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March 31, 2023

Young Chang
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New York Remediation Branch
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Dear Young Chang:

NECCO PARK 2022 ANNUAL REPORT

This document is the *Remedial Action Post-Construction Monitoring 2022 Annual Report* for the Chemours Necco Park Hydraulic Controls System (HCS), Groundwater Treatment Facility (GWTF), and landfill cap.

This seventeenth annual report for the Necco Park Remedy has been prepared pursuant to Administrative Order (AO) Index No. II CERCLA-98-0215 dated September 28, 1998, issued by United States Environmental Protection Agency (USEPA). This report describes hydraulic and chemistry monitoring conducted in 2022 as required by the *Long-Term Groundwater Monitoring Plan,* dated April 2005 for the DuPont Necco Park Site located in Niagara Falls, New York, and subsequent revisions (2010 and 2012).

Construction and start-up of the HCS and GWTF was substantially complete on April 5, 2005. Thereafter, the systems have been operated in accordance with the Operations and Maintenance Plan (O&M Plan). HCS operation uptime for 2022 was 95.0%. Excluding scheduled downtime for planned maintenance, HCS uptime for 2022 was also 95.0%. The groundwater elevations, geochemical results, and DNAPL monitoring indicate HCS continues to be effective at controlling source area groundwater at the Chemours Necco Park site. Furthermore, the results indicated monitored natural attenuation remains actively degrading the site compounds.

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

Sincerely,

Chemours

Paul F. Mazierski
Project Director

Enc. 2022 Annual Report

cc: D. Skaros/NYSDEC
E. Felter/Parsons

PARSONS

Remedial Action Post-Construction Monitoring 2022 Annual Report

NECCO Park
Niagara Falls, New York

Prepared for:

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March 2023

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Appendix C Landfill Cap Inspection Results (December 2022)

ACRONYMS

Acronym	Definition / Description
AOA	Analysis of Alternatives
BFBT	Blast-fractured bedrock trench
cis-DCE	cis-1,2-dichloroethene
CMMP	Cap Maintenance and Monitoring Plan
CRG	DuPont Corporate Remediation Group
CVOC	Chlorinated Volatile Organic Compounds
DDR	Data deliverable review
DNAPL	Dense non-aqueous phase liquid
DuPont	E. I. du Pont de Nemours and Company
gpm	Gallon(s) per minute
GWTF	Groundwater Treatment Facility
HCBD	Hexachlorobutadiene
HCS	Hydraulic controls system
HDPE	High-density polyethylene
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LTGMP	Long-Term Groundwater Monitoring Plan
MDL	Method detection limit
µg/l	Micrograms per liter
MNA	Monitored natural attenuation
MS	Matrix spike
MSD	Matrix spike duplicate
Necco Park	DuPont Necco Park Site
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and maintenance
PDI	Pre-design investigation
POTW	Publicly-owned treatment works
PQL	Practical quantitation limit
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance and Project Plan
RPD	Relative percent difference
SAMP	Sampling, Analysis, and Monitoring Plan
SAR	Source area report
SFR	Subsurface formation repair
SIU	Significant Industrial User
SOW	(Necco Park) Statement of Work
SVOC	Semi-volatile organic compound

Acronym	Definition / Description
TCE	Trichloroethene
TIC	Tentatively identified compound
TVOC	Total volatile organic compound
USEPA	United States Environmental Protection Agency
VC	Vinyl chloride
VOC	Volatile organic compound

EXECUTIVE SUMMARY

This Remedial Action Post-Construction Monitoring 2022 Annual Report has been prepared pursuant to Administrative Order Index No. II-CERCLA-98-0215 issued by United States Environmental Protection Agency (USEPA) on September 28, 1998. This is the eighteenth such report and describes hydraulic and chemistry monitoring conducted in 2022 at the Necco Park Site in Niagara Falls, New York. Monitoring activities were conducted in accordance with the agency approved Long-Term Groundwater Monitoring Plan (LTGMP) dated April 2005 (DuPont Corporate Remediation Group [CRG] 2005a), and subsequent agency approved revisions (USEPA, 2011, 2015, and 2016).

The Necco Park Remedial Action consists of an upgraded cap over the landfill and an enhanced groundwater hydraulic control system (HCS) from the previous pumping system which first began operation in the early 1980's. The HCS includes a network of five groundwater recovery wells and a groundwater treatment facility (GWTF). Construction and startup of the HCS and GWTF was substantially complete on April 5, 2005. Thereafter, the systems have been operated in accordance with the Operations and Maintenance Plan (DuPont CRG 2005b). HCS operation uptime for 2022 was 95.0%. Excluding scheduled downtime for planned maintenance, HCS uptime for 2022 was 95.0%. Summaries of system operations and hydraulic head data were previously provided to the USEPA and the NYSDEC in the 2022 Quarterly Data Packages (Parsons 2022a, 2022b, 2022c, and 2023). This Annual Report provides a detailed evaluation of system effectiveness with respect to the performance standards presented in the Necco Park Statement of Work (SOW).

Hydraulic monitoring data from 2022 show that, overall, the HCS has maintained hydraulic control of the source area in the A- through F-Zones. Improved hydraulic control in the upper bedrock in the western portion of the site began in fourth quarter 2008 when a combined B-Zone blast-fractured bedrock trench and a new B/C-Zone recovery well (RW-11) were put into operation. Well RW-11 was installed to replace recovery well RW-10 which exhibited diminished hydraulic efficiency after startup in 2005.

As referenced in Chemours May 5, 2021 response to USEPA's April 21, 2021 letter comment 4, further improvements were made to operations and maintenance scheduling in 1Q21, whereby the RW-5 inline spare pump is now brought on-line prior to potential failure during weekends. This has reduced RW-5 downtime associated with weekend pump failures from 506 hours in 2020 down to 55 hours in 2021 all of which occurred prior to the process change. These operational improvements continued in 2022 and resulted in zero hours of weekend pump failures at RW-5.

Two well rehabilitation events were completed in B/C-Zone recovery wells during 2022 using high pressure jetting and vacuum technique developed with National Vacuum, Inc. during 2012-2013. The spring well rehabilitation occurred March 30 and 31 and the fall event occurred October 25 and 26. Additionally, DNAPL recovery events were completed at RW-4 on February 9 and August 11. Both well rehabilitation events had a typical modest removal of sediments and maintenance of flow rate. The flow at RW-5 remains at an increased rate (approximately 2 – 3 gpm), when compared with the 2005 – 2015 average as the result of more thorough well cleaning in the Fall 2015, thereby demonstrating that the significant improvement on well yield has been maintained.

On October 19, 2022, Necco Park treatment system emission stack was replaced in-kind. By adjusting influent and effluent tank storage setpoints, downtime associated with emission stack replacement was minimized to less than 48 hours.

In accordance with the LTGMP (DuPont CRG 2005a), annual groundwater sampling began in 2008 after three years of biannual sampling had been conducted. In 2010, a revised sampling program was accepted by USEPA to focus on key locations on an annual basis and intermittently (every 5 years) sample the original 2005 program. In 2012, USEPA agreed to removal of AT wells from the program, sampling VOCs only in the treatment process, and other minor program changes (such as the elimination of drawdown maps in annual reports). In 2015, USEPA approved reductions in the DNAPL monitoring program. In 2016, the USEPA approved a request by Chemours CRG to end the requirement of 10% independent data validation of the groundwater data while QA/QC continues to include in-house data review. In 2019, prior to the 2019 annual groundwater sampling event, USEPA approved minor changes to the groundwater sampling methods, specifically the use of peristaltic pump for purging and sample for well allowable depth to water. The original LTGMP and MNA programs were last completed in 2018 and are scheduled to be completed next in 2023, on the five-year schedule.

The 2022 groundwater sampling results continue to show an overall decrease in concentrations of total volatile organic compounds (TVOCs) for all flow zones compared to historical results, with the exception of 150C (see below). The 2022 results indicate:

- Two of the four A-Zone wells sampled were less than 2 micrograms per liter (μg/l) TVOCs and the other two wells were 80.79 μg/l (137A) and 5.13 μg/l (146AR). A-Zone well 150A TVOC result in 2022 (no TVOCs detected) was tied for the lowest ever observed at this location, which also occurred in 2000 and 2020.
- TVOC concentrations at key source area limit wells in the B and C zones, such as 137B, 150B, 172B, and 145C continue to have stable/decreased concentrations and/or declining trends.
- Decreasing or stable TVOC concentrations are apparent in the D/E/F zones at key source area limit wells such as 136F, 146E, and 146F.
- There was an increase in TVOCs concentrations at 150C to 62,860 µg/l in 2020 and a subsequent decrease in 2021 to 53,560 µg/l. In 2022, TVOC concentrations dropped more significantly to 13,110 µg/l. These TVOC concentrations are higher than a previous peak of 2,352 µg/l in 2014, but are of similar magnitude to a historical concentration of 49,687 µg/l in 1990. As such, while the 2020 and 2021 concentrations at 150C are notable, these fluctuations are not unprecedented. Future sampling will determine if the concentration spike observed in 2020, and subsequent decrease in concentration in 2021 and 2022 truly represents a short term anomaly or a similar trend to peaks in 1990, 2014. Additionally, concentrations in this area of the B/C zone are similar, for example, to well 168B (side gradient to 150C but at the estimated source area edge) which have ranged from 59,248 to 21,570 µg/l in TVOC since 2012. These changes in concentrations, which are dominated by degradation products, are likely the result of short term increased flux within the downgradient edge of the plume and not changes in source area extent. Furthermore, hydraulic testing in 2022 demonstrated hydraulic influence from the HCS results in nearly 2 feet of change in water elevation, providing additional reassurance source area is controlled by groundwater recovery. Given the uptime improvements for RW-5 and RW-11 beginning in 2021, it is very likely that concentrations will continue to decrease over time.
- Overall, the TVOC concentrations are decreasing for all groundwater flow zones at the outer portions of the source area and in the downgradient far-field. In the few cases where there were increasing TVOC trends, the concentrations were within historical range, near the source area / a recovery well, or represented increases in degradation products.

Based on the 2019 through 2022 analytical results obtained using the USEPA-approved new sampling methods, analytical results compare favorably with the many previous years of existing data. If the new sampling methods has any bias compared to the previous methods, it is likely the results would be slightly biased higher. Future groundwater sampling is planned using the same methods employed in 2019 through 2022.

DNAPL was monitored monthly throughout 2022. As approved by the USEPA, a reduced list of wells was monitored monthly and semi-annually beginning in June 2015 with the full list of wells to be monitored once every two years (USEPA June 11, 2015 and USEPA August 12, 2015). Measurable DNAPL was observed in each of the ten monthly, one semiannual, and one biennial monitoring events during 2022. DNAPL removal in 2022 was completed as follows:

- February – 12 gallons from RW-4.
- March – 4 gallons from RW-4 and 2 gallons from RW-5.
- August – 16 gallons from RW-4, 0.12 gallon from 123A, 0.064 gallon from 129A, and 0.016 gallon from 190A .
- October – 6 gallons from RW-4 and 6 gallons from RW-5.

The total DNAPL recovered in 2022 was 46.2 gallons which is within the range of DNAPL typical recovery from the previous fourteen years (range is from 0 to 130 gallons). This volume represents less than 1% of the total DNAPL removed which is only a small fraction of the total mass removed.

The 2022 groundwater elevations, geochemical results and DNAPL monitoring indicated the HCS continues to be effective at controlling source area groundwater at the Chemours Necco Park site through 2022. Groundwater potentiometric contour maps depict a capture zone encompassing the source area in the B-, C-, D-, E- and F-Zones, and vertical gradient downward from the A to the B zone were maintained. Overall, the TVOC concentrations were decreasing for all groundwater flow zones in the source area and far-field. It is recommended that the long-term monitoring program continue in its current form, including the revisions from approved by the USEPA in 2011 and 2016. Future groundwater sampling and hydraulic testing related to concentrations 150C should provide information related to the trends (increase then decrease) in VOCs observed in 2020 through 2022.

Data on chlorinated ethenes in Necco Park groundwater is consistent with lines of evidence required for natural attenuation of contaminants (USEPA, Monitored Natural Attenuation Directive, 1999). Analytical results from 2022, such as concentrations of degradation products and geochemical conditions, continue to support the recommendation that MNA assessments be conducted every five years. The next MNA monitoring event is scheduled for 2023 and another full MNA analysis will be completed then.

1.0 INTRODUCTION

1.1 Site Location

The 24-acre Chemours Necco Park inactive industrial waste disposal site is located approximately 1.5 miles north of the Niagara River in a predominantly industrial area of Niagara Falls, New York (**Figure 1-1**).

1.2 Source Area Remedial Action Documentation and Reporting

The approved remedy for the Necco Park Site included construction of the Bedrock and Overburden Source Area Hydraulic Controls System (HCS) and the Landfill Cap Upgrade. Completion of the remedy and compliance with the performance standards described in the Statement of Work (SOW) are documented in the Remedial Action Report (DuPont Corporate Remediation Group [CRG] 2007). This 2022 Annual Report presents hydraulic and chemical monitoring results from the fifteenth year of operation of the hydraulic controls. In addition, this 2022 Annual Report includes historical groundwater chemistry results for assessment of groundwater quality trends.

2.0 HCS OPERATIONS SUMMARY

The Necco Park groundwater Operations and Maintenance (O&M) Plan (DuPont CRG 2005b), in conjunction with vendor O&M Manuals, describes normal operation and shutdown procedures, emergency shutdown procedures, alarm conditions, trouble-shooting, and preventative maintenance procedures for the HCS and the Groundwater Treatment Facility (GWTF). This section of the report summarizes 2022 HCS operations.

2.1 Operational Summary

Operational information for the HCS is provided in the 2022 Quarterly Data Packages (Parsons 2022a, 2022b, 2022c, and 2023) and summarized in the table below.

Period	HCS Uptime (%)	HCS Uptime [excluding scheduled maintenance downtime] (%)	Groundwater Treated (Gallons)	DNAPL[1] Removed (Gallons)
1Q22	92.7	92.7	3,016,517	18.0
2Q22	96.4	96.4	3,432,597	0.0
3Q22	98.4	98.4	3,339,511	16.2
4Q22	90.3	90.3	3,363,070	12.0
2022 Total	**95.0**	**95.0**	**12,805,142**	**46.2**

[1]DNAPL – dense non-aqueous phase liquid

A summary of monthly groundwater quantities and uptime for each recovery well is provided in **Table 2-1**.

The HCS remained operational throughout 2022, averaging 95.0% total system uptime through December 31, 2022 with no scheduled outage and one unscheduled outage described below. Excluding scheduled downtime for planned maintenance, HCS uptime for 2022 was 95.0%. GWTF downtime was minimized by continuously monitoring operating conditions and implementing mechanical and procedural changes to the process equipment and the Honeywell Experion® PKS (Process Knowledge System) process control system.

There was one reportable unscheduled maintenance activity in 2022. Between December 24 and 27 all pumping wells and the system were shut down due to an interlock cause by a buildup of ice in the emissions stack restricting air flow. This downtime was a total of 69.4 hours. There were no reportable scheduled HCS down time events in 2022.

Individual pumping wells were down for greater than 48 hours on three (3) occasions in 2022. Each of the three individual well downtimes were unscheduled. The unscheduled individual downtimes were as follows:

- RW-4 was down March 4 to 7 for 61 hours due to a level probe malfunction.

- RW-5 was down June 3 to 6 for 60.5 hours due to level probe malfunction.

- RW-4 and RW-5 were down between October 7 and 10 for 57 hours and RW-11 was down for 61 hours due to a pH control interlock.

The following table summarizes HCS reportable downtime in 2022 by component malfunction and scheduled maintenance:

Reason	Contributing Downtime %	Comments
Process component malfunction	2.1%	Unexpected process-related downtime because of alarms and interlocks.
Scheduled maintenance shutdowns and system upgrades/inspections	0.0%	Routine inspections, interlock verification, preventative maintenance, equipment inspection and mechanical upgrades to process-related infrastructure.

HCS downtime is considered reportable when any recovery well is not operating for a period of more than 48 consecutive hours (DuPont letter to USEPA, January 27, 2012).

As referenced in Chemours May 5, 2021 response to USEPA April 21, 2021 letter comment 4, further improvements were made to operations and maintenance scheduling in 1Q21, whereby the RW-5 inline spare pump is now brought on-line prior to potential failure during weekends. This has reduced RW-5 downtime associated with weekend pump failures from 506 hours in 2020 down to 55 hours in 2021 all if which occurred prior to the process change. There were zero hours of weekend pump failures at RW-5 in 2021 and 2022 after the process change was instituted in April 2021.

On October 19, 2022, Necco Park treatment system emission stack was replaced in-kind. By adjusting influent and effluent tank storage setpoints, downtime was minimized to less than 48 hours.

2.2 GWTF Process Sampling

In accordance with the Sampling, Analysis and Monitoring Plan (SAMP), quarterly process sampling is conducted to assess the effectiveness of the treatment system in removing volatile organic compounds (VOCs) from groundwater. Two influent samples are collected, one from the B/C-Zone influent tank and one from the D/E/F-Zone influent tank. One effluent sample is collected from the combined effluent tank. Beginning in 2012 and as approved by USEPA, these process samples are analyzed for VOCs only. Semi-volatile organic compound (SVOC) monitoring will be conducted as needed if significant changes occur to the hydraulic or chemical load observed during routine process monitoring or if there is a change in an operations condition (e.g. change in pump intake elevation). A summary of results for the process sampling conducted in 2022 is provided in **Table 2-2**.

2.3 Sewer Sampling Summary

Significant Industrial User (SIU) permit #76 with the City of Niagara Falls publicly-owned treatment works (POTW) regulates the treated groundwater effluent discharged from Necco Park. Results from the quarterly sampling conducted at the permitted discharge point (MS#1) are used to determine POTW compliance. There were no exceedances of the permit limits in 2022.

2.4 Recovery and Monitoring Well Rehabilitations and Maintenance

Two rehabilitation events were completed in B/C-Zone recovery wells during 2022 using high pressure jetting and vacuum technique developed with National Vacuum Environmental Services Corp. during 2012-2013. This technique allows for safer removal of the sediments, improved pressure control, and allows larger quantities of water to be withdrawn at a high pumping rate (i.e. over-pumping). The first well rehabilitation occurred March 30 (RW-4), March 31 (RW-5), and April 5 (RW-11). The second event took place on October 25 (RW-4) and October 26 (RW-5). Additionally, DNAPL recovery events were completed at RW-4 on February 9 and August 11 and on August 10 at monitoring wells 123A, 129A, and 190A. Rehabilitation events had a typical modest removal of sediments and maintenance of flow rate. The flow at RW-5 remains at an increased rate (approximately 2 – 3 gpm), when compared with the 2005 – 2015 average as the result of more thorough well cleaning in the Fall 2015, thereby demonstrating that the significant improvement on well yield has been maintained.

Well painting, labeling and protective casing repairs were performed in 2022 as part of continual site monitoring well maintenance. One wells hinged cap was replaced, J-plugs were replaced on three wells, and 49 well casings were painted and/or re-labeled.

3.0 HCS PERFORMANCE

3.1 Hydraulic Head Monitoring

Potentiometric surface maps based on water level elevations are the primary evidence of groundwater control. Supporting lines of evidence are well hydrographs and groundwater chemistry changes. Sections 3.1 and 3.2 discuss the results of hydraulic head monitoring and the associated potentiometric maps and hydrographs. Section 3.3 discusses the groundwater chemistry.

Groundwater hydraulic head measurements are used to evaluate control of groundwater in the overburden and bedrock groundwater flow zones by the HCS at Necco Park. Monitoring and recovery well locations are shown in **Figure 3-1**. Depth-to-water measurements and measuring point elevation data are used to calculate the elevation of groundwater and to generate hydrographs that show groundwater elevation trends in individual monitoring wells (**Table 3-1**). Hydrographs and potentiometric surface-contour maps included in this report (**Figures 3-8 and 3-10 through 3-14**) were selected from maps prepared and presented in the 2022 Quarterly Data Packages.

3.2 Hydraulic Control Assessment

Assessment of hydraulic control is described for each relevant bedrock zone in the following sections.

3.2.1 A-Zone

The overburden materials comprising the A-Zone are generally characterized by high clay content and low hydraulic conductivity. Groundwater flow in the A-Zone is primarily downward to the more transmissive fractured bedrock, as expected in this low permeability formation.

The hydrographs in **Figure 3-2** demonstrate the long-term drawdown from groundwater extraction in context of the seasonal variability. Decreases in water elevations from pre-startup are due to the combined effect of the impermeable landfill cap and continuous downgradient groundwater extraction from the recovery wells. The decreasing hydrographs represent long-term drawdown in an unconfined low-permeability unit and storage depletion. The water content of the unit continued to decrease by reductions in infiltration from the cap and groundwater recovery in the underlining water bearing unit (B-Zone). While there are fluctuations in the hydrographs, the overall trend is a clear decrease in the water elevations compared to pre-startup. In a few cases, there is an increasing trend from the originally large drawdown observed; however, these remain well below static conditions (approximately 2 -3 feet).

Figures 3-8 and 3-9 present A-Zone potentiometric surface contours and vertical gradient maps. The potentiometric map demonstrated that the groundwater flow was toward the capture systems. The cones of depression surrounding recovery wells RW-5 and RW-11 are significant, ranging from 3 to 4 feet of closed contours in the A-Zone (**Figure 3-8**). The 2022 water levels in the area of RW-11 suggest the well rehabilitations have helped sustain a large cone of depression around this location in the A-Zone.

Vertical gradients were downward (negative) between the A/B-Zones as presented in **Table 3-2** (2022 average gradients) and shown in **Figure 3-9** (November 9, 2022 gradients). These gradients demonstrate that the predominant flow potential is downward; therefore, the horizontal flow (i.e. to the south) is insignificant.

3.2.2 B and C Bedrock Water-Bearing Zones

Groundwater flow directions in the B-Zone and C-Zone were consistent throughout 2022 (**Figure 3-10**). Hydraulic controls in the B-Zone and C-Zone were maintained throughout 2022, which is attributable to high recovery well up time and well pumping rates. Additionally, long-term monitoring demonstrates the continuation of capture zone improvements in the area of RW-11. The improvements were the result of installation and maintenance of the hybrid recovery well RW-11 which includes a screened interval within a BFBT in the B-Zone and an open bedrock hole for the C-Zone. Increases in yield at RW-5 during the Fall of 2015 have been maintained as well as the increased capture zone due to continued semiannual rehabilitation events.

B-Zone

Groundwater elevation hydrographs, along with potentiometric surface contour maps, illustrate the hydraulic effects of the HCS in the B-Zone. RW-4, RW-5 and RW-11 have induced inward (toward the recovery wells) hydraulic gradients over a large area (**Figures 3-3** and **3-10**), capturing site groundwater in the source area. **Figure 3-3** is a plot of well hydrographs from B-Zone wells in the area near and surrounding RW-11. This plot demonstrates the improved effectiveness of capturing groundwater from installation of the BFBT and RW-11.

Primary evidence of groundwater control is observed in the potentiometric contour map provided in **Figure 3-10**. The contour map demonstrates large cones of depression established for each of the recovery wells. As mentioned in the well rehabilitation section above, the Fall 2015 rehabilitation at RW-5 created significant improvements in flow and mass removal and semiannual or more frequent rehabilitation events continue to maintain these improvements.

C-Zone

Groundwater elevation hydrographs and potentiometric surface-contour maps illustrate the hydraulic effects of the HCS in the C-Zone (**Figures 3-4** and **3-11**). The C-Zone influence attributed to RW-4, RW-5, and RW-11 extends north to wells 115C, 123C, and 159C, and west to 136C. As demonstrated in the hydraulic testing in 2022 (and previous years) the southern extent of influence extends to 137C, 150C, and 168C. Beginning in 2008, hydraulic control in the C-Zone was improved significantly with the rehabilitation of RW-5 and the start-up of RW-11. The semiannual rehabilitations of these recovery wells, conducted as a preventative action taken which maintains well performance.

After the Fall 2015 rehabilitation at RW-5, significant improvements in flow and mass removal were observed including with a wider cone of depression in the C-Zone. This resulted in a less pronounced depression immediately surrounding RW-5 in the C-Zone maps (compared with previous years) because of an improved connection to the aquifer (**Figure 3-11**). However, connectivity analysis conducted in 2016 (Parsons, 2016) demonstrated that a set point ranging from 563 to 565 in RW-5 resulted in drawdown of greater than 5 feet in the recovery well. Similarly, at 162C (approximately 70 feet east of RW-5) greater than 4 feet of drawdown was observed. This verified the large drawdown in the C-Zone as noted in the past reports. Further testing and analyses were completed in 2022 and discussed in the section on 150C (Section 3.5).

3.2.3 D, E, and F Bedrock Water-Bearing Zones

Groundwater elevation hydrographs and potentiometric surface-contour maps illustrate the effectiveness of the HCS in maintaining hydraulic control in the D-, E-, and F-Zones (**Figures 3-5** through **3-7** and **3-12** through **3-14**). The hydrographs clearly indicate the initial and sustained drawdown of groundwater elevation in the recovery wells and the surrounding monitoring wells. Potentiometric maps demonstrate the consistent cone of depression and that associated hydraulic gradients were toward the recovery wells throughout 2022, indicating the HCS is effectively controlling groundwater migration. This is further demonstrated in the spatial relationship of the source area depiction and the flow patterns depicted in **Figures 3-12** through **3-14**.

3.3 Groundwater Chemistry Monitoring

3.3.1 Background

Extensive monitoring has been conducted at Necco Park dating back to the early 1980s. Monitoring includes (but is not limited to) pre-design investigations, remedial investigations, geologic investigation, analysis of remedial alternatives, and source area investigations. Groundwater monitoring continues to meet the following objectives as defined in the SOW:

- Monitor reductions in aqueous chemistry in zone-specific source area wells as a consequence of the hydraulic control from recovery well pumping;
- Monitor the far-field groundwater chemistry to determine if the recovery system is controlling off-site migration of chemical constituents associated with the Necco Park site;
- Monitor for the presence of DNAPL;
- Monitor natural attenuation and intrinsic bioremediation in the source area and far-field; and
- Continue to evaluate the overall effectiveness of the remedial action.

The first annual status report following completion of hydraulic control elements of the Necco Park remedy (2005 Annual Report) included an extensive discussion of the first monitoring results and how these results compared to source area criteria introduced in the 1995 Analysis of Alternatives (AOA) report (DuPont Environmental Remediation Services 1995). This 2022 report provides an update of groundwater chemistry trends in relation to the long-term remedy for groundwater as well as an update of data relevant to the Source Area Criteria. The Source Area Criteria are provided in **Table 3-3**, with the 2022 results and comparison to criteria provided in **Tables 3-4** and **3-5**.

