |
| Quantity of water used (gal.) | 63 |
| Quantity of cement used (lbs.) | 8×94=752 |
| Cement type | Type I |
| Quantity of bentonite used (lbs.) | 31 |
| Quantity of calcium chloride used (lbs.) | — |
| Volume of grout prepared (gal.) | ~97 |
| Volume of grout used (gal.) | 97 |

## WELL SCHEMATIC*




COMMENTS:

casing left in hole. road box removed. Concrete 0–0.5 ft BLS. Wells were stage grouted.

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

# APPENDIX B
# 2021 ANALYTICAL RESULTS

PARSONS

# APPENDIX B
## 2021 Analytical Results - Monitoring Wells

| Method | Parameter Name | Location / Date / Units | DEC-3R 09/10/2021 FS | DEC-3R 09/10/2021 DUP | DEC-4R 09/10/2021 FS | MW-10D 09/08/2021 FS | MW-12C/CD 09/08/2021 FS | MW-13A 09/08/2021 FS | MW-14A 09/08/2021 FS | MW-14B 09/08/2021 FS | MW-14D 09/08/2021 FS | MW-15A 09/08/2021 FS | MW-15CD 09/08/2021 FS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Field Parameters** | | | | | | | | | | | | |
| | COLOR | NONE | none | none | none | none | none | none | none | none | none | none | none |
| | DEPTH TO WATER | Feet | 12.21 | 12.21 | 13.66 | 10.91 | 13.27 | 9.366 | 6.32 | 9.24 | 16.12 | 2.62 | 15.54 |
| | ODOR | NONE | moderate | moderate | none | strong | strong | none | strong | strong | weak | strong | weak |
| | ORP | MV | -156.7 | -156.7 | -138.2 | -71.9 | -85.3 | -58.1 | -1 | 30.7 | -95.8 | -158 | -95.2 |
| | PH | STD UNITS | 5.0 | 5.0 | 5.32 | 4.31 | 4.89 | 5.64 | 5.08 | 4.58 | 5.52 | 6.74 | 5.37 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 0.04 | 0.04 | 0.01 | 1 | 7 | 3 | 6 | 17 | 8 | 2 | 35 |
| | TEMPERATURE | DEGREES C | 22.30 | 22.30 | 20.3 | 25.60 | 21.70 | 22.20 | 21.90 | 20.40 | 18.5 | 18.80 | 17.80 |
| | TURBIDITY QUANTITATIVE | NTU | 1.45 | 1.45 | -- | -- | 9.77 | 48.0 | -- | 24 | -- | -- | -- |
| | **Volatile Organics** | | | | | | | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | <1000 | <2000 | 35 | <4000 | 2200 | <1 | <1000 | 19000 | <400 | <100 | 15000 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <1000 | <2000 | 1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | 1,1-Dichloroethane | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | 1,1-Dichloroethene | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | 1,4-Dichlorobenzene | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | 1,4-Dichlorobutane | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | Benzene | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | Carbon Tetrachloride | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | Chlorobenzene | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | Chloroform | UG/L | <1000 | <2000 | 5.7 | <4000 | <2000 | <1 | <1000 | 100000 | <400 | 380 | 31000 |
| 8260C | cis-1,2 Dichloroethene | UG/L | 35000 J | 51000 J | 23 | 60000 | 8400 | 2.9 | 17000 | 40000 | 21000 | 2000 | 19000 |
| 8260C | Methyl Chloride | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | Methylene Chloride | UG/L | <5000 | <10000 | <5 | <20000 | <10000 | <5 | <5000 | <50000 | <2000 | <500 | <20000 |
| 8260C | Tetrachloroethene | UG/L | <1000 | <2000 | 35 | <4000 | 30000 | <1 | 19000 | 29000 | <400 | <100 | 25000 |
| 8260C | Tetrahydrothiophene | UG/L | <2000 | <4000 | <2 | <8000 | <4000 | <2 | <2000 | <20000 | <800 | <200 | <8000 |
| 8260C | Toluene | UG/L | <1000 | <2000 | <1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | trans-1,2-Dichloroethene | UG/L | <1000 | <2000 | 3.1 | <4000 | <2000 | <1 | <1000 | <10000 | <400 | <100 | <4000 |
| 8260C | Trichloroethene | UG/L | <1000 | <2000 | 57 | 87000 | 40000 | 3 | 36000 | 370000 | <400 | 370 | 160000 |
| 8260C | Vinyl Chloride | UG/L | <1000 | <2000 | <1 | 4200 | <2000 | 2.9 | 2300 | <10000 | 30000 | 1800 | <4000 |
| | Total VOCs | UG/L | 35000 | 51000 | 159.8 | 151200 | 80600 | 8.8 | 74300 | 558000 | 51000 | 4550 | 250000 |
| | **Inorganics** | | | | | | | | | | | | |
| 9012B | Cyanide, total | UG/L | -- | -- | -- | -- | 160 | 53 | -- | 110 | -- | 150 | -- |

< Non detect at stated reporting limit. J Estimated concentration.

B Not detected substantially above the level reported in the laboratory or field blanks.

UJ Undetected-estimated reporting limit

# APPENDIX B
## 2021 Analytical Results - Monitoring Wells

| Method | Parameter Name | Location / Date / Units | MW-15F 09/08/2021 FS | MW-16A 09/09/2021 FS | MW-17A 09/09/2021 FS | MW-17F 09/09/2021 FS | MW-18A 09/09/2021 FS | MW-18C 09/09/2021 FS | MW-18C 09/09/2021 DUP | MW-18D 09/09/2021 FS | MW-19CD1 09/10/2021 FS | MW-1AR3 09/08/2021 FS | MW-1BR 09/08/2021 FS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Field Parameters** | | | | | | | | | | | | |
| | COLOR | NONE | none | none | none | none | none | none | none | none | none | none | none |
| | DEPTH TO WATER | Feet | 9.59 | 9.37 | 15.46 | 12.42 | 12.53 | 14 | 14 | 12.55 | 20.53 | 9.38 | 11.92 |
| | ODOR | NONE | weak | none | weak | weak | weak | strong | strong | none | strong | none | none |
| | ORP | MV | -186 | -76.8 | -186.1 | -199.4 | -146.4 | -188.9 | -188.9 | -169.2 | -190.9 | -126.3 | -84.1 |
| | PH | STD UNITS | 5.43 | 7.94 | 5.30 | 5.12 | 5.0 | 5.36 | 5.36 | 5.32 | 4.80 | 4.35 | 5.22 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 37 | 5 | 7 | 3 | 10 | 1.3 | 1.3 | 2 | 0.01 | 2 | 3 |
| | TEMPERATURE | DEGREES C | 16.50 | 21.30 | 18.10 | 18.20 | 21.60 | 25.30 | 25.30 | 22.20 | 17.00 | 20.00 | 25.10 |
| | TURBIDITY QUANTITATIVE | NTU | -- | 4.79 | 16.2 | -- | 47 | 11.1 | 11.1 | -- | -- | 14.8 | 12.17 |
| | **Volatile Organics** | | | | | | | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | 3000 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | 1,1-Dichloroethane | UG/L | <4 | <4 | 4.6 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | 1,1-Dichloroethene | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <4 | <4 | 2.8 | 4600 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | 1,4-Dichlorobenzene | UG/L | <4 | <4 | 3.6 | 1900 | 7.3 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | 1,4-Dichlorobutane | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | Benzene | UG/L | 31 | <4 | 7 | 1000 | 12 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | Carbon Tetrachloride | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | Chlorobenzene | UG/L | <4 | <4 | 27 | 8900 | 36 | 710 | 150 | <4 | <2000 | <10000 | <2000 |
| 8260C | Chloroform | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | 74000 | 16000 | <2000 |
| 8260C | cis-1,2 Dichloroethene | UG/L | 7.9 | 33 | 2.6 | <400 | <5 | <400 | <100 | 270 | 32000 | 55000 | 20000 |
| 8260C | Methyl Chloride | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | Methylene Chloride | UG/L | <20 | <20 | <10 | <2000 | <25 | <2000 | <500 | <20 | <10000 | 300000 | <10000 |
| 8260C | Tetrachloroethene | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | 4400 | <10000 | 4800 |
| 8260C | Tetrahydrothiophene | UG/L | <8 | <8 | 640 | <800 | 280 | 17000 | 8100 | 14 | <4000 | <20000 | <4000 |
| 8260C | Toluene | UG/L | <4 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | trans-1,2-Dichloroethene | UG/L | 38 | <4 | <2 | <400 | <5 | <400 | <100 | <4 | <2000 | <10000 | <2000 |
| 8260C | Trichloroethene | UG/L | 14 | 140 | <2 | <400 | <5 | <400 | <100 | <4 | 100000 | 40000 | 93000 |
| 8260C | Vinyl Chloride | UG/L | 98 | 4.6 | 14 | 720 | <5 | 1000 | 380 | 64 | <2000 | 15000 | <2000 |
| | Total VOCs | UG/L | 188.9 | 177.6 | 701.6 | 17120 | 335.3 | 18710 | 8630 | 348 | 210400 | 426000 | 120800 |
| | **Inorganics** | | | | | | | | | | | | |
| 9012B | Cyanide, total | UG/L | -- | 45000 | 76 | -- | 46 | 1200 | 1600 | -- | -- | <10 | 120 |

< Non detect at stated reporting limit. J Estimated concentration.

B Not detected substantially above the level reported in the laboratory or field blanks.

UJ Undetected-estimated reporting limit

# APPENDIX B
## 2021 Analytical Results - Monitoring Wells

| Method | Parameter Name | Location / Date / Units | MW-1C 09/08/2021 FS | MW-1D 09/08/2021 FS | MW-20AR 09/09/2021 FS | MW-20B 09/09/2021 FS | MW-21A 09/08/2021 FS | MW-23F 09/09/2021 FS | MW-24A 10/15/2021 FS | MW-24B 09/08/2021 FS | MW-24B 09/08/2021 DUP | MW-25B 09/10/2021 FS | MW-25B 09/10/2021 DUP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Field Parameters** | | | | | | | | | | | | |
| | COLOR | NONE | none | none | none | none | none | none | none | none | none | none | none |
| | DEPTH TO WATER | Feet | 11.31 | 15.39 | 2.68 | 15.45 | 10.12 | 14.85 | 10.25 | 12.1 | 12.1 | 12.98 | 12.98 |
| | ODOR | NONE | none | none | none | none | none | none | none | weak | weak | moderate | moderate |
| | ORP | MV | -149.1 | -20.7 | -157.4 | -144.6 | -24.5 | -199.8 | 44.4 | -101.6 | -101.6 | -199.8 | -199.8 |
| | PH | STD UNITS | 4.81 | 4.72 | 5.36 | 5.23 | 5.90 | 5.60 | 7.36 | 4.74 | 4.74 | 5.3 | 5.25 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 0 | 13 | 3 | 11 | 4 | 3 | 6.85 | 10 | 10 | 0.0 | 0.01 |
| | TEMPERATURE | DEGREES C | 21.00 | 21.90 | 22.90 | 17.00 | 23.3 | 16.80 | 18.20 | 21.40 | 21.40 | 22.20 | 22.20 |
| | TURBIDITY QUANTITATIVE | NTU | 14.7 | 7.23 | 11.12 | 2.28 | 23.7 | -- | 0.88 | 35.1 | 35.1 | 12.20 | 12.2 |
| | **Volatile Organics** | | | | | | | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | 2200 | 180 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | 1,1-Dichloroethane | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | 1,1-Dichloroethene | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | 12 J | 22 J |
| 8260C | 1,4-Dichlorobenzene | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | 17 J | 32 J |
| 8260C | 1,4-Dichlorobutane | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | 3.3 J | 6.1 J |
| 8260C | Benzene | UG/L | <1000 | 41 | <1 | <20 | <1 | 4.3 | <20 | <200 | <20 | <2 | 2.8 |
| 8260C | Carbon Tetrachloride | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | Chlorobenzene | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | 240 | 320 |
| 8260C | Chloroform | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | cis-1,2 Dichloroethene | UG/L | 10000 | 1500 | <1 | 630 | <1 | 11 | 690 | 4500 J | 480 J | <2 | <2 |
| 8260C | Methyl Chloride | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | Methylene Chloride | UG/L | <5000 | <200 | <5 | <100 | <5 | <20 | <100 | <1000 | <100 | <10 | <10 |
| 8260C | Tetrachloroethene | UG/L | 21000 | <40 | <1 | <20 | <1 | <4 | 310 | <200 | <20 | <2 | <2 |
| 8260C | Tetrahydrothiophene | UG/L | <2000 | <80 | <2 | <40 | <2 | 130 | <40 | <400 | <40 | 36 J | 79 J |
| 8260C | Toluene | UG/L | <1000 | <40 | <1 | <20 | <1 | <4 | <20 | <200 | <20 | <2 | <2 |
| 8260C | trans-1,2-Dichloroethene | UG/L | <1000 | <40 | <1 | <20 | <1 | 9.4 | 28 | <200 | <20 | <2 | <2 |
| 8260C | Trichloroethene | UG/L | 26000 | 1100 | 4.2 | 41 | <1 | <4 | 260 | 330 J | 67 J | <2 | <2 |
| 8260C | Vinyl Chloride | UG/L | 2000 | 210 | <1 | <20 | <1 | 31 | 210 | 1300 J | 130 J | <2 | <2 |
| | Total VOCs | UG/L | 61200 | 3031 | 4.2 | 671 | 0 | 185.7 | 1498 | 6130 | 677 | 308.3 | 461.9 |
| | **Inorganics** | | | | | | | | | | | | |
| 9012B | Cyanide, total | UG/L | 220 | 27 | <10 | 19 | 25 | -- | 120 | 7900 | 8000 | 25 | 23 |

< Non detect at stated reporting limit. J Estimated concentration.

B Not detected substantially above the level reported in the laboratory or field blanks.

UJ Undetected-estimated reporting limit

# APPENDIX B
## 2021 Analytical Results - Monitoring Wells

| Method | Parameter Name | Location / Date / Units | MW-25C/CD 09/10/2021 FS | MW-25D 09/10/2021 FS | MW-25F 09/10/2021 FS | MW-26CD 09/10/2021 FS | MW-28A 09/09/2021 FS | MW-29B 09/10/2021 FS | MW-2A 09/09/2021 FS | MW-2C 09/09/2021 FS | MW-30B 09/10/2021 FS | MW-3A 09/10/2021 FS | MW-3B 09/10/2021 FS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Field Parameters** | | | | | | | | | | | | |
| | COLOR | NONE | none | none | none | none | none | none | none | none | gray | none | none |
| | DEPTH TO WATER | Feet | 15.34 | 13.47 | 13.68 | 15.87 | 9.41 | 14.06 | 16.9 | 14.51 | 12.26 | 7.6 | 10.56 |
| | ODOR | NONE | weak | weak | weak | none | weak | none | none | none | strong | none | none |
| | ORP | MV | -165.9 | -169 | -190.1 | -173.4 | -150.6 | -171.9 | -175.3 | -147 | -191.1 | -143.9 | -122.3 |
| | PH | STD UNITS | 4.76 | 4.77 | 4.88 | 4.92 | 5.91 | 4.9 | 6.12 | 5.43 | 4.72 | 8.22 | 7.36 |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 0.04 | 0.02 | 0.01 | 0.01 | 8 | 0.02 | 17 | 17 | 0.04 | 2.3 | 5.12 |
| | TEMPERATURE | DEGREES C | 21.30 | 20.0 | 19.4 | 16.7 | 21.40 | 21.90 | 18.90 | 16.80 | 24.10 | 23.4 | 20.70 |
| | TURBIDITY QUANTITATIVE | NTU | 10.2 | -- | -- | -- | 29.9 | 2.89 | 9.11 | 7.68 | 3.65 | 5.68 | 35.9 |
| | **Volatile Organics** | | | | | | | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | 7100 | <40 | <1 | <500 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | 1,1-Dichloroethane | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | 1,1-Dichloroethene | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | 1,4-Dichlorobenzene | UG/L | <50 | <400 | <40 | <400 | <100 | 32 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | 1,4-Dichlorobutane | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | 1300 | <1 | <500 |
| 8260C | Benzene | UG/L | 560 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | 89 | <1 | <500 |
| 8260C | Carbon Tetrachloride | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | Chlorobenzene | UG/L | <50 | <400 | <40 | <400 | <100 | 110 | <40 | <1000 | 130 | <1 | <500 |
| 8260C | Chloroform | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | 17000 |
| 8260C | cis-1,2 Dichloroethene | UG/L | 53 | 20000 | 97 | 14000 | 4600 | <4 | 1600 | 6900 | <40 | 2.3 | <500 |
| 8260C | Methyl Chloride | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | Methylene Chloride | UG/L | <250 | <2000 | <200 | <2000 | <500 | <20 | <200 | <5000 | <200 | <5 | <2500 |
| 8260C | Tetrachloroethene | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | 19000 | <40 | <1 | 2000 |
| 8260C | Tetrahydrothiophene | UG/L | 3200 | 1200 | <80 | <800 | <200 | <8 | <80 | <2000 | 57000 | <2 | <1000 |
| 8260C | Toluene | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | trans-1,2-Dichloroethene | UG/L | <50 | <400 | <40 | <400 | <100 | <4 | <40 | <1000 | <40 | <1 | <500 |
| 8260C | Trichloroethene | UG/L | <50 | <400 | <40 | <400 | 120 | <4 | <40 | 98000 | <40 | <1 | 1500 |
| 8260C | Vinyl Chloride | UG/L | 380 | 13000 | 1400 | 7500 | 410 | <4 | 1500 | <1000 | <40 | 2.5 | <500 |
| | Total VOCs | UG/L | 4193 | 34200 | 1497 | 21500 | 5130 | 142 | 3100 | 131000 | 58519 | 4.8 | 20500 |
| | **Inorganics** | | | | | | | | | | | | |
| 9012B | Cyanide, total | UG/L | 11 | -- | -- | -- | 150 | <10 | 640 | 780 | 2900 | 700 | 23 |

< Non detect at stated reporting limit. J Estimated concentration.

B Not detected substantially above the level reported in the laboratory or field blanks.

UJ Undetected-estimated reporting limit

# APPENDIX B
## 2021 Analytical Results - Monitoring Wells

| Method | Parameter Name | Location / Date / Units | MW-4CR 09/09/2021 FS | MW-5BR 09/09/2021 FS | MW-8A 09/10/2021 FS | MW-8B 09/10/2021 FS | MW-9AR 09/10/2021 FS | MW-U-1 09/10/2021 FS | TRIP BLANK 09/08/2021 TB | TRIP BLANK 09/09/2021 TB | TRIP BLANK 09/10/2021 TB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Field Parameters** | | | | | | | | | | |
| | COLOR | NONE | none | none | slight | none | moderate | none | -- | -- | -- |
| | DEPTH TO WATER | Feet | 11.18 | 16.49 | 9.91 | 9.2 | 9.88 | 13.1 | -- | -- | -- |
| | ODOR | NONE | none | none | strong | moderate | moderate | none | -- | -- | -- |
| | ORP | MV | -118.4 | -114.2 | -162 | -185.2 | -141.5 | -195.5 | -- | -- | -- |
| | PH | STD UNITS | 5.29 | 4.78 | 5.23 | 5.75 | 5.01 | 6.9 | -- | -- | -- |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 6 | 8 | 0.01 | 0.005 | 0.03 | 0.3 | -- | -- | -- |
| | TEMPERATURE | DEGREES C | 16.90 | 18.9 | 22.40 | 22.40 | 26.40 | 39.90 | -- | -- | -- |
| | TURBIDITY QUANTITATIVE | NTU | 44.3 | -- | 21.9 | 12.1 | 35.1 | 14.7 | -- | -- | -- |
| | **Volatile Organics** | | | | | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,1-Dichloroethane | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,1-Dichloroethene | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,4-Dichlorobenzene | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | 1,4-Dichlorobutane | UG/L | <100 | <1 | <2000 | 100 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Benzene | UG/L | <100 | <1 | <2000 | 46 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Carbon Tetrachloride | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Chlorobenzene | UG/L | <100 | 1.6 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Chloroform | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | cis-1,2 Dichloroethene | UG/L | 690 | <1 | <2000 | <40 | 1.3 | 42 | <1 | <1 | <1 |
| 8260C | Methyl Chloride | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Methylene Chloride | UG/L | <500 | <5 | <10000 | <200 | <5 | <5 | <5 | <5 | <5 |
| 8260C | Tetrachloroethene | UG/L | 180 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Tetrahydrothiophene | UG/L | <200 | <2 | 96000 | 19000 | 32 | <2 | <2 | <2 | <2 |
| 8260C | Toluene | UG/L | <100 | <1 | <2000 | <40 | <1 | <1 | <1 | <1 | <1 |
| 8260C | trans-1,2-Dichloroethene | UG/L | <100 | <1 | <2000 | 100 | <1 | <1 | <1 | <1 | <1 |
| 8260C | Trichloroethene | UG/L | 2300 | <1 | <2000 | <40 | 1.3 | <1 | <1 | <1 | <1 |
| 8260C | Vinyl Chloride | UG/L | <100 | 3.8 | <2000 | 250 | <1 | 18 | <1 | <1 | <1 |
| | Total VOCs | UG/L | 3170 | 5.4 | 96000 | 19496 | 34.6 | 60 | 0 | 0 | 0 |
| | **Inorganics** | | | | | | | | | | |
| 9012B | Cyanide, total | UG/L | 310 | -- | 1200 | 610 | 770 | <10 | -- | -- | -- |

< Non detect at stated reporting limit. J Estimated concentration.

B Not detected substantially above the level reported in the laboratory or field blanks.