Monitoring completed in 2022 represents the eighteenth year of LTGMP performance monitoring and the fifteenth year of annual-only sampling. In accordance with the Long-Term Groundwater Monitoring Plan (LTGMP) (DuPont CRG 2005a), chemical monitoring was conducted on a semi-annual basis during the first three years of system operation. Sampling has been annual since the beginning of the fourth year of system operation, with modifications to the number of wells sampled. In 2010, DuPont proposed to reduce the number of wells monitored annually based on existing data showing either very low concentrations or concentrations decreasing over time. USEPA agreed to the changes in a letter dated July 16, 2010, but required that the full list of wells be sampled on a three- or five-year schedule to monitor source area groundwater chemistry trends.

The full list of wells was last sampled during the 2018 annual sampling event, and the full well list will again be sampled in 2023. The list of wells used for long-term monitoring is included in **Table 3-6**. **Figure 3-1** provides a well location map.

3.3.2 Sample Collection and Analysis

The annual sampling event was completed between August 26 and September 7, 2022. Parsons of Buffalo, New York, completed the sampling. Samples and associated quality assurance/quality control (QA/QC) samples were analyzed by TestAmerica Laboratories located in Barberton, Ohio.

As described in the Necco Park SAMP, groundwater sampling was conducted using USEPA low-flow sampling methodology and either a peristaltic pump (approved by USEPA, 2019) or using an air-driven bladder pumps equipped with disposable Teflon© bladders. In several cases where wells were unable to maintain low flow yields a low-flow impeller pump was used to purge the well dry and was then sampled with a bladder pump within 24 hours. The pumps were fitted with dedicated HDPE tubing.

Samples were collected at 26 monitoring well locations during the 2022 annual event. The well locations are listed in **Table 3-6**. Analytical indicator parameters are listed in **Table 3-7**. Analytical results for the sampling event conducted in 2022 are provided as **Appendix A**. For reporting purposes, the results are discussed as total VOCs (TVOCs). This is consistent with historic reporting where TVOCs are indicator compounds used to assess groundwater contamination and trends over time. Results for the respective flow zones are discussed below.

3.3.3 Source Areas Delineation

The 2022 groundwater sampling results have been compared to the same historically employed criterion to evaluate source area limits. Consistent with the AOA, any location where DNAPL was observed at least once was included in the source area. Groundwater chemistry data for the 2022 sampling event was also compared to solubility criteria to evaluate source area extent. Consistent with previous assessments, these included effective solubility for a given compound and one percent of a given compound's pure-phase solubility.

Calculated solubility criteria for DNAPL compounds evaluated during this study are presented in **Table 3-3**. A comparison of 2005 through 2022 data to the effective solubility and one percent of pure-phase solubility criteria are provided in **Tables 3-4** and **3-5**, respectively. Refinement of the monitoring program reduced the number of well comparisons from 2010 through 2012 in **Table 3-4**.

A discussion of the source area results by flow zone is provided below. It should be noted that some of the wells which are within the source area are sampled in the 5 year cycle and are not sampled annually.

A-Zone

The A-Zone source area has been defined as the Necco Park property and a limited area south of the property line. The A-Zone source limits have not changed from those provided with the 100% design submittal. The 2022 sample results indicate no exceedance of the solubility criteria. There has been only one exceedance of the solubility criteria since long term monitoring began: the 2005 first round results for well D-11 reported HCBD above the one percent solubility criteria.

Semi-annual DNAPL observations conducted at A-Zone well location 131A in 2022 indicated that no DNAPL was present. The most recent DNAPL observation at an A-Zone well prior to 2021 was at well 131A in May 2006. This well is located on the landfill. In April 2021 a foot of DNAPL was observed in 129A and in November 2021 1.26 feet and 0.06 feet was observed in 129A and 190A, respectively. Both 129A and 190A are within the source area for the site. In April 2022, DNAPL was found in 129A (0.4 feet) and 190A (0.1 feet) as well as 123A (0.2 feet). Well 123A is also within the source area for the A -Zone. In August 2022, DNAPL was again found in 129A (0.1 feet), 190A (0.02 feet), and 123A (0.1 feet).

Groundwater flow in the A-Zone is predominantly downward to the B-Zone. Therefore, hydraulic control of the upper bedrock groundwater flow will capture flow from the A-Zone. As discussed in Section 3.3, the installation of the BFBT and recovery well RW-11 (November 2008) enhanced the degree of A-Zone hydraulic control. Based on the results of the 2021 source area criteria and DNAPL monitoring, the system is effective in controlling the A-Zone source area.

B/C-Zone

The B/C-Zone source limits have not changed from those provided with the 100% design submittal. The results indicate one well exceeded the solubility criteria in 2022. At 168C, hexachlorobenzene exceed the solubility criteria for the first time in 2020 and exceeded again in 2021 and 2022. The refined sampling program reduced the frequency of some of the wells that typically exceed the criteria.

Two wells in the B/C-Zone exceeded the more conservative one percent criteria in 2022 (172B and 168C). At 171B hexachlorobutadiene (HCBD) concentration was 2,900 µg/L in 2020 and 620 µg/L in 2021, which is above the 20 µg/L criteria, but HCBD was not detected (<0.54 µg/L) in 2022. Hexachlorobenzene was not detected in 2021 (<3.1 µg/L) and 2022 (<0.16 µg/L) after being found in 2020 at 22 J µg/L, which was above the 0.11 µg/L criteria. Tetrachloroethene (PCE) concentration was below criteria (1,500 µg/L) in 2021 and 2022 compared to the 2020 result of 3,400 µg/L. At 172B, the reported HCBD concentration was 110 µg/L which is above the 20 µg/L criteria. HBCD has been above criteria at this location since 2007. At 168C, hexachlorobenzene was 2.1 J µg/L which is above the 0.11 µg/L criteria and HCBD was 150 µg/L which is above the 20 µg/L criteria. PCE was 1,500 µg/L which matches the criteria and TCE exceeded for the first time, matching the criteria of 11,000 µg/L.

Exceedances of the one percent solubility criteria at well locations 171B and 172B represent the spatial limit of the B-Zone source area. As discussed in Section 3.5, TVOC concentrations have significantly decreased since 2002 at locations 171B and 172B. While well 136B had exceeded the one percent solubility criteria from 2012 to 2014, the concentrations in 2015 through 2022 were below the criteria. Historic exceedance of the one percent solubility criteria at well location 136B for PCE represents the western edge of the limit of the B-Zone source area. The TVOC concentrations (which cannot be related to the one percent solubility criteria or individual compound concentrations, but do represent temporal trends) demonstrate that the concentrations at 136B have steadily declined to under 1,000 micrograms per liter (µg/l) from near 3,000 µg/l in 2012. The TVOC concentration at 136B in 2022 (714 µg/l) while not as low as the 2021 concentration of 572 µg/L still represents a continual declining trend in TVOCs at 136B. TCE exceeded the 1% solubility criteria for TCE in 2020 at well 150C but decreased to below the criteria in 2021 and 2022. Prior to 2020, the concentrations were below the criteria. Well 150C is south of the C-Zone source area limits. Well 168C had not exceeded the one percent criteria for HCBD since 2011 but had exceeded fairly frequently prior to 2011 and hexachlorobenzene had not exceeded in the past but had a detection limit greater than the criteria for each time it was analyzed. PCE at 168C had been below criteria but in both 2021 and 2022 was found at the criteria of 1,500 μg/l. TCE, which had not previously exceeded criteria, was also identified at the criteria of 11,000 µg/L in 2022 at 168C. Well 168C represents the southern edge of the limit of the C-Zone source area.

The frequency of observed DNAPL in B/C-Zone wells has decreased over the course of the monitoring program. In 2022, measurable DNAPL was observed during monthly or semi-annual DNAPL monitoring in RW-4, RW-5, and 129C.

Results of the source area criteria analysis and DNAPL monitoring suggests that operation of recovery wells RW-4, RW-5, and RW-11 has achieved and maintained control of the B/C-Zone.

D/E/F-Zone

None of the 10 wells sampled in 2022 exceeded the effective solubility criteria in the D/E/F wells. One of the 10 wells typically had exceeded the more conservative one percent pure-phase criteria. Well 165E is within the limit of the D/E/F-Zone source area and had exceeded the one percent pure-phase criteria (20 μg/l) for hexachlorobutadiene since 2007, except for 2016 and 2021. In 2022, Hexachlorobutadiene was found at 50 J µg/L.

Source zone criteria comparison analysis conducted during 2022 confirms that the operation of recovery wells RW-8 and RW-9 has achieved and maintained source control of the D/E/F-Zone.

3.4 Groundwater Chemistry Results and Trends

An analysis of 2022 chemistry results and trends has been completed to assess the effectiveness of the HCS and previous groundwater pumping system in reducing organic compound concentrations in groundwater. TVOC concentrations versus time plots for A-Zone overburden and B- through F-Zone bedrock monitoring wells are presented in **Appendix B**.

In general, operation of the HCS and the previous groundwater recovery system, combined with the presence of the landfill cap and Subsurface Formation Repair (SFR), have contributed to an overall trend of declining TVOC concentrations in the A-Zone overburden and bedrock fractures zones. TVOC concentration decreases at several near source area and far-field wells are significant and coincide strongly with the onset of HCS operations in April 2005, thereby demonstrating the effectiveness of containments and remediation of site groundwater. Natural attenuation processes are also contributing to the reduction in chemical mass in the bedrock fracture zones.

A-Zone Overburden

Results from the four LTGMP A-Zone wells indicate TVOC concentrations are all 5.13 μg/l or less, except for well 137A. Sampling results for well 137A (80.79 μg/l) represents the location of the highest reported A-Zone TVOCs and the 2022 TVOC concentration was the second lowest (with the 2021 result being the lowest) observed at this location. Other well locations were significantly lower: 145A (1.13 µg/L), 146AR (5.13 μg/L), and 150A (ND). The not detected TVOC result at 150A was last observed in 2020. The 2022 results are consistent with historical results in that they show no significant off-site horizontal chemical migration in the overburden.

Three of the four annual wells used to monitor the A-Zone (145A, 146AR, and 150A) exhibit near consistently low (less than about 5 μg/l) TVOC concentrations with no true discernable trend. These three wells have been less than 5 μg/l since 2007 or earlier except for 146AR that had a negligible increase in 2020 to 10.79 μg/l which improved in 2021 (6.3 μg/L) and 2022 (5.13 μg/L).

Closer to the landfill, well 137A has shown the greatest decline of the A-Zone wells with concentrations ranging close to 1,200 μg/l in 2005 to as low as 71.03 μg/l in 2021. A downward trend between 2005 and 2013 is evident at 137A, has been maintained through 2022 and suggests groundwater extraction in the RW-10/RW-11 area has effectively controlled offsite groundwater flow in this location.

B-Zone

Results from the eight LTGMP B-Zone wells indicate TVOC concentrations were consistent with previous years with decreases in TVOC over time, thereby demonstrating effective groundwater capture by the recovery wells (**Appendix B**). Results were below 2,000 μg/l in five of the wells sampled in 2022. Six of the eight wells exhibit large decreases in TVOC over time, thereby demonstrating effective groundwater capture by the recovery wells.

Source area limit wells 171B and 172B show a continued overall TVOC declining trend. Well 171B has decreased 3 orders of magnitude between 2002 and 2018 from over 100,000 μg/l to 141.47 μg/l but exhibited an increase in 2019 (9,730 μg/l) and 2020 (24,363 μg/l). In 2021 well 171B (1,788 μg/L) and 2022 (792 μg/L) declined from the concentrations observed in 2019 and 2020 to closer to concentrations observed between 2006 and 2018. Well 172B has decreased one order of magnitude to 4,342 μg/l during a similar timeframe. Additionally, the concentrations suggest that there is an active natural attenuation component to the VOCs, as biogenic degradation compounds including cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC) are prevalent compounds in the TVOC results at these well locations. The trend towards increased degradation compounds coupled with an absence of source area constituents is evident at well location 171B based on the 2007 through 2021 VOC results. Additionally, well 145B, just outside the source area in the southeast corner, also provides evidence of hydraulic control as concentrations have decreased significantly. Concentrations were over 30,000 μg/l in 2006 and have decreased to less than 10,000 since 2010 and as low as 3.12 μg/l in 2018. In 2021 the TVOC concentration was 3,273 μg/l which is similar to the range observed over the past 10 years. At 145B, the concentration of DCE is the highest parameters within the TVOC results.

Far-field wells 146B and 150B also demonstrate the effectiveness of the groundwater control system. Concentrations have decreased by one order of magnitude at both wells since 2000. In 2022, the TVOC concentration at 146B was 38.1 μg/l and at 150B the TVOC concentration was 186.4 μg/l.

Three B-Zone wells (136B, 137B, and 168B) have a slight overall flat to decreasing trend with more apparent decreasing trends from 2012 to 2022. At location 136B, which is at the southwestern edge of the source area, there is a slight overall declining trend in the data and a more robust declining trend in the data between 2012 and 2022. The 2022 result at 136B (714 μg/l) is the third lowest found at this location to date. At well 168B (southern edge of the source area), the TVOC concentrations are within the 2000 through 2012 range, but appeared to be increasing between 2005 and 2012, then decreasing between 2012 and 2022. Since 2012 (59,248 μg/l) TVOC concentrations have decreased to 21,570 μg/l, in 2022. At well 137B, along the southern source area boundary, there appears to be a slight overall decreasing trend in the data, with the early data to 2010 slightly unstable then from 2011 to 2022 the data is stable with a strong decreasing trend during this time period. TVOC concentrations at 137B have ranged from 271.1 μg/l to 2,112 μg/l and were 324.6 μg/l (average of sample and duplicate sample, 331.0 μg/l and 318.2 μg/l) in 2022.

C-Zone

Results from the four C-Zone wells analyzed for long term trends indicate TVOC concentrations are consistent with previous long-term monitoring results and source area is controlled.

Wells 145C and 168C are used to delineate the C-Zone source area limit. These wells had TVOC concentrations in 2022 between 980.4 μg/l (145C) and 30,910 μg/l (168C). At 145C concentrations were lowest in the record for the six years in a row between 2013 and 2018, and a decreasing trend is evident, even with a slight TVOC concentration uptick from 2019 to 2022 up to 2,187 μg/l, the decreasing trend with time remains evident. In 2022 the TVOC result at 145C was 980.4 μg/l. Since this is a source area well, it is expected to take an extended period for concentrations to decline. At downgradient well 168C, the concentration initially decreased after 2005 start-up but later increased to the 10,000 to 15,000 μg/l range. The concentrations had been slightly decreasing again between 2010 and 2017. In 2018, a significant decline was observed to 216.9 μg/l, the lowest observed TVOC concentration at 168C to date. However, between 2019 and 2022 TVOCs have increased each year reaching 30,910 μg/l in 2022.

TVOC concentrations at downgradient well 146C were over 20 μg/l prior to 2006; however, the concentrations decreased between 2006 and 2013 to below 15.0 μg/l. Concentrations between 2014 and 2017 increased to between 58.0 μg/l and 76.0 μg/l. In 2018 TVOC concentration decreased to 50.9 μg/l and decreased further in 2019 (25.3 μg/l) and 2020 (19.6 μg/l), the lowest in seven years. In 2021, TVOC concentrations decreased again to 14.3 μg/l, the lowest in eight years. In 2022, TVOC concentrations slightly increased to 17.3 μg/l.

At location 150C, concentrations are variable and have decreased from 2020 to 2021 and again from 2021 to 2022. A more details description of several lines of information including concentration changes at well 150C are provided in section 3.5.

D-Zone

Results from the four D-Zone wells indicate TVOC concentrations are generally low and/or declining over time at these monitoring locations.

Well 165D is within the source area. TVOC concentration here were under 25 μg/l between 2016 and 2019. Well 165D had TVOC concentrations which have been declining since the peak of approximately 1,600 μg/l in May 2006. An increase in TVOC concentrations was found in 2020 with a result of 5,734 μg/l. In 2021 TVOC concentrations at 165D decreased to 2,731 μg/l. In 2022 TVOC concentrations dropped further to 1,766 μg/l, well below the 2020 result but not back in the previously observed

TVOC range. Future TVOC results will determine if the spike encountered in 2020 is a new trend in TVOC concentrations or is an anomalous result.

TVOC concentrations at far-field wells (136D, 145D, and 148D) ranged from 3.53 μg/l (148D) to 402.4 μg/l (145D). At wells 136D and 145D, the concentrations have continued to decline since the historical concentrations as high as approximately 3,000 μg/l. In 2022, the TVOC concentrations in wells 136D and 145D have decreases to 46.29 μg/l and 402.4 μg/l, respectively. At far field well 148D, the concentrations remained low and have been below 5.3 μg/l from 1996 to present. At 148D there is a potential declining trend from 2016 to 2022, however, due to the low concentrations (< 5 μg/l) there is little meaning to the trend.

Consistent with previous long-term monitoring results, biogenic degradation compounds including cis-DCE and VC dominate TVOC results for wells 136D, 145D, 148D, and 165D (see Section 3.5 for more details on MNA). Furthermore monitoring has shown hydraulic control from the HCS extends beyond the D/E/F-Zone source area limits, and concentrations in D-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

E-Zone

Results from the three E-Zone wells (146E, 150E, and 165E) indicate TVOC concentrations were between 737.9 μg/l and 8,910 μg/l. Well 165E (8,910 μg/l) is within the E-Zone source area and has shown an increasing TVOC trend between 2006 and 2011 however, more recent TVOC results have indicated a strong declining trend from 2011 through 2022. This well is less than 100 feet up-/side-gradient to RW-9. It is likely that the effectiveness of capture on the E-Zone at RW-5 is related to the increasing concentrations observed through 2011, as expected in this type of capture scenario. The 2019 and 2020 TVOC concentration at well 146E (487.5 μg/l and 190.3 μg/l) were the lowest observed at this location. In 2021 (529.6 μg/l) and 2022 (737.9 μg/l), TVOC concentrations at 146E, while higher than 2019 and 2020, were still the lowest observed outside of the previous two years. TVOC results for well 146E, located at the edge of the source area limits, have been trending lower, with concentrations typically over 10,000 μg/l prior to 2009 and between 3,500 and 6,300 μg/l between 2009 and 2014. In 2015 the TVOC concentration at 146E increased to 11,566 μg/l from 3,531 μg/l in 2014. 2016 TVOC concentrations increased again to 14,169 μg/l. Even with the TVOC increases observed in the 2015 and 2016 sampling events, the overall trend for TVOCs continues to be declining. Well 150E also located near, but outside the source area limits has maintained initial decreases observed in 1996, with concentrations ranging from 6,590 μg/l (1996) to 388 μg/l (2015) and typically between 500 and 1,500 μg/l in recent years, however in 2019 the TVOC concentration increase to 7,835 μg/l (the highest observed at this location). The 2020 results indicate this increase observed in 2019 was anomalous with TVOC concentrations dropping back down (1,020.1 μg/l), but in 2021 bounced back up to 5,250.0 μg/l. In 2022, TVOCs dropped back to 2,704 μg/l. While the 2022 result is a decrease from the 2019 and 2021 results, they are significantly less than the result observed in 2019. All E-Zone groundwater monitoring locations are stable or on a declining trend. Degradation products including cis-DCE and VC dominate TVOC results for all the E-Zone wells. As discussed in Section 3.5, the presence of these degradation compounds is indicative of the occurrence of active natural attenuation processes.

Groundwater concentrations in E-Zone wells demonstrate that the HCS is effectively controlling groundwater flow as designed.

F-Zone

Results from the three F-Zone wells indicate TVOC concentrations ranged from 7.21 μg/L to 9,430 μg/l, and all three locations showed decreasing trends. Similar to the results from the E-Zone wells TVOC, results for all the F-Zone wells are mostly dominated by biogenic degradation compounds cis-DCE and VC.

TVOC concentrations at well 146F, at the edge of the F-Zone source area have decreased from a high of 36,700 μg/l in 2000 to 9,430 μg/l in 2022. TVOC concentrations at near source well 136F have also steadily declined since HCS startup from 8,348 μg/l (2005) to 7.21 μg/l (2022). TVOC concentrations have been below 10 μg/l for the last 5 years. TVOC concentrations at location 150F have shown a steady trend lower since 1998, with concentrations decreasing from initially over 4,500 μg/l to 725 μg/l in 2022.

TVOC concentrations have apparently decreased at these F-Zone locations in response to the startup of the HCS, which indicates that the HCS is effectively controlling groundwater flow as designed.

3.5 Concentration Trends at 150C

At monitoring well 150C, concentrations have been somewhat variable over time, having a reported concentration of 49,687 µg/l in 1990 followed by decreases following final startup after 2004, followed by distinct short term increases in 2013-2014 and 2020-2022. While the 2020 concentration increase at 150C is notable, an increase and subsequent decrease in concentrations at 150C is not unprecedented. In fact, variability of this sort is typical of a monitoring well which is just downgradient but relatively close to the zone-specific source area. The following lines of evidence have been developed for evaluation of the recent trends at 150C and relationship to the remedial action and the source area extent:

Chemistry:

- Groundwater concentrations declined from approximately 63,000 to 13,000 µg/L for 2020 through 2022, which is a 79% decrease (see Appendix B).
- Concentration increases in 2014 and 2020 are dominated by cis-DCE and VC (see Figure 3-15). In 2022 the concentrations of TCE had decreased to not detectable at 220 µg/L. This, as well as source area criteria (below), indicates 150C is near but downgradient of the source area.
- Well 150C concentrations have never exceeded the source area criteria for effective solubility and only once exceeded the far more conservative 1% total solubility criteria. This exceedance occurred in 2020 where a TCE concentration of 12,000 µg/L was reported. This is slightly above the TCE 1% criteria of 11,000 µg/L.
- During this same period of CVOC increased concentrations, hexachlorobutadiene, the primary constituent of Necco Park DNAPL (59%), was below detection limits.

Hydraulics:

Groundwater levels and hydraulic testing data were collected in 2022 to evaluate hydraulic capture associated with recovery wells within the C-Zone. Transducers were deployed to select C-Zone wells in the area of RW-5 and 150C. Several recovery/drawdown events were observed associated with system downtime and maintenance events. As observed in Figures 3-16 and 3-17:

- the effects of drawdown at 162C, near RW-5 area, were at least 3.8 feet and potentially greater as recovery was not fully completed.
- at 150C, approximately 750 feet downgradient, there was a notable response to pumping with up to 1.8 feet of drawdown.
- at 168C an influence of approximately 0.2 feet was observed.

It is clear that the hydraulic influence from the recovery system in the C-Zone as far south as 150C is obtained from the current remedial system.

Operations:

To further enhance hydraulic control of the remedial system in the B/C-Zones, improvements were made to operations and maintenance in 2021, specifically at RW-5. This included bringing the RW-5 inline spare pump on-line during weekdays prior to potential failure during weekends, drastically reducing RW-5 downtime associated with weekend pump failures. As seen in Table 2-1, average recovery well uptimes have increased considerably for RW-5 (from 83.6% in 2020 to 91.6% in 2022) and for RW-11 (from 90.8% in 2020 to 94.7% in 2022). These noticeable enhancements to O&M of the remedial system should continue to produce more consistent hydraulic control upgradient and in the vicinity of 150C.

DNAPL recovery:

As demonstrated in Section 3.7 greater than 70% of the total DNAPL was recovered in the first 6 years and 95% total DNAPL was recovered in the first 23 years (between 1989 and 2011). There has been no significant increase in DNAPL recovery between 2019 and 2022 and these years the recovery volumes are significantly lower than early in the program.

In summary, detailed lines of evidence demonstrate that the increased concentrations observed at 150C are indicative of a short term increased flux of mostly degradation compounds indicative of a downgradient plume and do not indicate changes in source area extent. Given the changes in operations and increased uptime, it is expected that concentrations will continue to decrease over time.

Recommendations:

The following recommendations regarding further review of mechanisms potentially associated with concentrations at 150C:

- Evaluate 2023 concentrations at 150C to determine if the increase in concentrations observed in 2020 through 2022 represents a trend or a short term increase.

- Transducers will continue to be deployed in selected wells to support the capture evaluation in the C-Zone.
- Detailed hydrogeological testing, such as bore fluid replacement testing, focusing on RW-5.

3.6 Evaluation of New Groundwater Sampling Methods

As approved by the USEPA, groundwater sampling was completed using a low-flow peristaltic pump in wells with depths to water less than approximately 20 feet to improve field efficiency, reduce decontamination, and reduce waste. In deeper wells or wells that exhibited significant drawdown, an impeller pump or bladder pump was used. This approved sampling method replaced the use of only bladder pumps prior to 2019. Analytical results for the different sampling methods can be seen in the plots of the analytical data included in **Appendix B**.

Based on the 2019 through 2022 analytical results obtained using the USEPA-approved new sampling methods, analytical results compare favorably with the many previous years of existing data. None of the well locations sampled from 2019 through 2022 exhibited anomalously low TVOC results out of historical range. Future groundwater sampling events plan to use the same methods employed from 2019 through 2022.

3.7 Monitored Natural Attenuation (MNA) Assessment

Based on the 2018 MNA sampling results (discussed in the 2018 Annual Report) and USEPA approval (USEPA July 16, 2010), future MNA sampling is currently scheduled to be completed on a five-year schedule. The next MNA sampling is scheduled to be completed in 2023. However, VOC and field parameter concentrations from 2022 generally indicate that MNA remains an active component in the source area and the far-field plume. For example, downgradient constituents are predominately degradation products (DCE and VC), and source area groundwater has remained anaerobic and likely sulfate reducing and or methanogenic.

3.8 DNAPL Monitoring and Recovery

As described in the LTGMP and the DNAPL Monitoring and Recovery Plan, monitoring for the occurrence of DNAPL has been conducted routinely at the Necco Park site since the early 1980s. An active recovery and monitoring program was instituted in 1989 to remove free-phase DNAPL from monitoring and groundwater recovery wells. The historically established monitoring program was modified based on results of the Pre-design Investigations. In 2015, the USEPA agreed to a request from Chemours to reduce the number of wells monitored monthly and semi-annually for DNAPL. However, the USEPA requested that once every two years, the full list of DNAPL wells are checked. The revised monitoring schedule began in June 2015.

The 2022 monthly DNAPL monitoring results are summarized in **Table 3-8** with removal events as follows:

- February – 12 gallons RW-4.
- March – 4 gallons RW-4 and 2 gallons from RW-5.
- August – 16 gallons from RW-4, 0.12 gallon from 123A, 0.064 gallon from 129A, and 0.016 gallon from 190A .

- October – 6 gallons from RW-4 and 6 gallons from RW-5.

The total DNAPL recovered in 2022 was 46.2 gallons which is within the range of DNAPL typical recovery from the previous ten years (range is from 0 to 130 gallons). This volume represents less than 1% of the total DNAPL removed and only a small fraction of the total mass removed. **Figure 3-15** provides DNAPL recovery volumes over the length of the program. As demonstrated in the plot, greater than 70% of the total DNAPL was recovered in the first 6 years and 95% total DNAPL was recovered in the first 23 years (between 1989 and 2011). The decline in DNAPL recovery is typical and generally expected. Furthermore small increases and decreases on a year to year basis are expected for a site such as Necco Park. DNAPL observations over the last three years are significantly lower than early in the program (1989 -1991) and very similar to yearly volumes since 1992. There has not been a significant increase in DNAPL recovery between 2019 and 2022.

3.9 Quality Control/Quality Assurance

The 2022 annual groundwater samples were submitted to TestAmerica Laboratories in Barberton, Ohio, for all chemical analyses. In accordance with the LTGMP and consistent with previous years, QA/QC procedures included in-house data review. In previous years through 2016, 10% independent validation of the data was completed by Environmental Standards, Inc., of Valley Forge, Pennsylvania. On July 30, 2015, Chemours proposed to eliminate the 10% validation based on 10 years of no instances when significant data qualification or rejection of data occurred as a result of findings from the 10% full validation that wasn't also identified by the 100% CDRP. The USEPA approved the proposed reduction in a letter dated October 19, 2016. All other provisions of the QAPP remain unchanged.

3.9.1 Sample Collection

All samples were collected in accordance with the scope and technical requirements defined in the project Work Plan and Quality Assurance Project Plan (DuPont CRG 2005c) and USEPA approved changes agreed to via email May 30, 2019. May 2019 approved changes allowed for the use of a peristaltic pump or a low flow impeller pump such as the Grundfos Rediflow2 to complete low flow groundwater sampling. Samples were submitted in seven delivery groups received at the laboratories between August 26 and September 8, 2022. Based on laboratory receipt records, all samples were received in satisfactory condition, properly preserved, and within USEPA holding time and temperature requirements. Field QC samples collected during the sampling round included two field duplicate pairs, two daily equipment blank samples, and seven trip blanks (volatile organics).

In-House Data Collection

The quality of the data set was evaluated by the AECOM Analytical Data Quality Management Group using the analytical results provided in hard-copy contract laboratory protocol-type data packages in conjunction with an automated data evaluation of the electronic data deliverables (the Chemours Data Review [DVM] process described below). The laboratory data packages presented a review of the QA/QC procedures conducted by the laboratory and included case narratives identifying any significant issues associated with sample receipt, preparation, and analysis.

The electronic data was processed through an automated program developed by Chemours, referred to as the DVM, where a series of checks were performed on the data, essentially resulting in a summary level validation. The data were evaluated against holding time criteria, checked for laboratory blank, equipment blank, and trip blank contamination, and assessed against the following:

- Matrix spike(MS)/matrix spike duplicate (MSD) recoveries
- Relative percent differences (RPDs) between MS/MSD samples
- Laboratory control sample (LCS)/control sample duplicate (LCSD) recoveries
- RPDs between LCS/LCSD
- RPDs between laboratory replicates
- Surrogate spike recoveries
- RPDs between field duplicate samples

The DVM also applied the following data qualifiers to analysis results, as warranted:

DEFAULT QUALIFIERS

Qualifier	Definition
B	Not detected substantially above the level reported in the laboratory or field blanks.
R	Unusable result. Analyte may or may not be present in the sample.
J	Analyte present. Reported value may not be accurate or precise.
UJ	Not detected. Reporting limit may not be accurate or precise.

All volatile organic sample analyses were completed within the 14-day USEPA method 8260C holding time guidance for preserved volatiles. For two of the equipment blanks (EB-1 and EB-2), the semi volatile organic analyses USEPA method 8270D holding time guidance of 7 days from collection for extraction was exceeded by a factor of two due to re-extraction. The reported non-detect results were unusable. One field sample (145B) had the 8270D preparation hold time exceeded. The reporting limit and estimated results may be biased low. The semi-volatiles analyses met the USEPA holding time guidance of 40 days of collection for analysis for aqueous samples. All organic parameters were reported to the current laboratory method detection limit (MDL). Target compounds detected between the MDL and the reporting limit (PQL/RL) were J qualified as estimated concentrations.

A number of samples required dilutions for analysis of volatiles and semi-volatiles due to the levels of target compounds and/or non-target interferences. As a result, the reporting limits for the affected samples are elevated.

The semi-volatile analysis included a target tentatively identified compound reported as TIC #1. All positive results reported for TIC #1 have been J qualified as estimated concentrations. Additionally, a non-target tentatively identified compound was detected in 150F and was J qualified as estimated concentrations.

The laboratory instrumentation cannot separate 3-methylphenol and 4-methylphenol under the chromatographic conditions used for sample analysis. The results reported represent the combined total of both semi-volatile compounds.

All inorganics were reported to the current laboratory MDLs. Detections between the MDL and the PQL/RL were J-qualified as estimated concentrations.

A number of samples required dilutions for chloride analysis. As a result, the reporting limits for the affected samples are elevated.

The USEPA method 300.0 holding time guidance for barium (180 days) was met for all samples in the program.

Evaluation of the Relative Percent Difference (%RPD) between field duplicate and parent sample is performed via the automated DVM process. Vinyl chloride had a high %RPD between the parent 136D and the blind duplicate (BLIND1-D). The positive analyte detections in the other pair (137B) of blind field duplicate collected for this program compared very well (less than the 30% RPD guideline used for aqueous samples).

All samples were collected in accordance with the scope and technical requirements defined in the project Work Plan and Quality Assurance Project Plan (DuPont CRG 2005c). Samples were submitted in seven delivery groups received at the laboratories between August 26 and September 7, 2022. Based on laboratory receipt records, all samples were properly preserved, and within USEPA holding time and temperature requirements. All samples were received in satisfactory condition.

4.0 CAP MAINTENANCE

The cap was substantially completed in 2005, and all remedial items were completed by August 2006. A lawn maintenance contractor maintains both the landfill cap and ditch vegetation. Landfill cap maintenance activities are conducted in accordance with the Cap Maintenance and Monitoring Plan (CMMP). Results of the landfill cap maintenance inspection conducted on December 21, 2022 are provided in **Appendix C**. No leachate seeps or settlement was identified, and all aspects of the landfill that were inspected were found acceptable.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Hydraulic Control Effectiveness

5.1.1 Conclusions

The HCS continues to be effective at controlling source area groundwater at the Necco Park site. The following observations support this conclusion:

- Water levels in the A-Zone continue a long-term decreasing trend due to the in-place remedial measures including the impermeable landfill cap and groundwater pumping. The A-Zone is dewatering vertically from the hydraulic depression created by the HCS in the B-Zone. This is evident in vertical gradients, drawdown calculations, and time series plots of water level elevations.
- Groundwater potentiometric contour maps depict a capture zone encompassing the source area in the B-, C-, D-, E- and F-Zones.

The addition of RW-11 continues to be an improvement in A-, B-, and C-Zone hydraulic control in the southwestern part of the site. Furthermore, increases in well yield at RW-5 in Fall 2015 increased capture in the A, B and C-Zone around this well.

5.1.2 Recommendations

Based on the site history, years of monitoring, and observations made in 2022, the following procedures are recommended:

- Continue to rehabilitate RW-4, RW-5, RW-11, semi-annually and/or as necessary.
- Evaluate 2023 concentrations at 150C to determine if the increase in concentrations observed in 2020 through 2022 represents a trend or a short term increase that is continuing to decrease. Transducers will continue to be deployed in relevant B/C zone wells to support the capture evaluation in the B/C zone in the area of RW-5. Additional testing at RW-5 may be included to test influence on the B and C zone from RW-5 pumping.
- Evaluate the capture in the B/C zone with detailed hydrogeological testing, focusing near RW-5.

5.2 Groundwater Chemistry Monitoring

5.2.1 Conclusions

The 2022 and historical chemistry monitoring results indicate the following:

- Overall, the TVOC concentrations are decreasing for all groundwater flow zones in the source area and far-field. In the very few locations where there were increasing trends of TVOC, the concentrations were within historical range or inside the source area near a recovery well.
- Analytical results for 2022 would not change the A-Zone and B/C-Zone source area limits as delineated in the SAR.
- Analytical results for 2022 (including well 146E) support the 2005 Annual Report conclusion of a reduced source area limit for the D/E/F-Zone as delineated in the SAR based on the analytical results from well 146E.

- Results from groundwater sampling events completed since HCS startup show that the HCS is effectively controlling zone-specific source areas.

5.2.2 Recommendations

The 2022 sampling results represent the 21st groundwater sampling event in the long-term monitoring program. It is recommended that the long-term monitoring program continue in its current form, including the revisions from 2010, 2011, 2016, and 2019.

5.3 MNA Conclusions and Recommendations

The next sampling event for formal MNA monitoring is scheduled to be completed in 2023. However, the analytical results from 2022, such as concentrations of degradation products and geochemical conditions, continue to support the recommendation that MNA assessments be conducted every five years, with the next event scheduled for 2023.

5.4 DNAPL Monitoring and Recovery

5.4.1 Conclusions

Results of the 2022 DNAPL monitoring and historical recovery efforts indicate the following:

- Monitoring for the presence of DNAPL was completed monthly during 2022.
- Measurable DNAPL was identified in each of the months in 2022.
- Approximately 8,999.2 gallons of DNAPL have been recovered since the recovery program was initiated in 1989.
- As approved by the USEPA, a revised list of wells was monitored monthly and semi-annually beginning in June 2015. The full list of well previously checked for DNAPL is monitored once every two years.

5.4.2 Recommendation

Continue DNAPL monitoring as revised and approved by the USEPA in 2015 and recover DNAPL where encountered.

5.5 Landfill Cap

5.5.1 Conclusions and Recommendations

With establishment of a continuous vegetative cover, the landfill cap construction is complete and is maintained in accordance with the CMMP. In 2022, no repairs to the landfill cap were necessary and the cap was appropriately maintained. The landfill cap inspection was completed on December 21, 2022 and will continue in 2023.

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TABLES

Table 2-1
HCS Recovery Well Performance Summary - 2022
Remedial Action Post-Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

	B/C-ZONE						D/E/F-ZONE			
	RW-4		RW-5		RW-11		RW-8		RW-9	
	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°	Total Gallons Pumped	Uptime°
January	56,062	96.25%	124,849	91.25%	225,849	96.24%	300,127	92.74%	302,820	95.58%
February	25,294	92.90%	122,600	94.33%	205,847	95.79%	305,870	95.83%	311,220	95.83%
March	18,030	79.34%	121,767	83.40%	217,733	89.33%	340,912	95.51%	337,537	95.50%
April	28,479	98.70%	134,424	88.70%	222,340	96.30%	377,526	100.00%	444,185	100.00%
May	19,847	98.00%	144,044	96.00%	209,831	98.00%	389,179	100.00%	461,525	100.00%
June	20,163	96.00%	111,482	88.00%	188,641	96.00%	321,458	95.00%	359,473	95.00%
July	21,105	98.53%	122,979	98.20%	184,355	98.53%	334,767	98.50%	377,029	98.52%
August	16,239	94.77%	149,416	97.88%	217,260	98.13%	356,533	98.12%	405,994	98.12%
September	16,072	99.90%	158,570	99.80%	221,738	100.00%	342,165	97.60%	415,289	99.90%
October	16,764	84.80%	121,399	81.80%	219,298	84.40%	366,330	98.80%	455,904	98.80%
November	21,682	99.00%	172,490	98.90%	269,368	99.00%	329,361	95.80%	327,388	95.80%
December	22,735	84.20%	149,093	80.80%	246,458	84.20%	276,680	84.20%	323,120	84.30%
2022 TOTAL / AVG.	282,472	93.5%	1,633,113	91.6%	2,628,718	94.7%	4,040,908	96.0%	4,521,484	96.4%
2021	233,574	92.7%	1,526,397	83.1%	2,700,141	89.1%	3,939,018	94.4%	3,590,515	93.6%
2020	220,949	90.2%	1,828,035	83.6%	3,024,489	90.8%	3,046,342	92.2%	3,096,254	91.6%
2019	263,589	90.0%	2,054,652	82.9%	3,077,949	86.6%	3,551,504	93.1%	3,605,878	90.9%
2018	304,833	88.4%	2,146,956	82.1%	3,140,119	87.6%	3,741,978	89.6%	4,215,450	92.1%
2017	187,283	82.1%	2,408,465	74.8%	2,841,144	85.7%	4,198,265	91.8%	4,192,719	91.8%
2016	233,743	83.7%	2,270,861	74.6%	2,422,531	82.1%	4,508,452	87.6%	3,191,504	87.6%
2015	274,254	77.0%	2,000,841	75.1%	1,668,783	77.4%	4,470,155	82.9%	3,563,902	82.8%
2014	290,476	95.7%	1,889,388	88.4%	2,155,520	91.6%	5,653,830	98.0%	4,301,449	98.1%
2013	433,801	92.5%	1,005,124	89.3%	3,367,369	84.4%	5,680,340	94.4%	5,250,524	93.8%
2012	475,401	94.9%	1,221,900	88.8%	3,538,799	85.4%	5,135,229	97.7%	4,774,110	97.7%
2011	115,439	90.7%	1,380,257	84.6%	2,772,890	85.8%	4,587,729	96.7%	4,763,517	97.1%
2010	144,749	90.3%	1,437,736	86.1%	3,327,973	86.0%	4,091,555	90.8%	4,772,745	90.6%
2009	106,849	93.7%	1,447,179	88.7%	5,585,699	90.8%	4,639,060	97.8%	4,397,025	97.6%
2008	103,262	90.9%	1,101,634	71.4%	1,149,746**	69.0%	3,680,999	96.9%	6,210,570	96.2%
2007	109,853	95.1%	1,391,339	83.6%	362,994*	92.6%	3,857,693	96.2%	5,506,023	95.9%
2006	92,358	90.0%	2,184,288	93.9%	701,579*	87.8%	4,581,348	95.0%	5,236,043	94.4%
2005	70,814	94.0%	1,966,338	93.0%	799,663*	95.0%	2,950,786	93.0%	3,881,318	93.0%

°Time taken for routine maintenance was not calculated as down-time

*RW-10 ** RW-10 and RW-11 Combination

Table 2-2
GWTF Process Sampling Results - 2022
Remedial Acton Post-Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

General Water Quality Analyte		B/C INFLUENT				D/E/F INFLUENT				COMBINED EFFLUENT			
		3/1/2022	5/17/2022	8/22/2022	11/9/2022	3/1/2022	5/17/2022	8/22/2022	11/9/2022	3/1/2022	5/17/2022	8/22/2022	11/9/2022
Field Parameters													
SPECIFIC CONDUCTANCE	µmhos/cm	6960	2491	5692	7170	5120	2032	3860	5270	5060	854	3864	5210
TEMPERATURE	°C	10.3	13.1	16.7	13.2	11.1	13.1	15.3	12.2	10.6	13	18.1	13.4
COLOR	ns	clear	clear	gray	clear	clear	clear	clear	clear	none	clear	clear	clear
ODOR	ns	yes	slight	slight	moderate	slight	slight	none	slight	none	moderate	none	slight
PH	std units	5.6	5.26	5.65	5.79	7.15	6.48	6.89	7.16	7.63	7.5	7.6	7.85
REDOX	mv	-133.2	-28.9	-92.2	-66.9	-231.5	-188.7	-195.1	-250.7	-67.6	-56.8	-47.3	-147.7
TURBIDITY	ntu	109.0	91.8	37.4	37.4	65.8	66.2	46	40.9	128	4.15	49.9	55.2
Volatile Organics													
1,1,2,2-TETRACHLOROETHANE	µg/l	3900	4100	5000	3300	1200	1000	930	780	880	36	780	740
1,1,2-TRICHLOROETHANE	µg/l	2700	2900	3100	2600	2100	1800	1600	1400	370	20	330	360
1,1-DICHLOROETHENE	µg/l	300	350 J	370 J	310 J	210	310	240	160 J	<1.3	<0.49	<9.8	<9.8
1,2-DICHLOROETHANE	µg/l	360	450 J	580	400	130	140 J	140 J	110 J	19	1.1	22	22
CARBON TETRACHLORIDE	µg/l	6300	6800	7200	6300	820	920	660	560	4.8 J	<0.26	<5.2	<5.2
CHLOROFORM	µg/l	13000	16000	18000	14000	2100	2400	1900	1700	110	19	76	87
CIS-1,2-DICHLOROETHENE	µg/l	6300	7900	8100	6300	8400	9800	7800	6500	61	10	77	91
METHYLENE CHLORIDE	µg/l	NA	2000 J	2900	NA	NA	4300	3900	NA	NA	6.9	76 J	NA
TETRACHLOROETHENE	µg/l	9500	9900	11000	9800	630	640	540	450	18	0.83 J	10 J	10 J
TRANS-1,2-DICHLOROETHENE	µg/l	300	390 J	390 J	310 J	590	700	580	430	<1.2	<0.51	<10	<10
TRICHLOROETHENE	µg/l	13000	15000	15000	13000	3300	3500	2800	2400	37	2.2	22	25
VINYL CHLORIDE	µg/l	1800	1400	1800	1500	1700	1500	1400	1100	0.91 J	<0.45	<9	<9
TOTAL VOLATILES	µg/l	**57,460**	**67,190**	**73,440**	**57,820**	**21,180**	**27,010**	**22,490**	**15,590**	**1,501**	**96**	**1,393**	**1,335**

< and ND = Non detect at stated reporting limit
J= Analyte present. Reported value may not be precise.

TABLE 3-1
Quarterly Hydaulic Monitoring Locations

Remedial Action Post-Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	Zone	Well ID	Zone	Well ID	Zone
53	A	159B	B	203D	D
111A	A	160B	B	RW-8	D/E/F
117A	A	161B	B	RW-9	D/E/F
119A	A	163B	B	202D	D
123A	A	167B	B	129E	E
129A	A	168B	B	136E	E
131A	A	169B	B	142E	E
137A	A	170B	B	145E	E
139A	A	171B	B	146E	E
140A	A	172B	B	150E	E
145A	A	201B	B	163E	E
146AR	A	BZTW-1	B	164E	E
150A	A	BZTW-2	B	165E	F
159A	A	BZTW-4	B	202E	E
163A	A	D-23	B	203E	F
168A	A	PZ-B	B	112F	F
173A	A	D-10	B/C	123F	F
174A	A	D-14	B/C	129F	F
175A	A	RW-5	B/C	130F	F
176A	A	RW-4	B/C	136F	F
178A	A	RW-11	B/C	145F	F
179A	A	105C	C	146F	F
184A	A	115C	C	148F	F
185A	A	123C	C	150F	F
186A	A	129C	C	163F	F
187A	A	130C	C	164F	F
188A	A	136C	C	165F	F
189A	A	137C	C	202F	F
190A	A	138C	C	203F	F
191A	A	139C	C	136G	G
192A	A	141C	C	TRW-6	B/C
193A	A	145C	C	TRW-7	B/C
194A	A	146C	C	PZ-205B	B
D-9	A	149C	C		
D-11	A	150C	C		
RDB-3	A	151C	C		
RDB-5	A	159C	C		
D-13	A	160C	C		
PZ-A	A	161C	C		
168A	A	162C	C		
102B	B	168C	C		
111B	B	204C	C		
112B	B	105D	D		
116B	B	111D	D		
118B	B	115D	D		
119B	B	123D	D		
120B	B	129D	D		
123B	B	130D	D		
129B	B	136D	D		
130B	B	137D	D		
136B	B	139D	D		
137B	B	145D	D		
138B	B	148D	D		
139B	B	149D	D		
145B	B	158D	D		
146B	B	159D	D		
149B	B	163D	D		
150B	B	164D	D		
151B	B	165D	D		

Notes: 1. Well 204C installed in 2008 to replace 112C. Water levels began in 1Q09.
2. Piezometers PZ-A, PZ-B, and 168A installed in 2008.
3. All AT zone wells were eliminated from the hydraulic monitoring program on consent from USEPA letter dated 01/27/2012.
4. PZ-205B installed in 2015.

Table 3-2

2022 Average A-Zone to B-Zone Vertical Gradients

Remedial Action Post Construction Monitoring - 2022 Annual report

Chemours Necco Park, Niagara Falls, New York

Well Pair		A	B	C	D	Vertical Gradient[2,3] (B-A) / (C-D)
		2022 Average A-Zone Head	2022 Average B-Zone Head	A-Zone Mid-Point of Well Screen	B-Zone Fracture Elevation[1]	
111A	111B	572.44	571.57	573.94	561.80	-0.07
119A	119B	573.84	573.16	571.63	556.90	-0.05
129A	129B	573.75	571.60	570.10	557.80	-0.17
137A	137B	571.91	571.13	570.10	561.30	-0.09
145A	145B	571.46	569.33	564.19	546.30	-0.12
150A	150B	571.98	570.44	564.69	553.18	-0.13
159A	159B	576.55	571.83	580.62	562.90	-0.27
163A	163B	572.88	572.87	572.49	564.96	0.00
168A	168B	572.34	569.86	555.22	544.90	-0.24

Notes:

1) A B-Zone fracture was not observed in the 145B borehole, therefore the midpoint of the open hole was used.
2) Unitless (ft/ft).
3) Negative values indicate a downward (from A-Zone to B-Zone) gradient.
4) Average gradients were used to better reflect typical vertical gradients at the site.

Table 3-3
DNAPL Components and Solubility Criteria Values
Remedial Action Post-Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

Contaminant	Mole Fraction in DNAPL (%)	Pure-Phase Solubility (µg/l)	One-Percent Pure-Phase Solubility (µg/l)	Effective Solubility (µg/l)
Hexachlorobutadiene	59	2,000	20	1,180
Hexachloroethane	9	50,000	500	4,500
Hexachlorobenzene	2	11	0.11	0.22
Carbon tetrachloride	5	800,000	8,000	40,000
Chloroform	1	8,000,000	80,000	80,000
Tetrachloroethene	3	150,000	1,500	4,500
1,1,2,2-Tetrachloroethane	5	2,900,000	29,000	145,000
Trichloroethene	4	1,100,000	11,000	44,000

Table 3-4
Effective Solubility Concentration Exceedances for DNAPL Compounds - 2005 through 2022 Annual Sampling
Remedial Action Post-Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event															
171B	B	Hexachlorobutadiene	1,180	2,100	BC	BC	BC	NS	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	2,900	BC	BC
		Hexachlorobenzene	0.22	BC	4.0	31 J	3.4 J	NS	1.4 J	BC	< 0.4	< 2.5	<0.95	BC	BC	< 0.41	< 0.32	< 0.41	0.48 J	BC	<0.39	22 J	<3.1	BC
105C	C	Carbon Tetrachloride	40,000	NS	NS	NS	BC	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Hexachlorobutadiene	1,180	1,700	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Chloroform	80,000	BC	180,000	NS	120,000	NS	90,000	82,000	BC	NS	NS	NS	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Tetrachloroethene	4,500	32,000	35,000	NS	36,000	NS	37,000 J	32,000	13,000	NS	NS	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Trichloroethene	44,000	280,000	190,000	NS	190,000	NS	160,000	140,000	74,000	NS	NS	NS	190,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
136C	C	Tetrachloroethene	4,500	4,100	3,600	3,300	3,100	5,200	3,800	14,800	5,600	NS	NS	NS	5,300	NS	NS	NS	NS	BC	NS	NS	NS	NS
137C	C	Tetrachloroethene	4,500	8,500	22,000	NS	7,900	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
168C	C	Hexachlorobenzene	0.22	<0.75	<1.5	<1.3	<1.3	<3.2	<1.3	<3.2	NS	<10	<4.8	<4.8	<1.6	<1.6	<0.81	<0.81	<0.81	<1.6	<3.1	1.5 J	0.92 J	2.1 J
105D	D	Carbon Tetrachloride	40,000	150,000	83,000	NS	170,000	NS	190,000	BC	200,000	NS	NS	NS	360,000	NS	NS	NS	NS	45,000	NS	NS	NS	NS
		Chloroform	80,000	98,000	35,000	NS	80,000	NS	90,000	96,000	120,000	NS	NS	NS	160,000	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Tetrachloroethene	4,500	12,000	57,000	NS	11,000	NS	13,000 J	12,000	16,000	NS	NS	NS	22,000	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Trichloroethene	44,000	120,000	51,000	NS	110,000	NS	120,000	130,000	180,000	NS	NS	NS	250,000	NS	NS	NS	NS	BC	NS	NS	NS	NS
137D	D	Tetrachloroethene	4,500	5,100	4,900	NS	BC	NS	7,200	5,300 J	4,700	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Trichloroethene	44,000	64,000	76,000	NS	BC	NS	91,000	70,000	76,000	NS	NS	NS	BC	NS	NS	NS	NS	65,000	NS	NS	NS	NS
		Hexachlorobenzene	0.22	3.0	11.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
139D	D	Hexachlorobenzene	0.22	38 J	11 J	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.2 J	NS	NS	NS	NS
		Hexachlorobutadiene	1,180	1,200	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	BC	NS	NS	NS	NS

BC: Below Criteria
NS: Not Sampled
"<" = compound not identified above the detection limit.