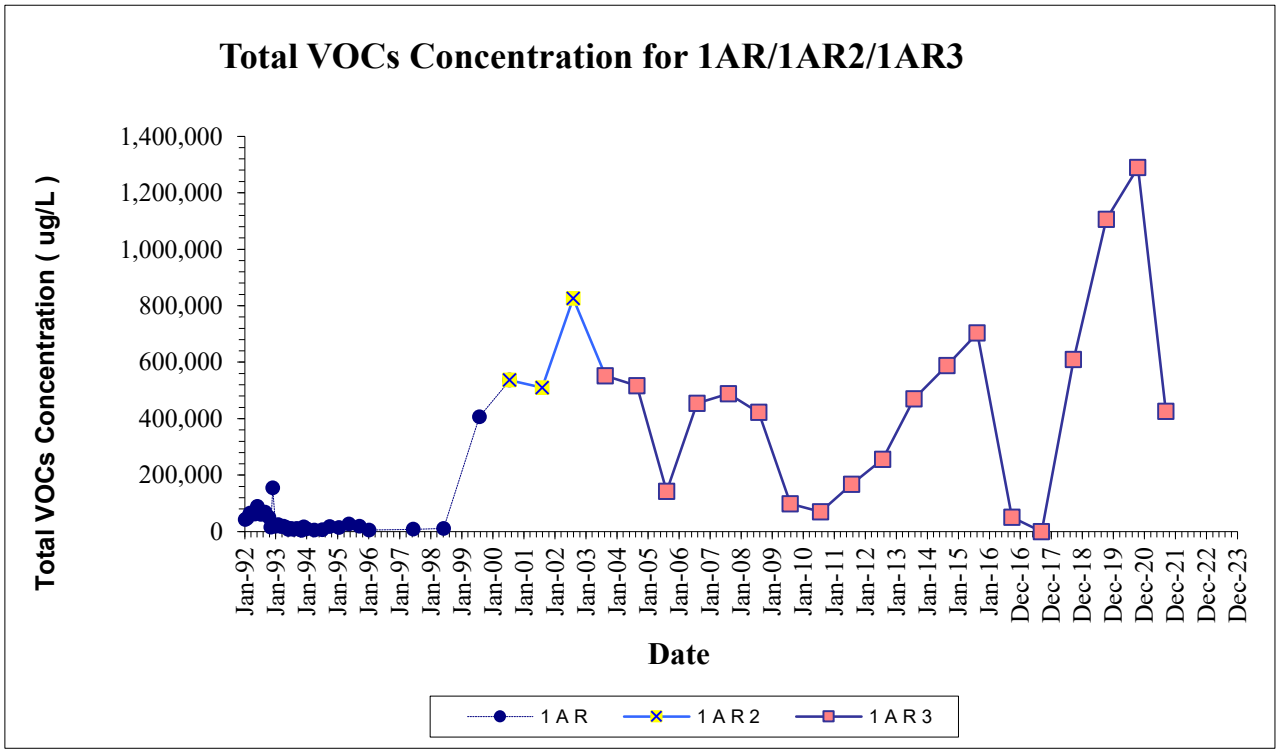
UJ Undetected-estimated reporting limit

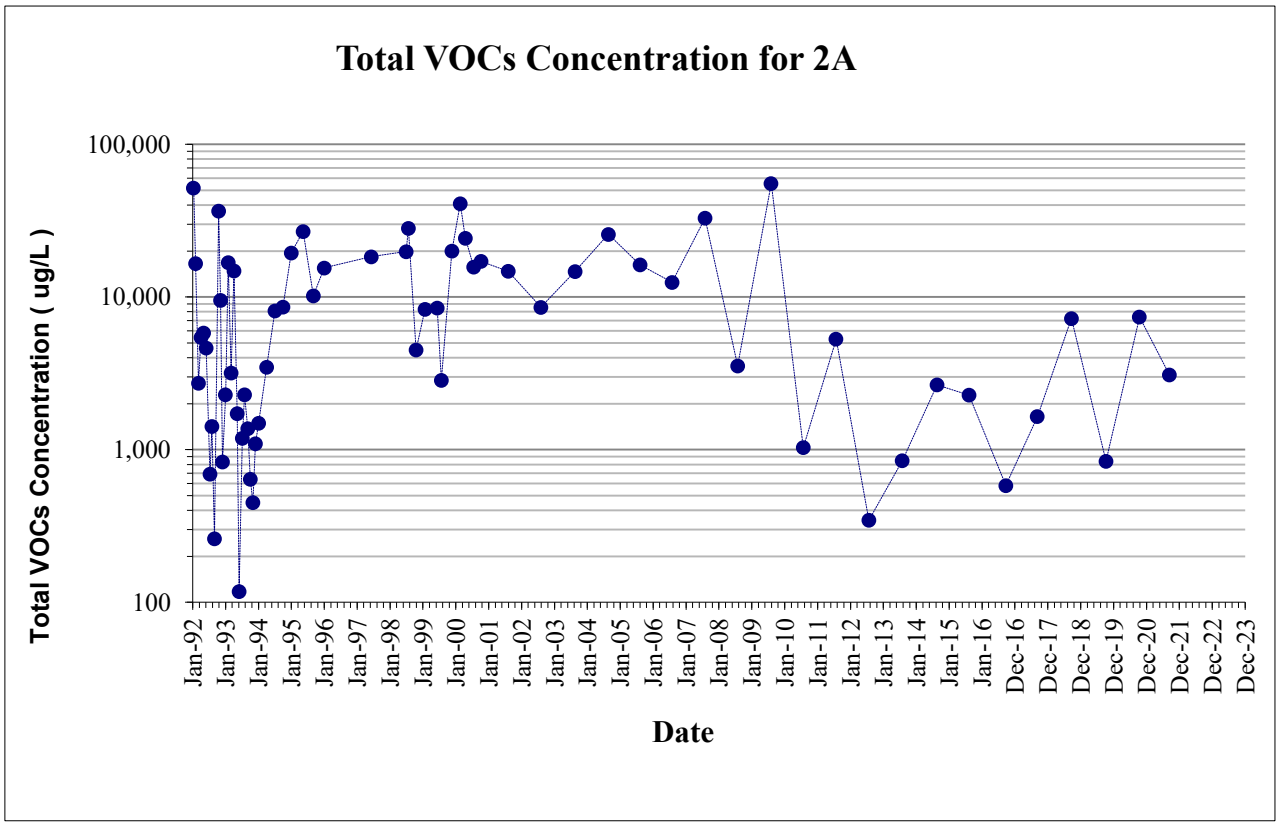
APPENDIX B

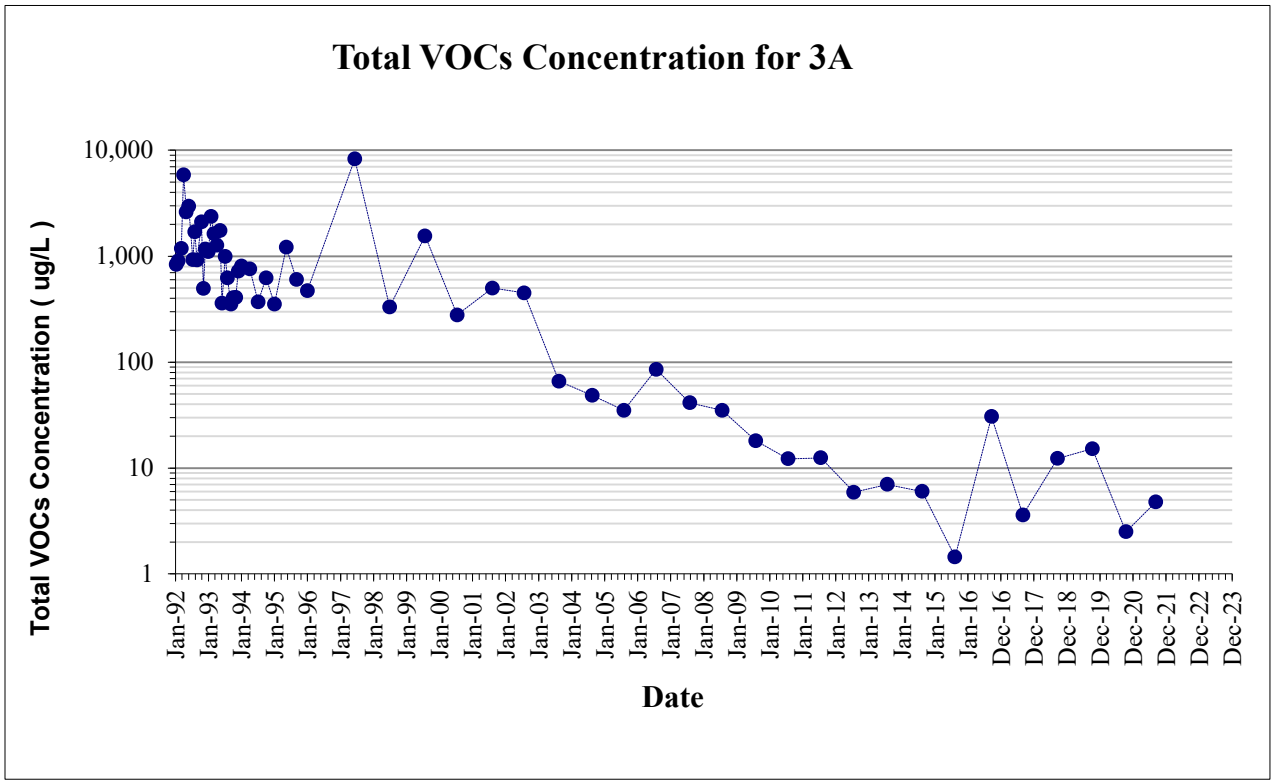
2021 Analytical Results -Surface Water

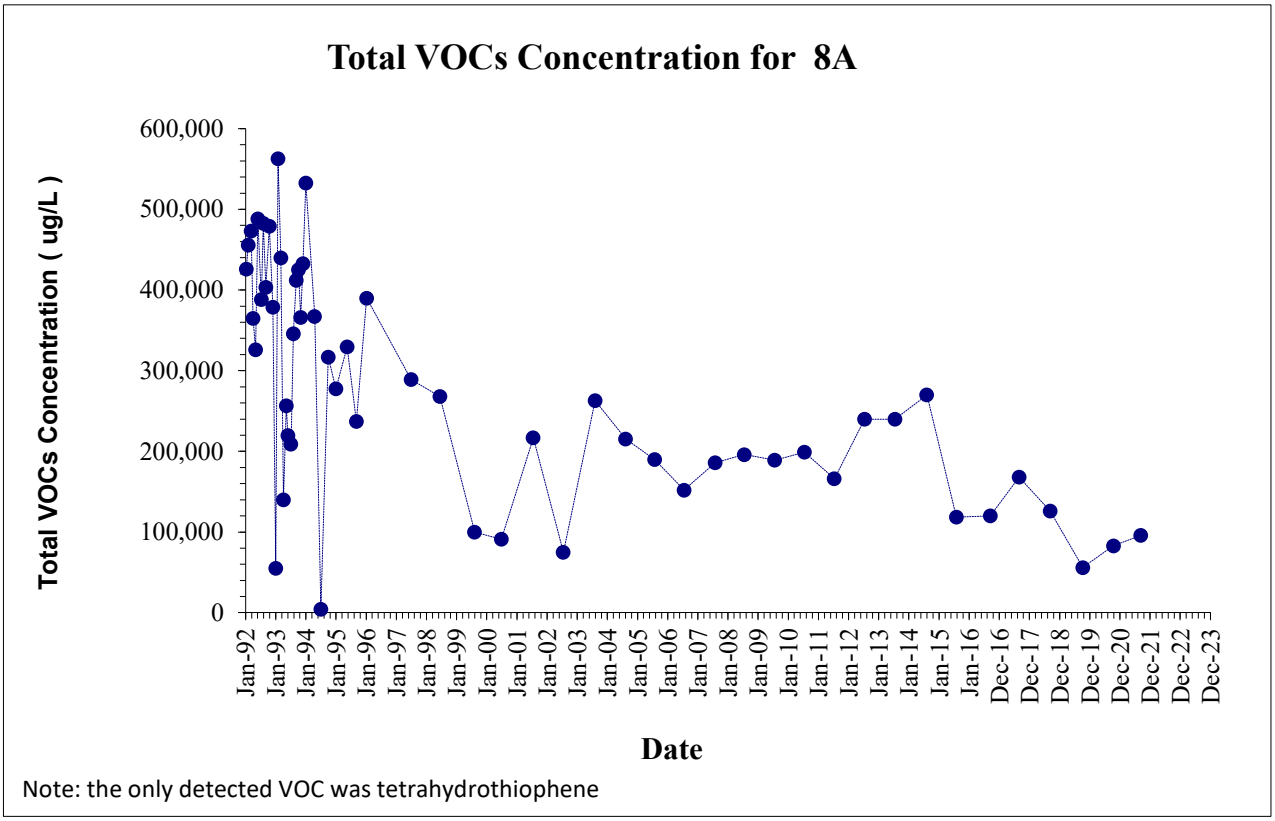
| Method | Parameter Name | Location<br>Date<br>Units | SW-1<br>10/13/2021<br>FS | SW-2<br>10/13/2021<br>FS | SW-2<br>10/13/2021<br>DUP | EB<br>10/13/2021<br>EB | TB<br>10/13/2021<br>TB |
|---|---|---|---|---|---|---|---|
| | **Volatile Organics** | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | <1.0 | 36 | 34 | <1.0 | <1.0 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | 1,1-Dichloroethane | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | 1,1-Dichloroethene | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | 1,4-Dichlorobenzene | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | 1,4-Dichlorobutane | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | Benzene | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | Carbon Tetrachloride | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | Chlorobenzene | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | Chloroform | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | cis-1,2 Dichloroethene | UG/L | <1.0 | 66 | 67 | <1.0 | <1.0 |
| 8260C | Methyl Chloride | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | Methylene Chloride | UG/L | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| 8260C | Tetrachloroethene | UG/L | <1.0 | 110 | 110 | <1.0 | <1.0 |
| 8260C | Tetrahydrothiophene | UG/L | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| 8260C | Toluene | UG/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 8260C | trans-1,2-Dichloroethene | UG/L | <1.0 | 1.4 | 1.4 | <1.0 | <1.0 |
| 8260C | Trichloroethene | UG/L | <1.0 | 100 | 100 | <1.0 | <1.0 |
| 8260C | Vinyl Chloride | UG/L | <1.0 | 3.9 | 3.9 | <1.0 | <1.0 |
| | Total VOCs | UG/L | 0 | 317.3 | 316.3 | 0 | 0 |
| | **Semi-Volatile Organics** | | | | | | |
| 8270D | Bis(2-Ethylhexyl)Phthalate | UG/L | <6.1 | <5.9 | <6.0 | <6.1 | - |
| 8270D | Hexachlorobutadiene | UG/L | <10 | <9.9 | <10 | <10 | - |
| 8270D | Hexachloroethane | UG/L | <10 | <9.9 | <10 | <10 | - |
| 8270D | Naphthalene | UG/L | <10 | <9.9 | <10 | <10 | - |
| | **Pesticides/PCBs** | | | | | | |
| 8081B | Alpha-BHC | UG/L | 0.29 | 0.26 | 0.27 | <0.051 | - |
| 8081B | beta-BHC | UG/L | 0.076 | 0.093 | 0.061 | <0.051 | - |
| 8081B | delta-BHC | UG/L | 0.065 | <0.049 | <0.049 | <0.051 | - |
| 8081B | Lindane | UG/L | <0.049 | <0.049 | <0.049 | <0.051 | - |
| 8082A | PCB 1016 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| 8082A | PCB 1221 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| 8082A | PCB 1232 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| 8082A | PCB 1242 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| 8082A | PCB 1248 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| 8082A | PCB 1254 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| 8082A | PCB 1260 | UG/L | <0.097 | <0.098 | <0.097 | <0.10 | - |
| | **Inorganics** | | | | | | |
| 6010C | Barium, dissolved | UG/L | <200 | <200 | <200 | <200 | - |
| 9012B | Cyanide, total | UG/L | <10 | <10 | <10 | <10 | - |

# APPENDIX C
# TVOC CONCENTRATION TREND PLOTS

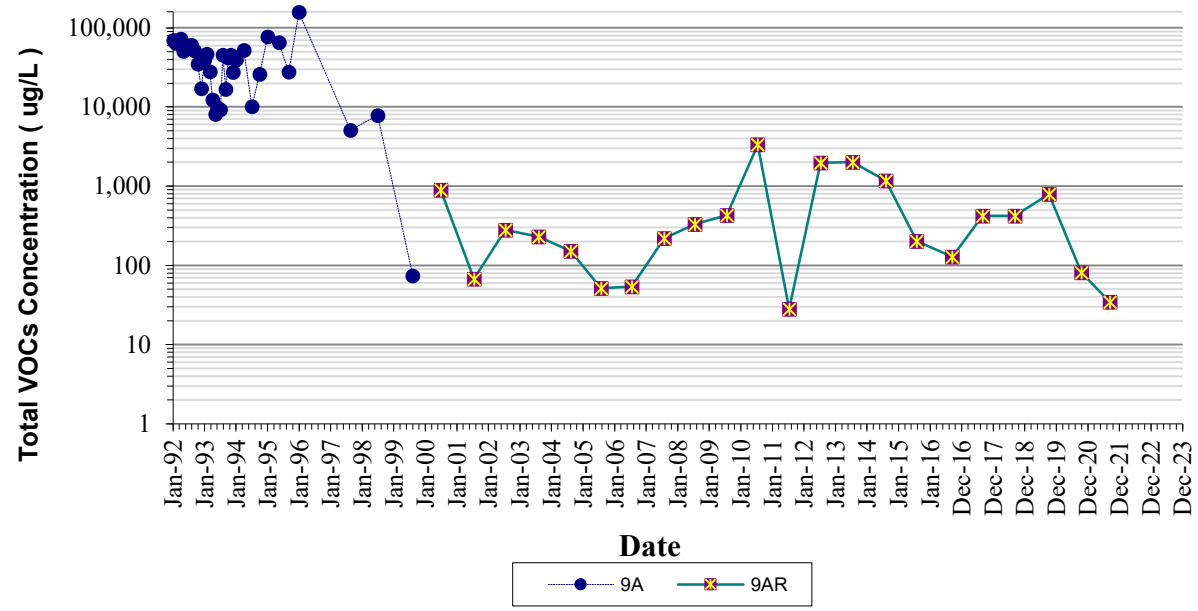

Total VOCs Concentration for 1AR/1AR2/1AR3
Total VOCs Concentration ( ug/L )
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date
1 A R
1 A R 2
1 A R 3


Total VOCs Concentration for 2A
Total VOCs Concentration ( ug/L )
100,000
10,000
1,000
100
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date

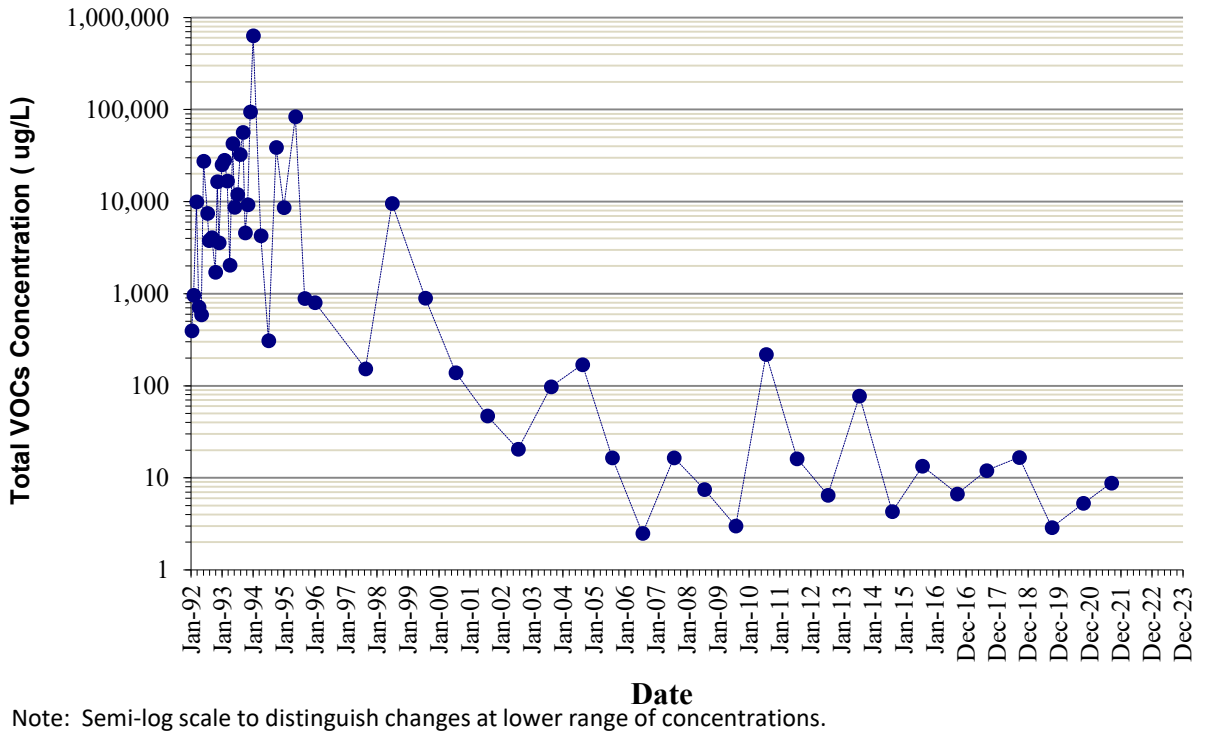


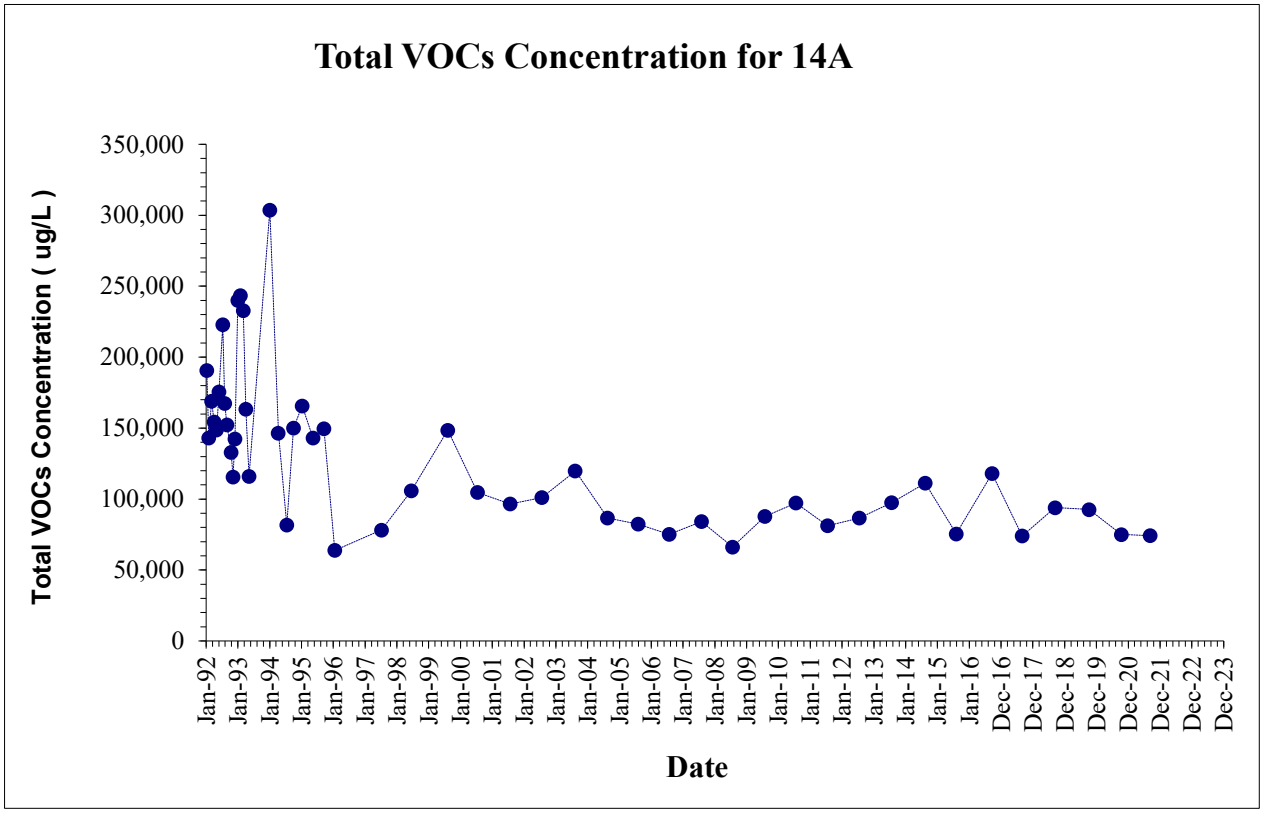

Note: the only detected VOC was tetrahydrothiophene




Note: the main VOC detected was THT
Note: Semi-log scale to distinguish changes at lower range of concentrations.




Note: Semi-log scale to distinguish changes at lower range of concentrations.


Total VOCs Concentration for 14A
Total VOCs Concentration ( ug/L )
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
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Jan-16
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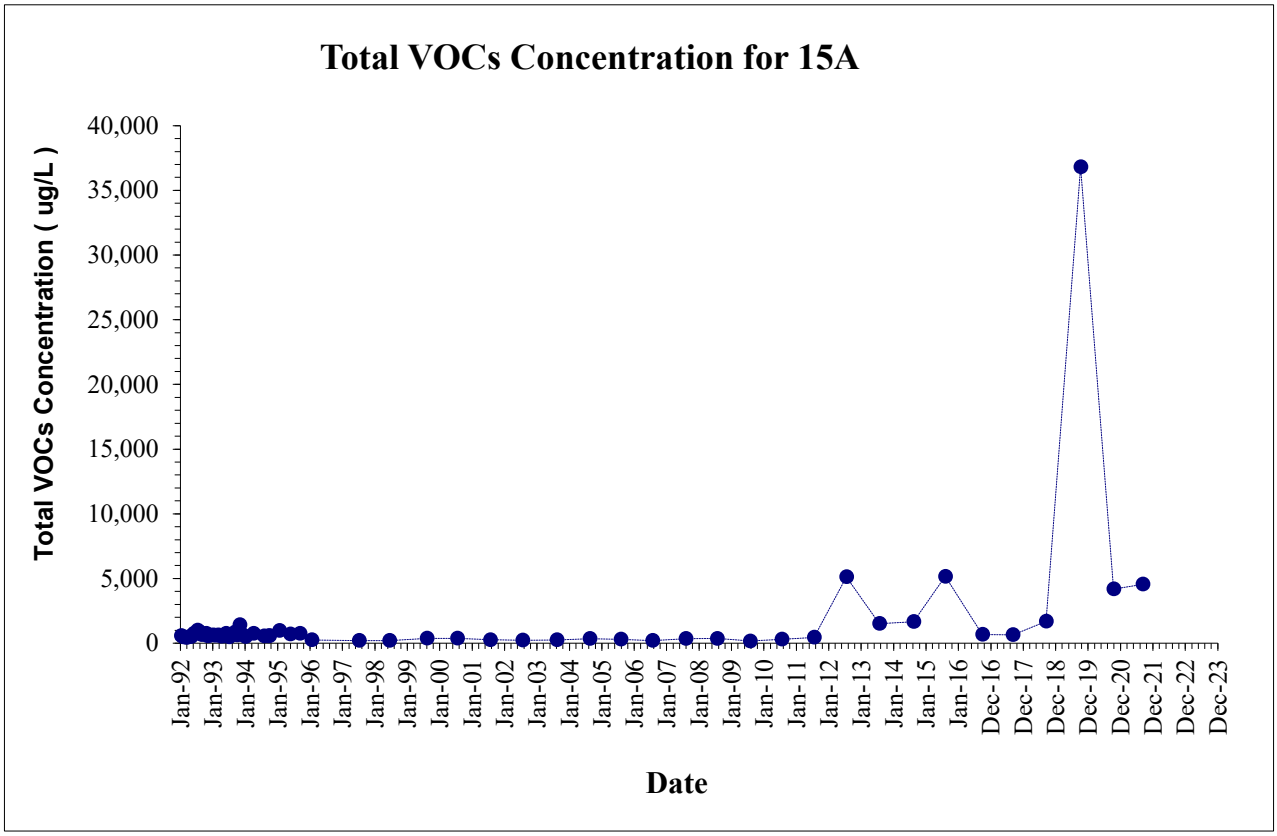
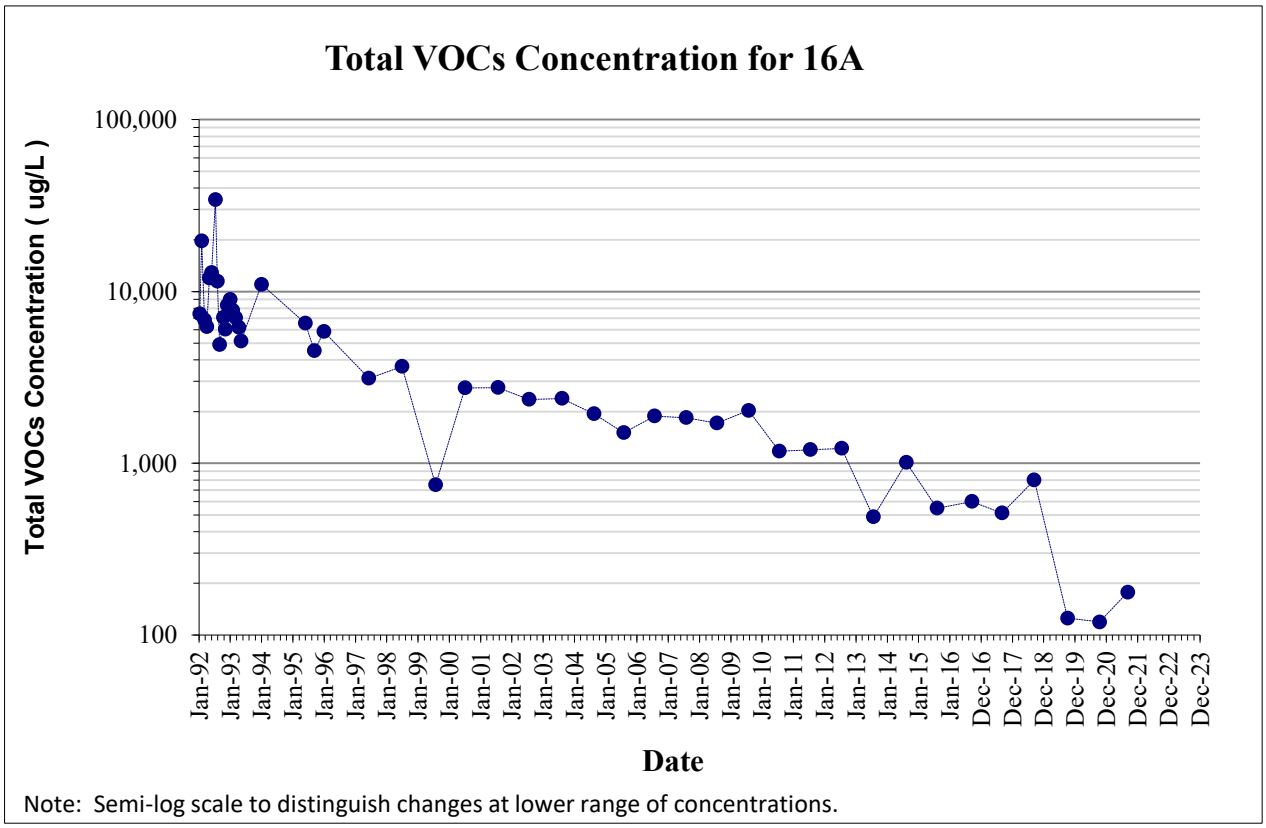
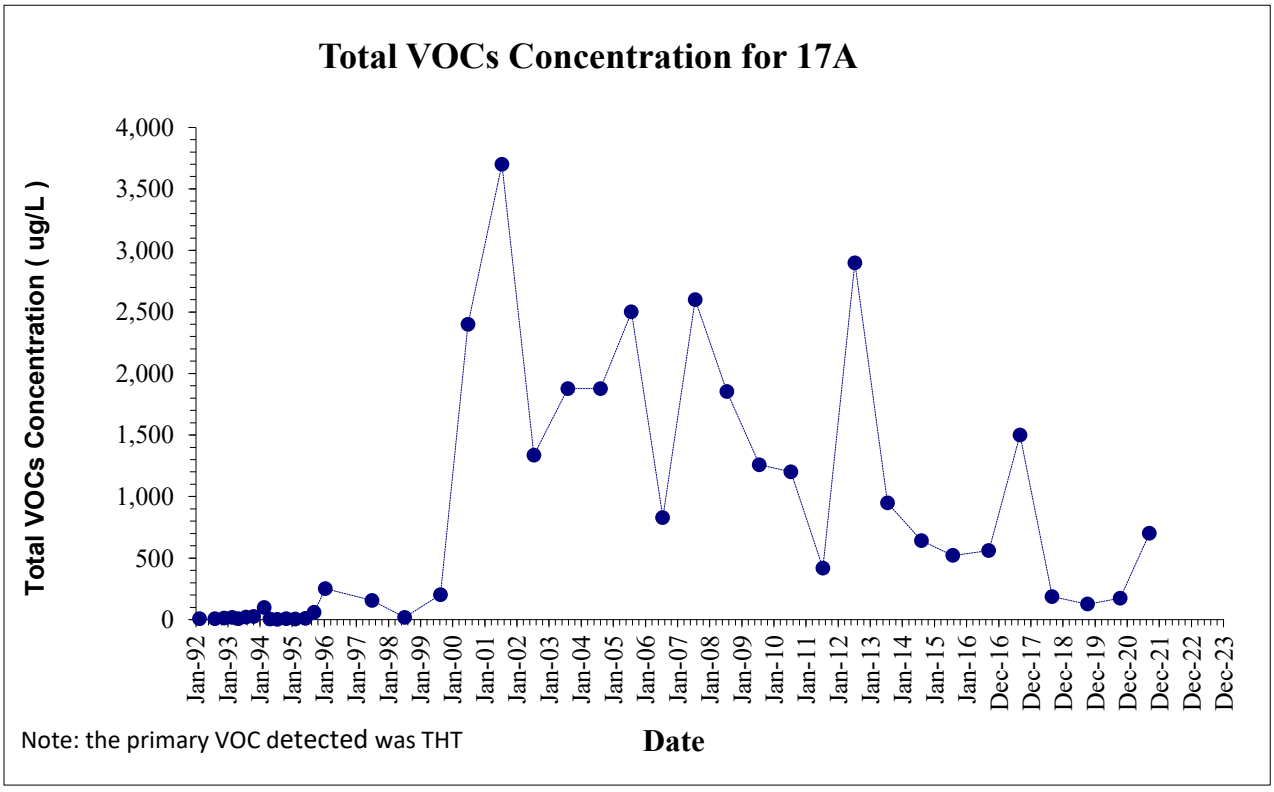
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date