Table 3-5

1% of Pure-Phase Solubility Concentration Exceedances for DNAPL Compounds - 2005 through 2022 Annual Sampling

Remedial Action Post-Construction Monitoring - 2022 Annual Report

Chemours Necco Park, Niagara Falls, New York

Well ID	Flow Zone	Analyte	Criteria (ppb)	2005		2006		2007		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
				1st Event	2nd Event	1st Event	2nd Event	1st Event	2nd Event															
D-11	A	Hexachlorobutadiene	20	29	BC	BC	BC	BC	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
136B	B	Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	1,500	1,600	BC	BC	2,000	1,500	1,500	BC	BC	BC	BC	BC	BC	BC	BC
139B	B	Tetrachloroethene	1,500	NS	NS	NS	2000 J	NS	4,600	3,100	3,200	NS	NS	NS	2,900	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Hexachlorobutadiene	20	78	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		1,1,2,2-Tetrachlorethane	29000	NS	NS	NS	29,000	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
171B	B	Hexachlorobutadiene	20	2,100	130	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	55	2,900	620	BC
		Hexachlorobenzene	0.11	BC	4.0	3.1 J	3.4 J	BC	1.4 J	BC	< 0.4	< 0.5	<0.95	BC	BC	<0.41	<0.32	<0.41	<0.45	<0.18	<0.39	22 J	<3.1	<0.16
		Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	3,400	BC	BC
172B	B	Hexachlorobutadiene	20	140	89	140 J	110	BC	110	54	170	210	20	130	45	120	53	48	79	63	43	180	150	110
		Tetrachloroethene	1,500	1,800	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
105C	C	Hexachlorobutadiene	20	1,700	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Carbon Tetrachloride	8,000	25,000	BC	NS	BC	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Chloroform	80,000	250,000	180,000	NS	120,000	NS	90,000	82,000	BC	NS	NS	NS	100,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Tetrachloroethene	1,500	32,000	35,000	NS	36,000	NS	37,000 J	32,000 J	13,000	NS	NS	NS	24,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Trichloroethene	11,000	280,000	190,000	NS	190,000	NS	160,000	140,000	74,000	NS	NS	NS	190,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
136C	C	Tetrachloroethene	1,500	4,100	3,600	3,300	3,100	5,200	3,800	4,800	5,600	NS	NS	NS	5,300	NS	NS	NS	NS	4,000	NS	NS	NS	NS
137C	C	Tetrachloroethene	1,500	8,500	22,000	NS	7,900	NS	2,200	2,700	BC	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Trichloroethene	11,000	BC	19,000	NS	16,000	NS	20,000	70,000	BC	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
150C	C	Trichloroethene	11,000	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	12,000	BC	BC
168C	C	Hexachlorobutadiene	20	330.0	64	54 J	NS	44 J	BC	BC	NS	<27	21 J	BC	BC	BC	BC	BC	BC	BC	BC	110	130	150
		Hexachlorobenzene	0.11	<0.75	<1.5	<1.3	<1.3	<3.2	<1.3	<3.2	NS	<10	<4.8	<4.8	<1.6	<1.6	<0.81	<0.81	<0.81	<1.6	<3.1	1.5 J	0.92 J	2.1 J
		Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	1,500	1,500
		Trichloroethene	11,000	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	11,000
105D	D	Hexachlorobutadiene	20	95.0	BC	NS	NS	NS	NS	NS	N/S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		Carbon Tetrachloride	8,000	150,000	83,000	NS	170,000	NS	190,000	190,000	200,000	NS	NS	NS	360,000	NS	NS	NS	NS	45,000	NS	NS	NS	NS
		Chloroform	80,000	98,000	BC	NS	80,000	NS	90,000	96,000	120,000	NS	NS	NS	160,000	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Tetrachloroethene	1,500	12,000	5,700	NS	11,000	NS	13,000 J	12,000 J	16,000	NS	NS	NS	22,000	NS	NS	NS	NS	4,200	NS	NS	NS	NS
		1,1,2,2-Tetrachlorethane	29,000	NS	NS	NS	88,000	NS	79,000	76,000	79,000	NS	NS	NS	100,000	NS	NS	NS	NS	BC	NS	NS	NS	NS
		Trichloroethene	11,000	120,000	51,000	NS	110,000	NS	120,000	130,000	180,000	NS	NS	NS	250,000	NS	NS	NS	NS	33,000	NS	NS	NS	NS
137D	D	Tetrachloroethene	1,500	5,100	4,900	NS	BC	NS	7,200	5,300	4,700	NS	NS	NS	BC	NS	NS	NS	NS	4,400	NS	NS	NS	NS
		Trichloroethene	11,000	64,000	76,000	NS	27,000	NS	91,000	70,000	76,000	NS	NS	NS	BC	NS	NS	NS	NS	65,000	NS	NS	NS	NS
139D	D	Hexachlorobenzene	0.11	38.0	11.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	5.2 J	NS	NS	NS	NS
		Tetrachloroethene	1,500	1,900	BC	NS	BC	NS	BC	BC	BC	NS	NS	NS	BC	NS	NS	NS	NS	BC	NS	NS	NS	NS
165E	E	Hexachlorobutadiene	20	27.0	BC	32 J	46 J	BC	45 J	91 J	44 J	79 J	26 J	130 J	65 J	130 J	34 J	<5.1	140 J	150 J	38 J	85 J	BC	50 J
		Tetrachloroethene	1,500	BC	BC	BC	BC	BC	BC	BC	BC	2,000	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
		Trichloroethene	11,000	BC	BC	BC	BC	BC	BC	BC	BC	11,000	12,000	12,000	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC

BC: Below Criteria
NS: Not Sampled
"<" = compound not identified above the detection limit.

Table 3-6
Chemical Monitoring List, Long-Term Groundwater Monitoring
Remedial Action Post Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

MONITORING WELL	ZONE	MONITORING WELL	ZONE
137A	A	136D	D
145A	A	145D	D
146AR	A	148D	D
150A	A	165D	D
136B	B	146E	E
137B	B	150E	E
145B*	B	165E	E
146B	B	136F	F
150B	B	146F	F
168B	B	150F*	F
171B	B		
172B	B		
145C*	C		
146C*	C		
150C*	C		
168C	C		

*Well does not meet bedrock zone water bearing criteria ($k<10^{-4}$ cm/sec).

Table 3-7
Indicator Parameter List, Long-Term Groundwater Monitoring
Remedial Action Post Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

Inorganic and General Water Quality Parameters	Volatile Organic Compounds	Semivolatile Organic Compounds
pH*	Vinyl chloride	Hexachloroethane
Specific conductivity*	1,1-dichloroethene	Hexachlorobutadiene
Temperature*	Trans-1,2-dichloroethene	Phenol
Turbidity*	Cis-1,2-dichloroethene	2,4,6-trichlorophenol
Dissolved oxygen *	Chloroform	2,4,5-trichlorophenol
Redox potential*	Carbon tetrachloride	Pentachlorophenol
Chloride	1,2-dichloroethane	Hexachlorobenzene
Dissolved barium	Trichloroethene	4-methlyphenol
	1,1,2-trichloroethane	TIC-1
	Tetrachloroethene	
	1,1,2,2-tetrachloroethane	

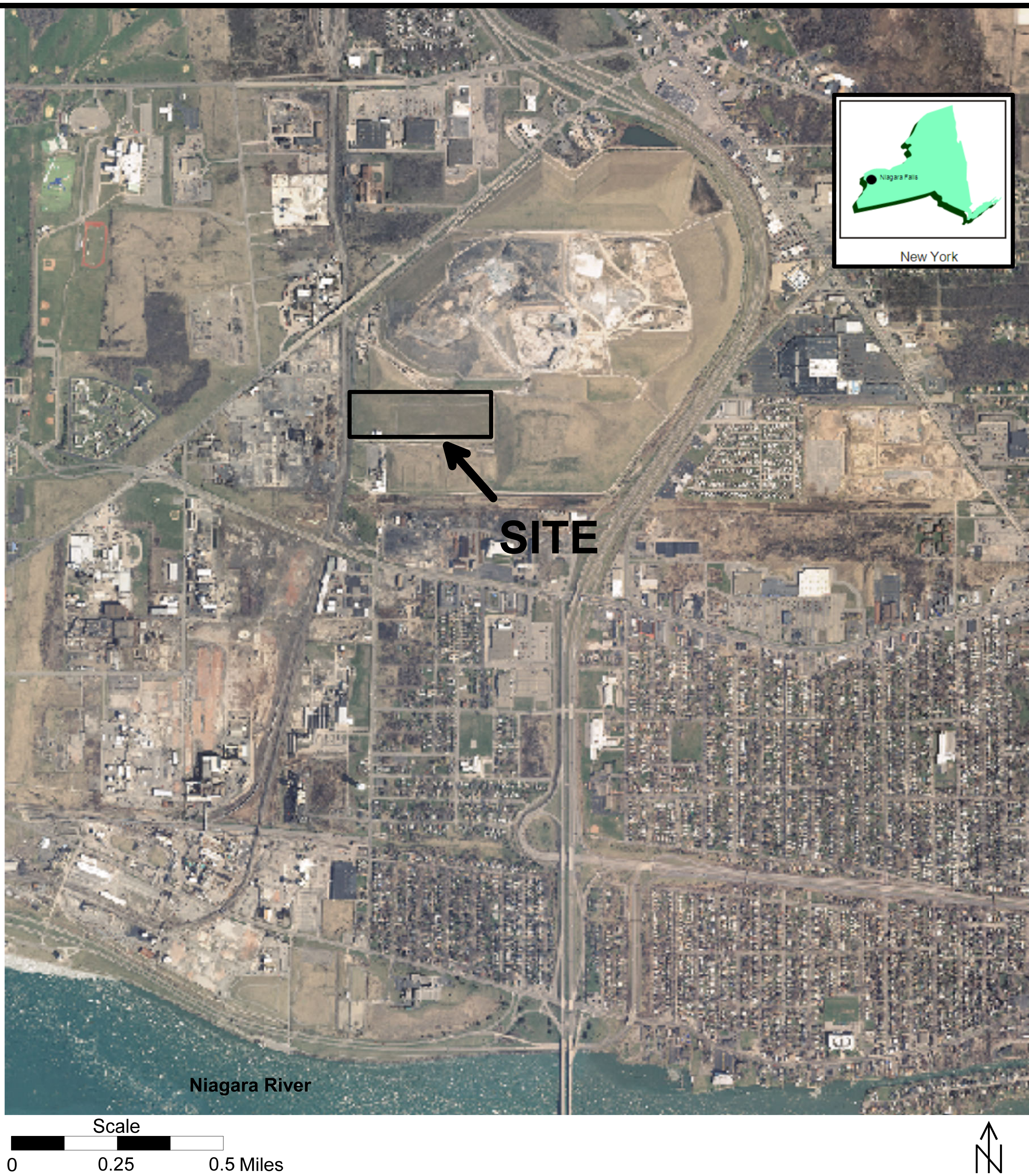
*Field parameter

Table 3-8
2022 DNAPL Recovery Summary
Remedial Action Post-Construction Monitoring - 2022 Annual Report
Chemours Necco Park, Niagara Falls, New York

Well ID	Frequency	31-Jan		28-Feb		30-Mar		22-Apr		31-May		30-Jun		29-Jul		31-Aug		26-Sep		26-Oct		30-Nov		30-Dec	
		FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS	FT	GALS
RW-4	Monthly	2.5		0.5	12.0	0.8	4.0	trace		2.5		3.5		3.8		0.1	16.0	1.0		1.3	6.0	0.8		1.2	
RW-5	Monthly	trace		trace		0.2	2.0	0.0		0.3		0.6		0.6		0.2		1.5		1.9	6.0	0.5		trace	
RW-11	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		<0.1		<0.1	
204C	Monthly	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.2		0.2	
VH-129C	Semi-annually	na		na		na		0.0		na		na		na		na		na		<0.1		na		na	
VH-131A	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-139C	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-161B	Semi-annually	na		na		na		0.0		na		na		na		na		na		5.0		na		na	
VH-161C	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-171B	Semi-annually	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
RW-6	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
RW-7	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
PZ-A	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-117A	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-123A	Biennial	na		na		na		0.2		na		na		na		na	0.1	na		0.1		na		na	
VH-129A	Biennial	na		na		na		0.4		na		na		na		na	0.1	na		0.3		na		na	
VH-190A	Biennial	na		na		na		0.1		na		na		na		na	0.0	na		0.6		na		na	
D-23	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
PZ-B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-160B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-167B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-168B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-169B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-170B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-172B	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-160C	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-162C	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-168C	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
VH-139A	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
CECOS52SR	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
CECOS18SR	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	
CECOS-53	Biennial	na		na		na		0.0		na		na		na		na		na		0.0		na		na	

na - not applicable/not taken due to reduction in scope, approved by USEPA (June 11, 2015 and August 12, 2015)
GALS - gallons purged

FIGURES



PARSONS

40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

Created by: RBP	Date: 02-13-23
Checked by: JWS	Date: 02-13-23
Approved by: EAF	Date: 02-13-23
Project Manager: EAF	Date: 02-13-23
Job number: 453196.03000	

FIGURE 1-1
SITE LOCATION MAP
NECCO PARK
NIAGARA FALLS, NY

//NYBUF03FS01/Dupont/Necco/HydroGeo/Mapping/gis/Figure 1-1-Necco Site Location.srf

PARSONS

40 LA RIVIERE DR., SUITE 122
BUFFALO, NY 14202
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Checked by: RBP	Date: 02-12-2021
Project Manager: Eric Felter	Date: 02-12-2021
Project Number: 452448.03000	

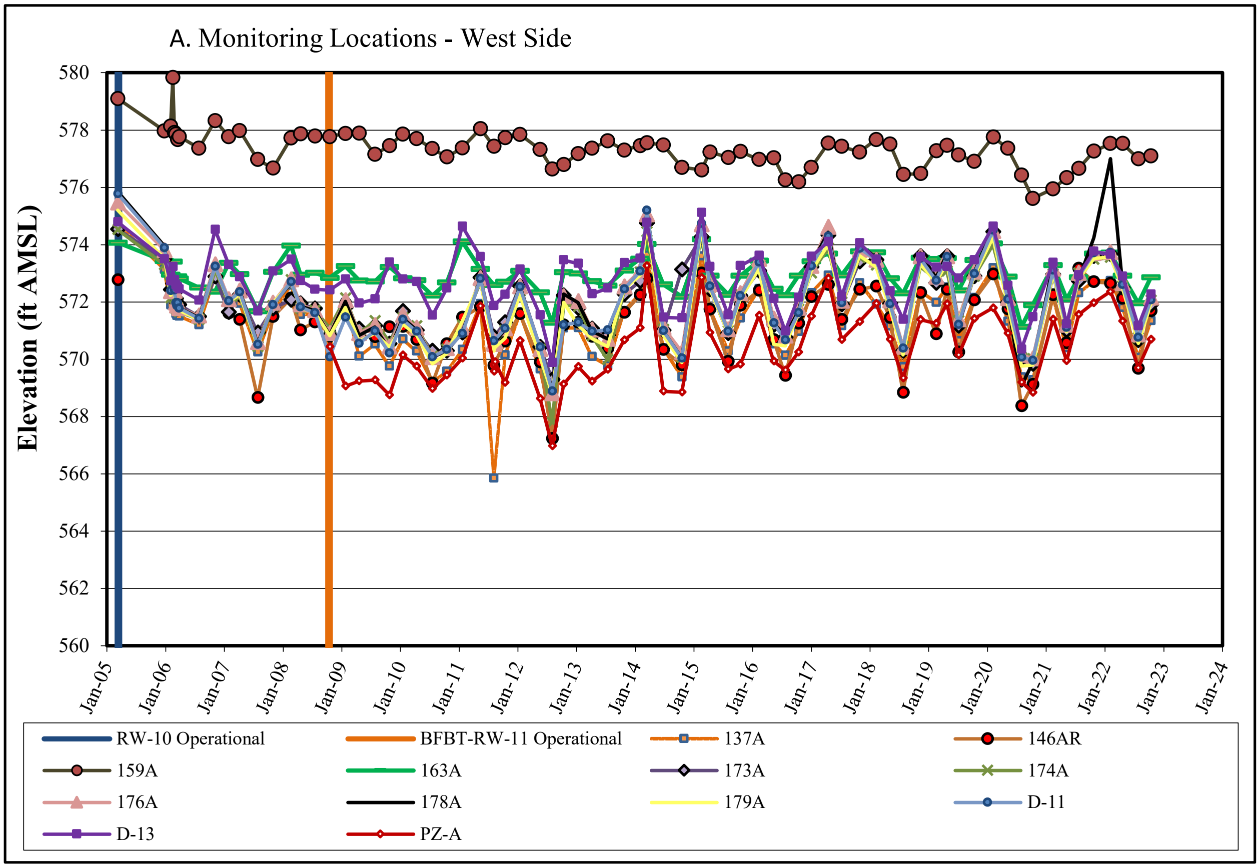
LEGEND

- RECOVERY WELLS
- ANNUAL SAMPLING WELLS
- 5 YEAR SAMPLING WELLS
- MONITORING WELL
- RAIL ROADS
- GROUT CURTAIN

FIGURE 3-1
WELL AND PIEZOMETER LOCATIONS
CHEMOURS NECCO PARK SITE
NIAGARA FALLS, NY

U:\Necco\hydrogeo\Maps\gis\Abandoned_Wells_TVOC.mxd

Figure 3-2
Select A-Zone Monitoring Wells
Groundwater Elevations 2005 through 2022
Chemours Necco Park



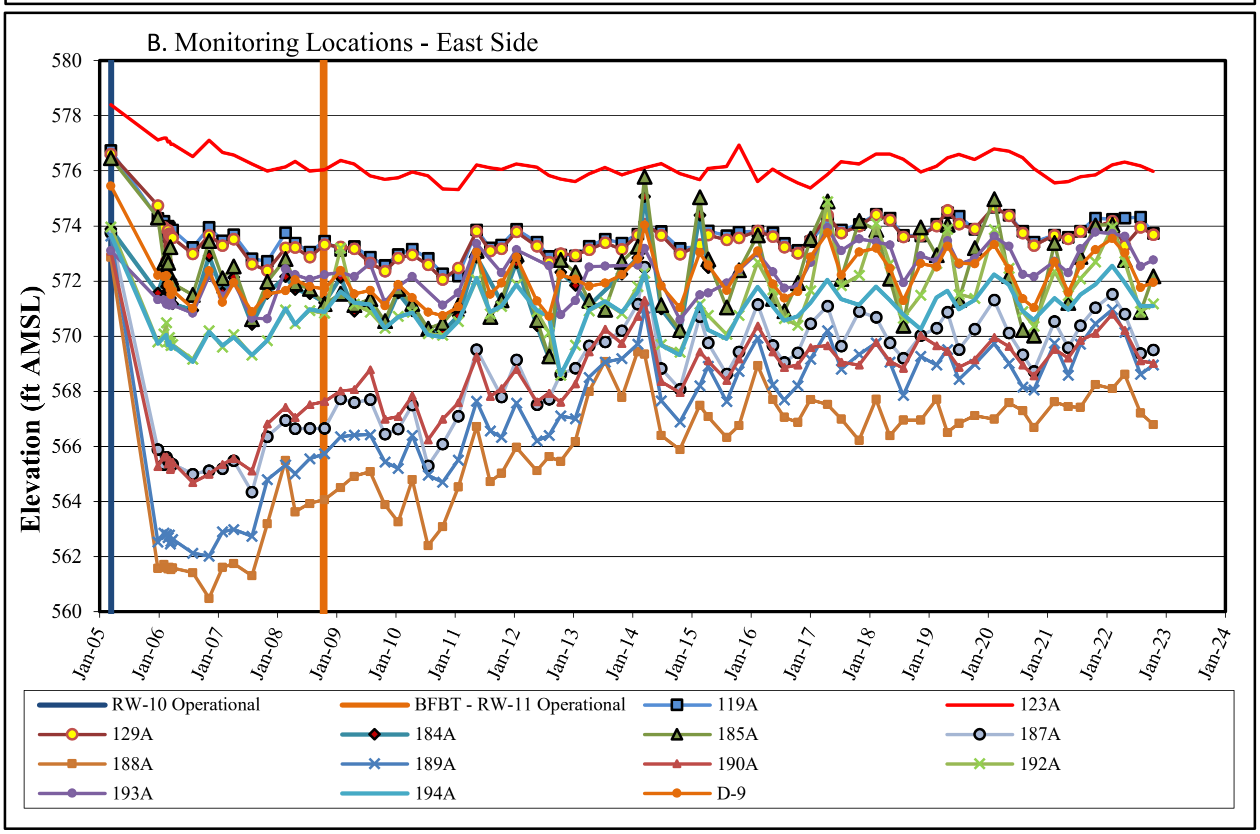
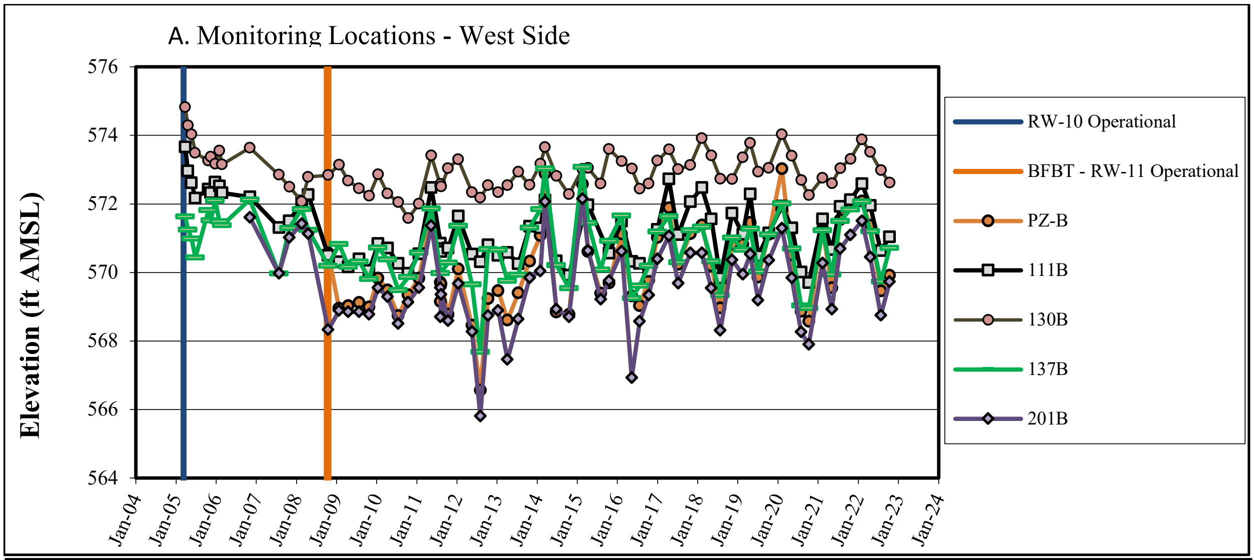
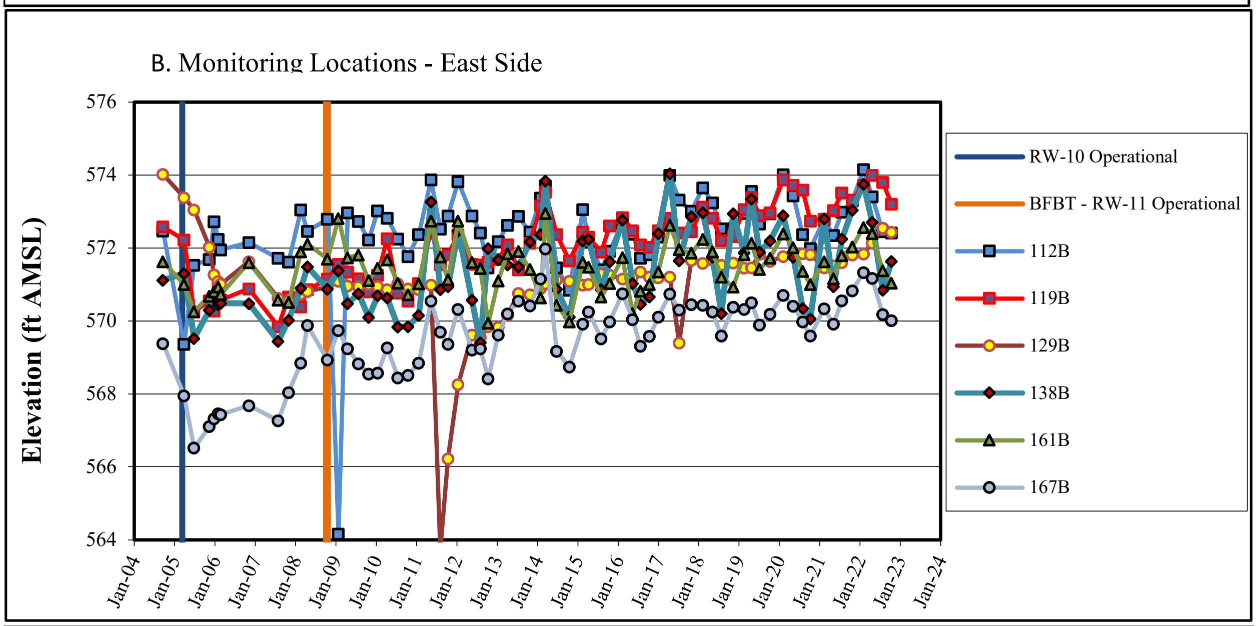


Figure 3-3
Select B-Zone Monitoring Wells
Groundwater Elevations 2005 through 2022
Chemours Necco Park