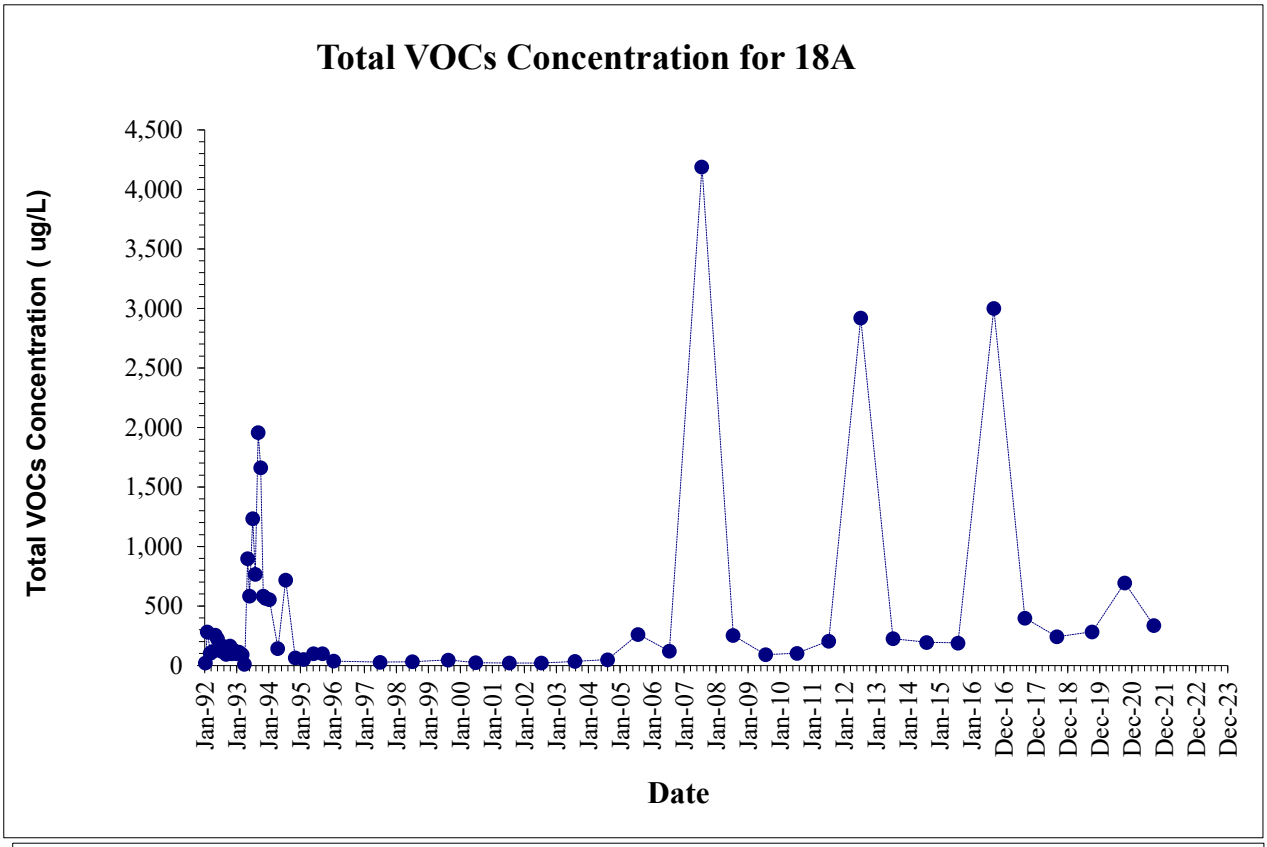

Total VOCs Concentration for 15A
Total VOCs Concentration ( ug/L )
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date

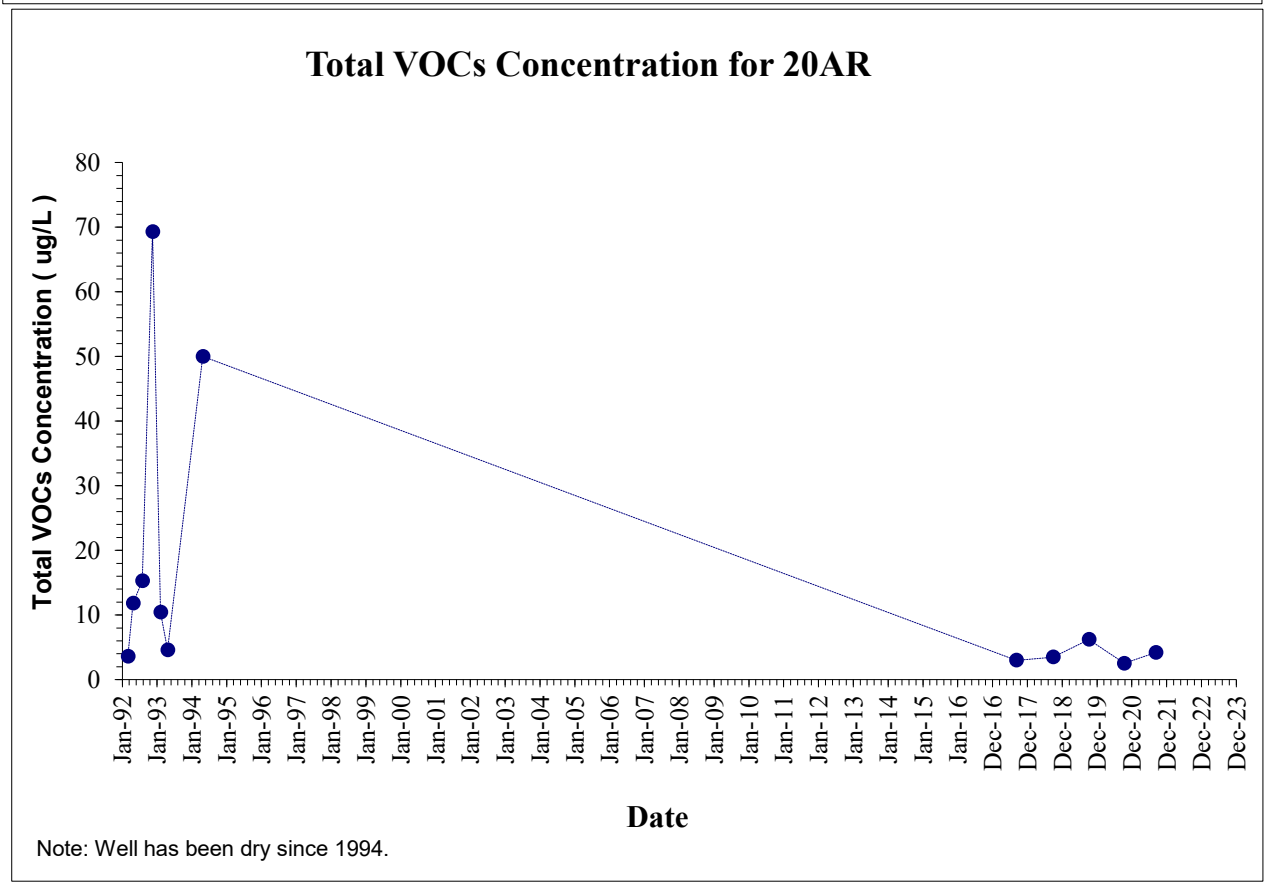



Note: Semi-log scale to distinguish changes at lower range of concentrations.

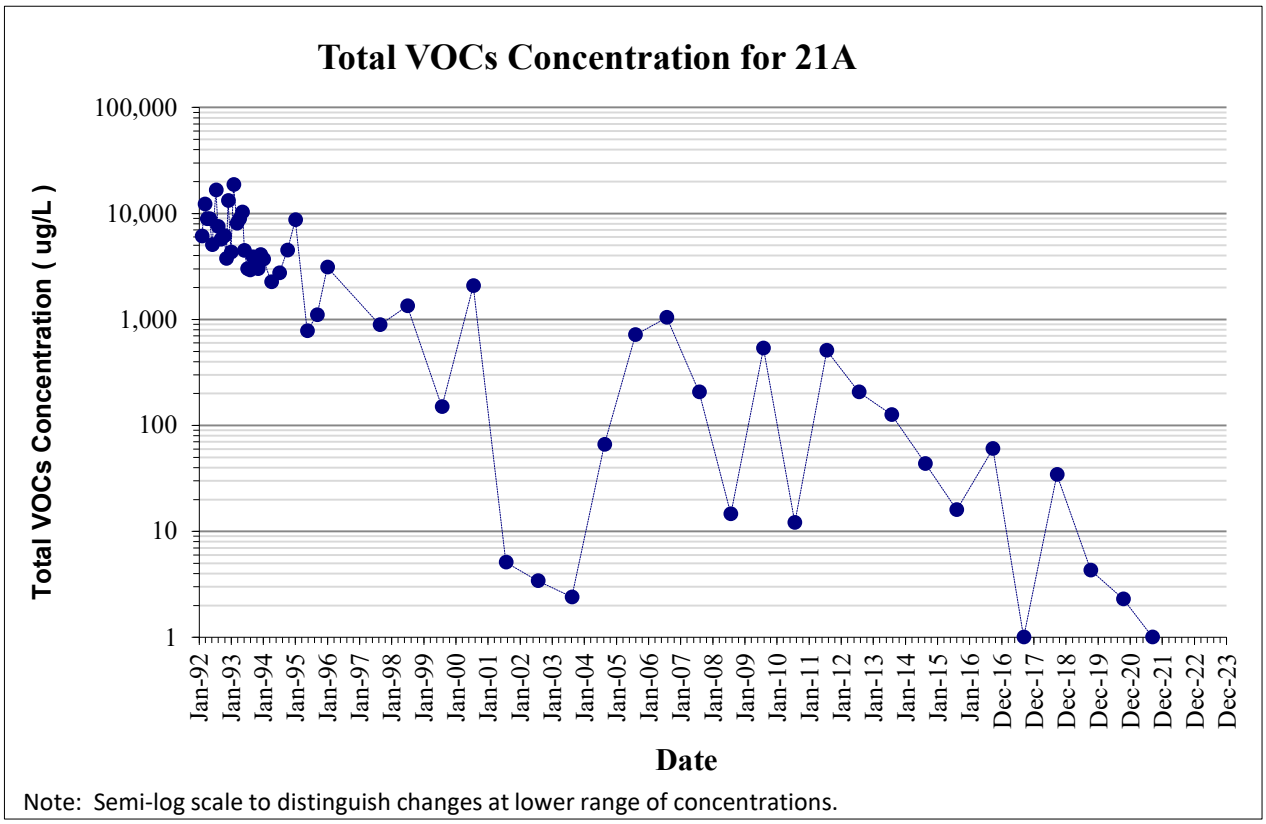



Note: the primary VOC detected was THT

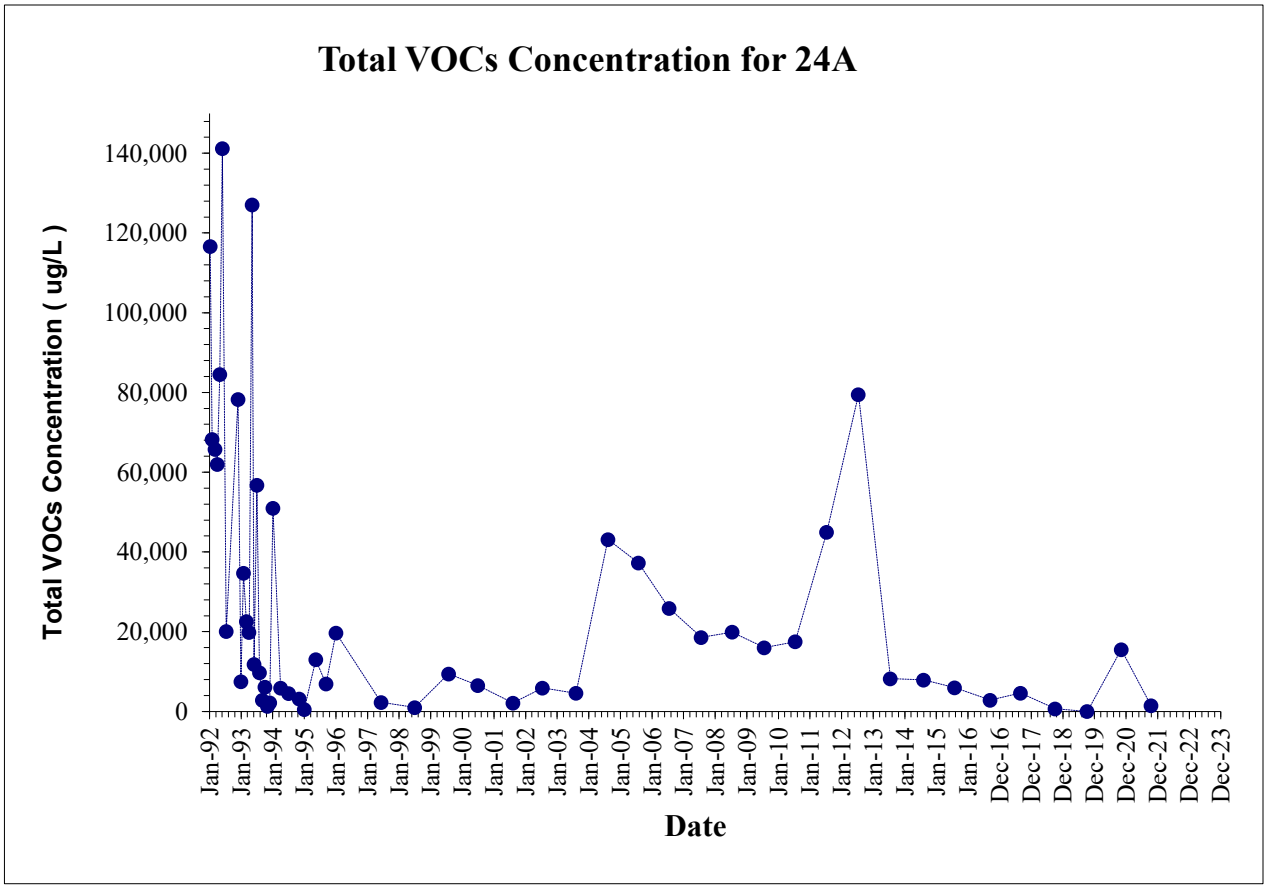


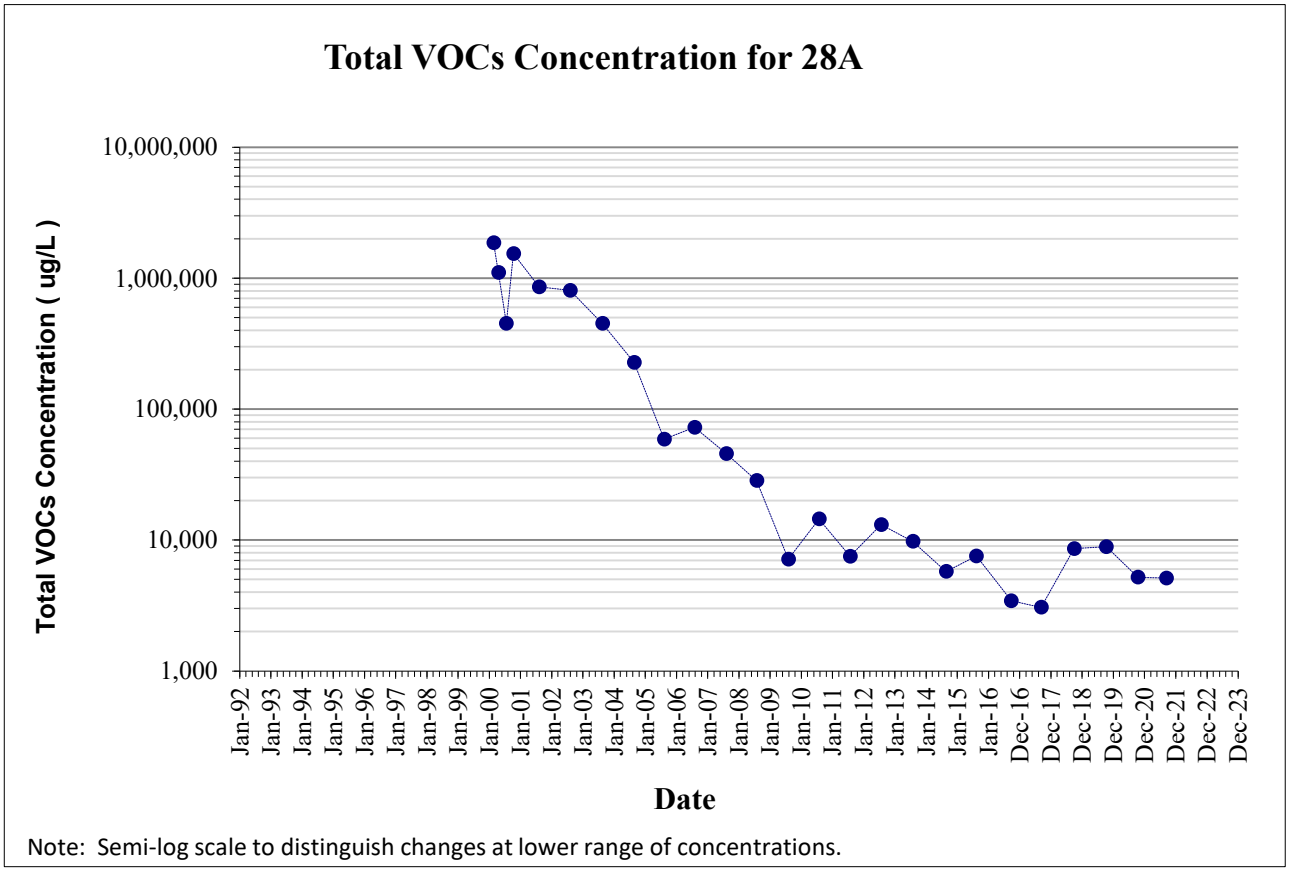




Note: Well has been dry since 1994.

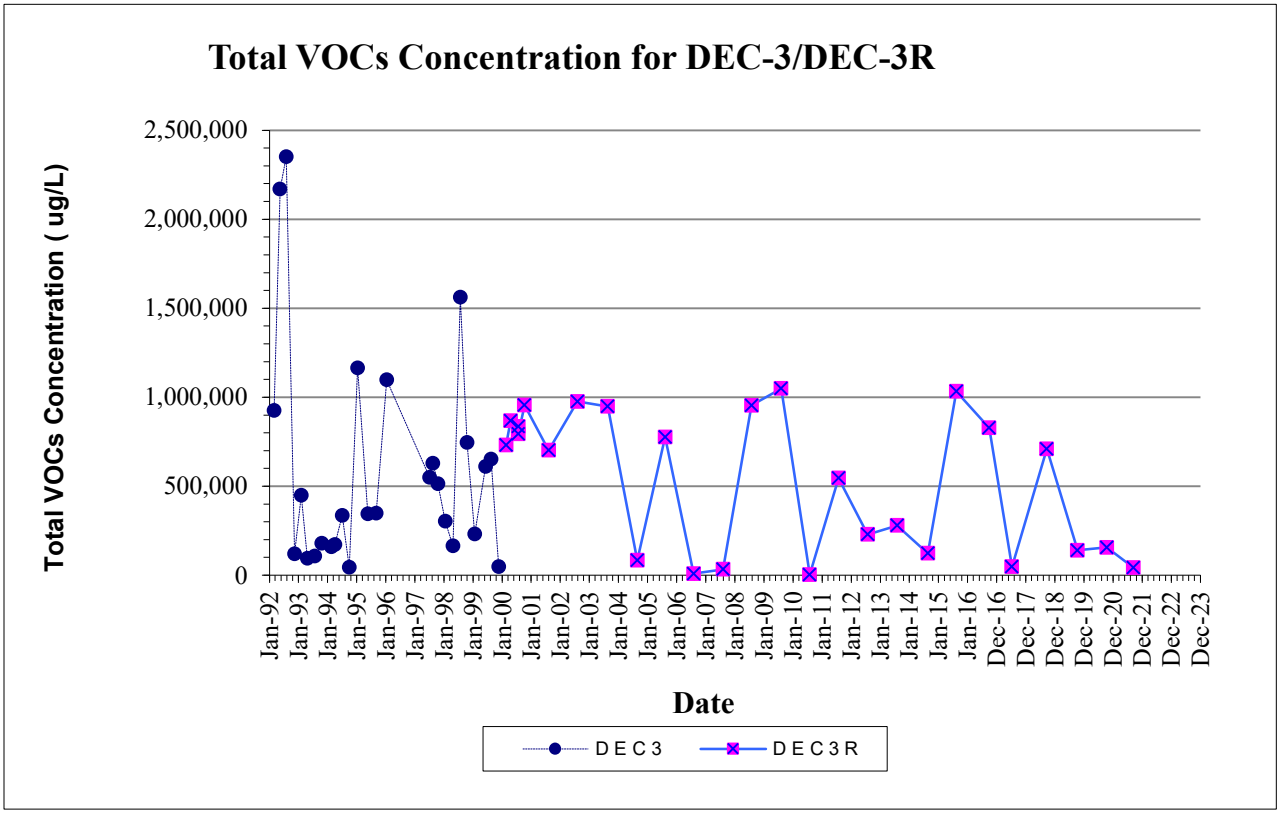


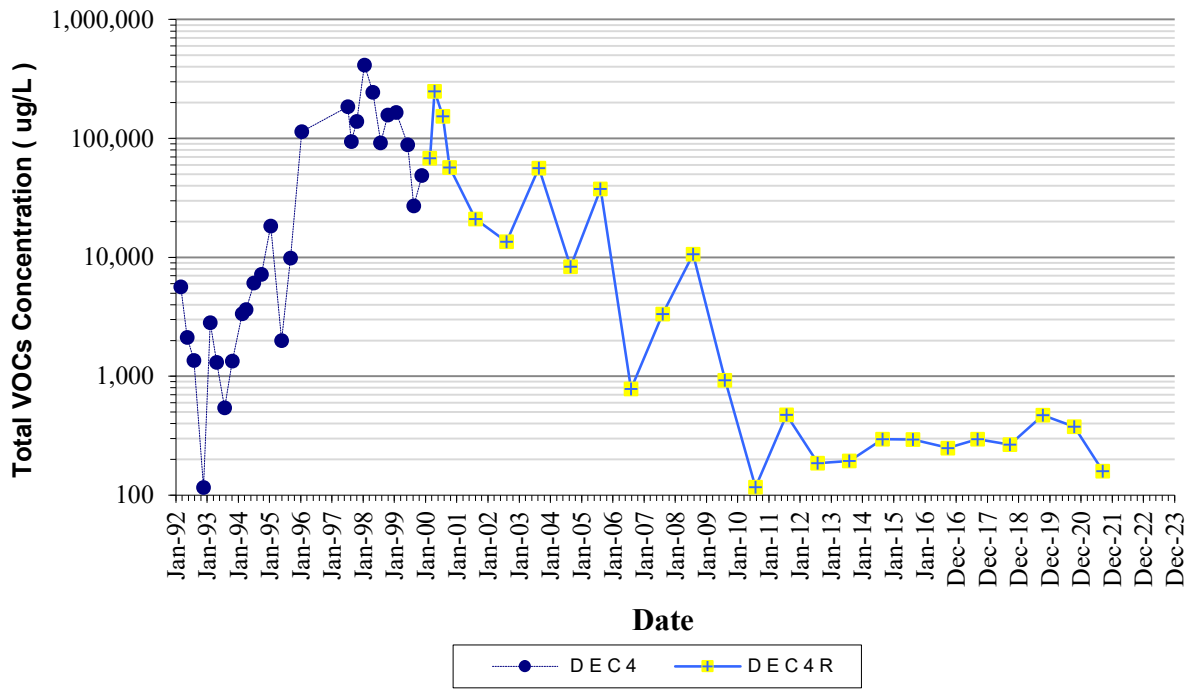

Note: Semi-log scale to distinguish changes at lower range of concentrations.



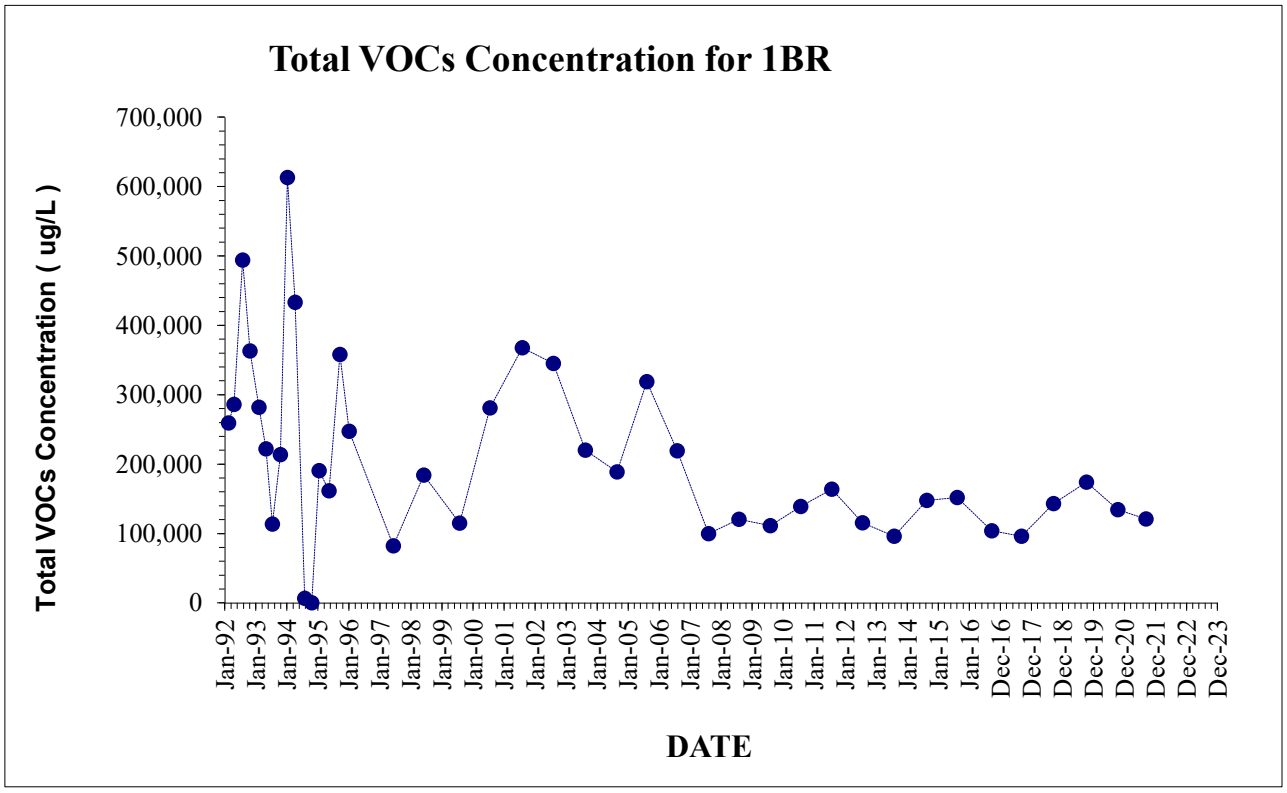


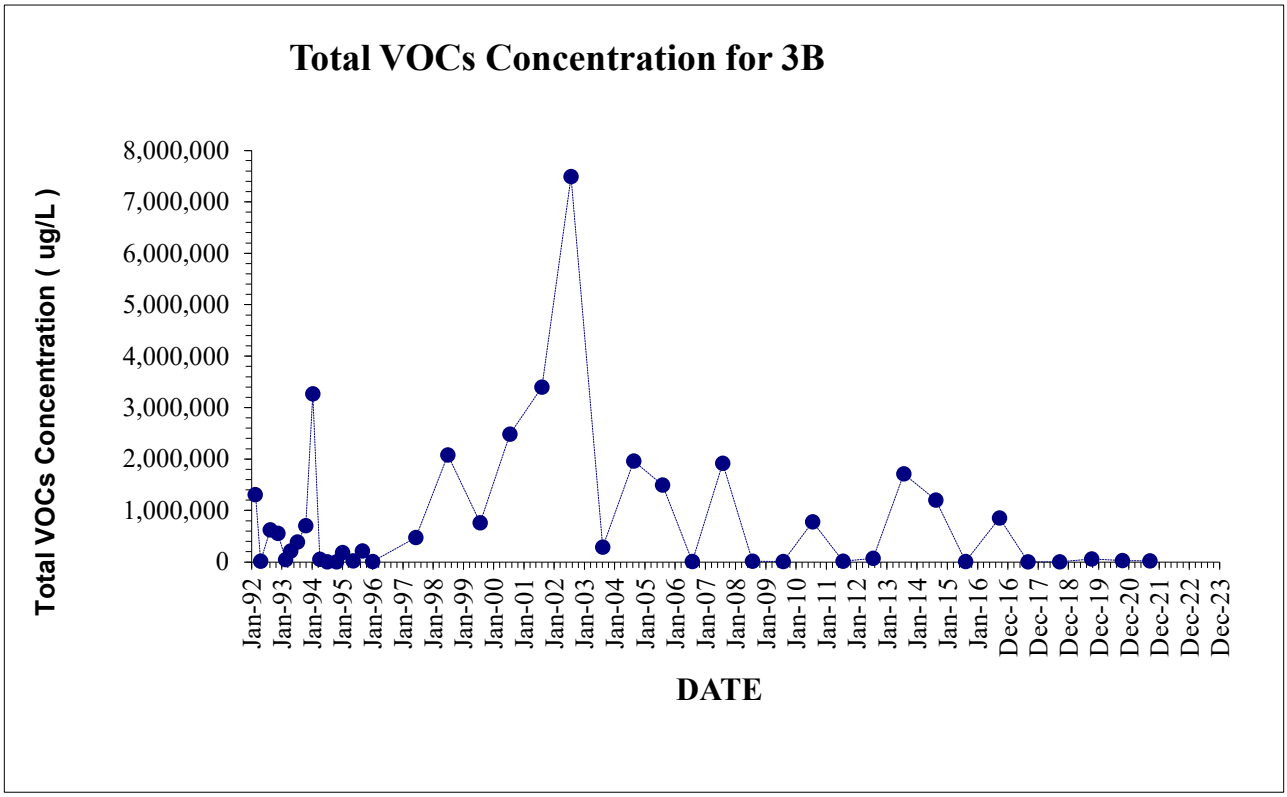

Note: Semi-log scale to distinguish changes at lower range of concentrations.






Note: Semi-log scale to distinguish changes at lower range of concentrations.


Total VOCs Concentration for 1BR
Total VOCs Concentration ( ug/L )
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
DATE


Total VOCs Concentration for 3B
Total VOCs Concentration ( ug/L )
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
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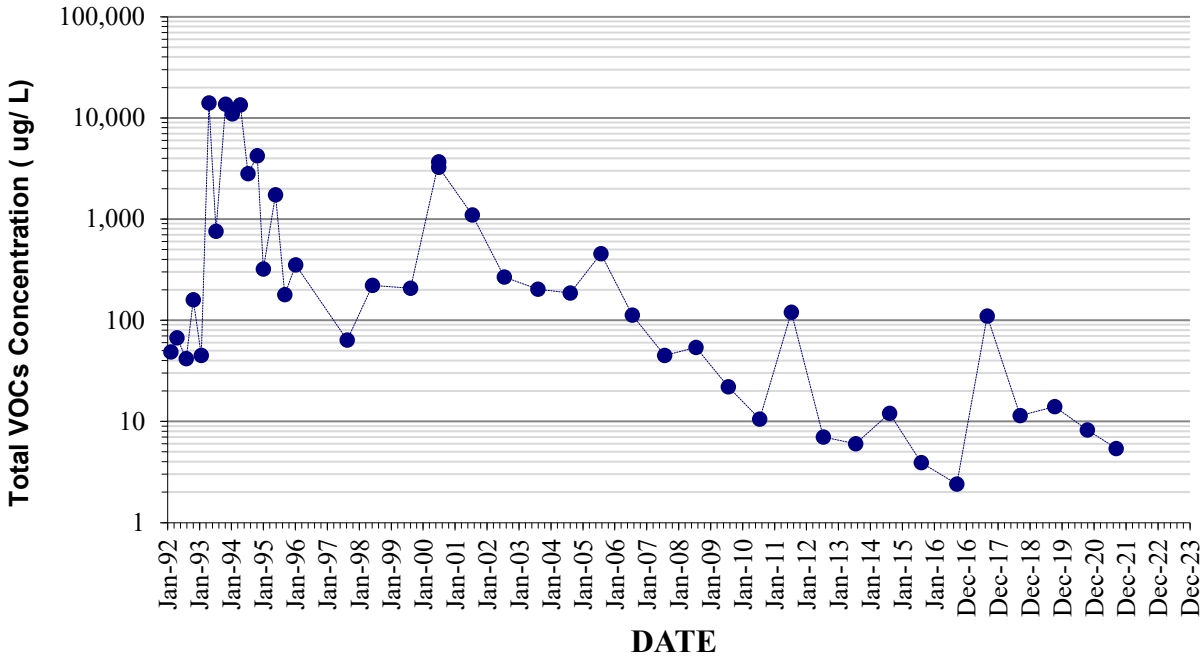
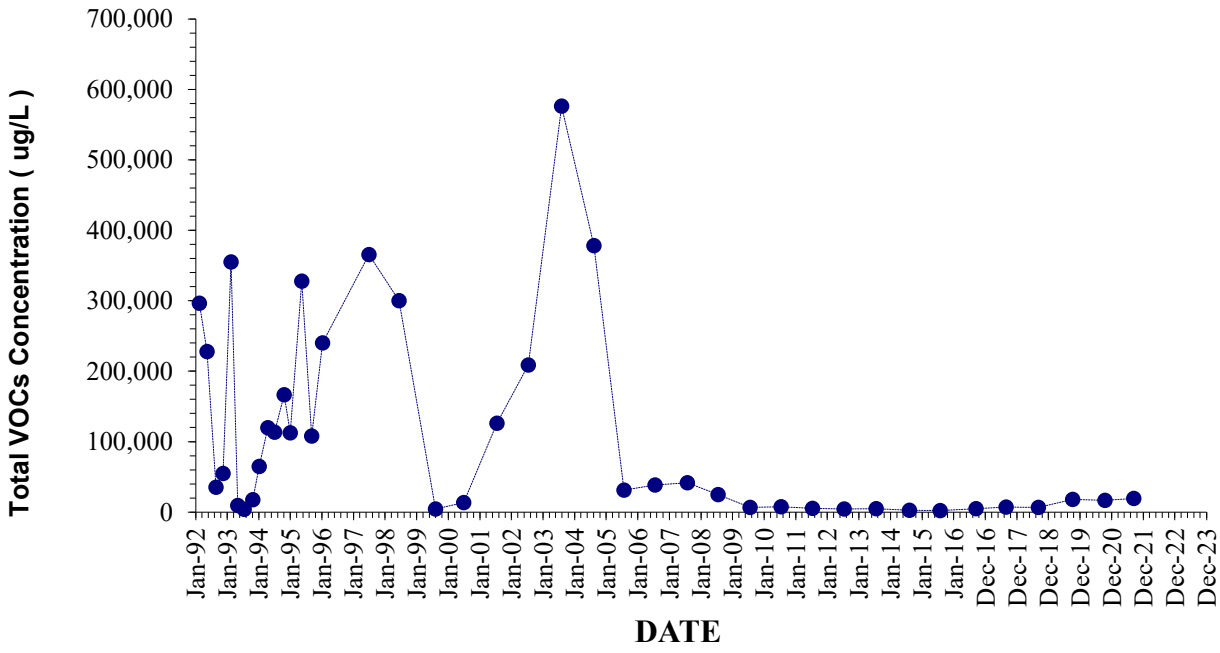
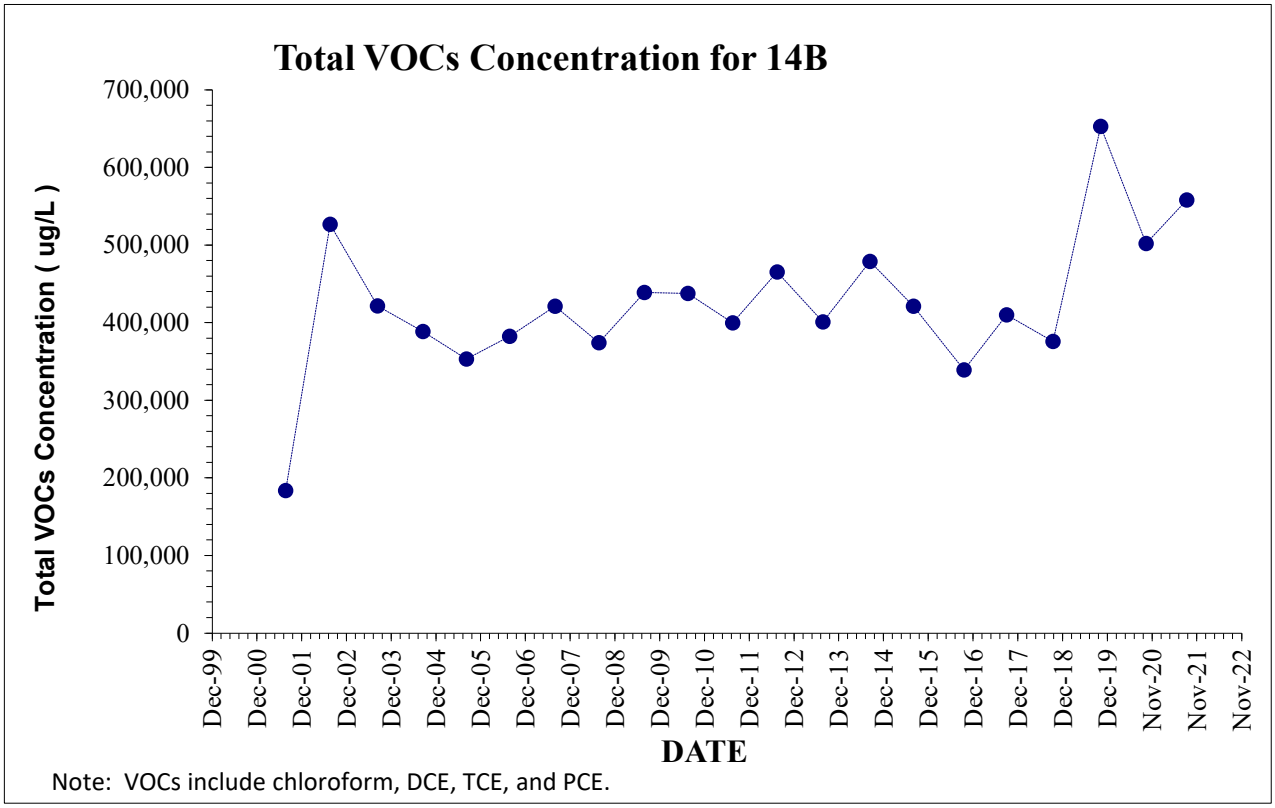
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
DATE



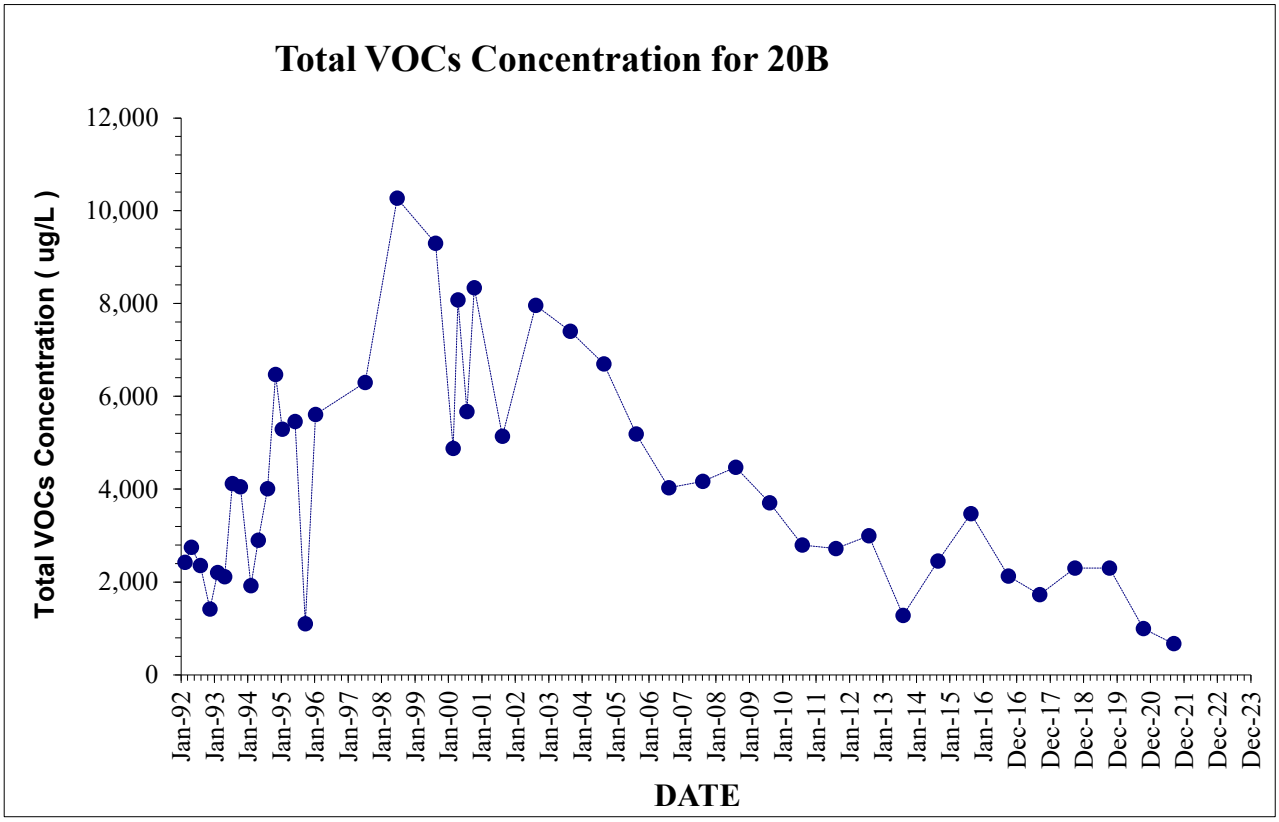

Note: Semi-log scale to distinguish changes at lower range of concentrations.

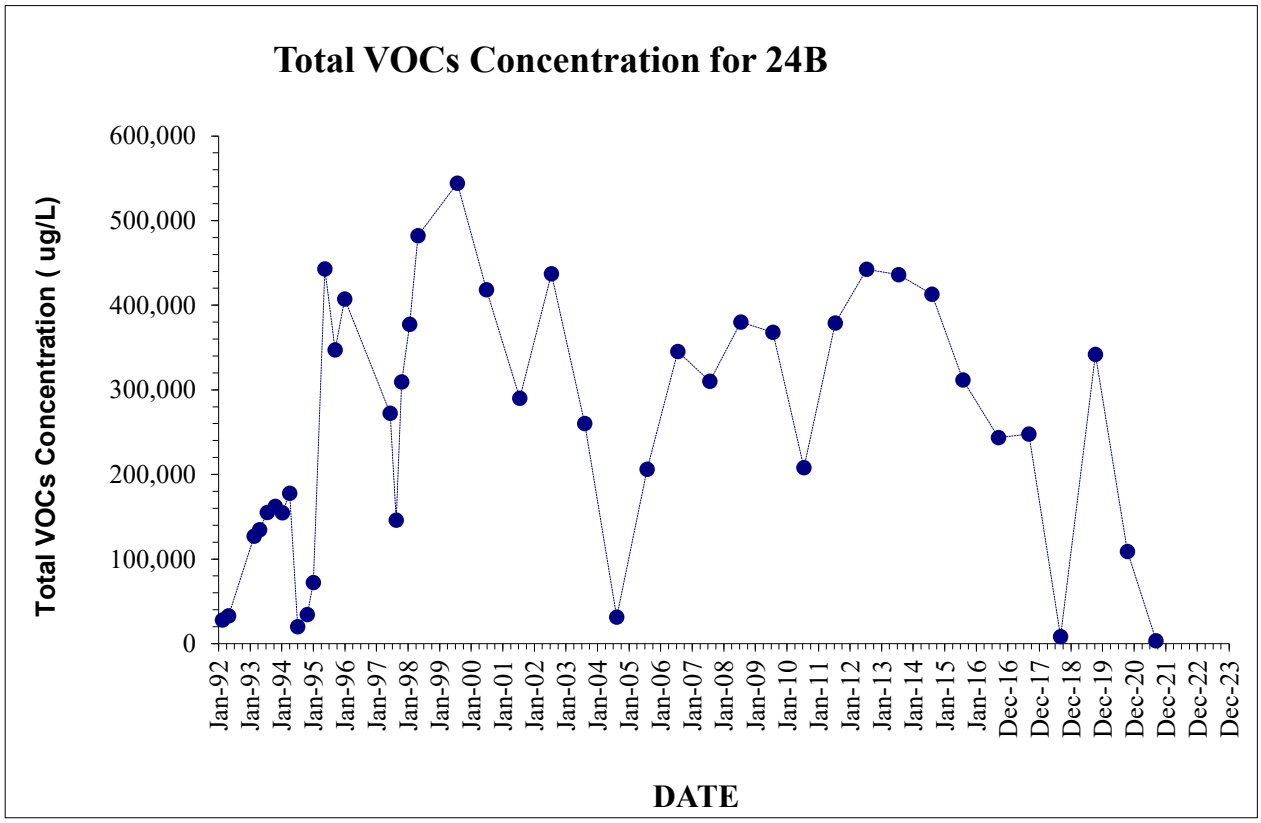


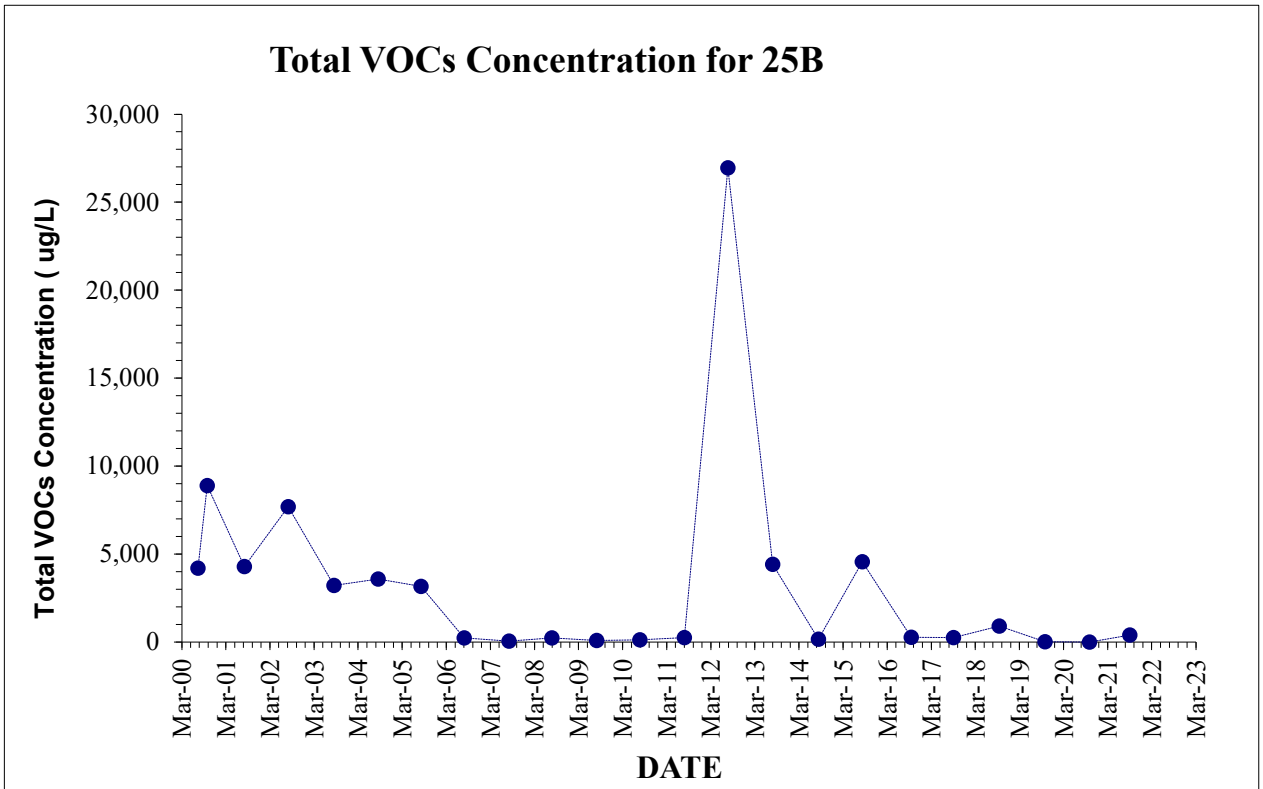

Note: Semi-log scale to distinguish changes at lower range of concentrations. THT is the main VOC.



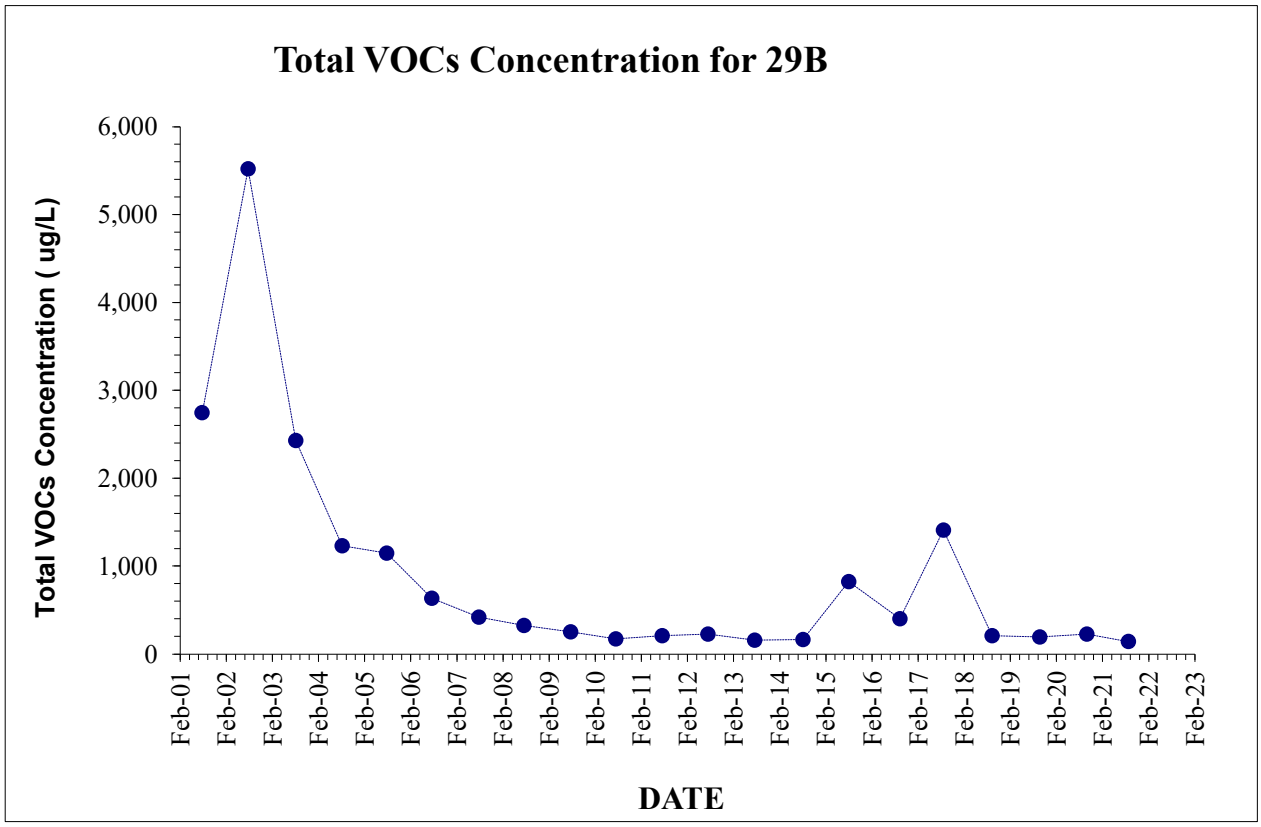

Note: VOCs include chloroform, DCE, TCE, and PCE.

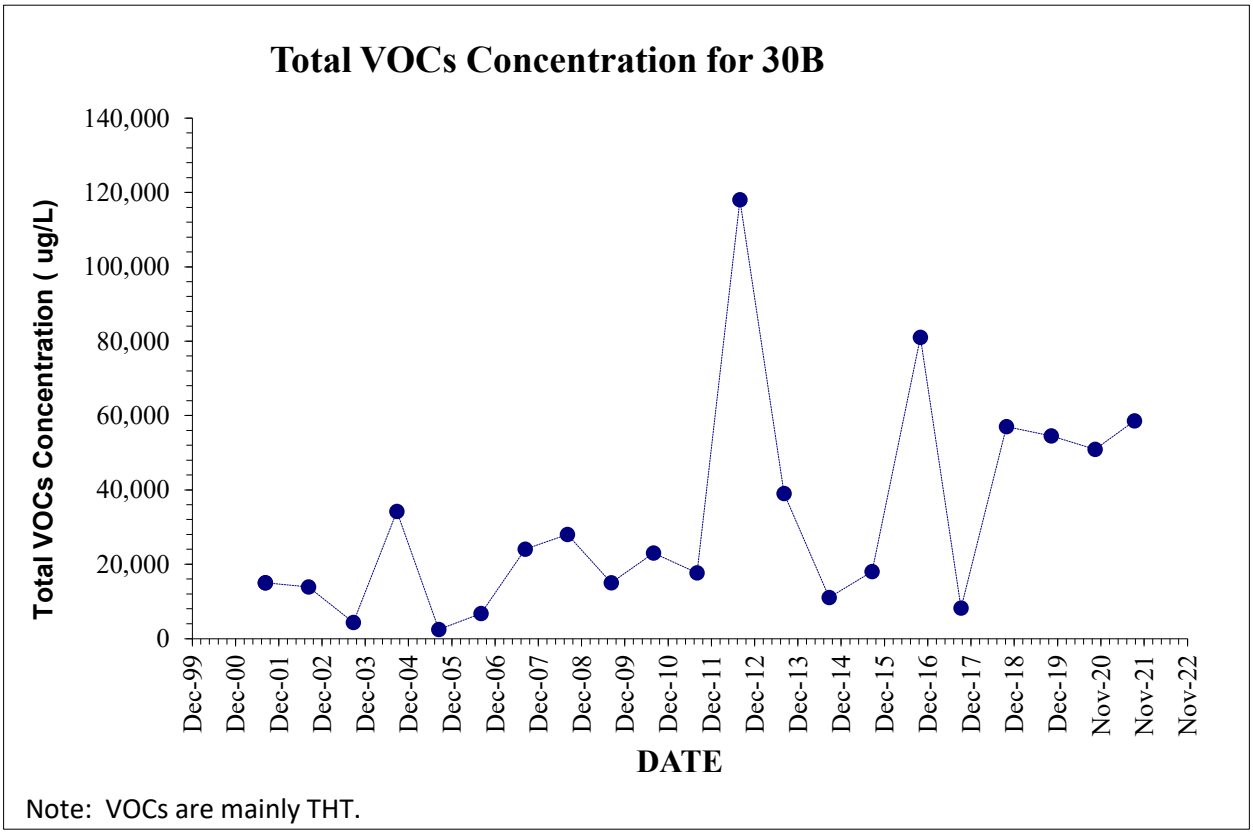




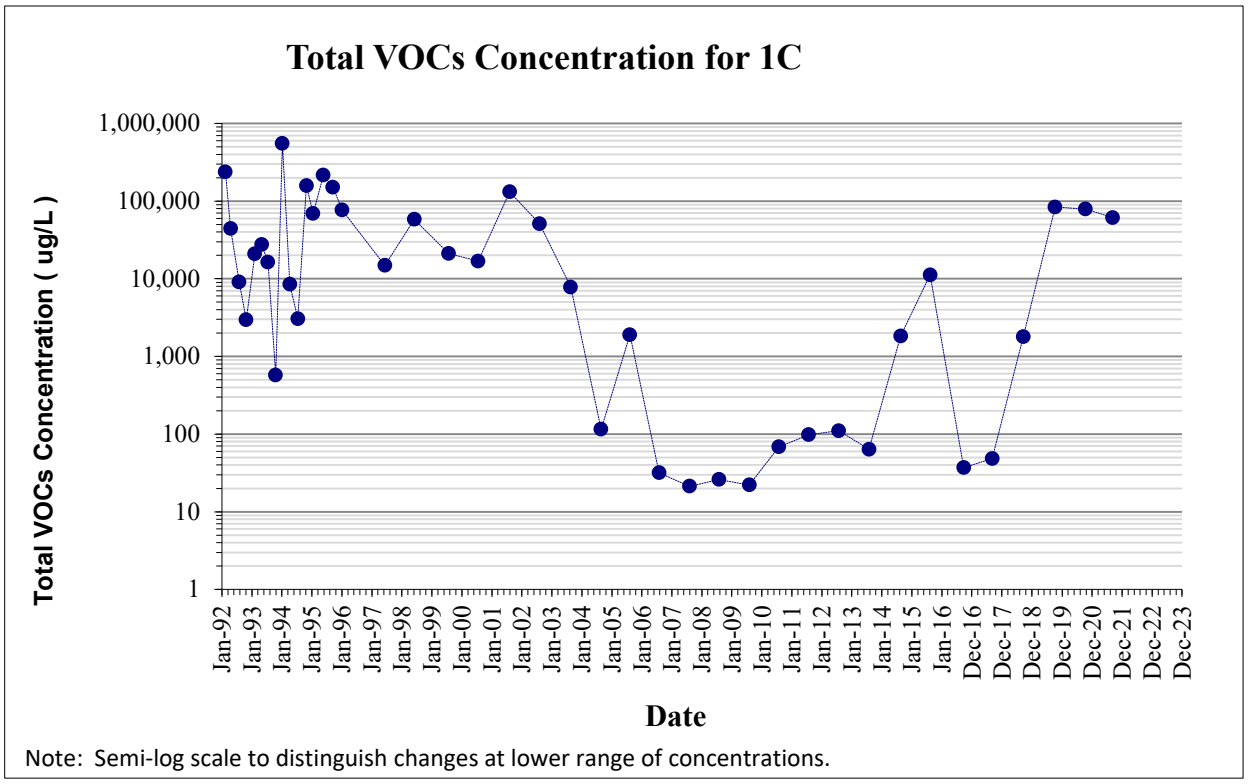




VOCs are predominantly chlorobenzene and THT.