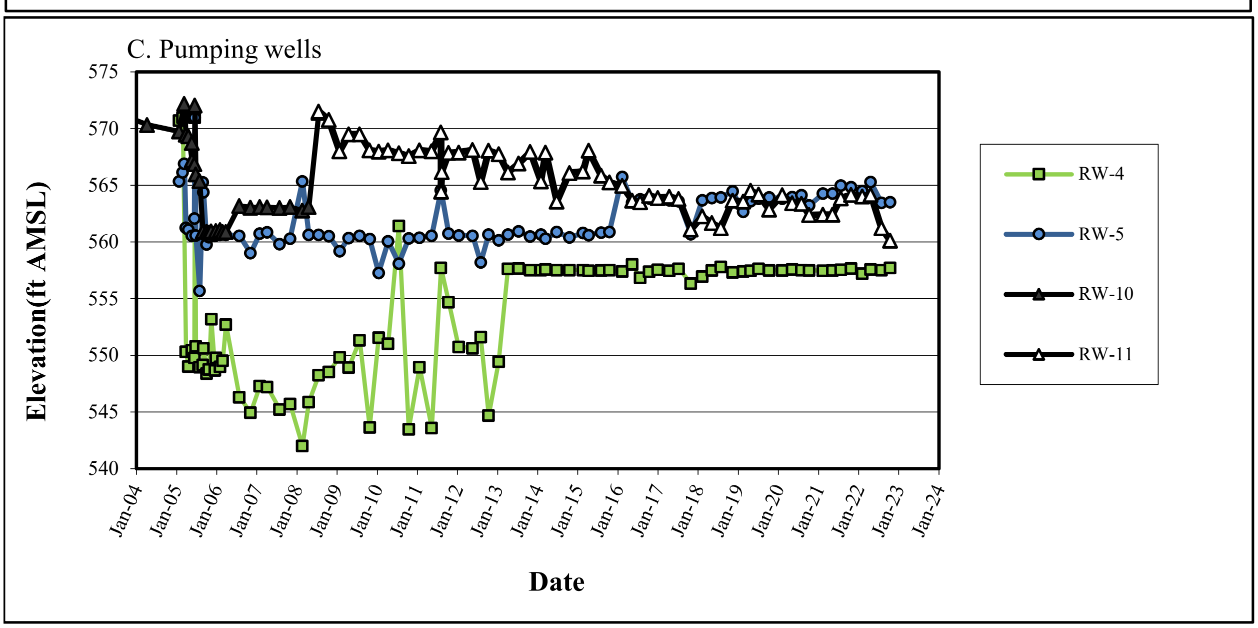
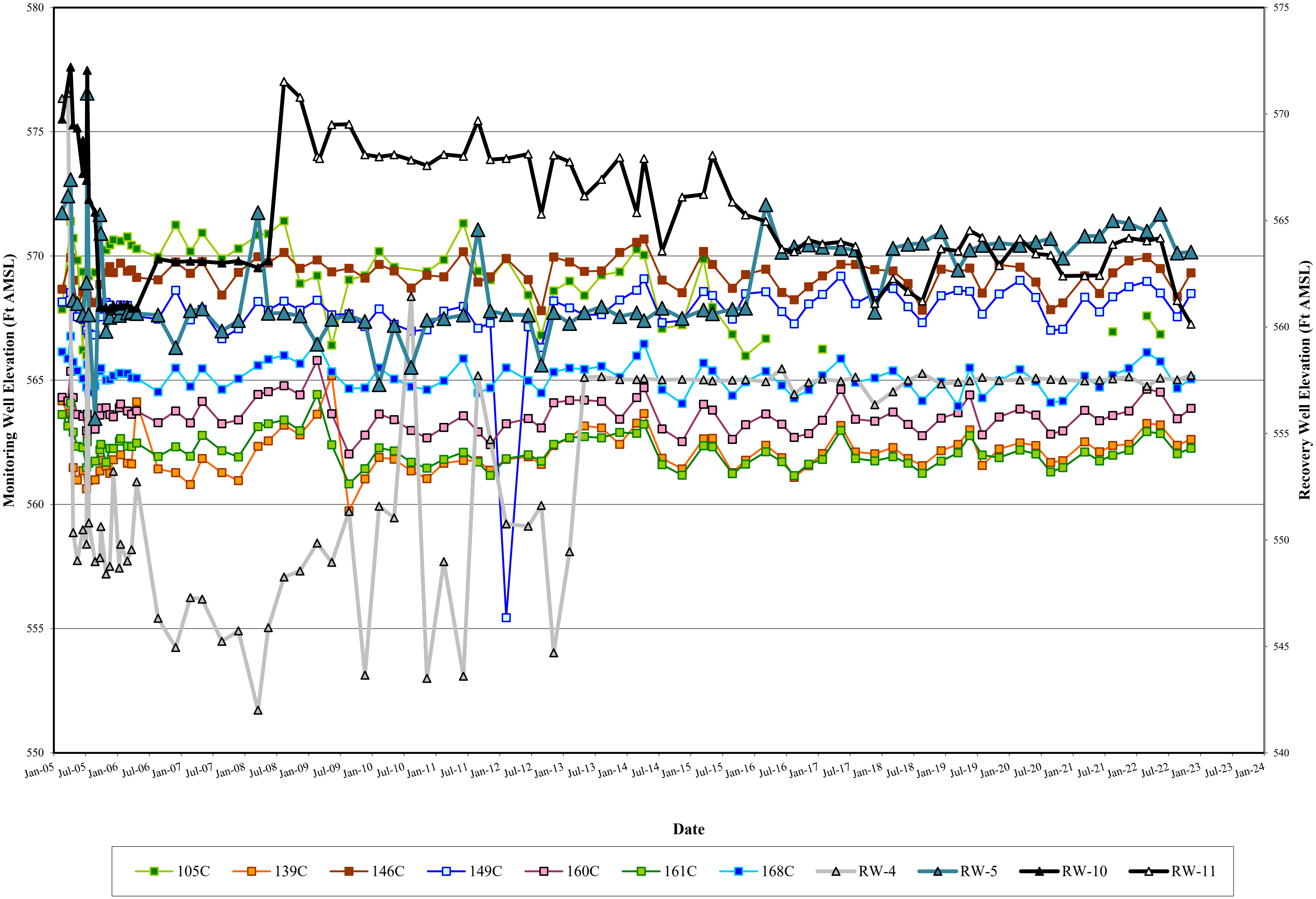
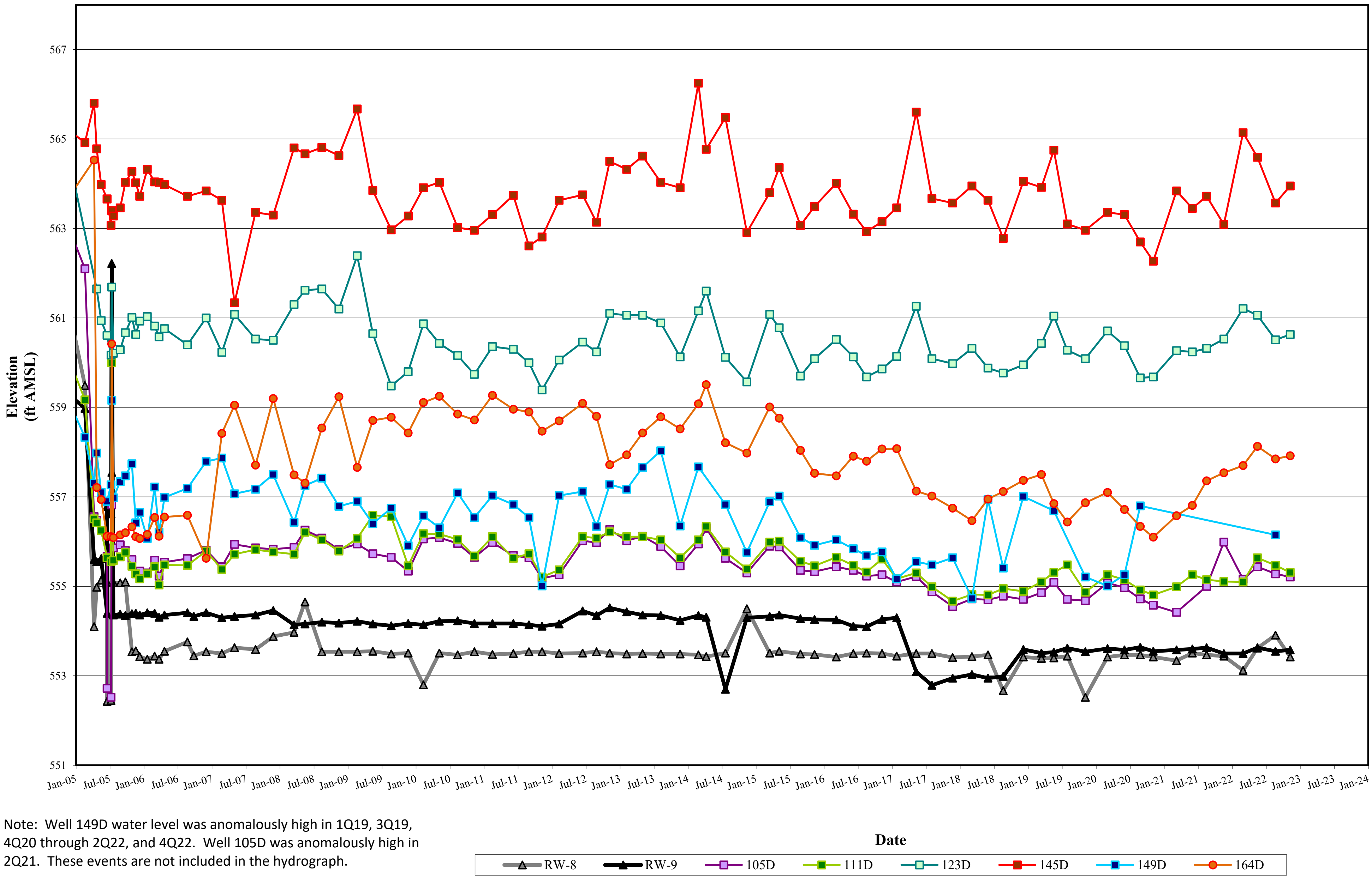


Figure 3-4
Select C-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2022
Chemours Necco Park



Necco 2022 C Zone Water Elev Trends.xlsx

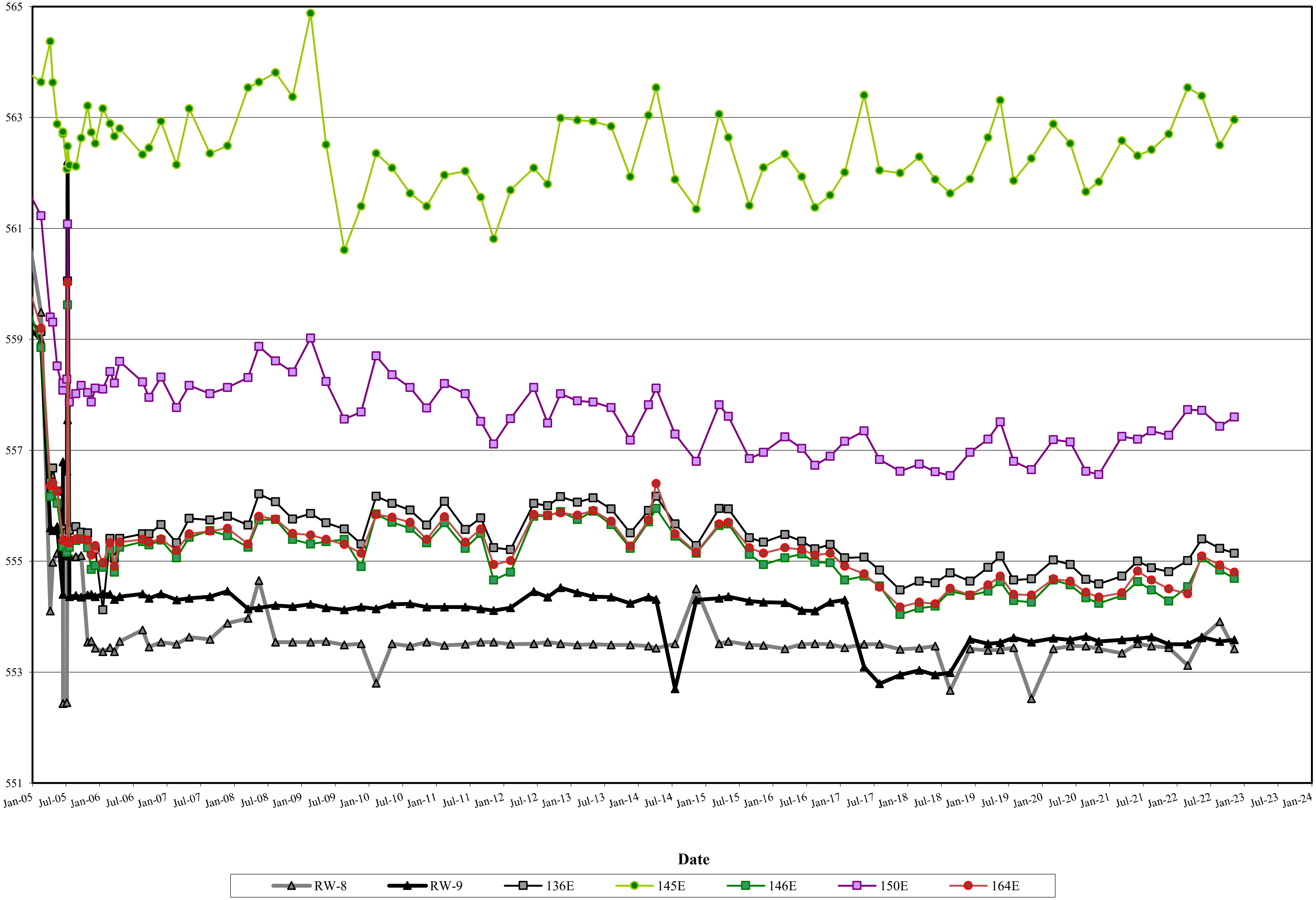
Figure 3-5
Select D-Zone Monitoring Wells
Groundwater Elevations 2005 through 2022
Chemours Necco Park



Note: Well 149D water level was anomalously high in 1Q19, 3Q19, 4Q20 through 2Q22, and 4Q22. Well 105D was anomalously high in 2Q21. These events are not included in the hydrograph.

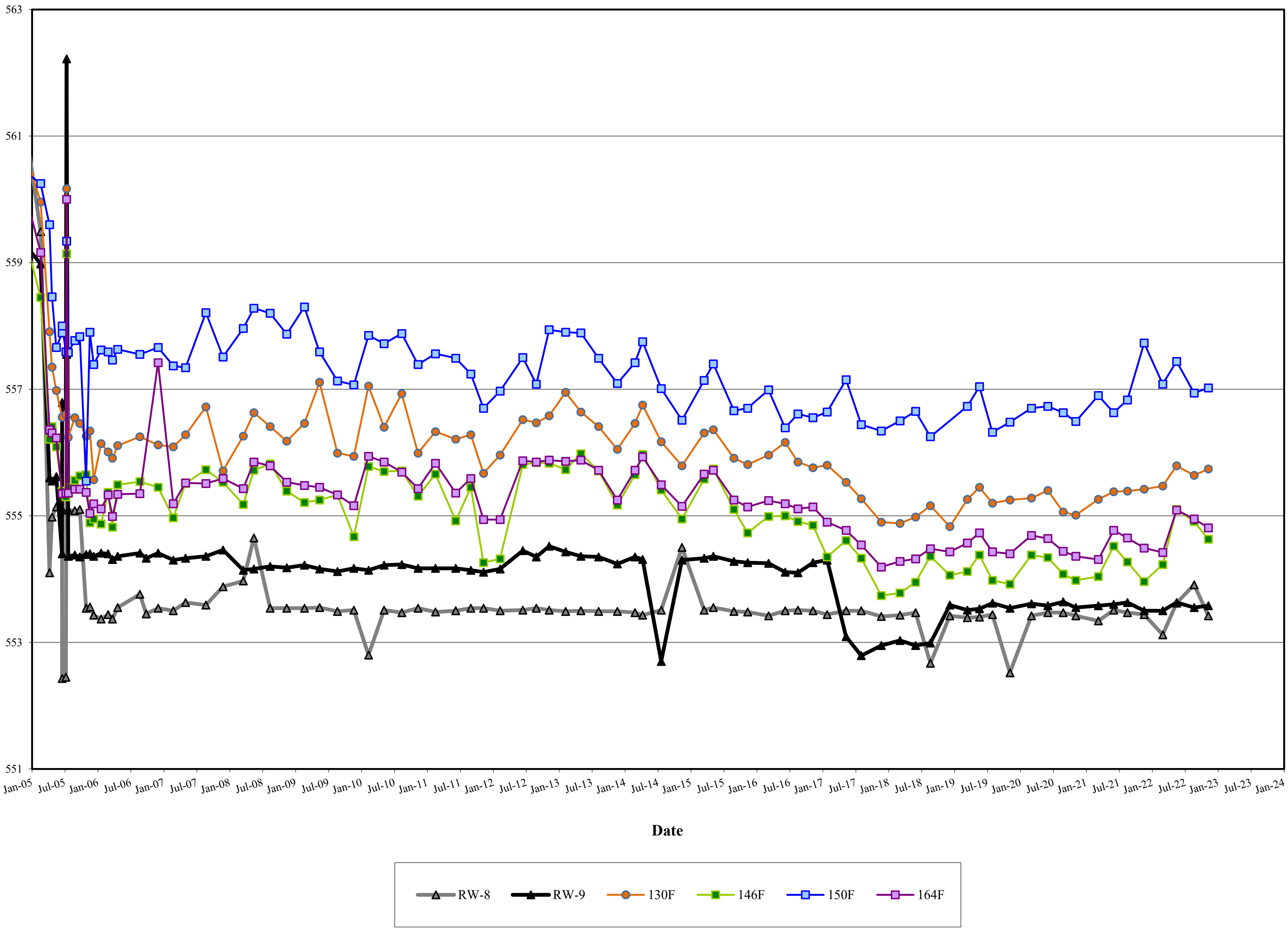
Necco 2022 D Zone Water Elev Trends.xlsx

Figure 3-6
Select E-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2022
Chemours Necco Park

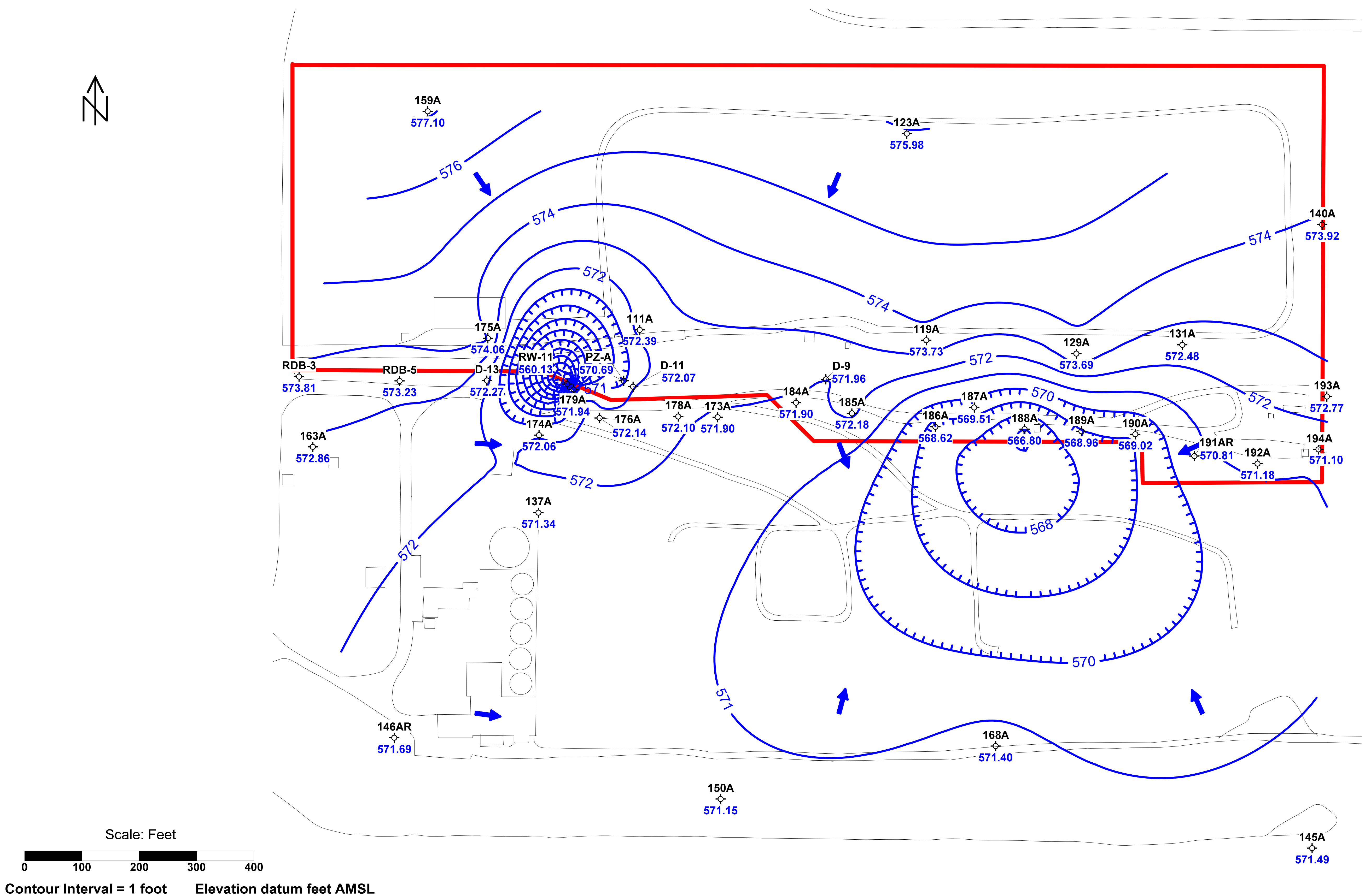


Necco 2022 E Zone Water Elev Trends.xlsx

Figure 3-7
Select F-Zone Monitoring Wells
Groundwater Elevations 2005 Through 2022
Chemours Necco Park



Necco 2022 F Zone Water Elev Trends.xlsx



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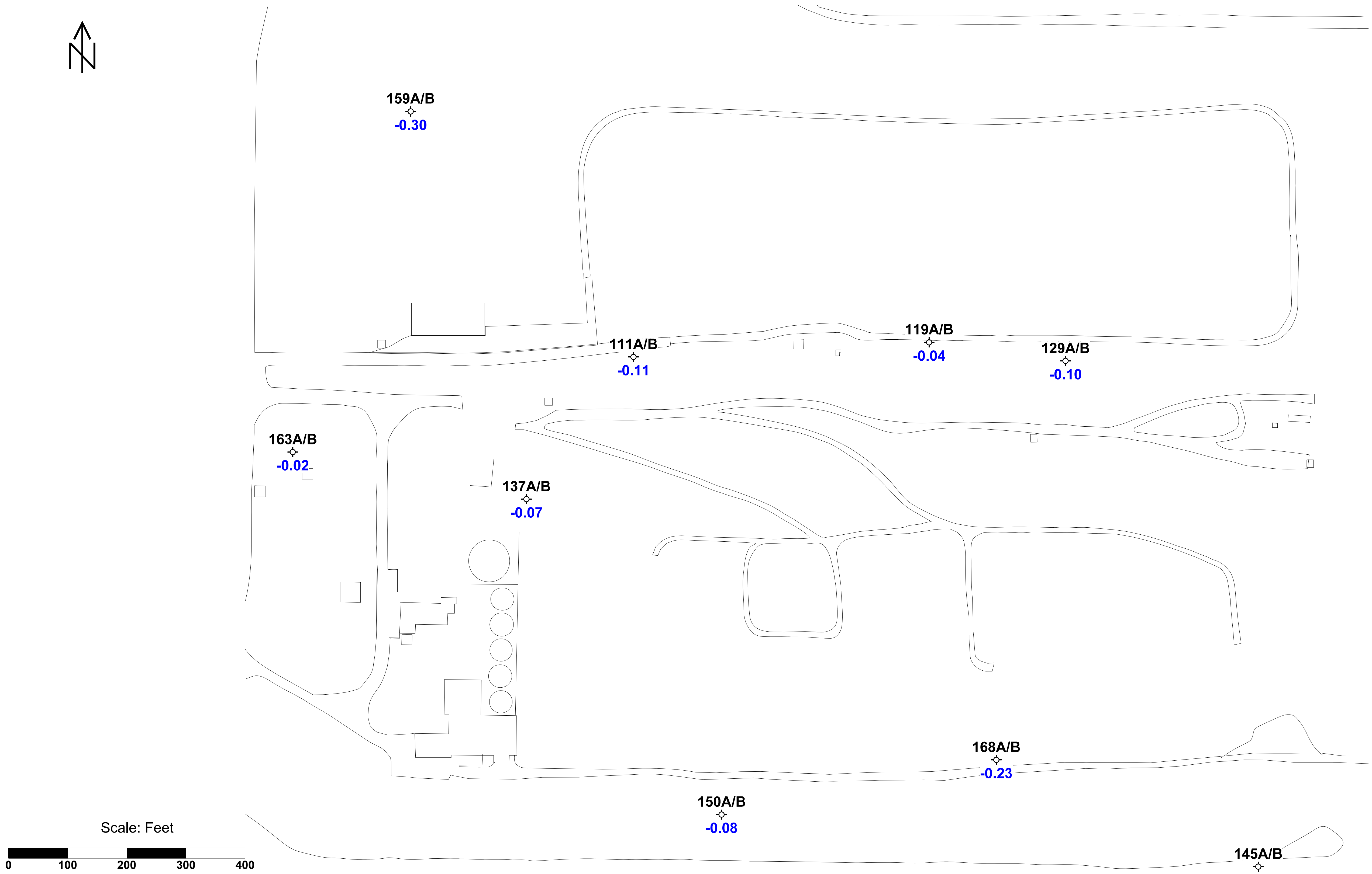
Job number: 453196.03000	

LEGEND

3B	Well ID		Potentiometric Contour
	Monitoring Well		Structure
	Pumping Well		Road
	Source Area Extent		

Figure 3-8
Potentiometric Surface Map
Chemours Necco Park: A-Zone
November 09, 2022

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2022-11-09 NEC Contour Tool/2022-11-09 - A PZ - F2.srf



Negative value indicates downward gradient

Elevation datum feet AMSL

PARSONS

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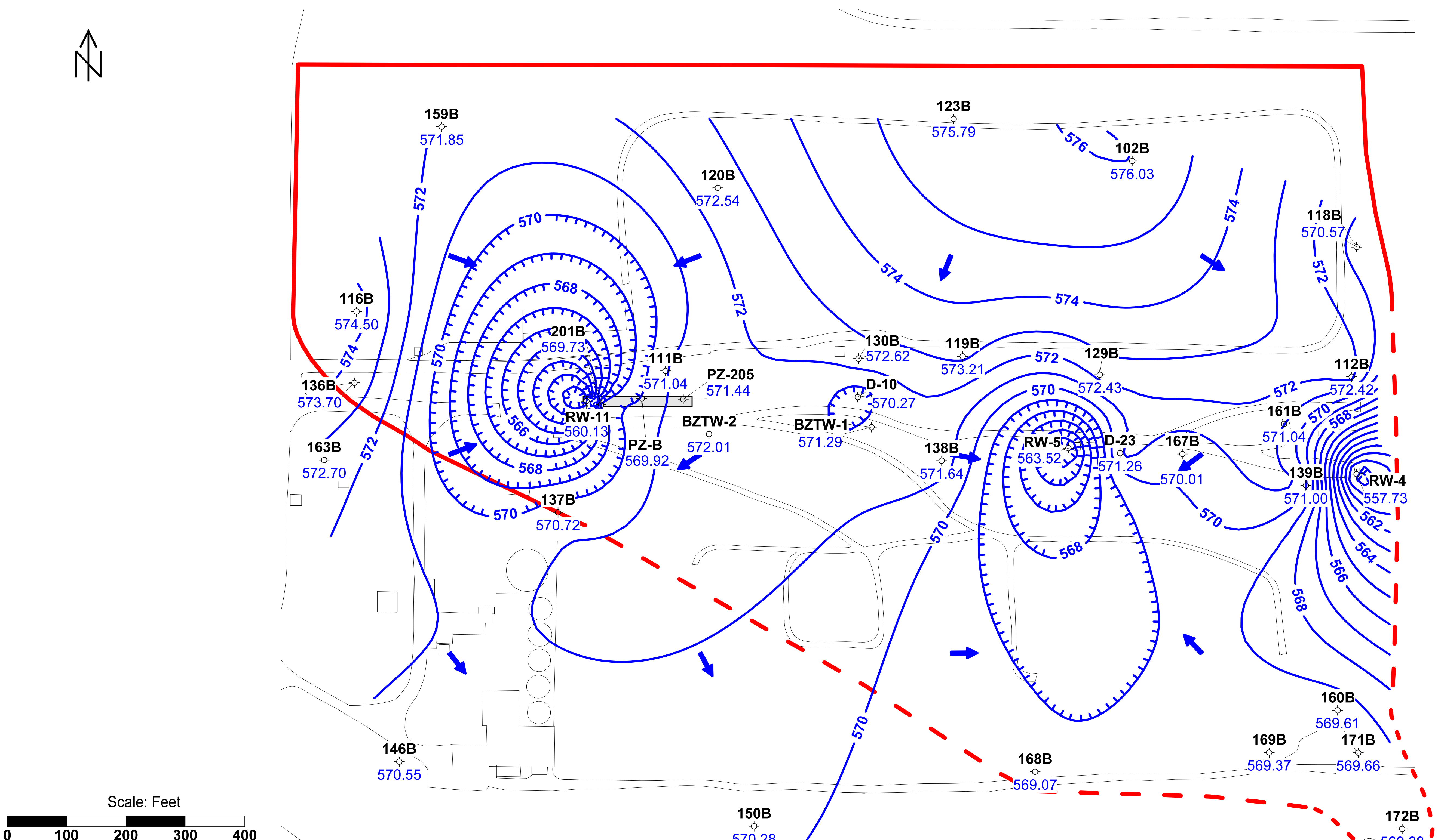
Created by: RBP	Date: 01/06/23
Checked by: JWS	Date: 01/10/23
Project Manager: EAF	Date: 01/10/23
Job number: 453196.03000	

LEGEND

150A/B	Well ID
✧	Monitoring Well
✦	Pumping Well
▭	Structure
═	Road
-0.14	Vertical Hydraulic Gradient

Figure 3-9
Vertical Gradient: A-Zone to B-Zone
Chemours Necco Park
November 09, 2022

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2022-11-09 NEC Contour Tool/2022-11-09 - ABvgrad - F3.srf



Scale: Feet

0 100 200 300 400

Contour interval = 1.0 foot
Elevation datum feet AMSL

Wells 149B and 151B are outside the area shown, but were used in the contouring.
Wells 170B, TRW-6, and TRW-7 were not used in the contouring.

PARSONS
40 La Riviere Dr, Suite 122
Buffalo, NY 14202
(716) 541-0730

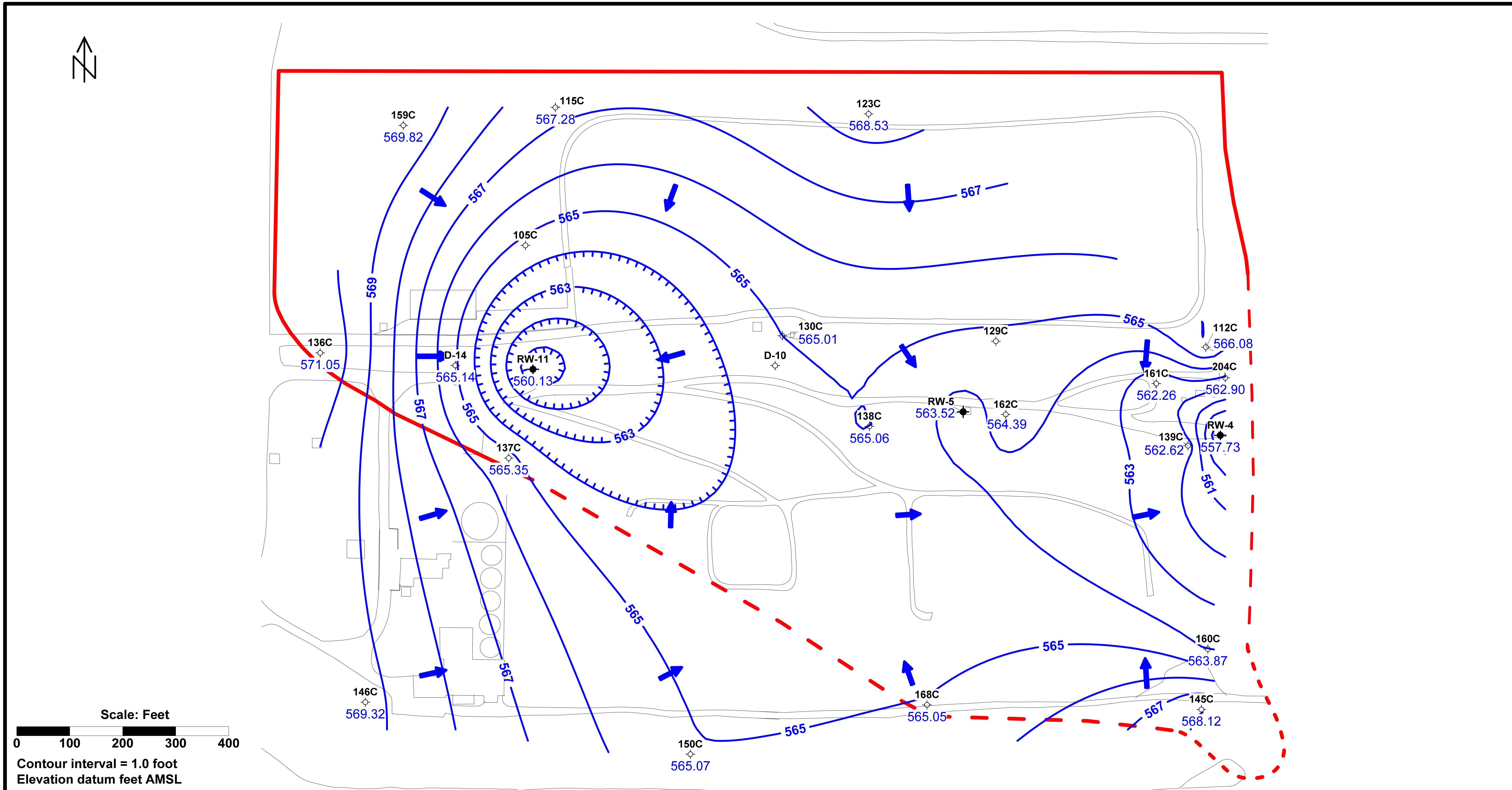
Created by: RBP	Date: 01/06/23
Checked by: JWS	Date: 01/10/23
Project Manager: EAF	Date: 01/10/23
Job number: 453196.03000	

LEGEND

3B	Well ID	Potentiometric Contour	Source Area Extent
	Monitoring Well	Structure	Approximate Location of Bedrock Fractured Blast Trench
	Pumping Well	Road	

Figure 3-10
Potentiometric Surface Map
Chemours Necco Park: B-Zone
November 09, 2022

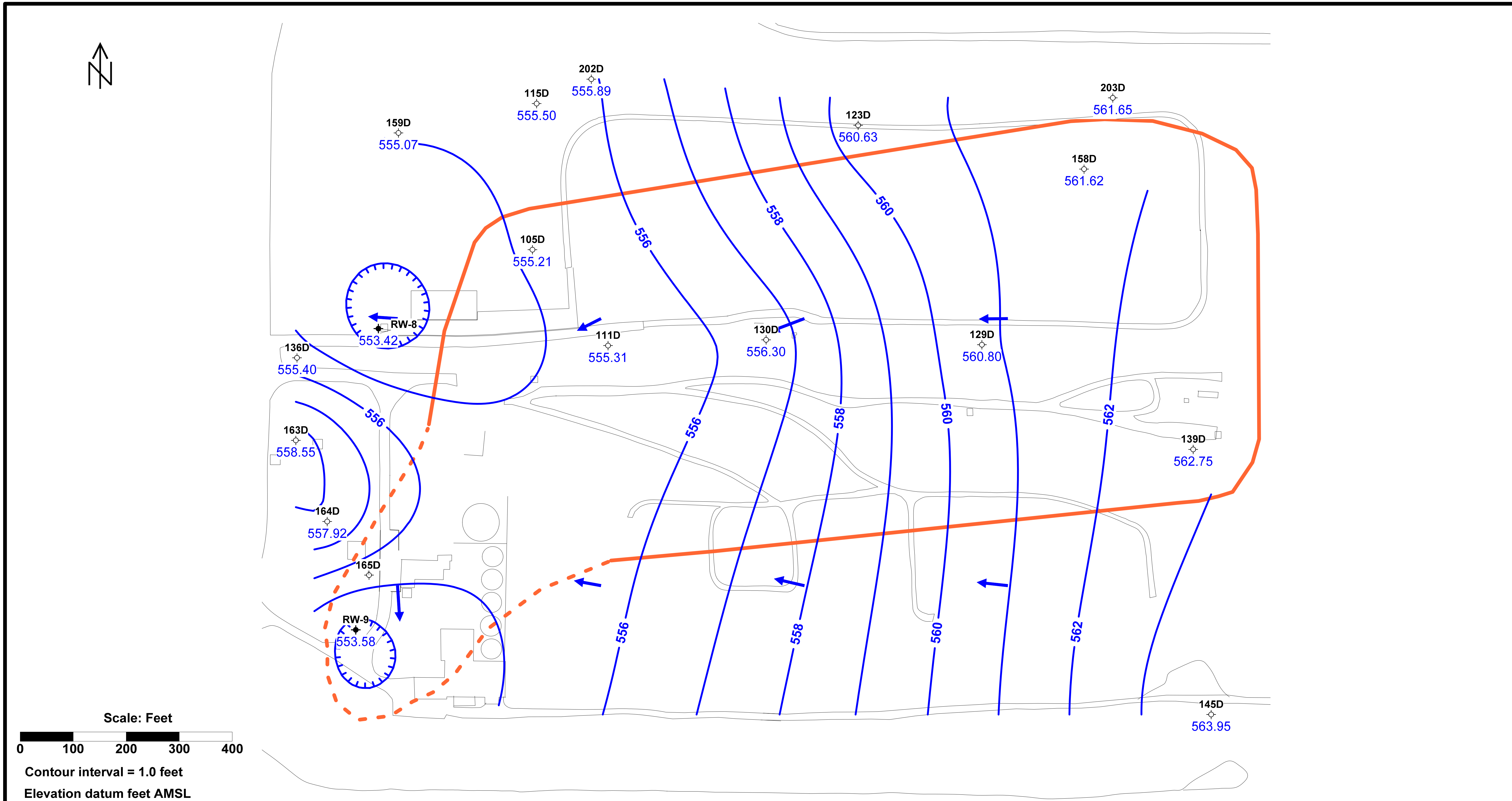
\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2022-11-09 NEC Contour Tool\2022-11-09 - PZ B - F5.srf



Wells 149C and 151C are outside the area shown, but were used in the contouring.
The water levels for 129C and D-10 were erroneously high and were not used in the contouring.
Well 105C was dry on 11/09/2022.

PARSONS 40 La Riviere Dr, Suite 122 Buffalo, NY 14202 (716) 541-0730	Created by: RBP — Date: 01/06/23 Checked by: JWS — Date: 01/10/23 Project Manager: EAF — Date: 01/10/23 Job number: 453196.03000	**LEGEND** 3B Well ID Monitoring Well Pumping Well Potentiometric Contour Structure Road Source Area Extent	**Figure 3-11** **Potentiometric Surface Map** **Chemours Necco Park: C-Zone** **November 09, 2022**

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2022-11-09 NEC Contour Tool\2022-11-09 - PZ C - F7.srf



Contour interval = 1.0 feet

Elevation datum feet AMSL

Well 148D located downgradient was not used in the interpolation.
Wells 149D and 165D were not used in the contour interpolation.

PARSONS
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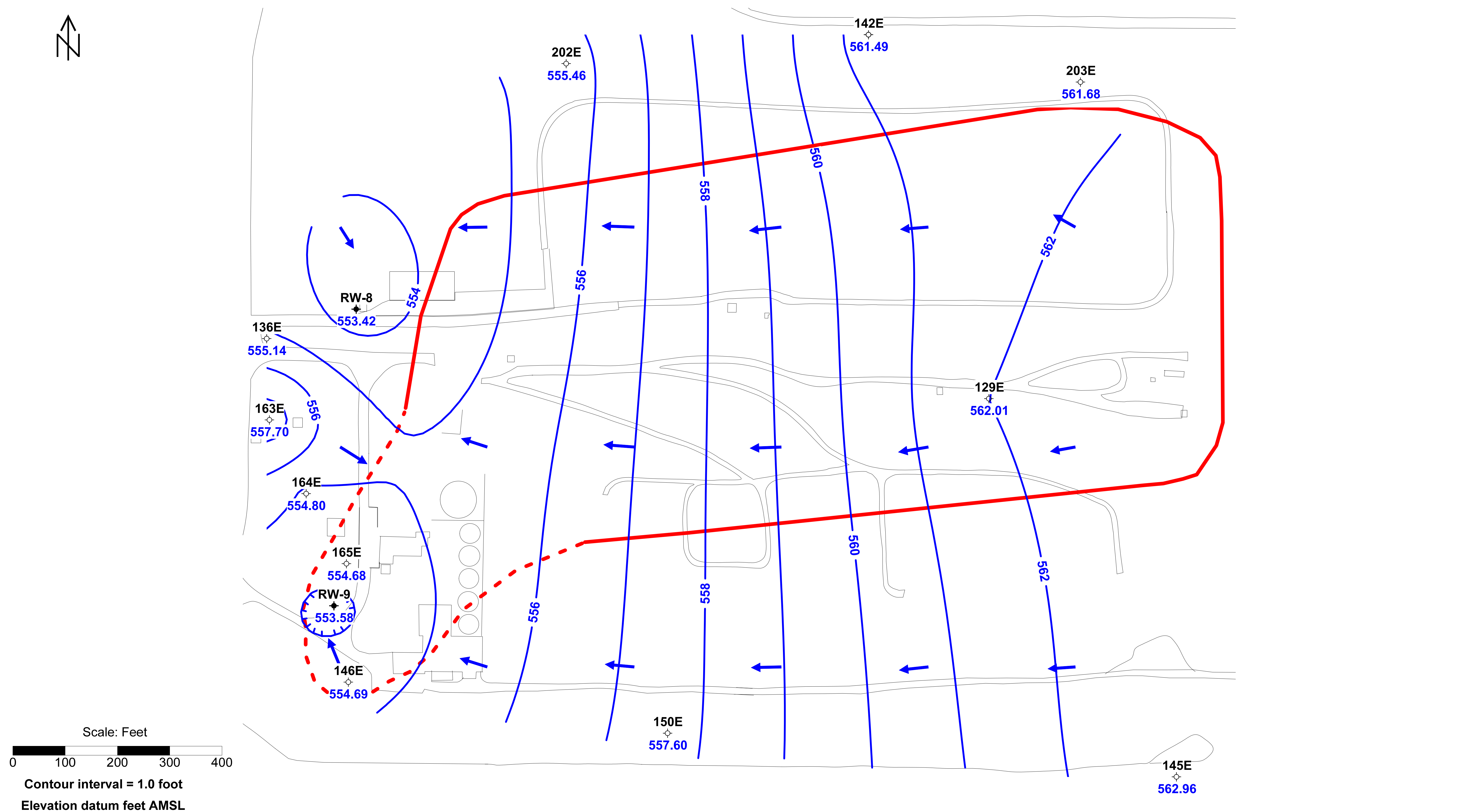
Project Manager: EAF	Date: 01/10/23
Job number: 453196.03000	

LEGEND

- 3B Well ID
- Monitoring Well
- Pumping Well
- Potentiometric Contour
- Structure
- Road
- Source Area Extent

Figure 3-12
Potentiometric Surface Map
Chemours Necco Park: D-Zone
November 09, 2022

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2022-11-09 NEC Contour Tool\2022-11-09 - PZ D - F9.srf



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Project Manager: EAF	Date: 01/10/23

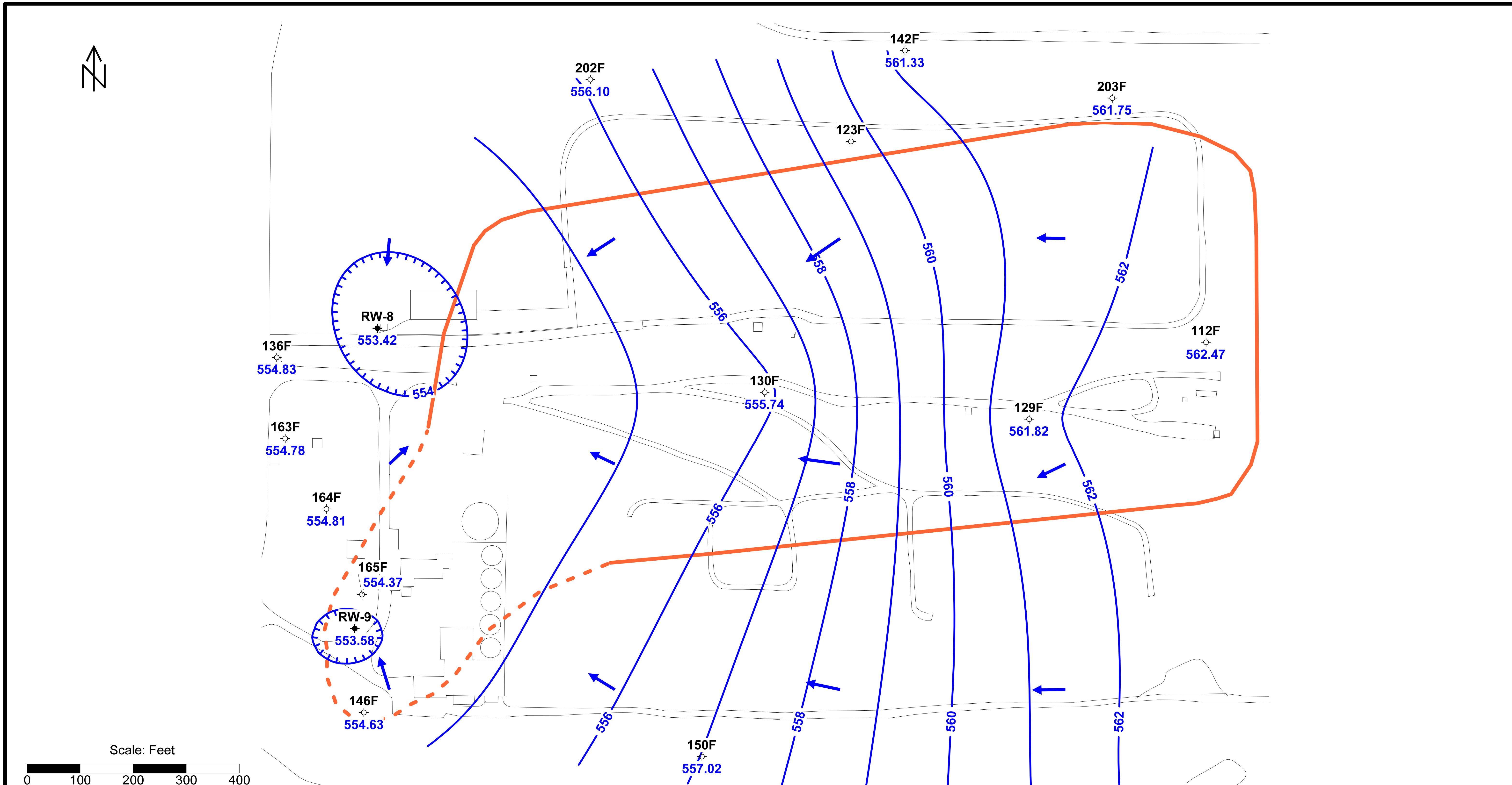
Job number: 453196.03000

LEGEND

3B	Well ID	Potentiometric Contour	Source Area Extent
	Monitoring Well	Structure	
	Pumping Well	Road	

Figure 3-13
Potentiometric Surface Map
Chemours Necco Park: E-Zone
November 09, 2022

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2022-11-09 NEC Contour Tool\2022-11-09 - PZ E - F11.srf



Contour interval = 1.0 foot
Elevation datum feet AMSL
148F located downgradient was not used in the interpolation.
Well 123F was not used in the contour interpolation.

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Checked by: JWS	Date: 01/10/23
Project Manager: EAF	Date: 01/10/23
Job number: 453196.03000	

LEGEND

3B Well ID	Potentiometric Contour	Source Area Extent	
Monitoring Well	Structure		
Pumping Well	Road		

Figure 3-14
Potentiometric Surface Map
Chemours Necco Park: F-Zone
November 09, 2022

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2022-11-09 NEC Contour Tool\2022-11-09 - PZ F - F13.srf

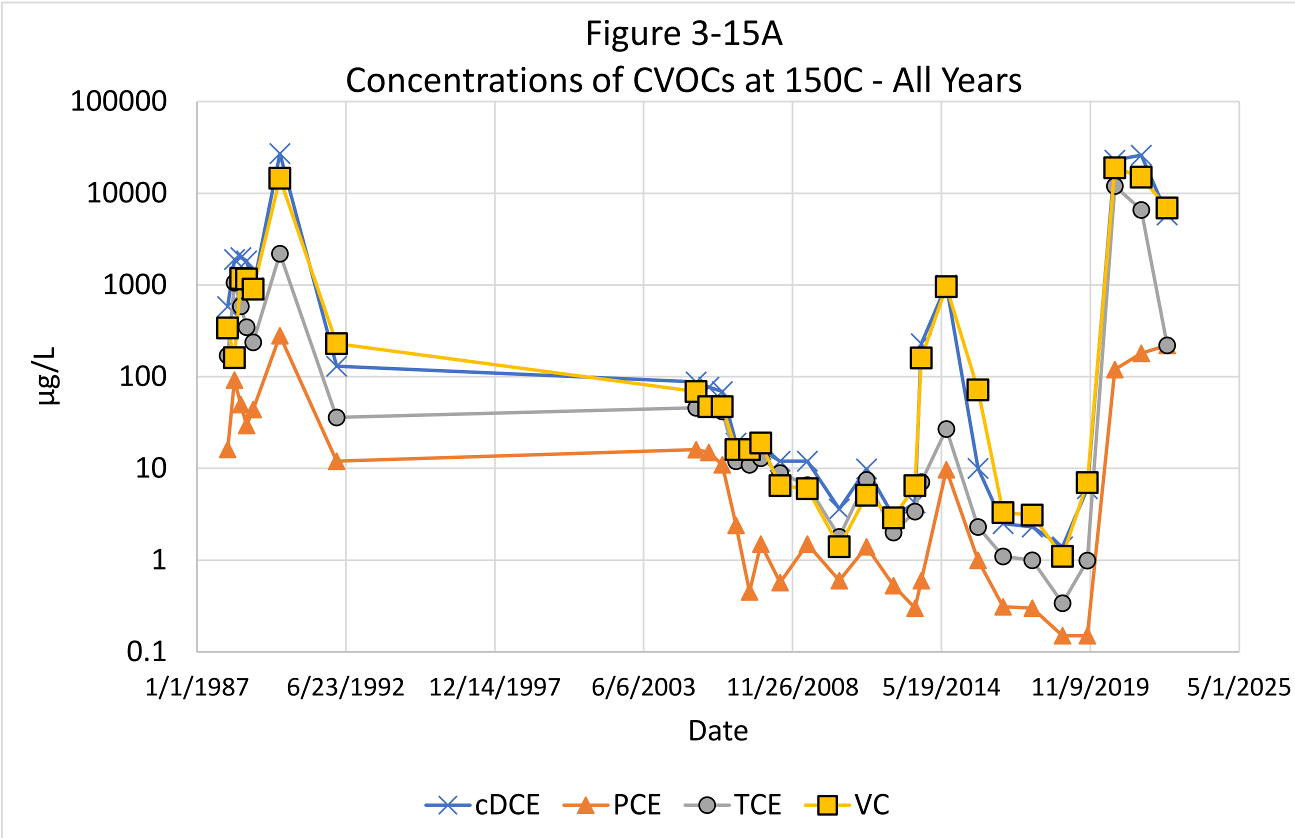


Figure 3-15A
Concentrations of CVOCs at 150C - All Years
100000
10000
1000
100
10
1
0.1
µg/L
1/1/1987
6/23/1992
12/14/1997
6/6/2003
11/26/2008
5/19/2014
11/9/2019
5/1/2025
Date
cDCE
PCE
TCE
VC