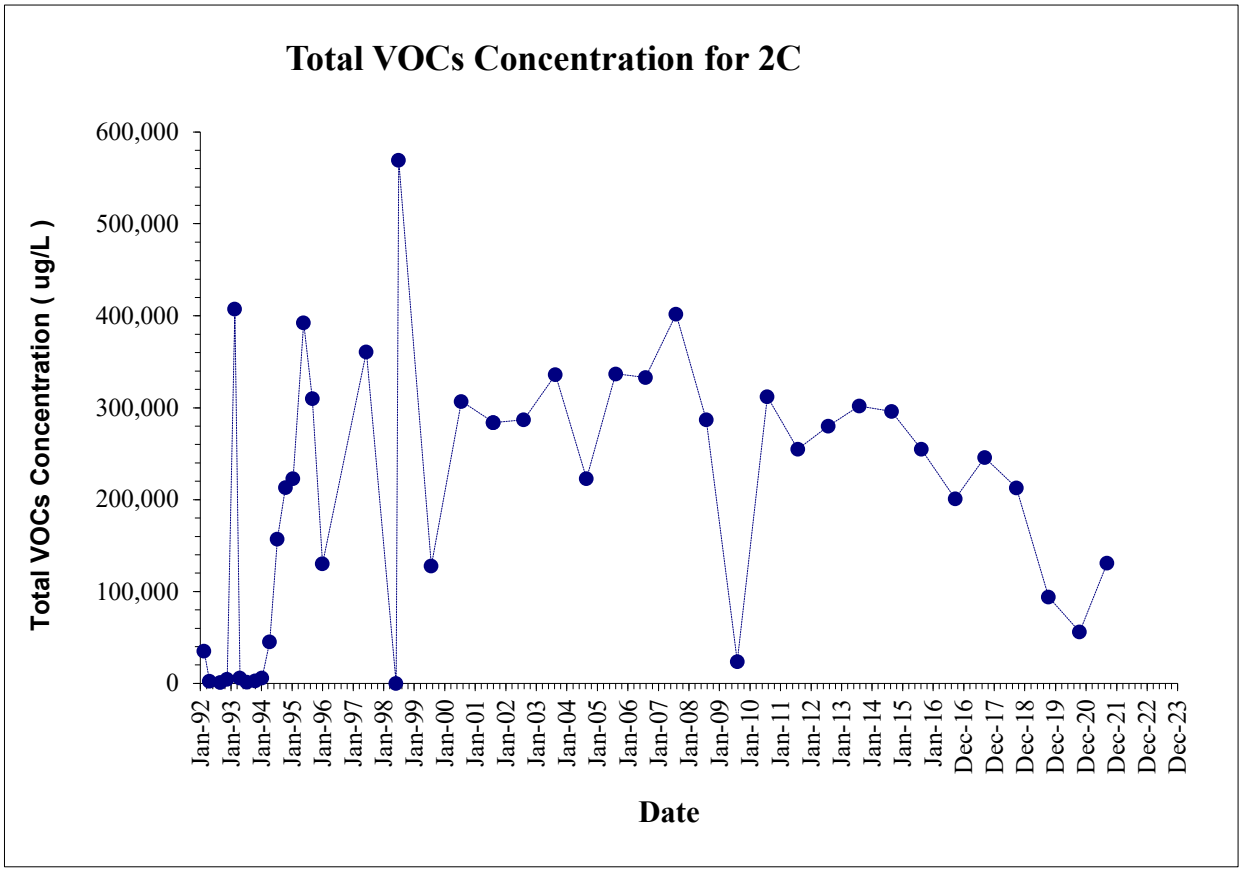


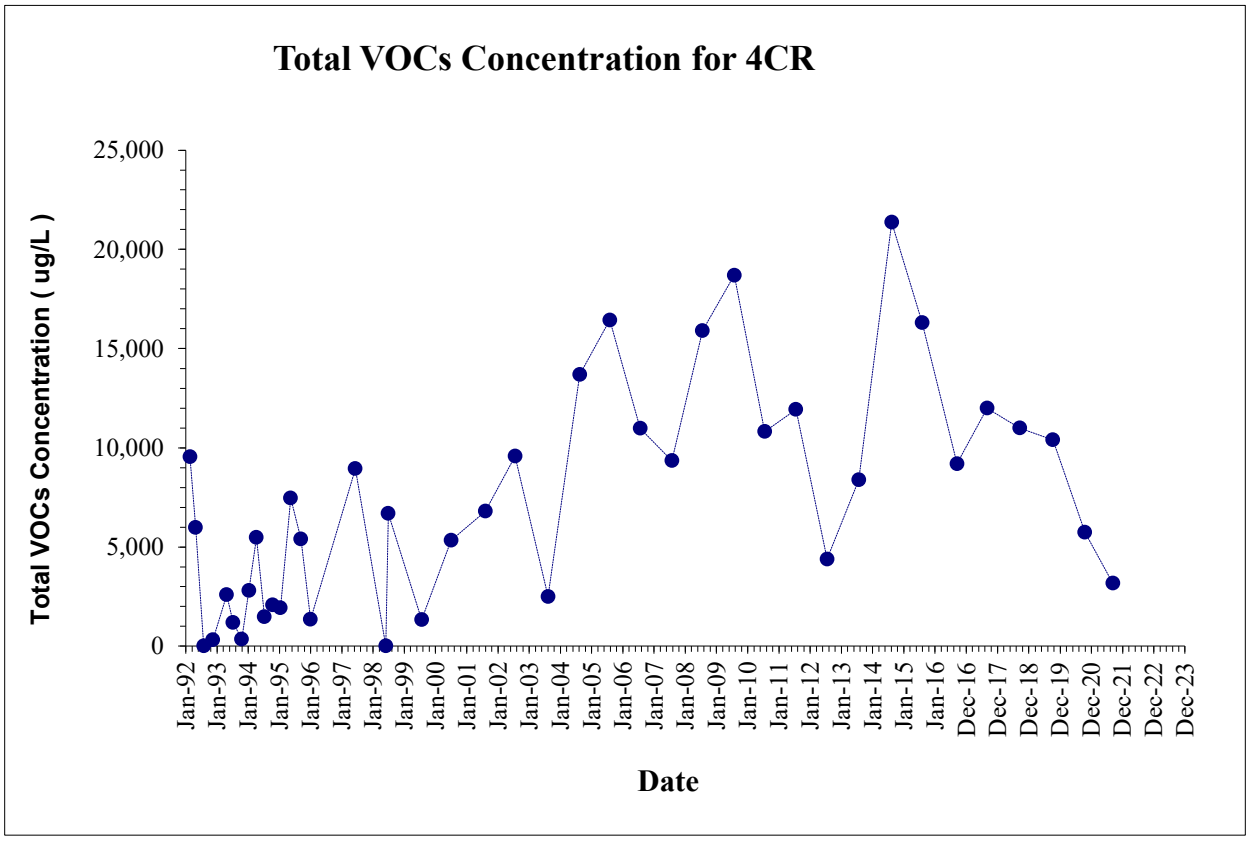



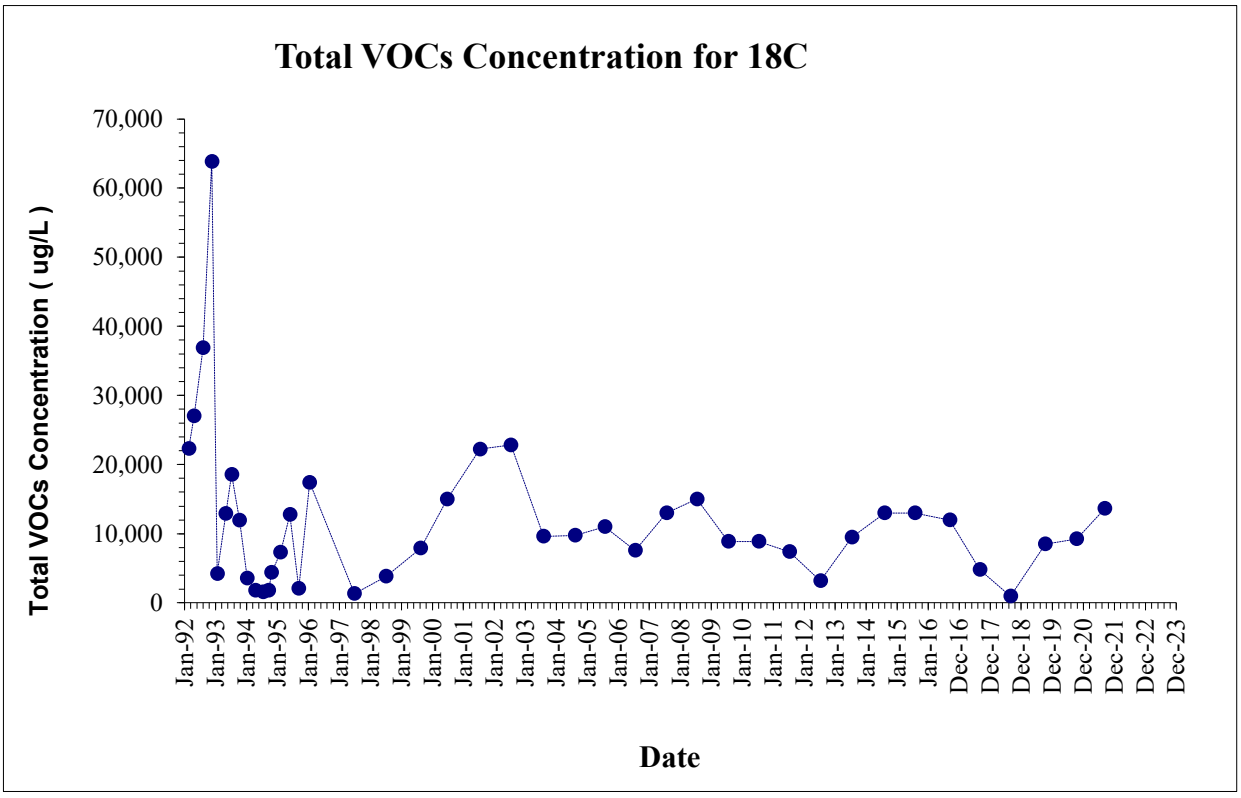

Note: VOCs are mainly THT.




Note: Semi-log scale to distinguish changes at lower range of concentrations.




Total VOCs Concentration for 4CR
Total VOCs Concentration ( ug/L )
25,000
20,000
15,000
10,000
5,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date


Total VOCs Concentration for 18C
Total VOCs Concentration ( ug/L )
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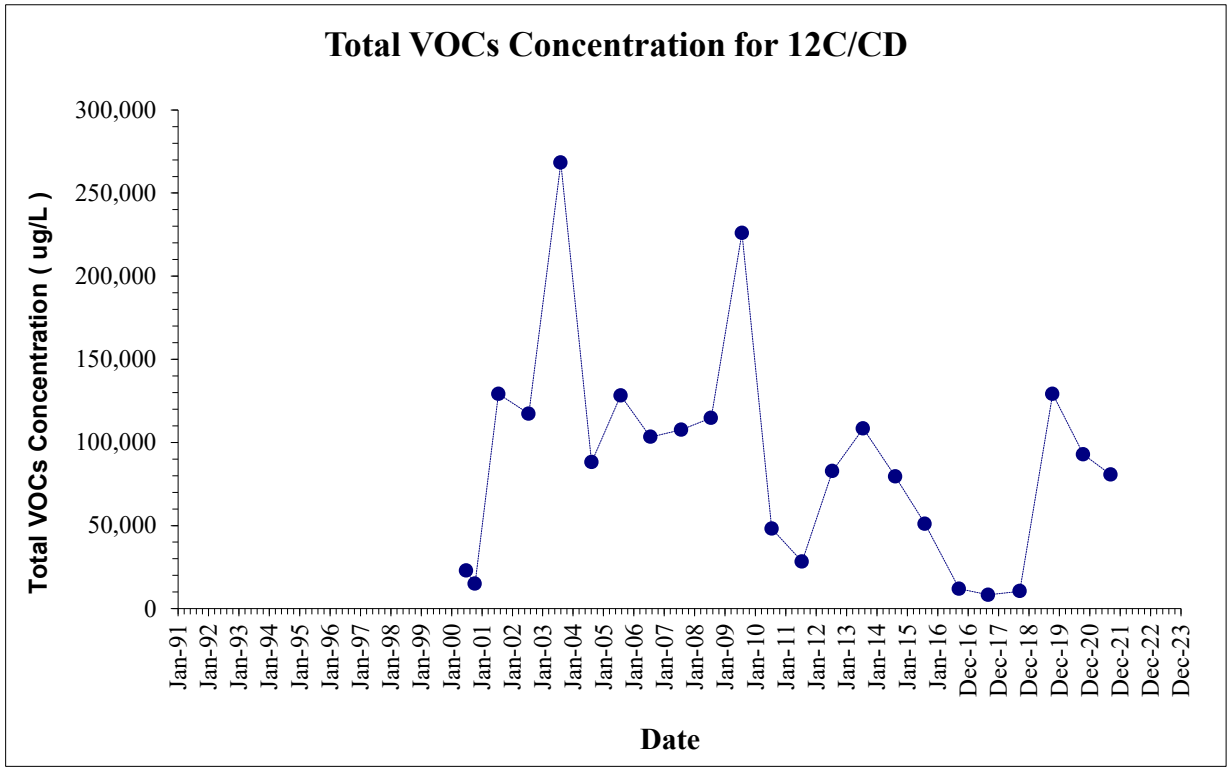
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date


Total VOCs Concentration for 12C/CD
Total VOCs Concentration ( ug/L )
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250,000
200,000
150,000
100,000
50,000
0
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
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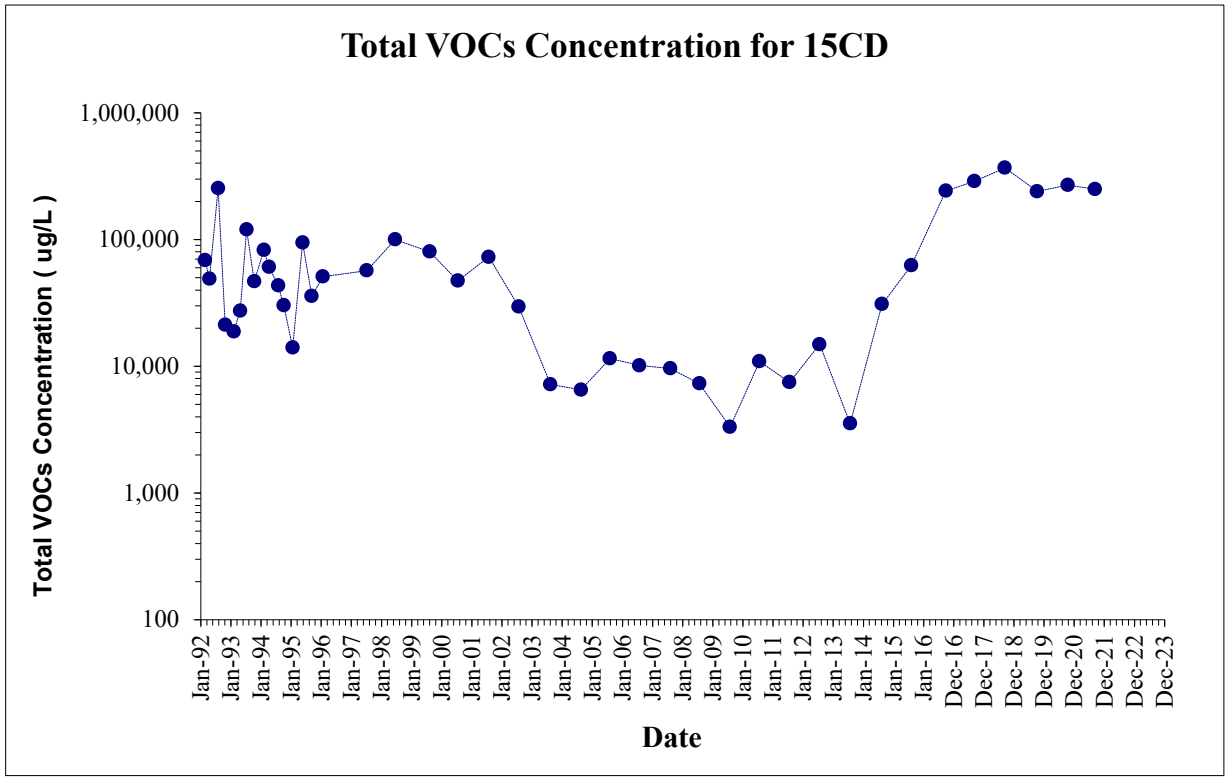
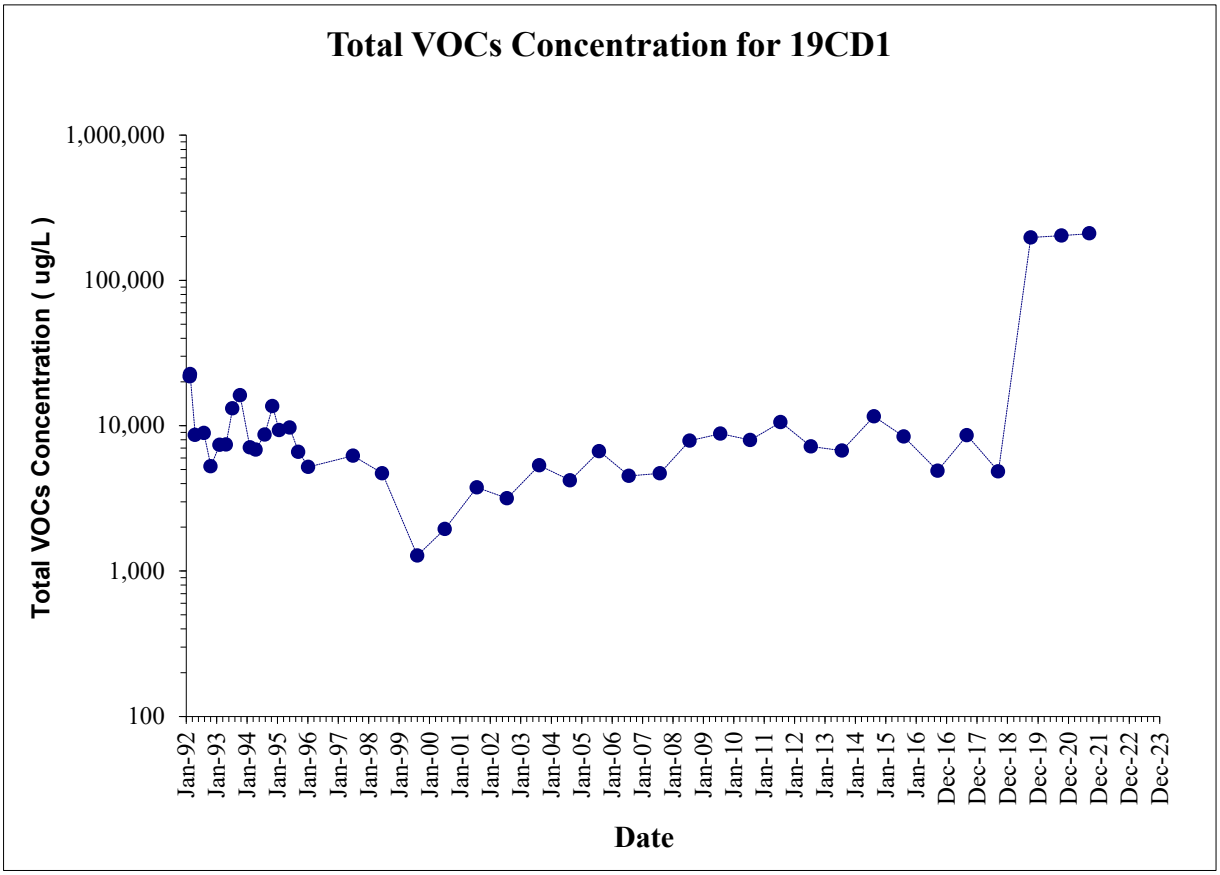
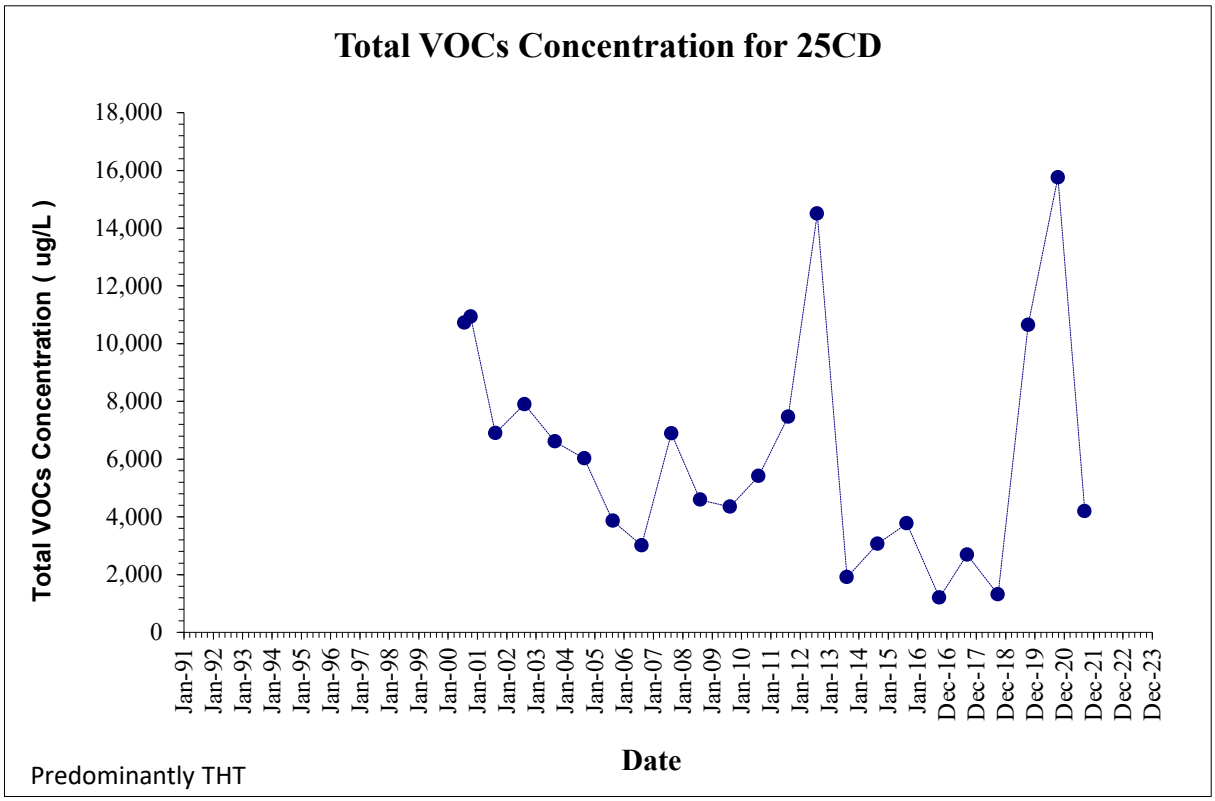
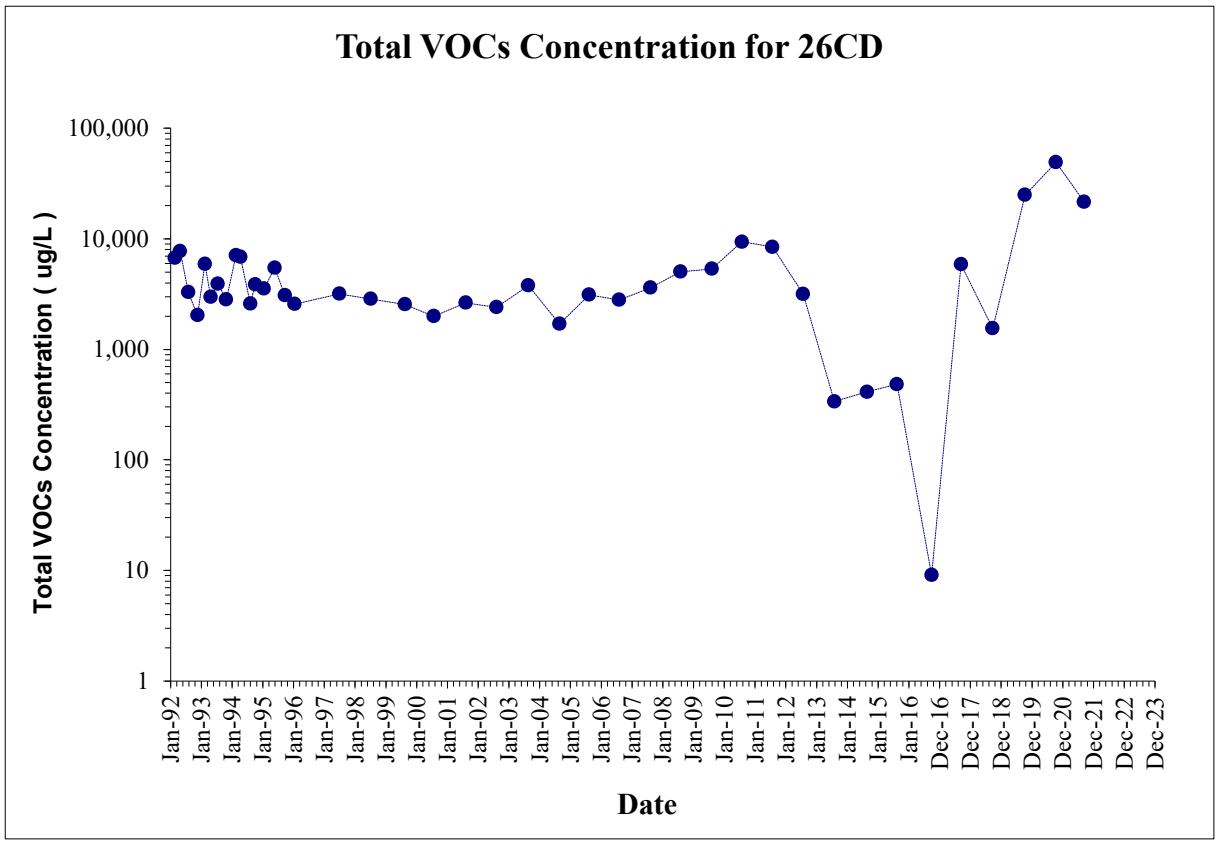
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date


Total VOCs Concentration for 15CD
Total VOCs Concentration ( ug/L )
1,000,000
100,000
10,000
1,000
100
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date