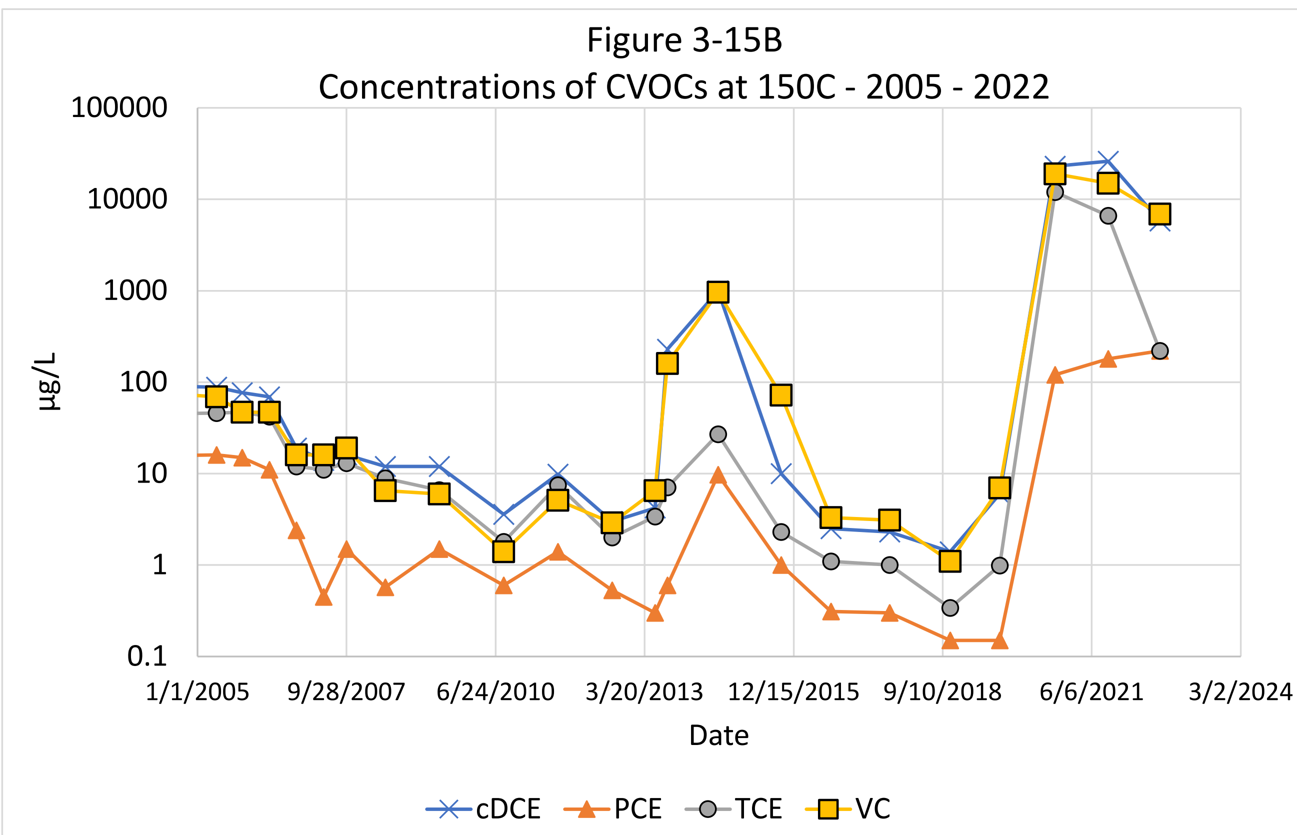


Figure 3-15B
Concentrations of CVOCs at 150C - 2005 - 2022
100000
10000
1000
100
10
1
0.1
µg/L
1/1/2005
9/28/2007
6/24/2010
3/20/2013
12/15/2015
9/10/2018
6/6/2021
3/2/2024
Date
cDCE
PCE
TCE
VC

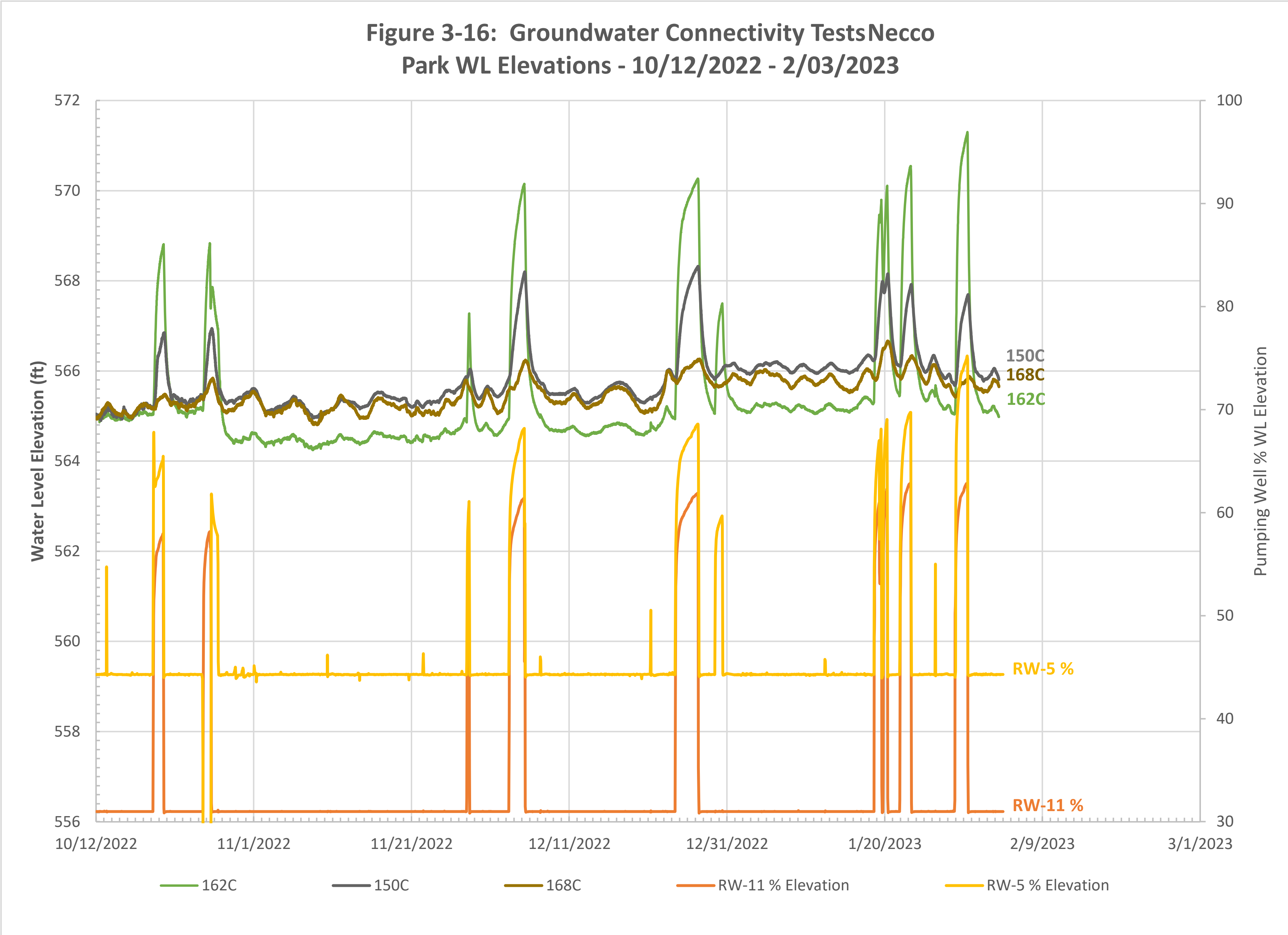


Figure 3-16: Groundwater Connectivity TestsNecco
Park WL Elevations - 10/12/2022 - 2/03/2023
Water Level Elevation (ft)
Pumping Well % WL Elevation
572
570
568
566
564
562
560
558
556
100
90
80
70
60
50
40
30
10/12/2022
11/1/2022
11/21/2022
12/11/2022
12/31/2022
1/20/2023
2/9/2023
3/1/2023
150C
168C
162C
RW-5 %
RW-11 %
162C
150C
168C
RW-11 % Elevation
RW-5 % Elevation

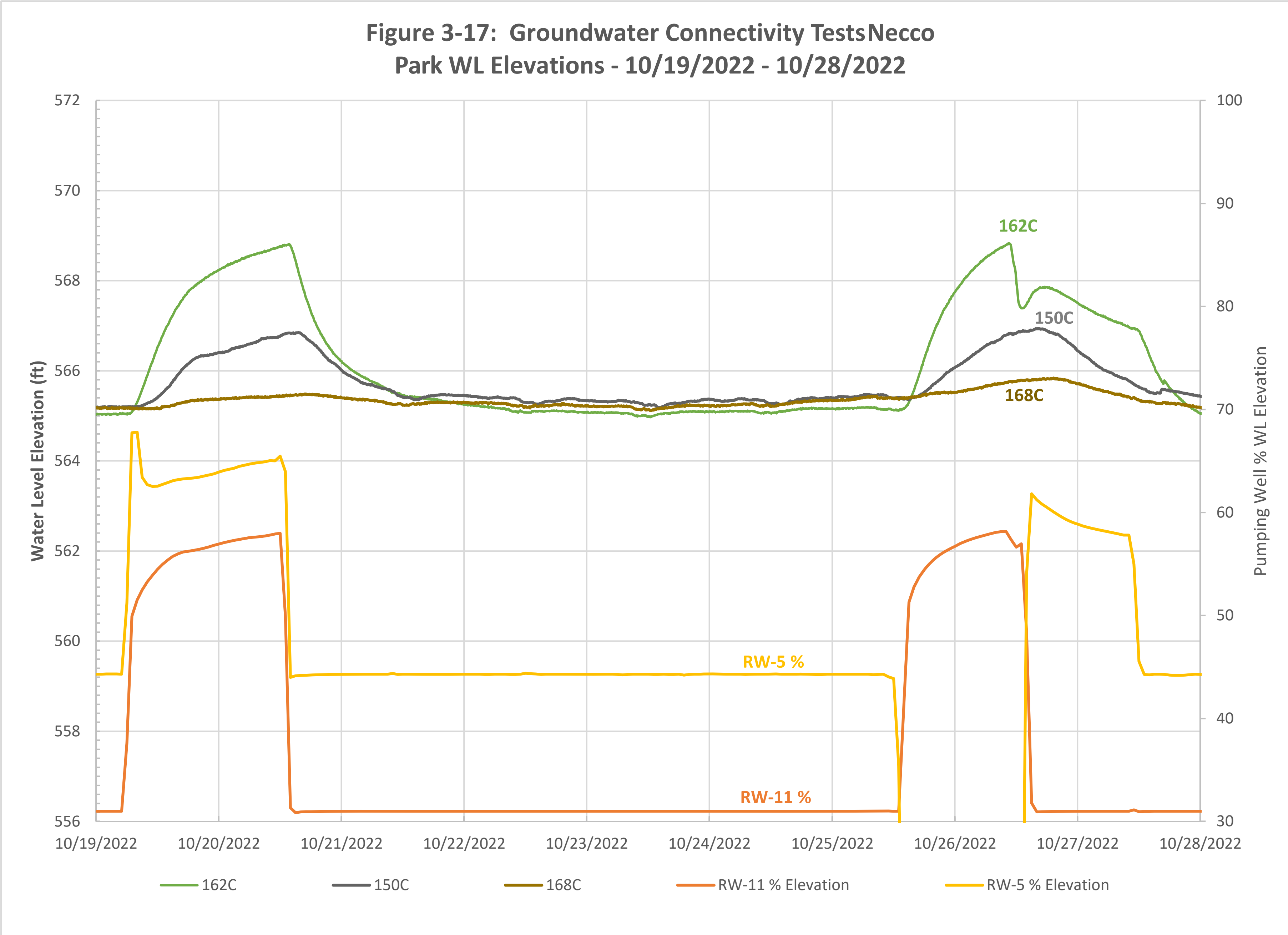
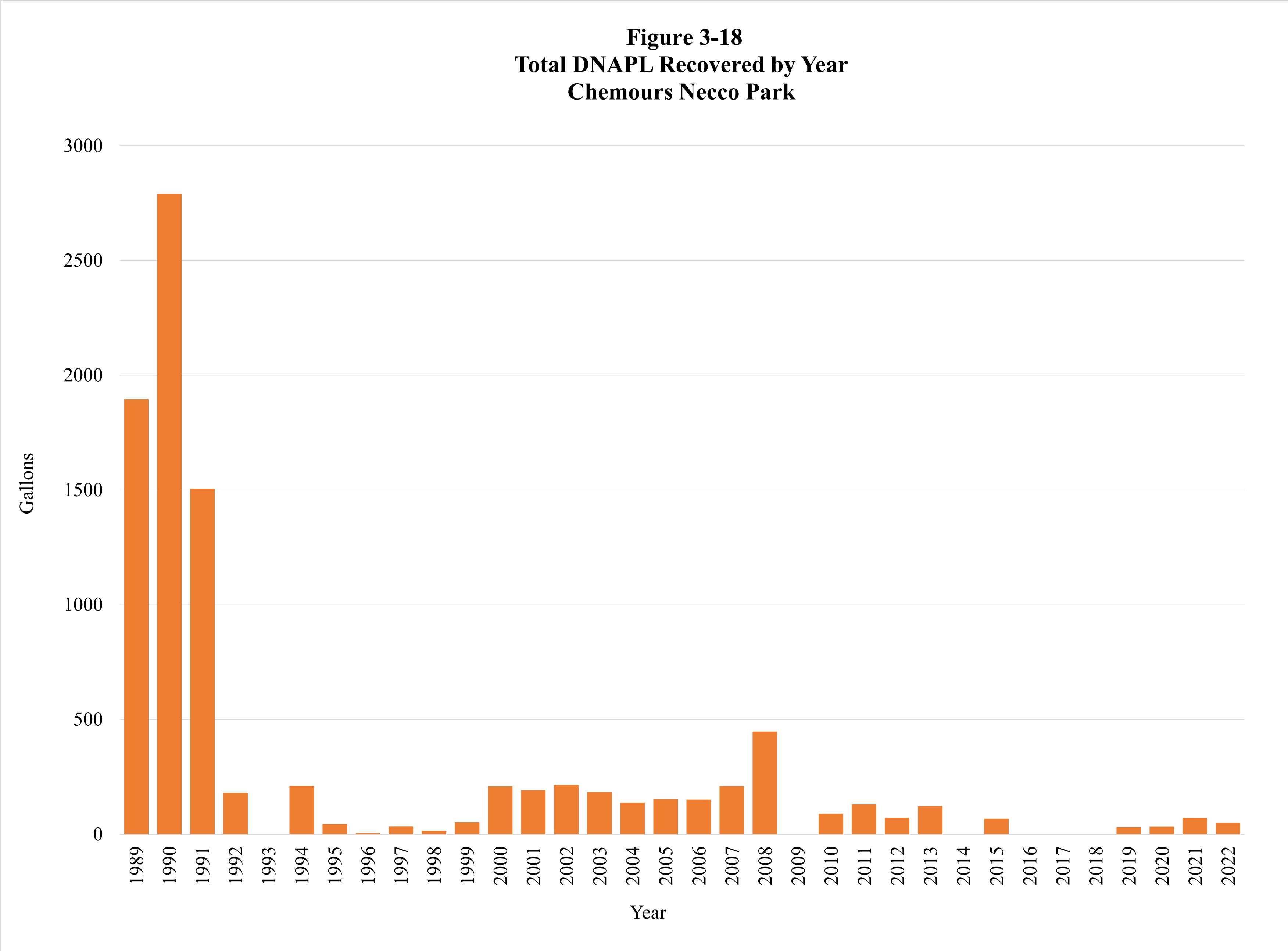


Figure 3-17: Groundwater Connectivity TestsNecco
Park WL Elevations - 10/19/2022 - 10/28/2022
Water Level Elevation (ft)
Pumping Well % WL Elevation
572
570
568
566
564
562
560
558
556
100
90
80
70
60
50
40
30
10/19/2022
10/20/2022
10/21/2022
10/22/2022
10/23/2022
10/24/2022
10/25/2022
10/26/2022
10/27/2022
10/28/2022
162C
150C
168C
RW-5 %
RW-11 %
162C
150C
168C
RW-11 % Elevation
RW-5 % Elevation



\\NYBUF03FS01\Dupont\Necco\DNAPL Reports and program\NECCO DNAPL totals_updated through 2022.xlsx

APPENDIX A
2022 ANNUAL GROUNDWATER SAMPLING RESULTS

APPENDIX A
2022 Analytical Results - Monitoring Wells

Method	Parameter Name	Location / Date / Units	136B 08/26/2022 FS	136D 08/26/2022 FS	136D 08/26/2022 DUP	136F 08/26/2022 FS	137A 08/31/2022 FS	137B 08/31/2022 FS	137B 08/31/2022 DUP	145A 08/29/2022 FS	145B 09/07/2022 FS	145C 09/02/2022 FS
	Field Parameters											
	DEPTH TO WATER	Feet	8.61	25.56	25.56	25.51	7.79	8.31	8.31	9.25	30.53	9.65
	COLOR	NONE	clear	Clear	Clear	lightbrown	clear	clear	clear	clear	--	Dark Gray
	DISSOLVED OXYGEN	MG/L	0	0	0	0	0	0	0	0	24.3	9.27
	ODOR	NONE	none	none	none	none	none	none	none	none	--	Weak
	OXIDATION REDUCTION POTENTIAL	MV	-218	-206	-206	-204	-254	-308	-308	-285	-149	-113
	PH	STD UNITS	7.99	6.94	6.94	7.15	12.2	12.55	12.55	6.61	7.14	6.86
	SPECIFIC CONDUCTANCE	UMHOS/CM	1910.00	1360.00	1360.00	1230.00	2510.00	5850.00	5850.00	6940.00	12700	4730.00
	TEMPERATURE	DEGREES C	16.73	14.67	14.67	14.4	20.7	19.35	19.35	18.29	15.68	19.89
	TURBIDITY QUANTITATIVE	NTU	9.1	6.78	6.78	8.44	0.82	2.1	2.1	1.02	87.5	0
	Volatile Organics											
8260C	1,1,2,2-Tetrachloroethane	UG/L	<6	<0.6	<0.6	<0.6	<0.6	<2.4	<1.5	<0.6	<60	<2.4
8260C	1,1,2-Trichloroethane	UG/L	<4.8	<0.48	<0.48	<0.48	<0.48	<1.9	<1.2	<0.48	<48	3.8 J
8260C	1,1-Dichloroethene	UG/L	<4.9	0.53 J	0.77 J	<0.49	2.4	8.3	7.8	<0.49	<49	4.2
8260C	1,2-Dichloroethane	UG/L	<2.1	0.48 J	0.77 J	4.7	0.59 J	2.6 J	2.3 J	<0.21	<21	2.3 J
8260C	Carbon Tetrachloride	UG/L	<2.6	<0.26	<0.26	<0.26	<0.26	<1	<0.65	<0.26	<26	<1
8260C	Chloroform	UG/L	<4.7	<0.47	<0.47	<0.47	1.4	<1.9	<1.2	<0.47	<47	4.3
8260C	cis-1,2 Dichloroethene	UG/L	300	18	22	0.91 J	21	98	93	0.52 J	1400	480
8260C	Tetrachloroethene	UG/L	300	<0.44	<0.44	<0.44	22	60	59	<0.44	<44	<1.8
8260C	trans-1,2-Dichloroethene	UG/L	<5.1	0.76 J	0.77 J	<0.51	1.5	7.1	7.1	<0.51	240	77
8260C	Trichloroethene	UG/L	70	1.9	1.6	<0.44	24	96	94	<0.44	<44	8.8
8260C	Vinyl Chloride	UG/L	44	19	26	1.6	7.9	59	55	0.61 J	470	400
	Total VOC	UG/L	714	40.67	51.91	7.21	80.79	331	318.2	1.13	2110	980.4
	Semi-Volatile Organics											
8270D	2,4,5-Trichlorophenol	UG/L	570	<1.9	<1.9	<2	<2	6.7 J	6.6 J	<1.9	<2.1 UJ	<1.9
8270D	2,4,6-Trichlorophenol	UG/L	64 J	<1.7	<1.7	<1.8	<1.8	<1.7	<1.7	<1.7	<1.9 UJ	<1.7
8270D	3- And 4- Methylphenol	UG/L	<1.3	<0.18	<0.18	<0.19	2.4 J	13 J	13 J	<0.18	1.1 J	1.7 J
8270D	Hexachlorobenzene	UG/L	<1.1	<0.15	<0.15	<0.16	<0.16	<0.15	<0.16	<0.15	<0.17 UJ	<0.15
8270D	Hexachlorobutadiene	UG/L	<3.6	<0.52	<0.52	<0.54	0.79 J	3.5 J	3.3 J	<0.52	<0.57 UJ	0.94 J
8270D	Hexachloroethane	UG/L	<2.6	<0.38	<0.38	<0.4	<0.4	<0.38	<0.38	<0.38	<0.41 UJ	<0.38
8270D	Pentachlorophenol	UG/L	630 J	<3	<3	<3.1	<3.1	3.2 J	3.8 J	<3	<3.2 UJ	<3
8270D	Phenol	UG/L	<0.85	<0.12	<0.12	<0.13	13	39	39	<0.12	0.37 J	0.32 J
8270D	Tentativley Identified Compound	UG/L	1.4 J	--	--	--	4.2 J	13 J	13 J	--	170 J	110 J
	Inorganics											
6010C	Barium, dissolved	MG/L	0.065 J	0.04 J	0.041 J	0.034 J	0.99	2.7	2.4	0.081 J	0.019 J	0.026 J
300	Chloride, total	MG/L	140	180	180	170	120	490	490	2000	3700	1400

< Non detect at stated reporting limit.

J Estimated concentration.

UJ Undetected-estimated reporting limit.

APPENDIX A
2022 Analytical Results - Monitoring Wells

Method	Parameter Name	Location / Date / Units	145D	146AR	146B	146C	146E	146F	148D	150A	150B	150C
		Date	09/02/2022	08/30/2022	08/29/2022	08/31/2022	08/26/2022	08/26/2022	08/31/2022	08/29/2022	08/29/2022	09/06/2022
		Units	FS	FS	FS	FS	FS	FS	FS	FS	FS	FS
	Field Parameters											
	DEPTH TO WATER	Feet	31.42	7.68	6.85	21.39	21.15	21.04	11.19	6.49	6.23	18.38
	COLOR	NONE	Black	clear	clear	lightbrown	clear	Black	clear	gray	clear	Clear
	DISSOLVED OXYGEN	MG/L	8.93	0	0	0	6.95	0	0	0	0	0
	ODOR	NONE	strong	none	none	none	weak	strong	weak	none	none	strong
	OXIDATION REDUCTION POTENTIAL	MV	-248	-194	-292	47	-336	-354	-392	-80	-349	-387
	PH	STD UNITS	6.89	8.47	11.35	6.14	6.89	6.31	11.23	6.96	11.69	6.84
	SPECIFIC CONDUCTANCE	UMHOS/CM	21900.0	672.000	872.000	1670.00	3850.00	13600.0	2090.00	2030.00	2350.00	11500.0
	TEMPERATURE	DEGREES C	18.89	17.57	19.85	18.46	15.33	15.04	16.37	22.08	14.73	14.36
	TURBIDITY QUANTITATIVE	NTU	0	3.67	1.6	15.5	0.92	2.53	1.9	18.1	1.14	3.98
	Volatile Organics											
8260C	1,1,2,2-Tetrachloroethane	UG/L	<2	<0.6	<0.6	<0.6	<2.4	<120	<0.6	<0.6	<2.4	<300
8260C	1,1,2-Trichloroethane	UG/L	13	<0.48	<0.48	<0.48	2.9 J	<96	<0.48	<0.48	<1.9	<240
8260C	1,1-Dichloroethene	UG/L	6.4	<0.49	5.3	<0.49	16	400	<0.49	<0.49	4	<250
8260C	1,2-Dichloroethane	UG/L	<0.7	0.24 J	<0.21	<0.21	13	<42	<0.21	<0.21	1.1 J	<110
8260C	Carbon Tetrachloride	UG/L	<0.87	<0.26	<0.26	<0.26	<1	<52	<0.26	<0.26	<1	<130
8260C	Chloroform	UG/L	37	0.5 J	<0.47	<0.47	31	<94	<0.47	<0.47	<1.9	<240
8260C	cis-1,2 Dichloroethene	UG/L	170	1.4	20	5.3	110	6500	1.6	<0.46	120	5800
8260C	Tetrachloroethene	UG/L	<1.5	0.99 J	<0.44	<0.44	<1.8	<88	0.63 J	<0.44	5.6	<220
8260C	trans-1,2-Dichloroethene	UG/L	64	<0.51	1.3	<0.51	65	360	<0.51	<0.51	5.7	410 J
8260C	Trichloroethene	UG/L	26	2	2.6	<0.44	30	170 J	1.3	<0.44	17	<220
8260C	Vinyl Chloride	UG/L	86	<0.45	8.9	12	470	2000	<0.45	<0.45	33	6900
	Total VOC	UG/L	402.4	5.13	38.1	17.3	737.9	9430	3.53	0	186.4	13110
	Semi-Volatile Organics											
8270D	2,4,5-Trichlorophenol	UG/L	<1.9	<1.9	18	<2	<4.1	140	<2	<1.9	13	<21
8270D	2,4,6-Trichlorophenol	UG/L	<1.7	<1.7	4.6 J	<1.8	<3.7	47 J	<1.8	<1.7	2.8 J	<19
8270D	3- And 4- Methylphenol	UG/L	2.9 J	<0.18	3.8 J	0.22 J	3.4 J	41 J	38	<0.18	9.4 J	53 J
8270D	Hexachlorobenzene	UG/L	<0.15	<0.15	<0.15	<0.16	<0.33	<0.77	<0.16	<0.15	<0.15	<1.7
8270D	Hexachlorobutadiene	UG/L	<0.52	<0.52	<0.52	<0.54	<1.1	<2.6	<0.54	<0.52	<0.52	<5.7
8270D	Hexachloroethane	UG/L	<0.38	<0.38	<0.38	<0.4	<0.81	<1.9	<0.4	<0.38	<0.38	<4.1
8270D	Pentachlorophenol	UG/L	<3	<3	36 J	<3.1	<6.3	<15	<3.1	<3	13 J	<32
8270D	Phenol	UG/L	3.7 J	<0.12	<0.12	<0.13	<0.26	99	3.9 J	<0.12	29	24 J
8270D	Tentativley Identified Compound	UG/L	220 J	--	2.1 J	--	88 J	1800 J	--	--	23 J	1400 J
	Inorganics											
6010C	Barium, dissolved	MG/L	0.057 J	0.035 J	0.015 J	0.025 J	0.049 J	0.036 J	0.038 J	0.048 J	0.53	0.088 J
300	Chloride, total	MG/L	7900	90	160	160	510	4200	490	150	470	3500

< Non detect at stated reporting limit.

J Estimated concentration.

UJ Undetected-estimated reporting limit.