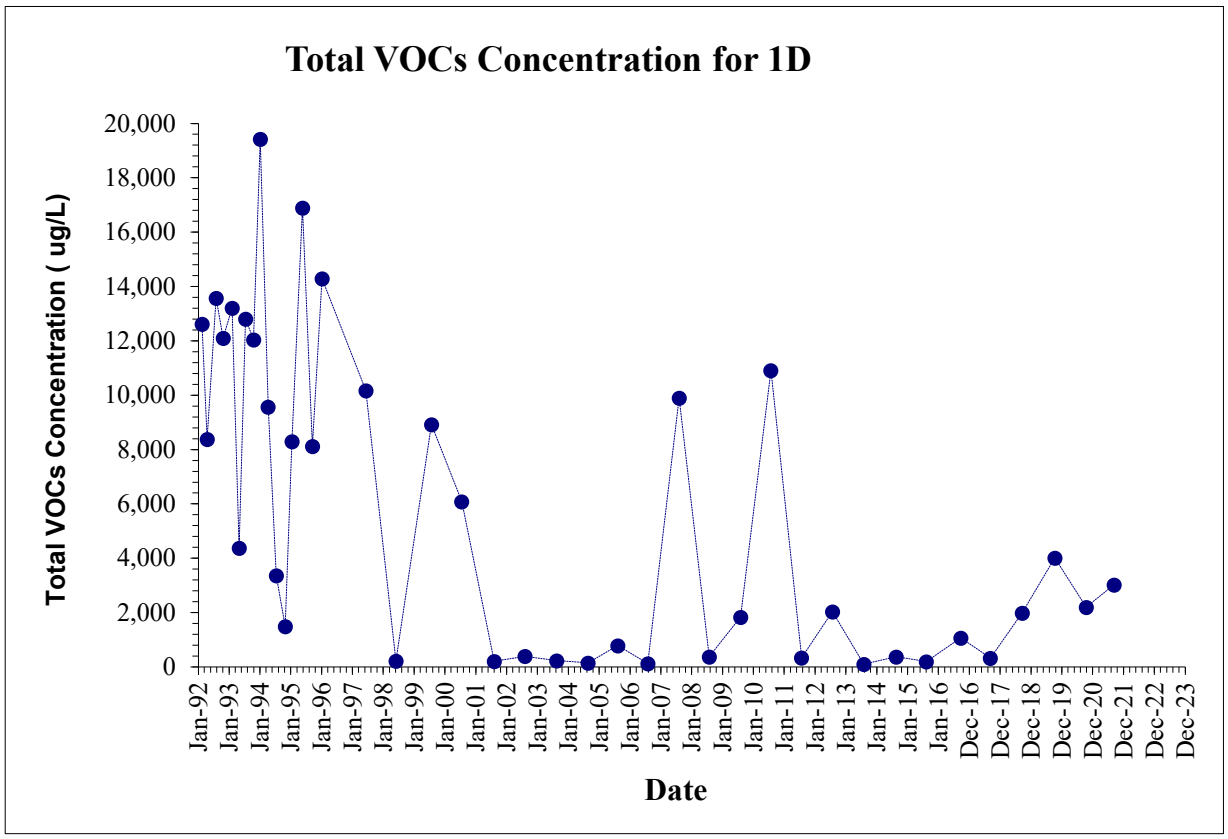


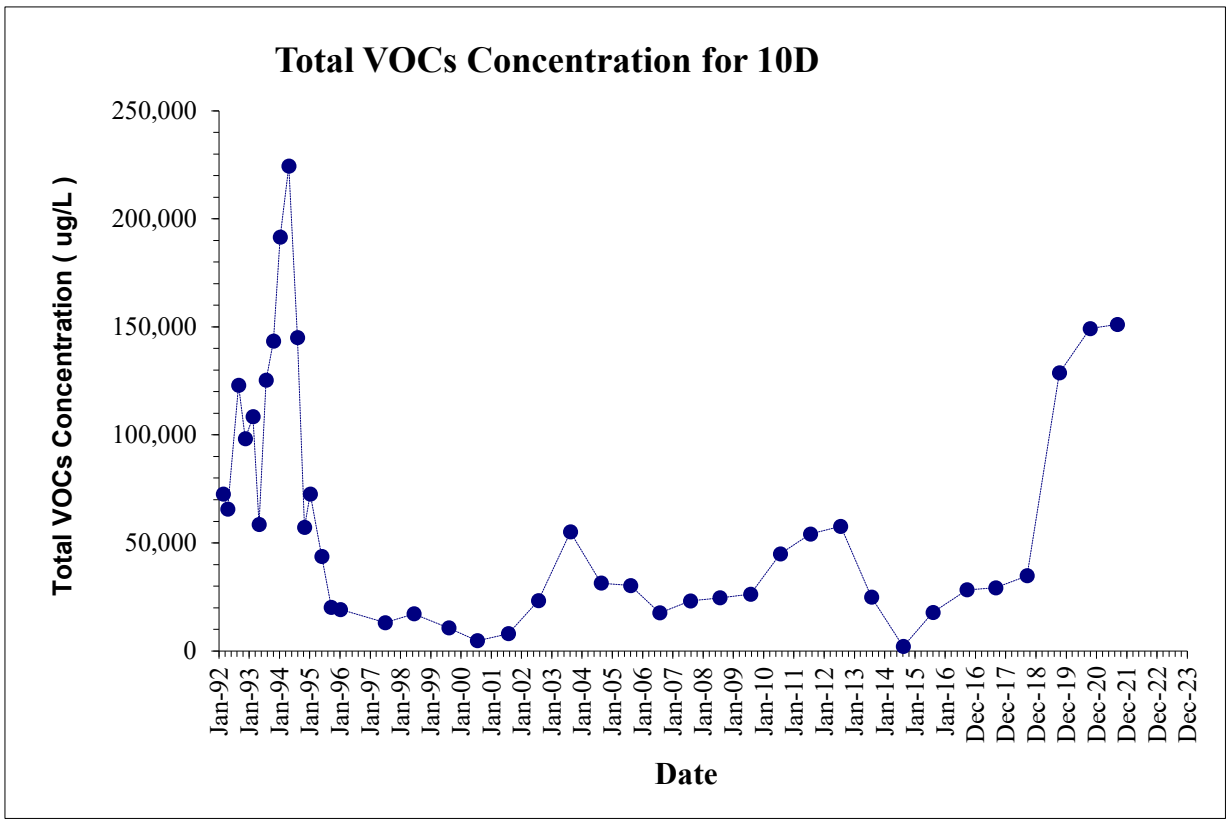




Predominantly THT

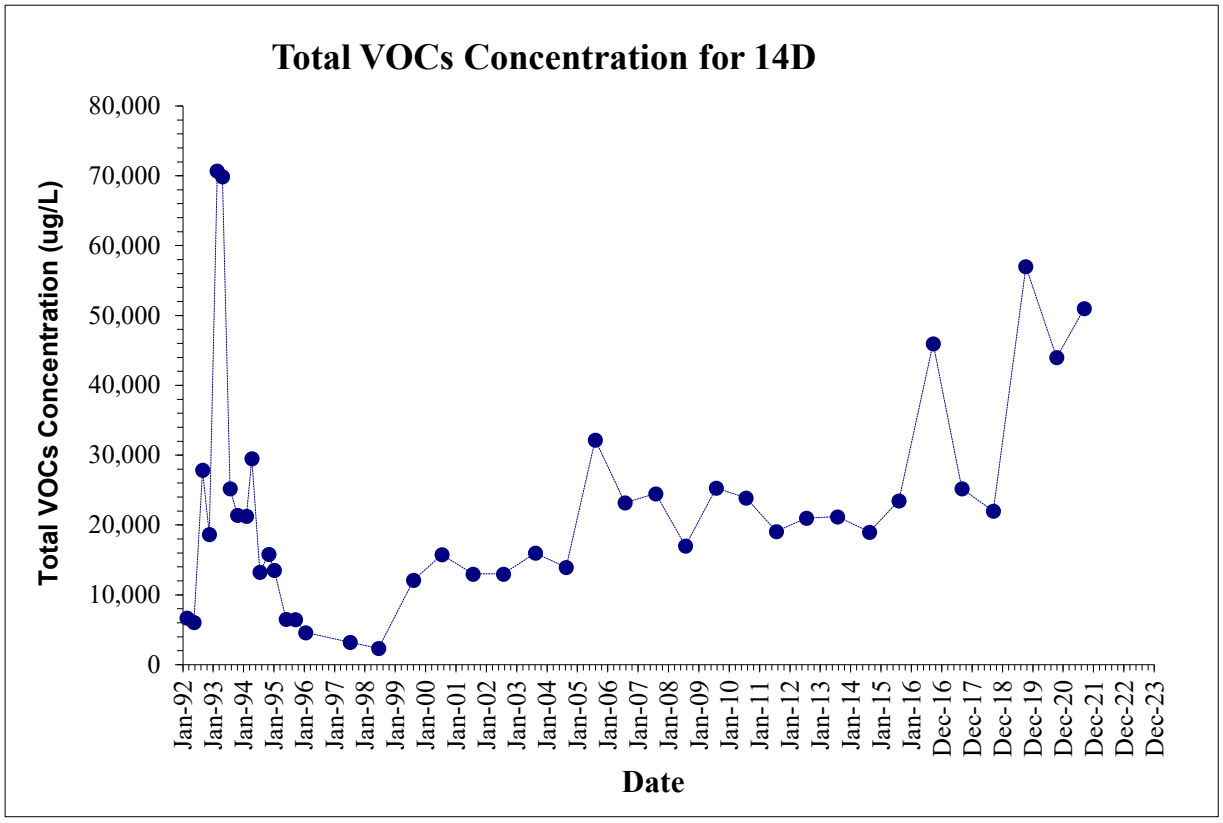

Total VOCs Concentration for 26CD
Total VOCs Concentration ( ug/L )
100,000
10,000
1,000
100
10
1
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Dec-16
Dec-17
Dec-18
Dec-19
Dec-20
Dec-21
Dec-22
Dec-23
Date

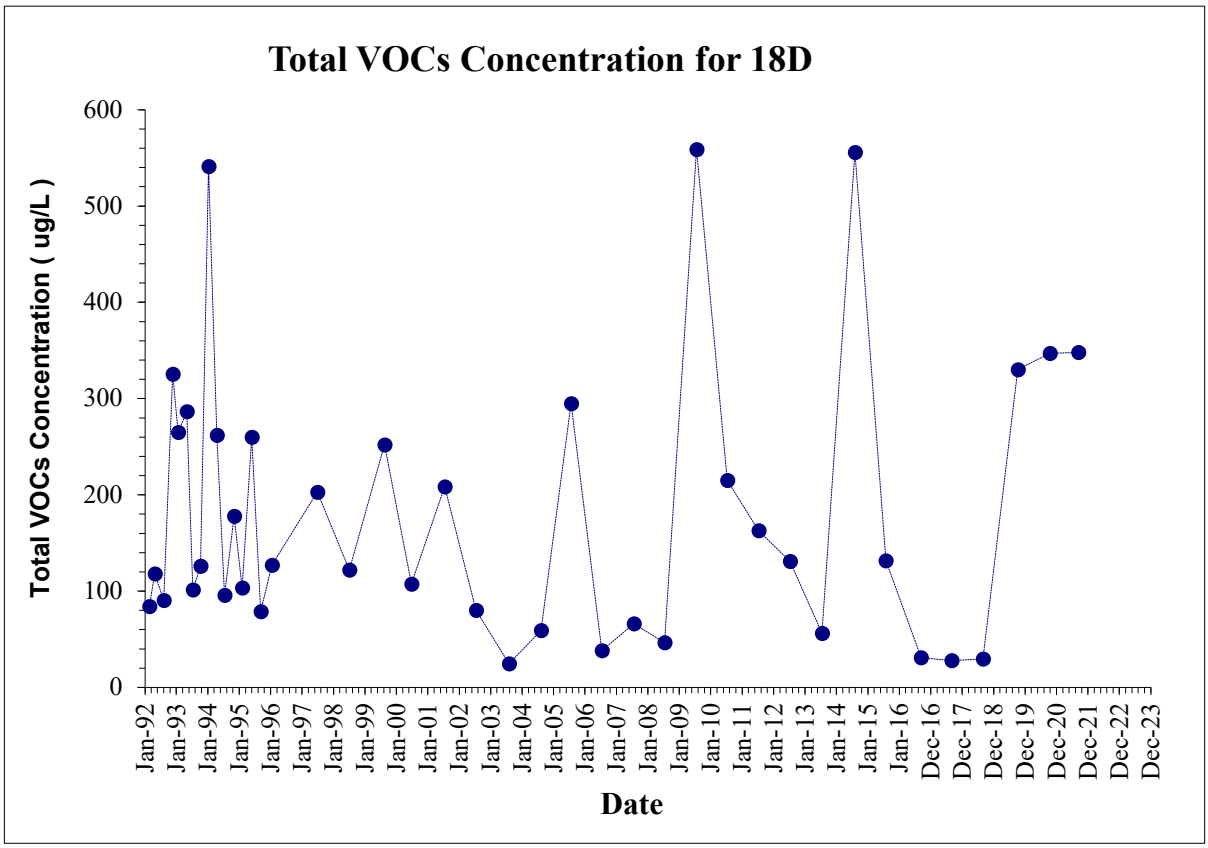
**Appendix C**
**D-Zone TVOC Graphs**



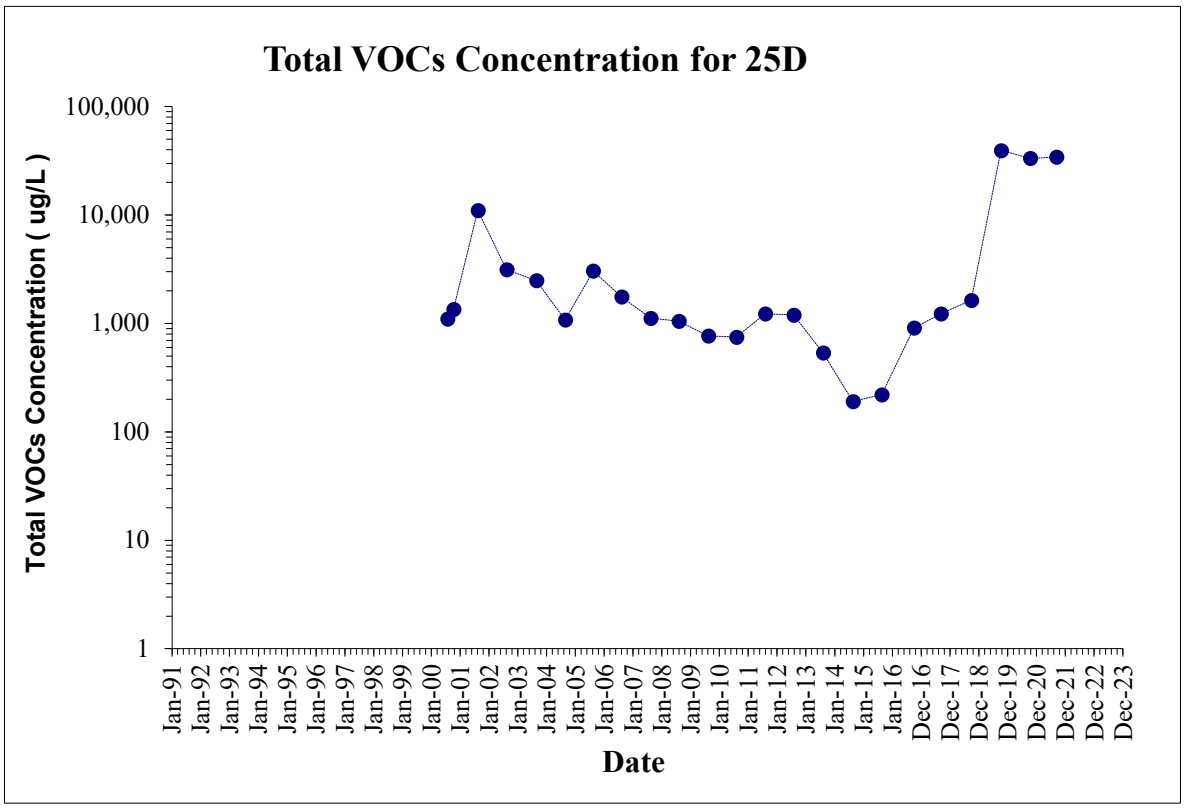



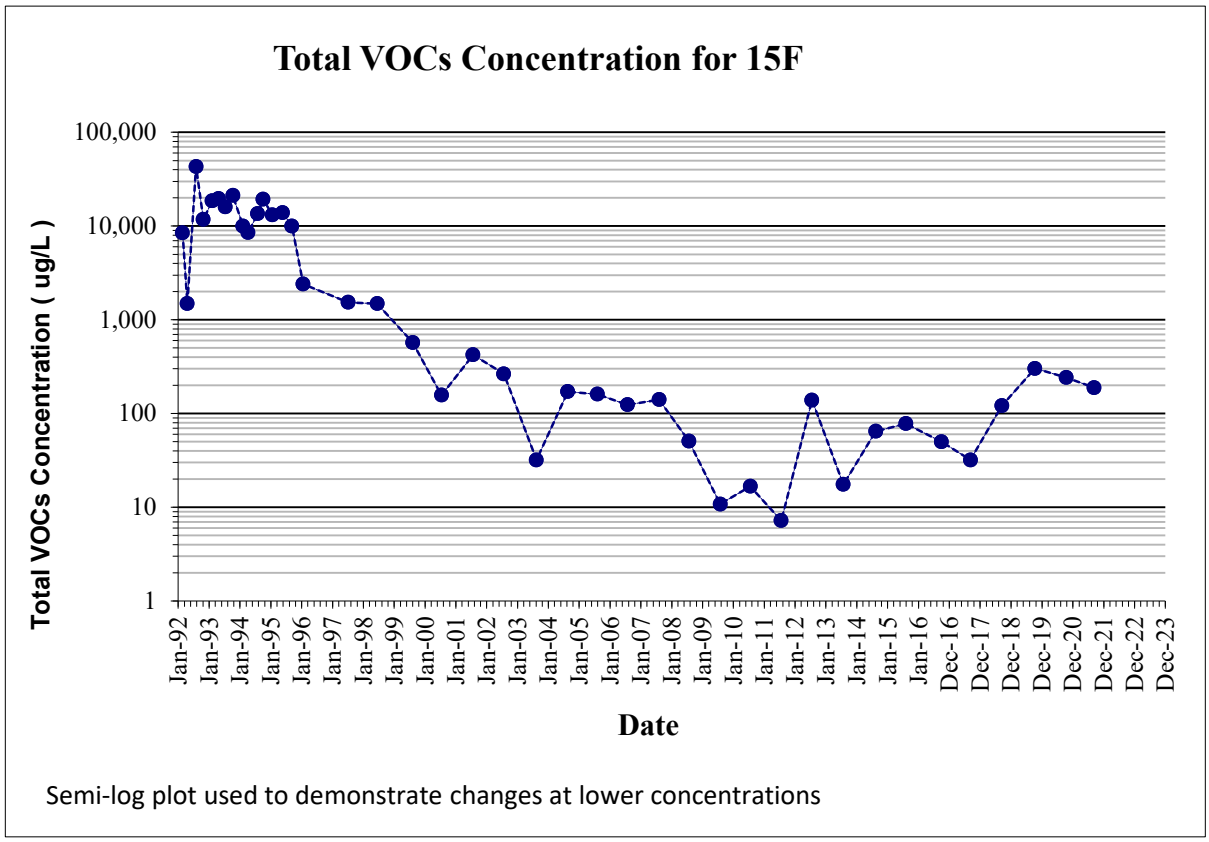
**Appendix C**
**D-Zone TVOC Graphs**



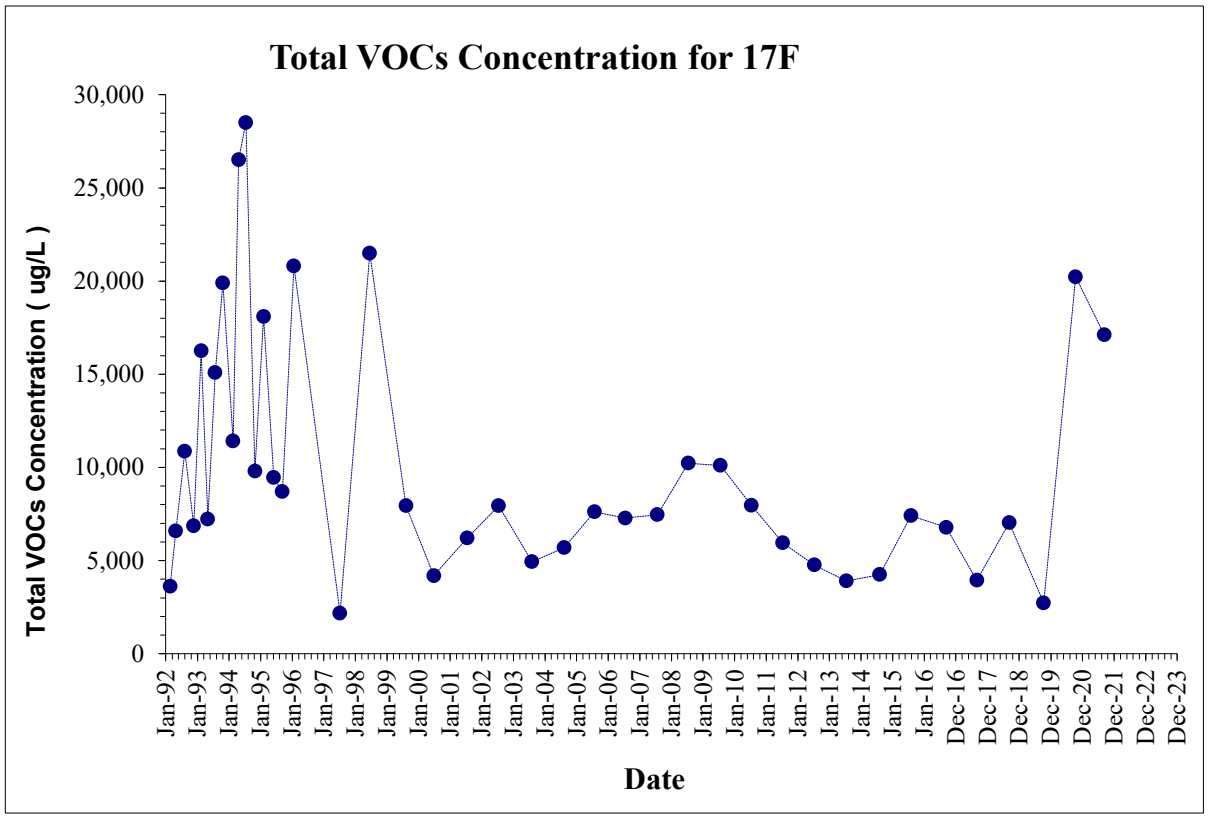



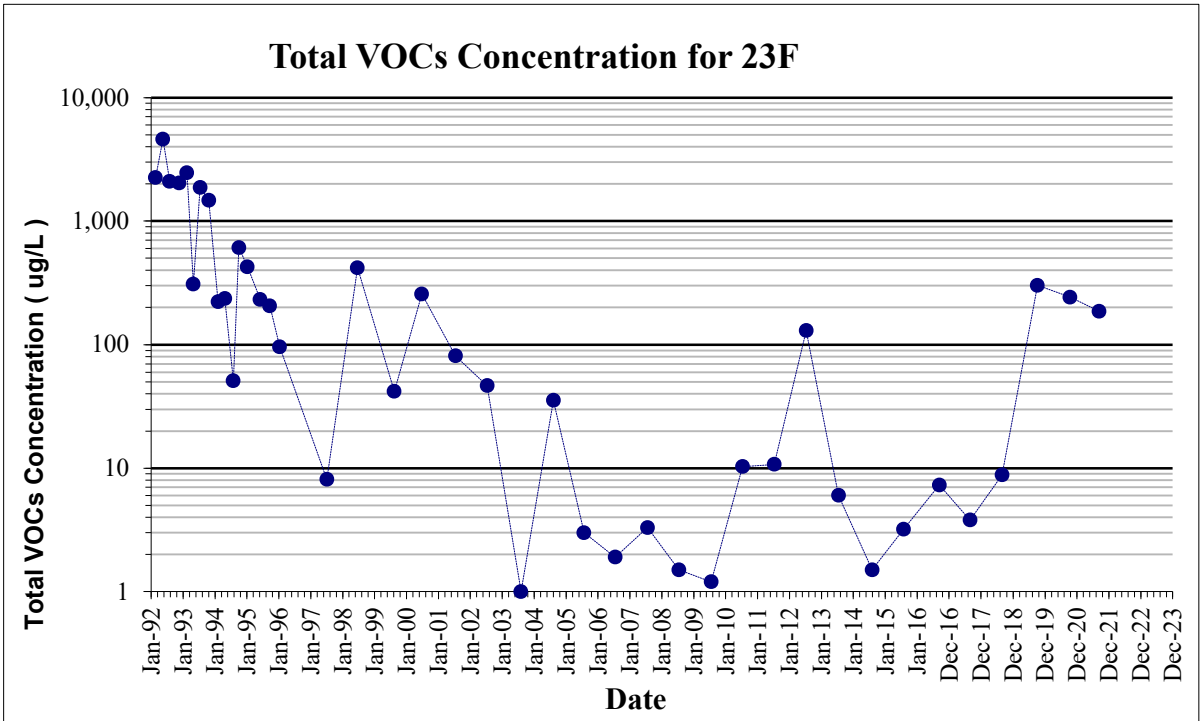
**Appendix C**
**D-Zone TVOC Graphs**



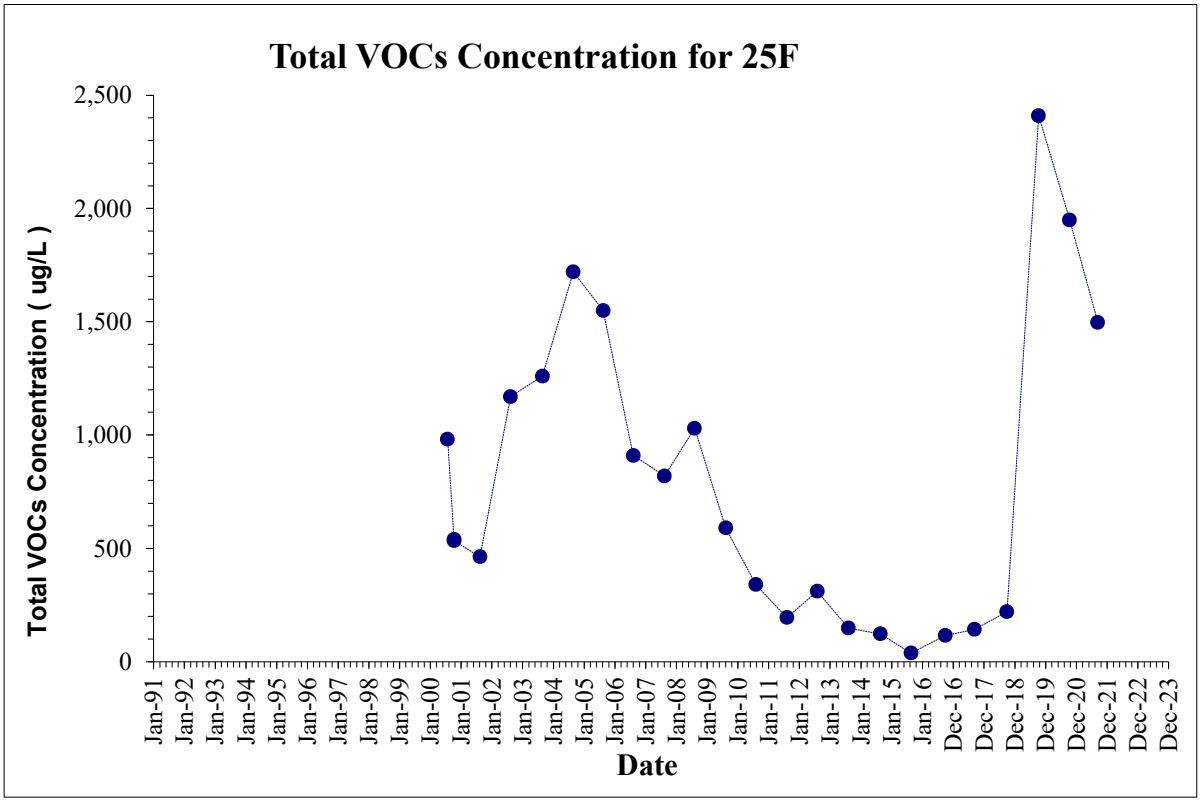



Semi-log plot used to demonstrate changes at lower concentrations






Semi-log plot used to demonstrate changes at lower concentrations
2003 TVOCs were actually below detection limits and 1 ug/L was used for graphing purposes



# ATTACHMENT 4
# FOURTH QUARTER DATA PACKAGE

# GROUNDWATER REMEDIATION SYSTEM
# FOURTH QUARTER 2021
## GROUNDWATER MONITORING DATA PACKAGE
## CHEMOURS NIAGARA PLANT
## NIAGARA FALLS, NIAGARA COUNTY, NEW YORK

*Prepared For:*

**THE CHEMOURS COMPANY FC LLC**
**CORPORATE REMEDIATION GROUP**

P.O. Box 788
Lewiston, NY 14092

*Prepared By:*

PARSONS

40 La Riviere Drive, Suite 350
Buffalo, New York 14202
Phone: (716) 541-0730

**March 2022**

# TABLE OF CONTENTS

# SECTION 1

# DATA PACKAGE SUMMARY

## 1.1 INTRODUCTION

This data package presents a summary of operating and monitoring data collected during the fourth quarter of 2021 (4Q21) for groundwater remediation measures at the Chemours Niagara Plant (the Plant) in Niagara Falls, New York. The Niagara Plant remediation program was implemented pursuant to an Administrative Consent Order with the New York State Department of Environmental Conservation (NYSDEC), Index Number B9-0206-87-09. This Data Package also includes the Silicone Oil Remediation Fourth Quarter Progress Report.

Tables 1 through 6 provide information related to the quarterly sampling program and operational statistics. Figures 1 through 6 provide groundwater potentiometric maps. Appendix A through C provide supporting data.

## 1.2 OPERATIONAL SUMMARY

Pumping well uptime was 96.4 percent for the original GWRS pumping wells, 99.3 percent for pumping well PW-37, and 98.4 percent for PW-39 during 4Q21. There were no scheduled or unscheduled system shutdowns greater than 24 hours in 4Q21. There were no wells down for greater than 48 hours during the quarter. No pumping well pumps required replacement during 4Q21.

From an operations standpoint, the air strippers effectively remove organics from groundwater. The refined indicator parameters for process sampling are summarized in Table 1. It is estimated that 1,749 pounds of volatile organic compounds were removed from groundwater during operation of the Groundwater Remediation System (GWRS) in 4Q21 (see Tables 2 and 3). Historical organic compound removal by the GWRS is summarized in Table 4.

Olin Production Well uptime was 100.0 percent during 4Q21. Beginning in 2020, under an intercompany agreement, slightly higher average pumping rates are being implemented during the summer months for Olin non-contact cooling water production needs. Organics removal at the Olin Production Well treatment system was estimated to be 660.3 pounds for 4Q21 (see Tables 2 and 5). Estimated organic compound removal for the Olin Production Well from October 1992 through December 2021 is approximately 49,997 pounds (Table 5).

Point source contaminant loading rates are provided in Table 6. Loading to the Niagara Falls Wastewater Facility (NFWWF) from Outfall 023 is estimated to have been 0.56 pounds of organics per day during 4Q21. Since effluent discharged through this outfall is treated at the NFWWF, this represents an additional 52 pounds of organics (Table 2) that were removed and treated during 4Q21.

Groundwater elevation data collected during 4Q21 indicated that inward hydraulic gradients exist in the A-Zone throughout most plant areas while the GWRS is operating, thereby decreasing

off-plant groundwater flow. Inward gradients are coincident with the southern border of the West Plant along Staub Road in both the A-Zone overburden (Figure 1) and A-Zone top-of-rock (Figure 2) and are largely attributed to pumping of the two blast-fractured bedrock trenches (BFBTs).

Investigation and recovery activities related to Silicone Oil Recovery have been conducted in accordance with the technical scope of work submitted on July 21, 1999 and approved by NYSDEC on August 26, 1999. During 4Q21, no silicone oil was observed in PW-20 and 28.5 gallons were recovered from PW-24 (Appendix C). Silicone oil has never been observed at PW-22 since inspections began at this location in 3Q00. To date, 64 gallons and 2,153.5 gallons of Silicone Oil have been recovered from PW-20 and PW-24 respectively. A total of 2,217.5 gallons of silicone oil have been removed from GWRS pumping wells since recovery began in June 1999.

## 1.3 NEW INSTALLATION OF EAST PLANT BFBT (PW-43)

Installation of a new BFBT (PW-43) in the East Plant was completed in December 2021. The new BFBT is 250 feet long and began operation (continuous pumping from PW-43) on December 20, 2021. The new BFBT replaces vertical pumping wells PW-28, PW-30, PW-32, and PW-34, which were taken offline. Given the proven efficiency and effectiveness of the BFBT technology as shown in the two BFBTs installed previously in the West Plant, installation of the new BFBT is expected to improve groundwater capture in the East Plant. Additional details of the new BFBT will be provided in the Annual Report for 2021.

# TABLES

# Table 1

## Refined Indicator Parameters
## Fourth Quarter 2021
## Chemours Niagara

| Volatiles | Base/Neutrals[1] |
|---|---|
| Benzene | 1,4-dichlorobutane |
| Carbon tetrachloride | bis(2-ethylhexyl)phthalate |
| Chlorobenzene | Naphthalene |
| Chloroform | 1,2-dichlorobenzene |
| Chloromethane | 1,4-dichlorobenzene |
| 1,1-dichloroethane | Hexachlorobutadiene |
| 1,1-dichloroethene | Hexachloroethane |
| trans-1,2-dichloroethene | **Pesticides/PCBs[1]** |
| cis-1,2-dichloroethene | alpha-BHC |
| Methylene chloride | beta-BHC |
| 1,1,2,2-tetrachloroethane | delta-BHC |
| Tetrachloroethene | gamma-BHC |
| Tetrahydrothiophene | Total PCBs |
| Toluene | |
| 1,1,1-trichloroethane | |
| 1,1,2-trichloroethane | |
| Trichloroethene | |
| Vinyl chloride | |
| **Inorganics and Other Parameters** | |
| Total cyanide[1] | |
| Soluble barium[1] | |
| pH* | |
| Temperature* | |
| Specific Gravity* | |
| Specific Conductivity* | |

[1] Analyses required once per year for these parameters on select samples.

* Field measurement

**Table 2**

**GWRS Operations Statistics**
**Fourth Quarter 2021**
**Chemours Niagara**

| Treatment System Operations | |
|---|---|
| ***GWRS*** | |
| Original 23 Pumping Wells System Uptime | 96.4% |
| Pumping Well 37 Uptime | 99.3% |
| Pumping Well 39 Uptime | 98.4% |
| Total Gallons Pumped | 2,974,775 |
| Average System Pumping Rate for Quarter (GPM) | 22.4 |
| Estimated Pounds of Organics Treated | 1,749 |
| Number of unscheduled treatment shutdowns (> 24 hours) | 0 |
| Number of scheduled treatment shutdowns (> 24 hours) | 0 |
| | |
| ***Olin System*** | |
| Pumping System Uptime | 100.0% |
| Estimated Pounds of Organics Treated | 660.3 |
| Carbon vessel changes | 3 |
| V-5 10/22/21 | |
| V-6 10/22/21 | |
| V-7 10/22/21 | |
| ***Outfall 023*** | |
| Estimated Pounds of Organics Treated | 52 |

| GWRS Pumping Well Operations | |
|---|---|
| ***Total Pump Replacements:*** | 0 |
| ***Number of Individual Pumps down > 48 hours:*** | 0 |

## Table 3

## Total Volatile Organic Compounds Removed by GWRS
## Fourth Quarter 2021
## Chemours Niagara

| Quarterly Total Flow (gallons) | Influent Total VOC Concentration (µg/l) | Effluent Total VOC Concentration (µg/l) | Estimated VOC Removal (lbs.) |
|---|---|---|---|
| 2,974,775 | 70,600 | *32.5* | 1,749 |

Note: Italisized values are an average of sample result and duplicate sample result.

**Table 4**

**Summary of Organic Compounds Removed by GWRS**
**Fourth Quarter 2021**
**Chemours Niagara**

| Time Period | Estimated Organic Removal (lbs)[1] | |
|---|---|---|
| 1991[2] | 4,700 | |
| 1992 | 10,350 | |
| 1993 | 7,220 | |
| 1994 | 7,320 | |
| 1995 | 7,840 | |
| 1996 | 9,436 | |
| 1997 | 6,463 | |
| 1998 | 7,000 | |
| 1999 | 3,382 | |
| 2000 | 3,010 | |
| 2001 | 3,224 | |
| 2002 | 3,848 | |
| 2003 | 2,820 | |
| 2004 | 2,645 | |
| 2005 | 2,237 | |
| 2006 | 11,589 | |
| 2007 | 8,678 | |
| 2008 | 7,932 | |
| 2009 | 12,128 | |
| 2010 | 7,854 | |
| 2011 | 9,004 | |
| 2012 | 8,453 | |
| 2013 | 9,433 | |
| 2014 | 8,567 | |
| 2015 | 8,255 | |
| 2016 | 6,629 | |
| 2017 | 10,815 | |
| 1Q18 | 1,454 | 2018 Total 5,794 |
| 2Q18 | 1,410 | |
| 3Q18 | 1,321 | |
| 4Q18 | 1,609 | |
| 1Q19 | 1,357 | 2019 Total 5,635 |
| 2Q19 | 1,393 | |
| 3Q19 | 1,389 | |
| 4Q19 | 1,496 | |
| 1Q20 | 1,208 | 2020 Total 5,689 |
| 2Q20 | 1,300 | |
| 3Q20 | 1,583 | |
| 4Q20 | 1,598 | |
| 1Q21 | 1,428 | 2021 Total 5,846 |
| 2Q21 | 1,110 | |
| 3Q21 | 1,559 | |
| 4Q21 | 1,749 | |
| **TOTAL** | **213,796** | |

[1] Estimated based on influent/effluent data and daily groundwater flow rates, except as noted.

[2] Estimated based on influent/effluent data and instantaneous flow to treatment system.

**Table 5**

**Summary of Organic Compounds Removed by Olin Production Well**
**Fourth Quarter 2021**
**Chemours Niagara**

| Date | Average Pumping Rate (gpm) | Influent Total VOC (µg/l) | Effluent Total VOC (µg/l) | Total VOC Removed (lbs/day) | Total VOC Removed (lbs) |
|---|---|---|---|---|---|
| 1992 | | | | | 5,470 |
| 1993 | | | | | 3,580 |
| 1994 | | | | | 3,530 |
| 1995 | | | | | 2,378 |
| 1996 | | | | | 2,240 |
| 1997 | | | | | 1,887 |
| 1998 | | | | | 1,392 |
| 1999 | | | | | 1,695 |
| 2000 | | | | | 1,214 |
| 2001 | | | | | 1,185 |
| 2002 | | | | | 1,374 |
| 2003 | | | | | 1,124 |
| 2004 | | | | | 1,044 |
| 2005 | | | | | 1,066 |
| 2006 | 590 | 491 | 71 | 3.0 | 1,096 |
| 2007 | 527 | 514 | 56 | 2.9 | 1,068 |
| 2008 | 529 | 547 | 6.7 | 3.4 | 1,257 |
| 2009 | 536 | 534 | 14 | 3.3 | 1,222 |
| 2010 | 557 | 483 | 5 | 3 | 1,168 |
| 2011 | 595 | 546 | 9 | 3.8 | 1,386 |
| 2012 | 578 | 459 | 11 | 3.1 | 1,137 |
| 2013 | 541 | 461 | 24 | 2.8 | 1,042 |
| 2014 | 574 | 534 | 32 | 3.5 | 1,269 |
| 2015 | 566 | 511 | 23 | 3.3 | 1,197 |
| 2016 | 573 | 468 | 11 | 3.1 | 1,137 |
| 2017 | *568* | *510* | *11* | *3* | 1301 |
| 1Q18 | *550* | 454 | 1 | 3 | 270 |
| 2Q18 | *567* | 299 | 14.6 | 1.9 | 176 |
| 3Q18 | *604* | 369 | 41.5 | 2.4 | 218 |
| 4Q18 | *590* | 453 | 18.3 | 3.1 | 283 |
| 1Q19 | *545* | 388 | 1.0 | 2.5 | 228 |
| 2Q19 | *533* | 356 | 28.1 | 2.1 | 191 |
| 3Q19 | *618* | 413 | 20.7 | 2.9 | 268 |
| 4Q19 | *579* | 1,065 | 7.8 | 7.3 | 676 |
| 1Q20 | *565* | 1,026 | 113.7 | 6.2 | 563 |
| 2Q20 | *559* | 765 | 0.0 | 5.1 | 467 |
| 3Q20 | *688* | 858 | 0.0 | 7.1 | 652 |
| 4Q20 | *529* | 1,141 | 0.0 | 7.2 | 666 |
| 1Q21 | *519* | 1,121 | 1.9 | 7.0 | 642 |
| 2Q21 | *574* | 926 | 0.0 | 6.4 | 580 |
| 3Q21 | *624* | 733 | 46.7 | 5.1 | 473 |
| 4Q21 | *541* | 1,106 | 0.0 | 7.2 | 660 |
| **TOTAL** | | | | | **49,997** |

An average analytical result is used when a field duplicate is reported.
All averages are italicized.
Annual VOCs removed is sum of quarterly VOCs removed

## Table 6

## Point Source Contaminant Loading Indicator Organics
## Fourth Quarter 2021
## Chemours Niagara

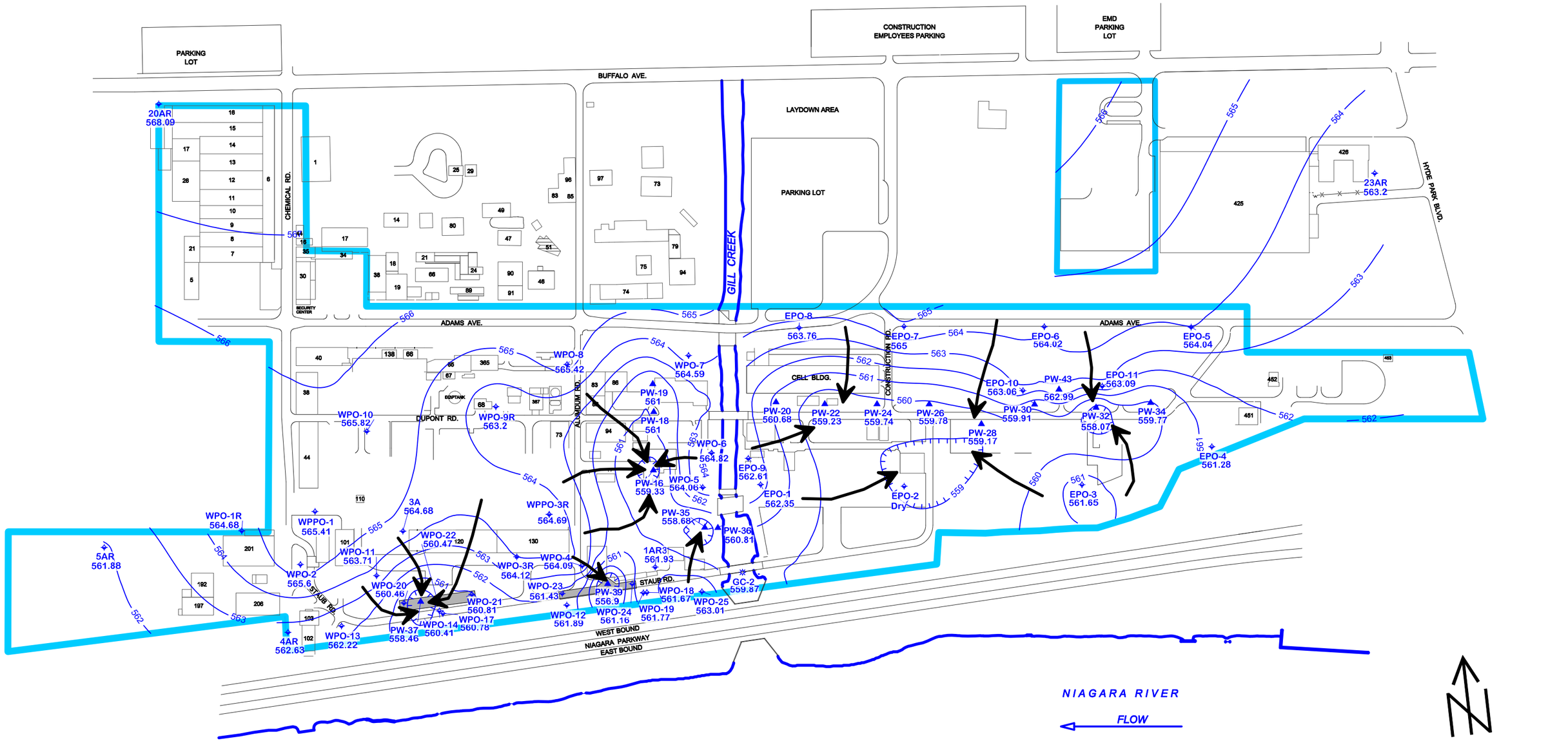
| Outfall Sample Location* | Quarterly Average Flow Rate (gpm) | Total Indicator Organic Concentration (µg/l)[(1)] | Quarterly Average Loading Rate (lb/day)[(1)] |
|---|---|---|---|
| 023 | 269 | *173.7* | 0.56 |
| Olin GAC[(2)] | 541 | 0.0 | 0.00 |

GAC = Granular Activated Carbon (Olin Treatment Effluent)
TIO average of field duplicate results are *italicized* .

(1) Values are not adjusted to account for concentrations of loadings indicator organics which may be present in the raw intake water.

(2) Average pumping rate for Olin well through quarter.

# FIGURES




Note:
Well EPO-2 was dry on November 4, 2021.

**PARSONS**
40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 12/07/21 |
| Checked by: JWS | Date: 12/09/21 |
| Project Manager: EAF | Date: 12/09/21 |
| | |
| Job number: 452457.03000 | |

## LEGEND

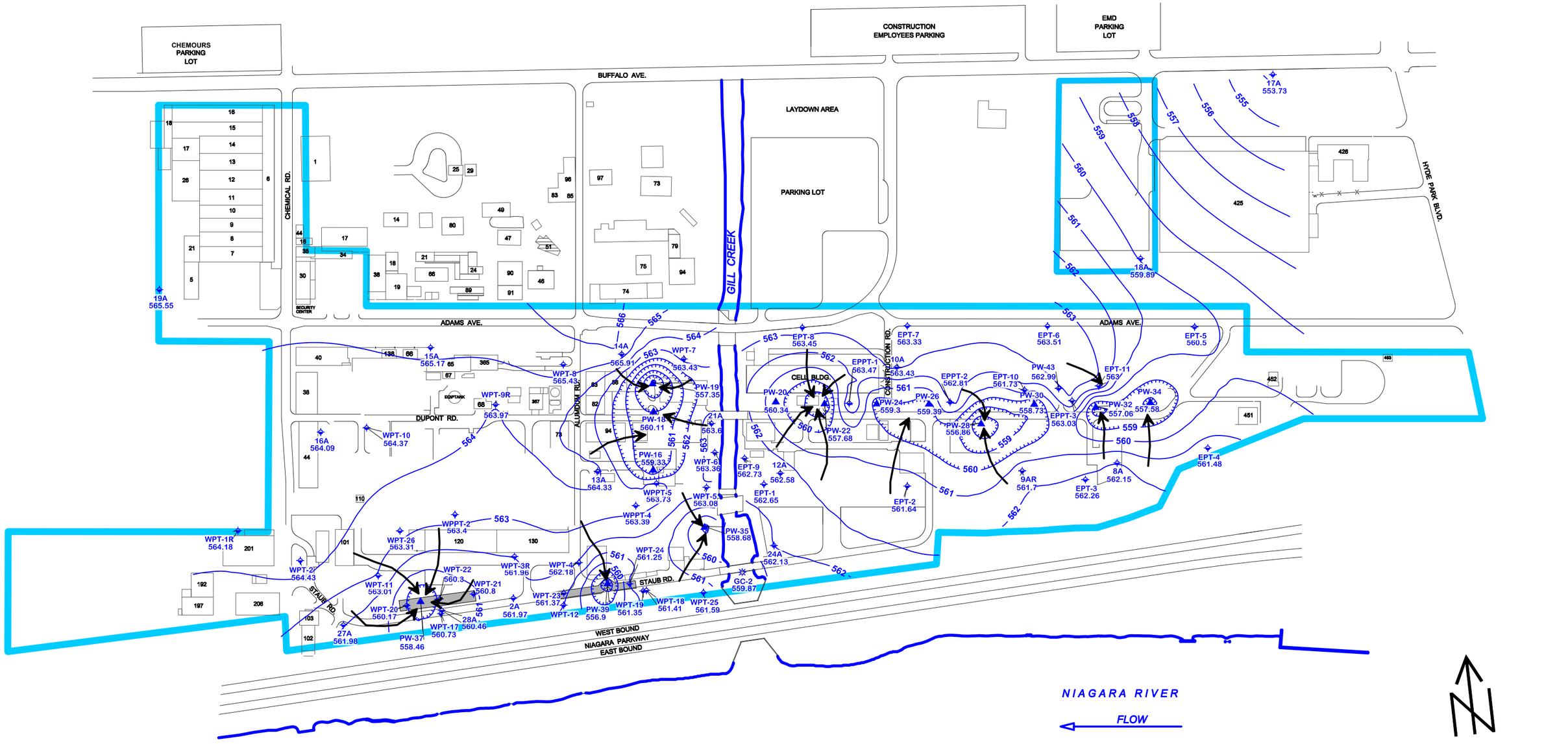
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

# FIGURE 1
# POTENTIOMETRIC SURFACE MAP
# A-ZONE OVERBURDEN - NOVEMBER 04, 2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-OBPZ.srf






**PARSONS**
40 La Riviere Dr, Suite 350
Buffalo, NY 14202
(716) 541-0730

| | |
|---|---|
| Created by: RBP | Date: 11/16/21 |
| Checked by: JWS | Date: 11/18/21 |
| Project Manager: EAF | Date: 11/18/21 |
| | |
| Job number: 452457.03000 | |

## LEGEND

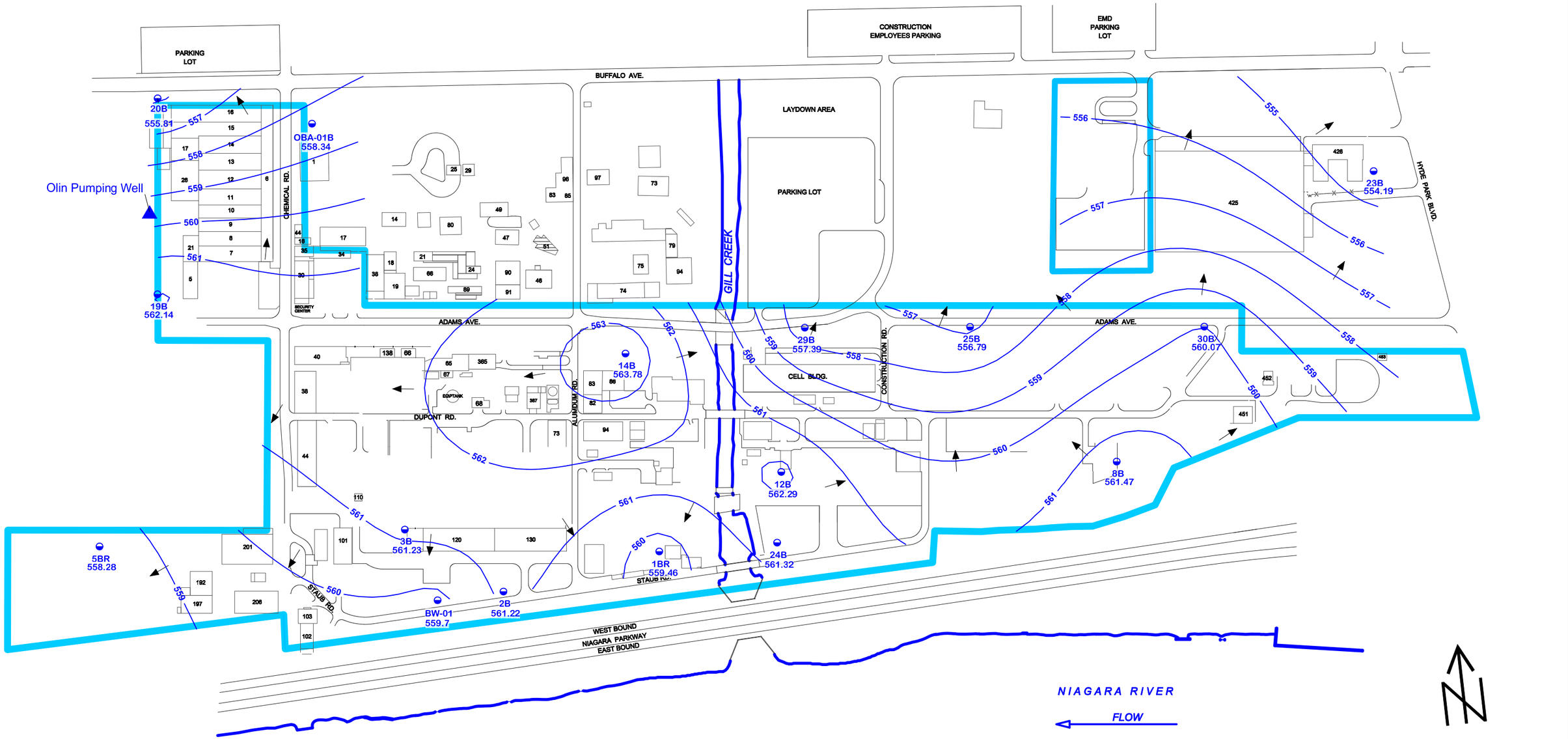
- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1AR3 WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL
- GILL CREEK SURFACE WELL or WATER SAMPLE LOCATION
- BLAST FRACTURED BEDROCK TRENCH
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 GROUNDWATER CONTOUR ELEVATION

# FIGURE 2
# POTENTIOMETRIC SURFACE MAP
# A-ZONE BEDROCK - NOVEMBER 04, 2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-BRPZ.srf





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| | |
|---|---|
| Created by: RBP | Date: 12/07/21 |
| Checked by: JWS | Date: 12/09/21 |
| Project Manager: EAF | Date: 12/09/21 |
| | |
| Job number: 452457.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

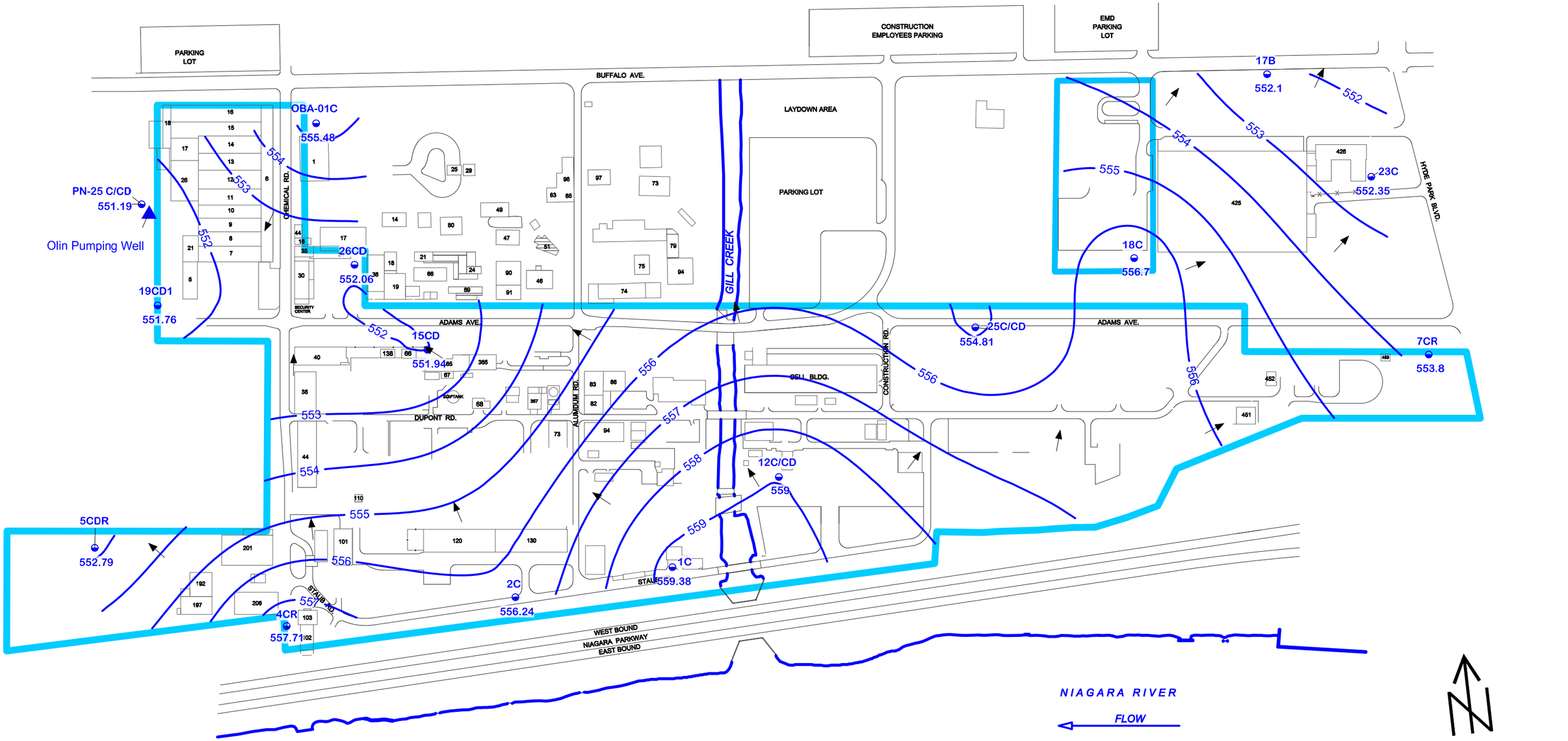
## CHEMOURS WELLS

- 1BR — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- UNDERGROUND UTILITY WELL

- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 561 — GROUNDWATER CONTOUR ELEVATION

# FIGURE 3
# POTENTIOMETRIC SURFACE MAP
# B-ZONE BEDROCK - NOVEMBER 04, 2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-BZPZ.srf




**PARSONS**
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|---|---|
| Created by: RBP | Date: 12/07/21 |
| Checked by: JWS | Date: 12/09/21 |
| Project Manager: EAF | Date: 12/09/21 |
| | |
| Job number: 452457.03000 | |

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

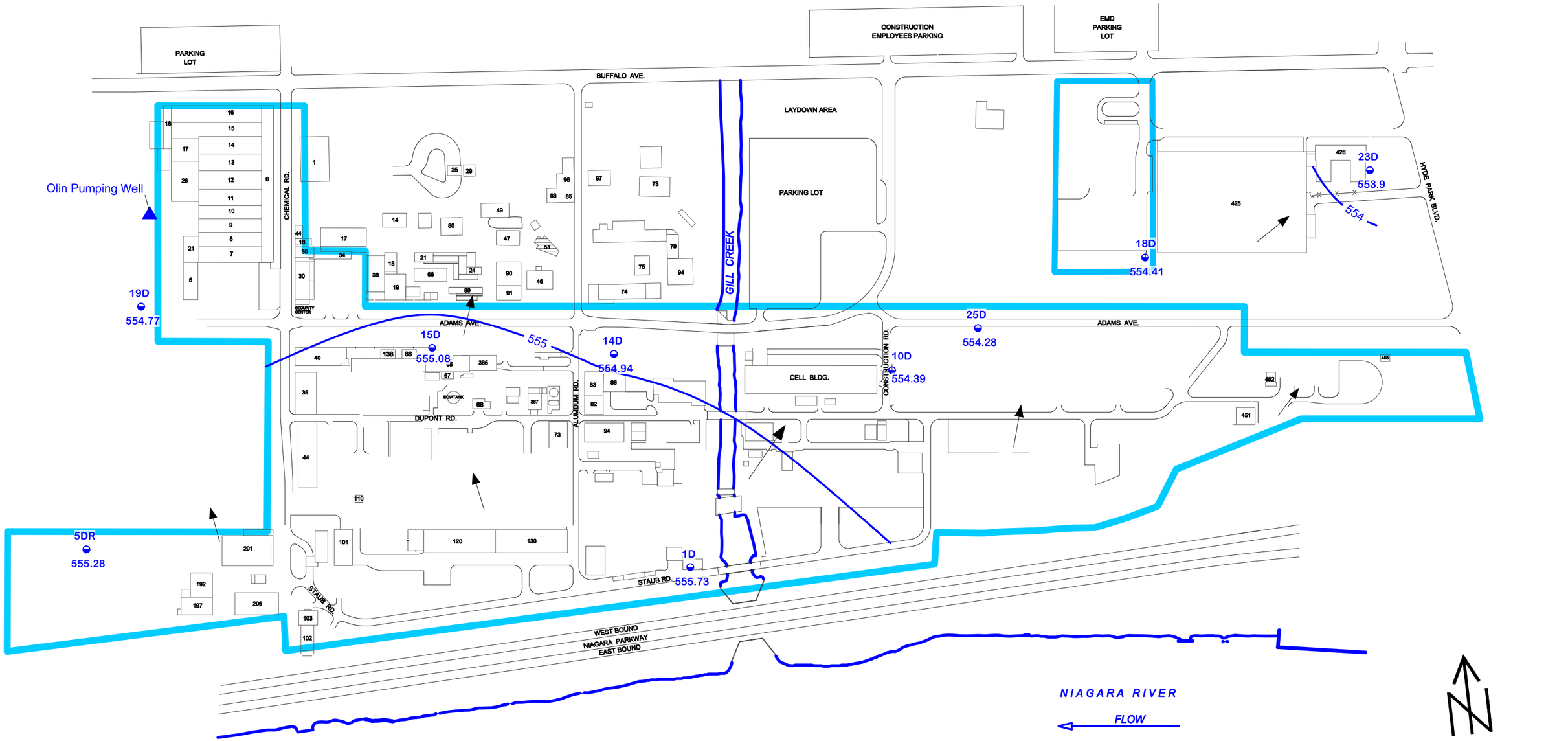
## CHEMOURS WELLS

- 1C — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL

- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 558 — GROUNDWATER CONTOUR ELEVATION

# FIGURE 4
# POTENTIOMETRIC SURFACE MAP
# C/CD-ZONE BEDROCK - NOVEMBER 04, 2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-CZPZ.srf




Graphic Scale

0 125 250 375 500

Feet

## LEGEND

- BUILDING
- ROAD
- CHEMOURS PROPERTY BOUNDARY
- SURFACE WATER

## CHEMOURS WELLS

- 1D — WELL ID
- PIEZOMETER
- PUMPING WELL
- MONITORING WELL
- GROUNDWATER CONTOUR
- GROUNDWATER CONTOUR DEPRESSION
- 557 — GROUNDWATER CONTOUR ELEVATION


**PARSONS**
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| | |
|---|---|
| Created by: RBP | Date: 12/07/21 |
| Checked by: JWS | Date: 12/09/21 |
| Project Manager: EAF | Date: 12/09/21 |
| | |
| Job number: 452457.03000 | |

# FIGURE 5
# POTENTIOMETRIC SURFACE MAP
# D-ZONE BEDROCK - NOVEMBER 04, 2021
# CHEMOURS NIAGARA PLANT, NIAGARA FALLS, NY

//NYBUF03FS01/Dupont$/Niagara/NiaPlant/Hydrogeo/Hydro/GW_contours/2021-11-04 NIA Contour Tool/2021-11-04-DZPZ.srf

# APPENDIX A

# CHEMOURS NIAGARA PLANT
# GROUNDWATER ELEVATION DATA
# FOURTH QUARTER 2021

**APPENDIX A**
**GROUNDWATER ELEVATION DATA - FOURTH QUARTER 2021**
**CHEMOURS NIAGARA PLANT**

| SAMPLE POINT | DATE | DEPTH TO WATER (FT) | CASING ELEVATION (FT AMSL) | GW ELEVATION (FT AMSL) | TIME | COMMENTS |
|---|---|---|---|---|---|---|
| BW-01 | 11/04/2021 | 11.83 | 571.53 | 559.70 | 12:01 | |
| DEC-3R | 11/04/2021 | 12.93 | 574.39 | 561.46 | 13:34 | |
| DEC-4R | 11/04/2021 | 14.41 | 575.81 | 561.40 | 13:40 | |
| DEC-5 | 11/04/2021 | 20.33 | 582.13 | 561.80 | 13:45 | |
| EPO-1 | 11/04/2021 | 10.32 | 572.67 | 562.35 | 12:21 | |
| EPO-2 | 11/04/2021 | DRY | 572.31 | - | 12:33 | |
| EPO-3 | 11/04/2021 | 11.02 | 572.67 | 561.65 | 13:29 | |
| EPO-4 | 11/04/2021 | 9.47 | 570.75 | 561.28 | 13:24 | |
| EPO-5 | 11/04/2021 | 6.31 | 570.35 | 564.04 | 13:42 | |
| EPO-6 | 11/04/2021 | 6.44 | 570.46 | 564.02 | 13:46 | |
| EPO-7 | 11/04/2021 | 5.71 | 570.71 | 565.00 | 13:53 | |
| EPO-8 | 11/04/2021 | 6.93 | 570.69 | 563.76 | 13:59 | |
| EPO-9 | 11/04/2021 | 9.75 | 572.36 | 562.61 | 12:19 | |
| EPO-10 | 11/04/2021 | 6.26 | 569.32 | 563.06 | 13:02 | |
| EPO-11 | 11/04/2021 | 6.62 | 569.71 | 563.09 | 13:09 | |
| EPPT-1 | 11/04/2021 | 5.49 | 568.96 | 563.47 | 12:40 | |
| EPPT-2 | 11/04/2021 | 9.60 | 572.41 | 562.81 | 12:54 | |
| EPPT-3 | 11/04/2021 | 9.02 | 572.05 | 563.03 | 13:05 | |
| EPT-1 | 11/04/2021 | 10.21 | 572.86 | 562.65 | 12:20 | |
| EPT-2 | 11/04/2021 | 10.58 | 572.22 | 561.64 | 12:32 | |
| EPT-3 | 11/04/2021 | 10.25 | 572.51 | 562.26 | 13:28 | |
| EPT-4 | 11/04/2021 | 9.55 | 571.03 | 561.48 | 13:24 | |
| EPT-5 | 11/04/2021 | 9.78 | 570.28 | 560.50 | 13:41 | |
| EPT-6 | 11/04/2021 | 7.01 | 570.52 | 563.51 | 13:45 | |
| EPT-7 | 11/04/2021 | 7.20 | 570.53 | 563.33 | 13:52 | |
| EPT-8 | 11/04/2021 | 7.21 | 570.66 | 563.45 | 13:58 | |
| EPT-9 | 11/04/2021 | 9.06 | 571.79 | 562.73 | 12:18 | |
| EPT-10 | 11/04/2021 | 7.48 | 569.21 | 561.73 | 13:02 | |
| EPT-11 | 11/04/2021 | 6.65 | 569.65 | 563.00 | 13:07 | |
| GC-2 | 11/04/2021 | 12.92 | 572.79 | 559.87 | 11:52 | |
| MW-10A | 11/04/2021 | 8.70 | 572.13 | 563.43 | 12:45 | |
| MW-10C | 11/04/2021 | 11.11 | 568.10 | 556.99 | 12:46 | |
| MW-10D | 11/04/2021 | 14.10 | 568.49 | 554.39 | 12:49 | |
| MW-12A | 11/04/2021 | 9.98 | 572.56 | 562.58 | 12:24 | |
| MW-12B | 11/04/2021 | 10.07 | 572.36 | 562.29 | 12:25 | |
| MW-12C/CD | 11/04/2021 | 13.77 | 572.77 | 559.00 | 12:22 | |
| MW-13A | 11/04/2021 | 8.80 | 573.13 | 564.33 | 11:33 | |
| MW-14A | 11/04/2021 | 6.39 | 572.30 | 565.91 | 11:20 | |
| MW-14B | 11/04/2021 | 8.51 | 572.29 | 563.78 | 11:23 | |
| MW-14C | 11/04/2021 | 16.03 | 572.10 | 556.07 | 11:22 | |
| MW-14D | 11/04/2021 | 17.74 | 572.68 | 554.94 | 11:19 | |
| MW-15A | 11/04/2021 | 3.44 | 568.61 | 565.17 | 13:07 | |
| MW-15C | 11/04/2021 | 12.02 | 568.52 | 556.50 | 13:05 | |

**APPENDIX A**
**GROUNDWATER ELEVATION DATA - FOURTH QUARTER 2021**
**CHEMOURS NIAGARA PLANT**

| SAMPLE POINT | DATE | DEPTH TO WATER (FT) | CASING ELEVATION (FT AMSL) | GW ELEVATION (FT AMSL) | TIME | COMMENTS |
|---|---|---|---|---|---|---|
| MW-15CD | 11/04/2021 | 16.61 | 568.55 | 551.94 | 13:04 | |
| MW-15D | 11/04/2021 | 13.49 | 568.57 | 555.08 | 13:06 | |
| MW-16A | 11/04/2021 | 8.24 | 572.33 | 564.09 | 11:20 | |
| MW-16B | 11/04/2021 | 10.38 | 572.96 | 562.58 | 11:19 | |
| MW-17A | 11/04/2021 | 18.25 | 571.98 | 553.73 | 14:22 | |
| MW-17B | 11/04/2021 | 19.84 | 571.94 | 552.10 | 14:23 | |
| MW-18A | 11/04/2021 | 10.92 | 570.81 | 559.89 | 14:28 | |
| MW-18C | 11/04/2021 | 14.01 | 570.71 | 556.70 | 14:27 | |
| MW-18D | 11/04/2021 | 16.48 | 570.89 | 554.41 | 14:29 | |
| MW-19A | 11/04/2021 | 8.12 | 573.67 | 565.55 | 11:05 | |
| MW-19B | 11/04/2021 | 11.12 | 573.26 | 562.14 | 11:05 | |
| MW-19C | 11/04/2021 | 19.71 | 573.59 | 553.88 | 11:04 | |
| MW-19CD1 | 11/04/2021 | 21.53 | 573.29 | 551.76 | 11:03 | |
| MW-19D | 11/04/2021 | 18.31 | 573.08 | 554.77 | 11:00 | |
| MW-1AR3 | 11/04/2021 | 9.75 | 571.68 | 561.93 | 11:55 | |
| MW-1BR | 11/04/2021 | 11.92 | 571.38 | 559.46 | 11:58 | |
| MW-1C | 11/04/2021 | 12.00 | 571.38 | 559.38 | 11:59 | |
| MW-1D | 11/04/2021 | 16.40 | 572.13 | 555.73 | 12:01 | |
| MW-20AR | 11/04/2021 | 2.42 | 570.51 | 568.09 | 11:08 | |
| MW-20B | 11/04/2021 | 14.28 | 570.09 | 555.81 | 11:10 | |
| MW-21A | 11/04/2021 | 9.81 | 573.41 | 563.60 | 12:14 | |
| MW-23AR | 11/04/2021 | 10.30 | 573.50 | 563.20 | 14:17 | |
| MW-23B | 11/04/2021 | 18.51 | 572.70 | 554.19 | 14:16 | |
| MW-23C | 11/04/2021 | 20.39 | 572.74 | 552.35 | 14:18 | |
| MW-23D | 11/04/2021 | 18.91 | 572.81 | 553.90 | 14:19 | |
| MW-24A | 11/04/2021 | 10.44 | 572.57 | 562.13 | 12:29 | |
| MW-24B | 11/04/2021 | 11.37 | 572.69 | 561.32 | 12:28 | |
| MW-25B | 11/04/2021 | 12.92 | 569.71 | 556.79 | 13:50 | |
| MW-25C/CD | 11/04/2021 | 15.90 | 570.71 | 554.81 | 13:49 | |
| MW-25D | 11/04/2021 | 16.25 | 570.53 | 554.28 | 13:48 | |
| MW-26C | 11/04/2021 | 13.50 | 568.39 | 554.89 | 14:05 | |
| MW-26CD | 11/04/2021 | 16.81 | 568.87 | 552.06 | 14:05 | |
| MW-27A | 11/04/2021 | 11.62 | 573.60 | 561.98 | 12:28 | |
| MW-28A | 11/04/2021 | 10.02 | 570.48 | 560.46 | 12:18 | |
| MW-29B | 11/04/2021 | 14.14 | 571.53 | 557.39 | 13:57 | |
| MW-2A | 11/04/2021 | 9.85 | 571.82 | 561.97 | 12:14 | |
| MW-2B | 11/04/2021 | 12.33 | 573.55 | 561.22 | 11:56 | |
| MW-2C | 11/04/2021 | 15.38 | 571.62 | 556.24 | 12:13 | |
| MW-30B | 11/04/2021 | 10.76 | 570.83 | 560.07 | 13:40 | |
| MW-3A | 11/04/2021 | 7.75 | 572.43 | 564.68 | 12:07 | |
| MW-3B | 11/04/2021 | 11.02 | 572.25 | 561.23 | 12:07 | |
| MW-4AR | 11/04/2021 | 11.19 | 573.82 | 562.63 | 12:32 | |
| MW-4CR | 11/04/2021 | 12.14 | 569.85 | 557.71 | 12:33 | |
| MW-5AR | 11/04/2021 | 13.13 | 575.01 | 561.88 | 12:42 | |

**APPENDIX A**
**GROUNDWATER ELEVATION DATA - FOURTH QUARTER 2021**
**CHEMOURS NIAGARA PLANT**

| SAMPLE POINT | DATE | DEPTH TO WATER (FT) | CASING ELEVATION (FT AMSL) | GW ELEVATION (FT AMSL) | TIME | COMMENTS |
|---|---|---|---|---|---|---|
| MW-5BR | 11/04/2021 | 16.65 | 574.93 | 558.28 | 12:43 | |
| MW-5CDR | 11/04/2021 | 22.21 | 575.00 | 552.79 | 12:43 | |
| MW-5CR | 11/04/2021 | 16.70 | 574.91 | 558.21 | 12:44 | |
| MW-5DR | 11/04/2021 | 19.82 | 575.10 | 555.28 | 12:44 | |
| MW-6AR | 11/04/2021 | 7.95 | 576.41 | 568.46 | 12:47 | |
| MW-7AR | 11/04/2021 | 17.51 | 571.90 | 554.39 | 13:17 | |
| MW-7CR | 11/04/2021 | 17.80 | 571.60 | 553.80 | 13:18 | |
| MW-8A | 11/04/2021 | 9.49 | 571.64 | 562.15 | 13:27 | |
| MW-8B | 11/04/2021 | 9.96 | 571.43 | 561.47 | 13:26 | |
| MW-9AR | 11/04/2021 | 10.96 | 572.66 | 561.70 | 13:31 | |
| MW-U-1 | 11/04/2021 | 12.95 | 573.25 | 560.30 | 10:56 | |
| MW-U-14 | 11/04/2021 | 7.93 | 571.26 | 563.33 | 10:58 | |
| MW-U-16 | 11/04/2021 | 11.13 | 573.78 | 562.65 | 13:43 | |
| OBA-01B | 11/04/2021 | 12.51 | 570.85 | 558.34 | 13:59 | |
| OBA-01C | 11/04/2021 | 14.93 | 570.41 | 555.48 | 13:56 | |
| PN-25 C/CD | 11/04/2021 | 20.07 | 571.26 | 551.19 | 10:52 | |
| PW-16 | 11/04/2021 | 14.12 | 573.45 | 559.33 | 11:35 | |
| PW-18 | 11/04/2021 | 10.02 | 570.13 | 560.11 | 11:29 | |
| PW-19 | 11/04/2021 | 15.95 | 573.30 | 557.35 | 11:29 | |
| PW-20 | 11/04/2021 | 9.41 | 569.75 | 560.34 | 12:16 | |
| PW-22 | 11/04/2021 | 11.82 | 569.50 | 557.68 | 12:38 | |
| PW-24 | 11/04/2021 | 9.45 | 568.75 | 559.30 | 12:41 | |
| PW-26 | 11/04/2021 | 9.01 | 568.40 | 559.39 | 13:33 | |
| PW-28 | 11/04/2021 | 10.51 | 567.37 | 556.86 | 13:00 | |
| PW-30 | 11/04/2021 | 10.08 | 568.81 | 558.73 | 12:59 | |
| PW-32 | 11/04/2021 | 11.11 | 568.17 | 557.06 | 13:06 | |
| PW-34 | 11/04/2021 | 11.34 | 568.92 | 557.58 | 13:11 | |
| PW-35 | 11/04/2021 | 14.00 | 572.68 | 558.68 | 12:05 | |
| PW-36 | 11/04/2021 | 8.70 | 569.51 | 560.81 | 12:06 | |
| PW-37 | 11/04/2021 | 10.58 | 569.04 | 558.46 | 12:21 | |
| PW-38 | 11/04/2021 | 11.69 | 572.07 | 560.38 | 11:59 | |
| PW-39 | 11/04/2021 | 14.86 | 571.76 | 556.90 | 11:40 | |
| PW-43 | 11/04/2021 | 8.13 | 571.04 | 562.91 | 13:04 | |
| TPW-01 | 11/04/2021 | 10.74 | 570.85 | 560.11 | 12:02 | |
| WPO-10 | 11/04/2021 | 6.21 | 572.03 | 565.82 | 11:21 | |
| WPO-11 | 11/04/2021 | 9.54 | 573.25 | 563.71 | 12:25 | |
| WPO-12 | 11/04/2021 | 11.94 | 573.83 | 561.89 | 11:47 | |
| WPO-13 | 11/04/2021 | 11.43 | 573.65 | 562.22 | 12:29 | |
| WPO-14 | 11/04/2021 | 10.10 | 570.51 | 560.41 | 12:19 | |
| WPO-15 | 11/04/2021 | 14.46 | 575.98 | 561.52 | 13:39 | |
| WPO-16 | 11/04/2021 | 13.27 | 574.84 | 561.57 | 13:35 | |
| WPO-17 | 11/04/2021 | 10.06 | 570.84 | 560.78 | 12:17 | |
| WPO-18 | 11/04/2021 | 10.71 | 572.38 | 561.67 | 11:47 | |

**APPENDIX A**
**GROUNDWATER ELEVATION DATA - FOURTH QUARTER 2021**
**CHEMOURS NIAGARA PLANT**

| SAMPLE POINT | DATE | DEPTH TO WATER (FT) | CASING ELEVATION (FT AMSL) | GW ELEVATION (FT AMSL) | TIME | COMMENTS |
|---|---|---|---|---|---|---|
| WPO-19 | 11/04/2021 | 10.72 | 572.49 | 561.77 | 11:46 | |
| WPO-1R | 11/04/2021 | 8.75 | 573.43 | 564.68 | 12:36 | |
| WPO-2 | 11/04/2021 | 7.72 | 573.32 | 565.60 | 12:52 | |
| WPO-20 | 11/04/2021 | 11.18 | 571.64 | 560.46 | 12:23 | |
| WPO-21 | 11/04/2021 | 11.25 | 572.06 | 560.81 | 11:58 | |
| WPO-22 | 11/04/2021 | 10.39 | 570.86 | 560.47 | 12:04 | |
| WPO-23 | 11/04/2021 | 10.41 | 571.84 | 561.43 | 11:50 | |
| WPO-24 | 11/04/2021 | 10.25 | 571.41 | 561.16 | 11:42 | |
| WPO-25 | 11/04/2021 | 8.76 | 571.77 | 563.01 | 11:50 | |
| WPO-3R | 11/04/2021 | 8.72 | 572.84 | 564.12 | 11:54 | |
| WPO-4 | 11/04/2021 | 8.29 | 572.38 | 564.09 | 11:45 | |
| WPO-5 | 11/04/2021 | 8.93 | 572.99 | 564.06 | 12:09 | |
| WPO-6 | 11/04/2021 | 12.91 | 577.73 | 564.82 | 12:11 | |
| WPO-7 | 11/04/2021 | 6.93 | 571.52 | 564.59 | 11:26 | |
| WPO-8 | 11/04/2021 | 2.92 | 568.34 | 565.42 | 11:33 | |
| WPO-9R | 11/04/2021 | 9.74 | 572.94 | 563.20 | 11:29 | |
| WPPO-1 | 11/04/2021 | 3.25 | 568.66 | 565.41 | 12:56 | |
| WPPO-3R | 11/04/2021 | 7.09 | 571.78 | 564.69 | 13:12 | |
| WPPT-2 | 11/04/2021 | 8.75 | 572.15 | 563.40 | 13:10 | |
| WPPT-4 | 11/04/2021 | 8.91 | 572.30 | 563.39 | 11:41 | |
| WPPT-5 | 11/04/2021 | 12.92 | 576.65 | 563.73 | 11:36 | |
| WPT-10 | 11/04/2021 | 7.78 | 572.15 | 564.37 | 11:21 | |
| WPT-11 | 11/04/2021 | 10.25 | 573.26 | 563.01 | 12:26 | |
| WPT-12 | 11/04/2021 | DRY | 573.41 | - | 11:48 | |
| WPT-17 | 11/04/2021 | 10.08 | 570.81 | 560.73 | 12:17 | |
| WPT-18 | 11/04/2021 | 11.54 | 572.95 | 561.41 | 11:47 | |
| WPT-19 | 11/04/2021 | 11.38 | 572.73 | 561.35 | 11:45 | |
| WPT-1R | 11/04/2021 | 9.84 | 574.02 | 564.18 | 12:37 | |
| WPT-2 | 11/04/2021 | 8.70 | 573.13 | 564.43 | 12:53 | |
| WPT-20 | 11/04/2021 | 12.02 | 572.19 | 560.17 | 12:22 | |
| WPT-21 | 11/04/2021 | 11.69 | 572.49 | 560.80 | 11:57 | |
| WPT-22 | 11/04/2021 | 11.34 | 571.64 | 560.30 | 12:03 | |
| WPT-23 | 11/04/2021 | 10.32 | 571.69 | 561.37 | 11:51 | |
| WPT-24 | 11/04/2021 | 10.21 | 571.46 | 561.25 | 11:41 | |
| WPT-25 | 11/04/2021 | 10.91 | 572.50 | 561.59 | 11:51 | |
| WPT-26 | 11/04/2021 | 8.69 | 572.00 | 563.31 | 12:09 | |
| WPT-3R | 11/04/2021 | 11.02 | 572.98 | 561.96 | 11:53 | |
| WPT-4 | 11/04/2021 | 10.38 | 572.56 | 562.18 | 11:44 | |
| WPT-5 | 11/04/2021 | 9.43 | 572.51 | 563.08 | 12:08 | |
| WPT-6 | 11/04/2021 | 14.34 | 577.70 | 563.36 | 12:10 | |
| WPT-7 | 11/04/2021 | 8.15 | 571.58 | 563.43 | 11:24 | |
| WPT-8 | 11/04/2021 | 3.23 | 568.66 | 565.43 | 11:31 | |
| WPT-9R | 11/04/2021 | 8.65 | 572.62 | 563.97 | 11:29 | |

# APPENDIX B

# CHEMOURS NIAGARA PLANT
# SUMMARY OF ANALYTICAL RESULTS
# FOURTH QUARTER 2021 SYSTEM MONITORING

# Appendix B
# Summary of Analytical Results
# Chemours Niagara Plant
# Fourth Quarter 2021

| Method | Parameter | Location / Date / Units | GWRS-INF 11/4/2021 FS | GWRS-EFF 11/4/2021 FS | GWRS-EFF 11/4/2021 DUP | OLIN-INF 11/4/2021 FS | OLIN-EFF 11/4/2021 FS | TRIP BLANK 11/4/2021 TB |
|---|---|---|---|---|---|---|---|---|
| | **Field Parameters** | | | | | | | |
| | COLOR | NONE | Clear | None | None | Clear | Clear | -- |
| | ODOR | NONE | None | None | None | Slight | None | -- |
| | OXIDATION REDUCTION POTENTIAL | MV | -14.4 | 168.3 | 168.3 | -44.9 | 151 | -- |
| | PH | STD UNITS | 7.29 | 8.23 | 8.23 | 7.41 | 7.25 | -- |
| | SPECIFIC CONDUCTANCE | UMHOS/CM | 12830 | 13150 | 13150 | 0.84 | 0.84 | -- |
| | TEMPERATURE | DEGREES C | 14.6 | 14.5 | 14.5 | 12.6 | 12.6 | -- |
| | TURBIDITY QUANTITATIVE | NTU | 0.53 | 5.33 | 5.33 | 1.48 | 0.33 | -- |
| | **Volatile Organics** | | | | | | | |
| 8260C | 1,1,1-Trichloroethane | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | 1,1,2,2-Tetrachloroethane | UG/L | <1000 | 25 | 25 | 20 | <1 | <1 |
| 8260C | 1,1,2-Trichloroethane | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | 1,1-Dichloroethane | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | 1,1-Dichloroethene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | 1,2-Dichlorobenzene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | 1,4-Dichlorobenzene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | 1,4-Dichlorobutane | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | Benzene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | Carbon Tetrachloride | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | Chlorobenzene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | Chloroform | UG/L | 27000 | <1 | <1 | 160 | <1 | <1 |
| 8260C | cis-1,2 Dichloroethene | UG/L | 10000 | <1 | <1 | 230 | <1 | <1 |
| 8260C | Methyl Chloride | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | Methylene Chloride | UG/L | <5000 | <5 | <5 | <100 | <5 | <5 |
| 8260C | Tetrachloroethene | UG/L | 8400 | 1.5 J | 4.7 J | 160 | <1 | <1 |
| 8260C | Tetrahydrothiophene | UG/L | <2000 | <2 | <2 | <40 | <2 | <2 |
| 8260C | Toluene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | trans-1,2-Dichloroethene | UG/L | <1000 | <1 | <1 | <20 | <1 | <1 |
| 8260C | Trichloroethene | UG/L | 23000 | 1.5 J | 5.6 | 490 | <1 | <1 |
| 8260C | Vinyl Chloride | UG/L | 2200 | <1 | 1.6 | 46 | <1 | <1 |
| | **Total VOCs** | UG/L | 70600 | 28 | 36.9 | 1106 | 0 | 0 |
| | **Other Organics** | | | | | | | |
| 8270D | Bis(2-Ethylhexyl)Phthalate | UG/L | -- | <5.8 | <5.8 | -- | -- | -- |
| 8270D | Hexachlorobutadiene | UG/L | -- | <9.6 | <9.7 | -- | -- | -- |
| 8270D | Hexachloroethane | UG/L | -- | <9.6 | <9.7 | -- | -- | -- |
| 8270D | Naphthalene | UG/L | -- | <9.6 | <9.7 | -- | -- | -- |
| 8081B | Alpha-BHC | UG/L | -- | 3.9 | 3.7 | -- | -- | -- |
| 8081B | beta-BHC | UG/L | -- | <0.49 | <0.48 | -- | -- | -- |
| 8081B | delta-BHC | UG/L | -- | <0.49 | <0.48 | -- | -- | -- |
| 8081B | Lindane | UG/L | -- | 1.4 | 1.4 | -- | -- | -- |
| 8082A | PCB 1016 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| 8082A | PCB 1221 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| 8082A | PCB 1232 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| 8082A | PCB 1242 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| 8082A | PCB 1248 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| 8082A | PCB 1254 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| 8082A | PCB 1260 | UG/L | -- | <0.098 | <0.48 | -- | -- | -- |
| | **Inorganics** | | | | | | | |
| 6010C | Barium, dissolved | MG/L | -- | <0.2 | <0.2 | -- | -- | -- |
| 9012B | Cyanide, total | MG/L | -- | 0.46 | 0.49 | -- | -- | -- |

< Not detected at stated reporting limit

J Estimated concentration

# APPENDIX C

# CHEMOURS NIAGARA PLANT
# SILICONE OIL REMEDIATION 4Q21

# TABLE 1
## Silicone Oil Recovery Summary - 4Q2021
## Niagara Plant
## Niagara Falls, NY

| DATE | PW-20 | | | PW-24 | | |
|---|---|---|---|---|---|---|
| | PRODUCT THICKNESS (FT) | AMOUNT RECOVERED (GALLONS) | CUMULATIVE TOTAL (GALLONS) | PRODUCT THICKNESS (FT) | AMOUNT RECOVERED (GALLONS) | CUMULATIVE TOTAL (GALLONS) |
| | | | 64.0 | | | 2125.0 |
| 10/04/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.5 | 2,126.5 |
| 10/11/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.0 | 2,127.5 |
| 10/20/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.0 | 2,128.5 |
| 10/25/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.5 | 2,130.0 |
| 11/01/21 | 0.0 | 0.0 | 64.0 | 0.0 | 3.0 | 2,133.0 |
| 11/08/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.5 | 2,134.5 |
| 11/15/21 | 0.0 | 0.0 | 64.0 | 0.0 | 3.5 | 2,138.0 |
| 11/18/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.5 | 2,139.5 |
| 11/22/21 | 0.0 | 0.0 | 64.0 | 0.0 | 3.0 | 2,142.5 |
| 11/29/21 | 0.0 | 0.0 | 64.0 | 0.0 | 2.0 | 2,144.5 |
| 12/06/21 | 0.0 | 0.0 | 64.0 | 0.0 | 2.5 | 2,147.0 |
| 12/13/21 | 0.0 | 0.0 | 64.0 | 0.0 | 4.5 | 2,151.5 |
| 12/20/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.0 | 2,152.5 |
| 12/27/21 | 0.0 | 0.0 | 64.0 | 0.0 | 1.0 | 2,153.5 |
| 4Q21 Totals | 0.0 | 0.0 | 64.0 | 0.0 | 28.5 | 2,153.5 |

**TOTAL SILICONE OIL RECOVERED SINCE JUNE 1999: 2,217.5 GALLONS**

**comments**:

11/18/2021: Switched out NF-311 Drum #2021-09-09-1 (19 Gals.) with #2021-11-18-1

11/18/2021: Switched out NF-311 Drum #2021-11-18-1 (12 Gals.) with #2021-12-16-1