APPENDIX A
2022 Analytical Results - Monitoring Wells

Method	Parameter Name	Location Date Units	150E 09/06/2022 FS	150F 09/02/2022 FS	165D 09/02/2022 FS	165E 08/30/2022 FS	168B 09/02/2022 FS	168C 09/02/2022 FS	171B 08/30/2022 FS	172B 08/29/2022 FS	EB 09/02/2022 EB	EB 09/02/2022 EB
	Field Parameters											
	DEPTH TO WATER	Feet	23.84	61.06	21.84	22.69	10.39	15.92	10.8	9.99	--	--
	COLOR	NONE	Black	Dark Gray	Dark Gray	Black	dark gray	dark gray	Black	Clear	--	--
	DISSOLVED OXYGEN	MG/L	11.63	9.43	8.39	0	10.06	8.66	0	3.83	--	--
	ODOR	NONE	strong	strong	Moderate	moderate	strong	strong	moderate	none	--	--
	OXIDATION REDUCTION POTENTIAL	MV	-363	-314	-197	-335	-292	-283	-341	-298	--	--
	PH	STD UNITS	6.21	6.29	7.7	6.94	6.31	6.13	6.44	6.38	--	--
	SPECIFIC CONDUCTANCE	UMHOS/CM	22800.0	23800.0	1910.00	2300.0	31600.0	46800.0	13300.0	9940.00	--	--
	TEMPERATURE	DEGREES C	16.72	22.27	20.23	15.22	18.15	18.26	15.88	15.94	--	--
	TURBIDITY QUANTITATIVE	NTU	2.71	664 AU	4.57	75	5.41	3.94	0.92	1.47	--	--
	Volatile Organics											
8260C	1,1,2,2-Tetrachloroethane	UG/L	<12	<6	73	360	<300	4900	140	1400	<0.6	<0.6
8260C	1,1,2-Trichloroethane	UG/L	<9.6	<4.8	37 J	270	<240	3300	9	55	<0.48	<0.48
8260C	1,1-Dichloroethene	UG/L	94	26	25 J	75 J	<250	400 J	<2.5	<20	<0.49	<0.49
8260C	1,2-Dichloroethane	UG/L	<4.2	<2.1	<11	59 J	<110	<110	<1.1	<8.4	<0.21	<0.21
8260C	Carbon Tetrachloride	UG/L	<5.2	<2.6	<13	56 J	<130	4000	11	67	<0.26	<0.26
8260C	Chloroform	UG/L	80	19	100	100	<240	5100	51	250	<0.47	<0.47
8260C	cis-1,2 Dichloroethene	UG/L	1400	550	1100	4800	12000	710	83	1300	<0.46	<0.46
8260C	Tetrachloroethene	UG/L	<8.8	<4.4	<22	<44	<220	1500	180	280	<0.44	<0.44
8260C	trans-1,2-Dichloroethene	UG/L	110	30	<26	210	710	<260	68	140	<0.51	<0.51
8260C	Trichloroethene	UG/L	160	13	81	180	260 J	11000	210	640	<0.44	<0.44
8260C	Vinyl Chloride	UG/L	860	87	350	2800	8600	<230	40	210	<0.45	<0.45
	Total VOC	UG/L	2704	725	1766	8910	21570	30910	792	4342	0	0
	Semi-Volatile Organics											
8270D	2,4,5-Trichlorophenol	UG/L	<13	<19	63	490	<9.9	<10	<2	<9.5	<2 R	<2.1 R
8270D	2,4,6-Trichlorophenol	UG/L	<12	<17	8.9 J	<35	<9	<9.1	<1.8	<8.6	<1.8 R	<1.9 R
8270D	3- And 4- Methylphenol	UG/L	33 J	14 J	2.2 J	6.6 J	120	4.6 J	<0.19	0.97 J	<0.19 R	<0.2 R
8270D	Hexachlorobenzene	UG/L	<1.1	<1.5	<0.31	<3.2	<0.81	2.1 J	<0.16	<0.77	<0.16 R	<0.17 R
8270D	Hexachlorobutadiene	UG/L	<3.5	<5.2	1.3 J	50 J	<2.7	150	<0.54	110	<0.54 R	<0.57 R
8270D	Hexachloroethane	UG/L	<2.6	<3.8	<0.75	<7.7	<2	56 J	<0.4	45 J	<0.39 R	<0.42 R
8270D	Pentachlorophenol	UG/L	<20	<30	<5.9	<61	<16	<16	<3.1	<15	<3.1 R	<3.3 R
8270D	Phenol	UG/L	160	58 J	0.7 J	<2.5	58	20 J	<0.13	<0.61	<0.13 R	<0.13 R
8270D	Tentativley Identified Compound	UG/L	3200 J	2100 J	32 J	69 J	2500 J	2100 J	--	34 J	--	--
	Inorganics											
6010C	Barium, dissolved	MG/L	0.38	0.074 J	0.028 J	0.074 J	0.67	0.17 J	0.03 J	0.02 J	0.0086 J	0.011 J
300	Chloride, total	MG/L	8200	8400	290	410	13000	20000	3900	2800	0.44 J	<0.28

< Non detect at stated reporting limit.

J Estimated concentration.

UJ Undetected-estimated reporting limit.

APPENDIX A
2022 Analytical Results - Monitoring Wells

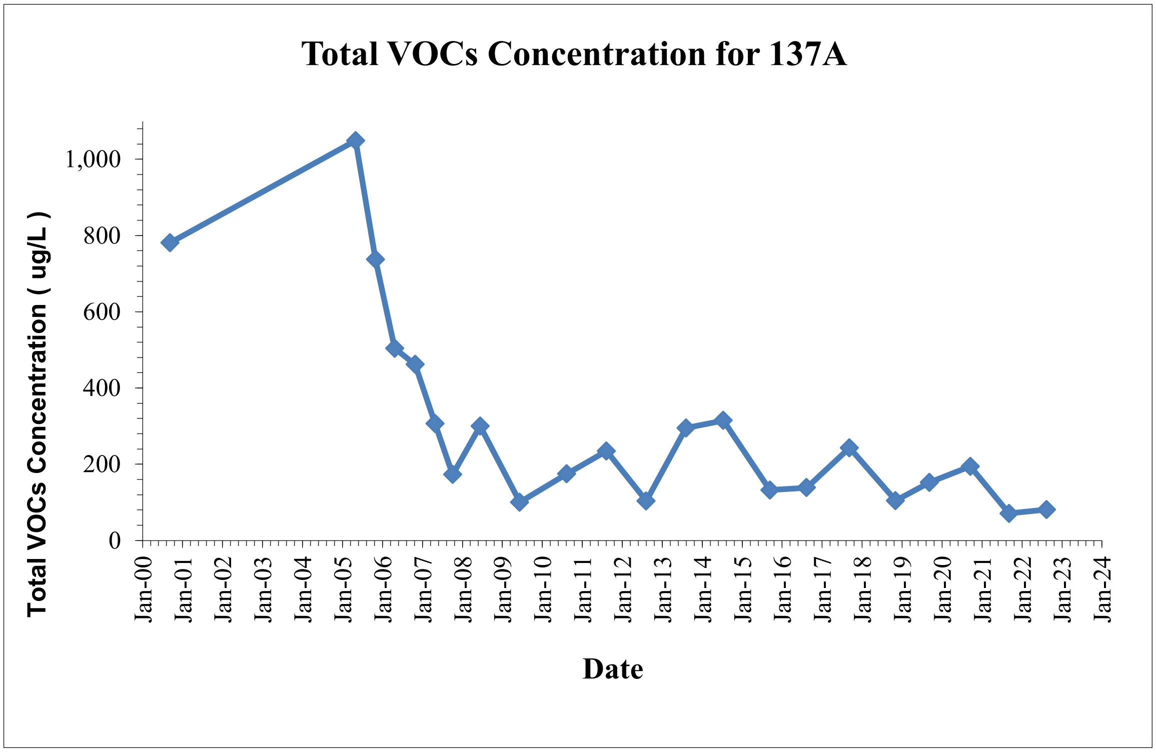
Method	Parameter Name	Location Date Units	TB 08/26/2022 TB	TB 08/29/2022 TB	TB 08/30/2022 TB	TB 08/31/2022 TB	TB 09/02/2022 TB	TB 09/06/2022 TB	TB 09/07/2022 TB
	Field Parameters								
	DEPTH TO WATER	Feet	--	--	--	--	--	--	--
	COLOR	NONE	--	--	--	--	--	--	--
	DISSOLVED OXYGEN	MG/L	--	--	--	--	--	--	--
	ODOR	NONE	--	--	--	--	--	--	--
	OXIDATION REDUCTION POTENTIAL	MV	--	--	--	--	--	--	--
	PH	STD UNITS	--	--	--	--	--	--	--
	SPECIFIC CONDUCTANCE	UMHOS/CM	--	--	--	--	--	--	--
	TEMPERATURE	DEGREES C	--	--	--	--	--	--	--
	TURBIDITY QUANTITATIVE	NTU	--	--	--	--	--	--	--
	Volatile Organics								
8260C	1,1,2,2-Tetrachloroethane	UG/L	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
8260C	1,1,2-Trichloroethane	UG/L	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48	<0.48
8260C	1,1-Dichloroethene	UG/L	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49
8260C	1,2-Dichloroethane	UG/L	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21	<0.21
8260C	Carbon Tetrachloride	UG/L	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
8260C	Chloroform	UG/L	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47
8260C	cis-1,2 Dichloroethene	UG/L	<0.46	<0.46	<0.46	<0.46	<0.46	0.48 J	<0.46
8260C	Tetrachloroethene	UG/L	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44
8260C	trans-1,2-Dichloroethene	UG/L	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51
8260C	Trichloroethene	UG/L	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44
8260C	Vinyl Chloride	UG/L	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45	<0.45
	Total VOC	UG/L	0	0	0	0	0	0	0
	Semi-Volatile Organics								
8270D	2,4,5-Trichlorophenol	UG/L	--	--	--	--	--	--	--
8270D	2,4,6-Trichlorophenol	UG/L	--	--	--	--	--	--	--
8270D	3- And 4- Methylphenol	UG/L	--	--	--	--	--	--	--
8270D	Hexachlorobenzene	UG/L	--	--	--	--	--	--	--
8270D	Hexachlorobutadiene	UG/L	--	--	--	--	--	--	--
8270D	Hexachloroethane	UG/L	--	--	--	--	--	--	--
8270D	Pentachlorophenol	UG/L	--	--	--	--	--	--	--
8270D	Phenol	UG/L	--	--	--	--	--	--	--
8270D	Tentativley Identified Compound	UG/L	--	--	--	--	--	--	--
	Inorganics								
6010C	Barium, dissolved	MG/L	--	--	--	--	--	--	--
300	Chloride, total	MG/L	--	--	--	--	--	--	--

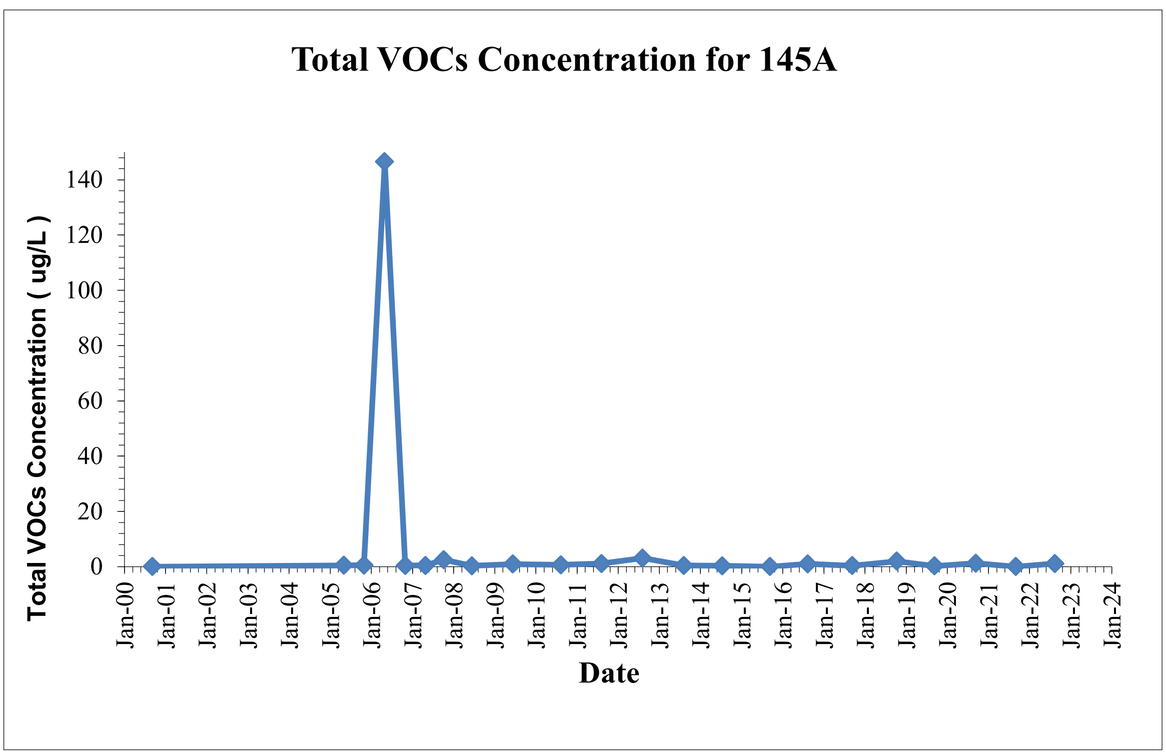
< Non detect at stated reporting limit.

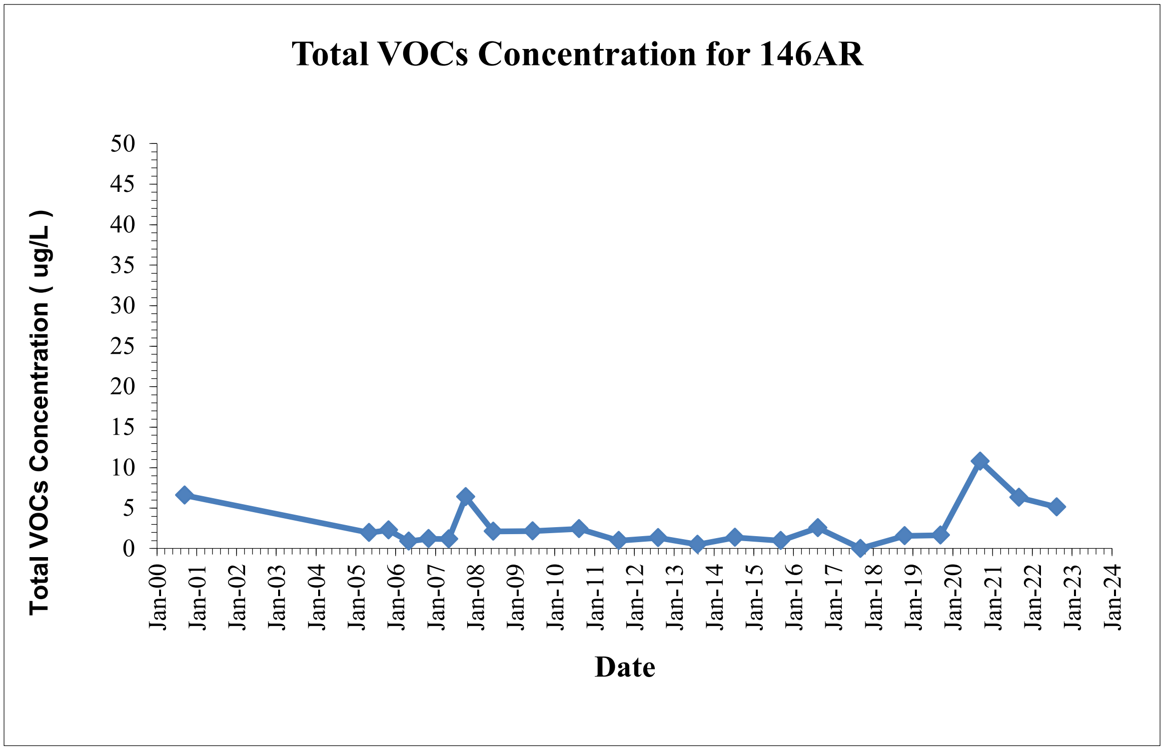
J Estimated concentration.

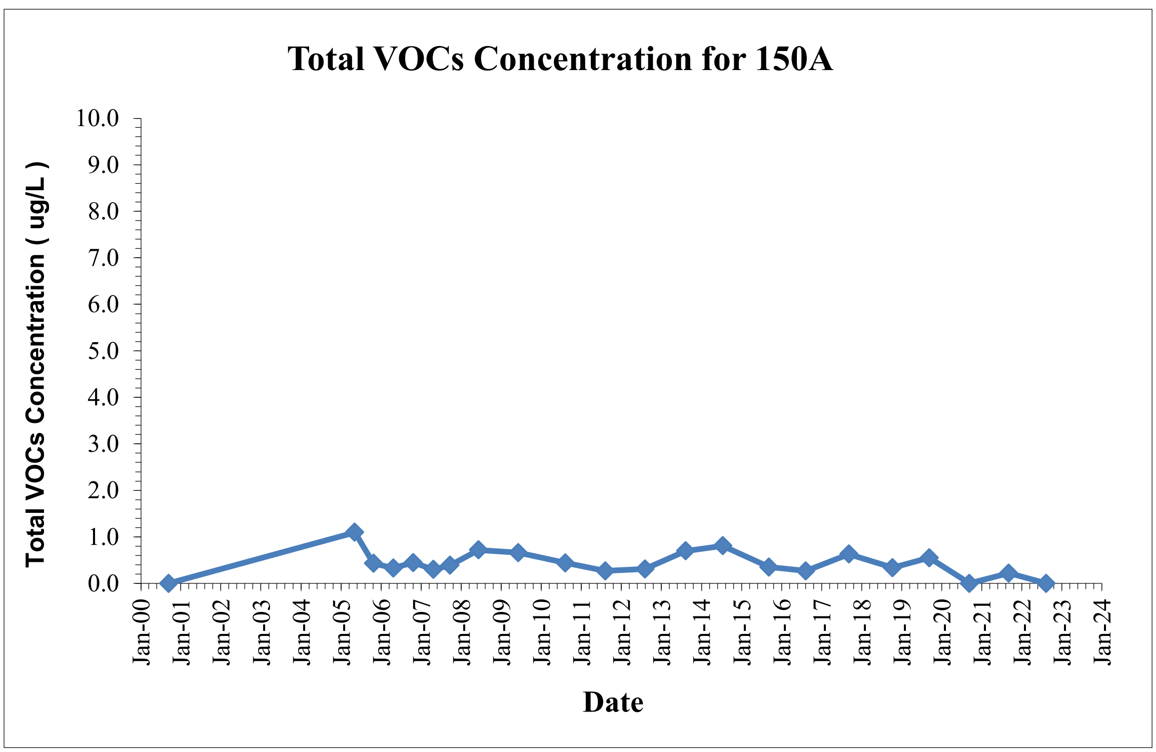
UJ Undetected-estimated reporting limit.

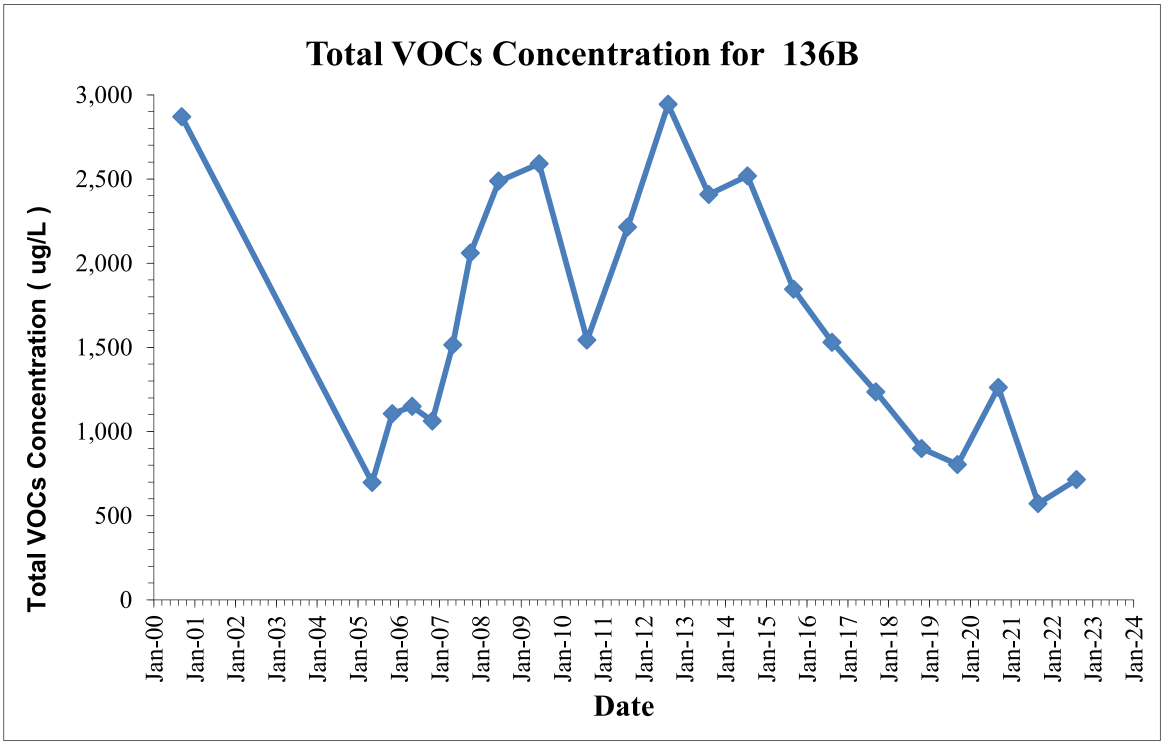
APPENDIX B
TVOC TREND PLOTS

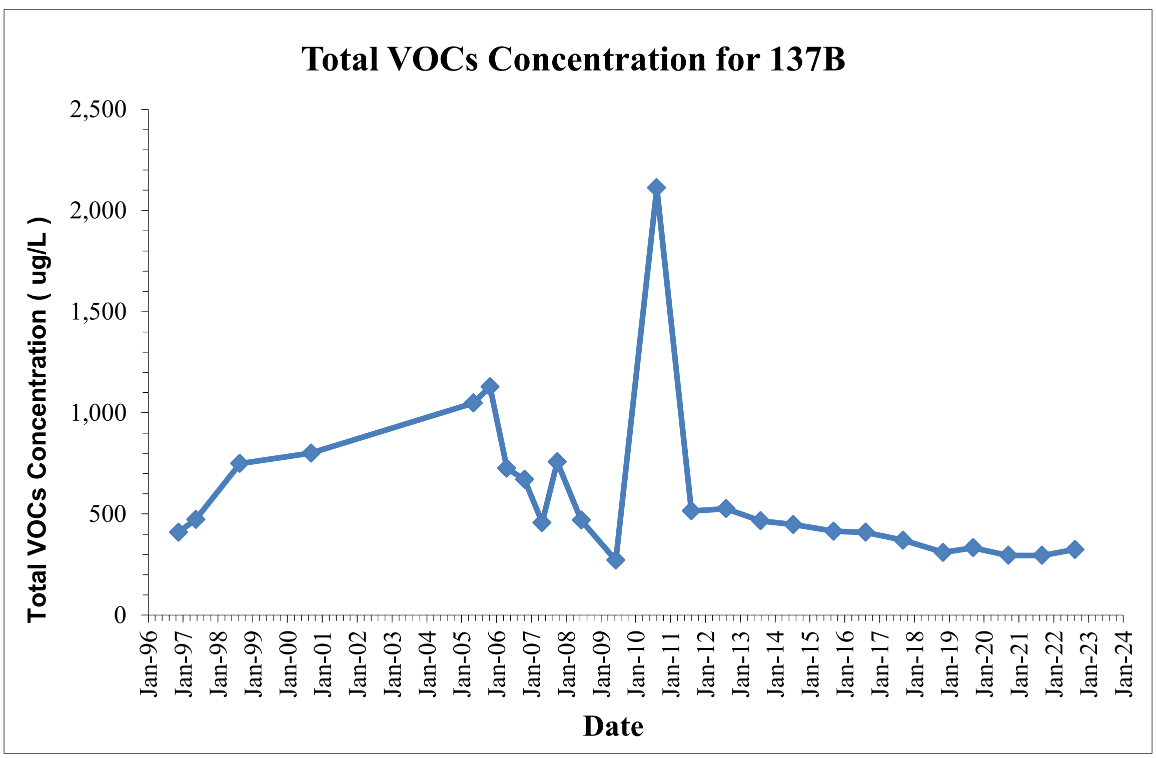

Total VOCs Concentration for 137A
Total VOCs Concentration (ug/L)
1,000
800
600
400
200
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

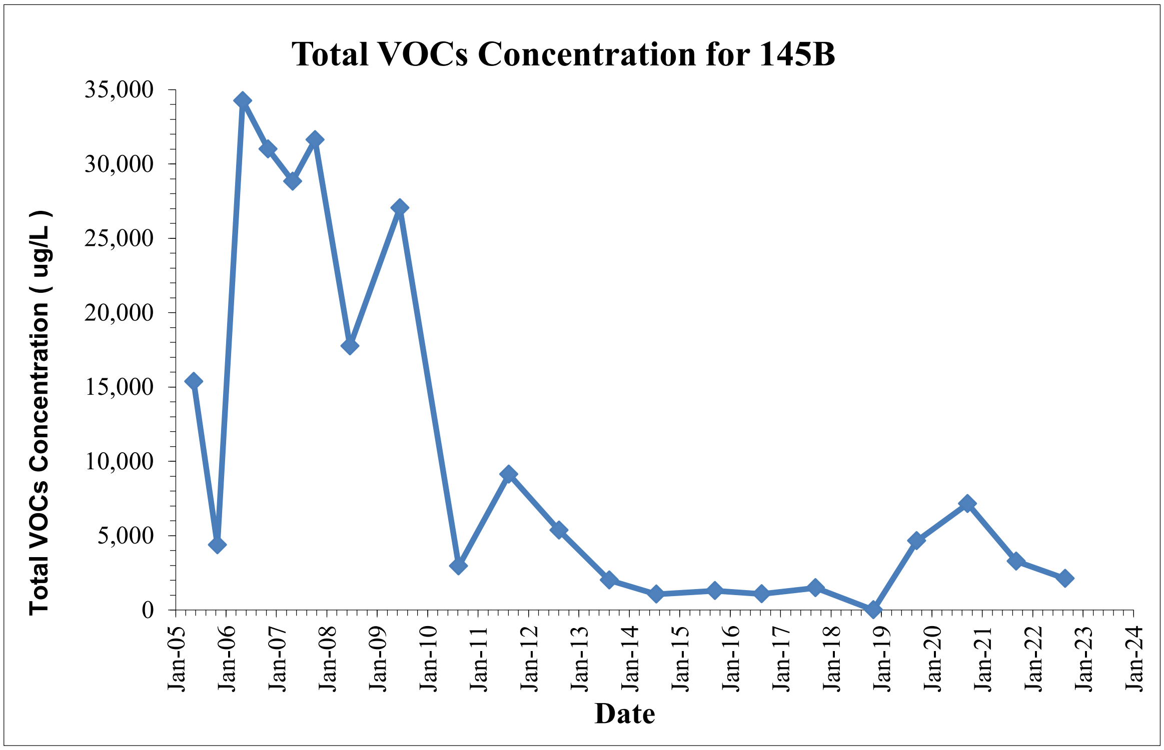

Total VOCs Concentration for 145A
Total VOCs Concentration (ug/L)
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

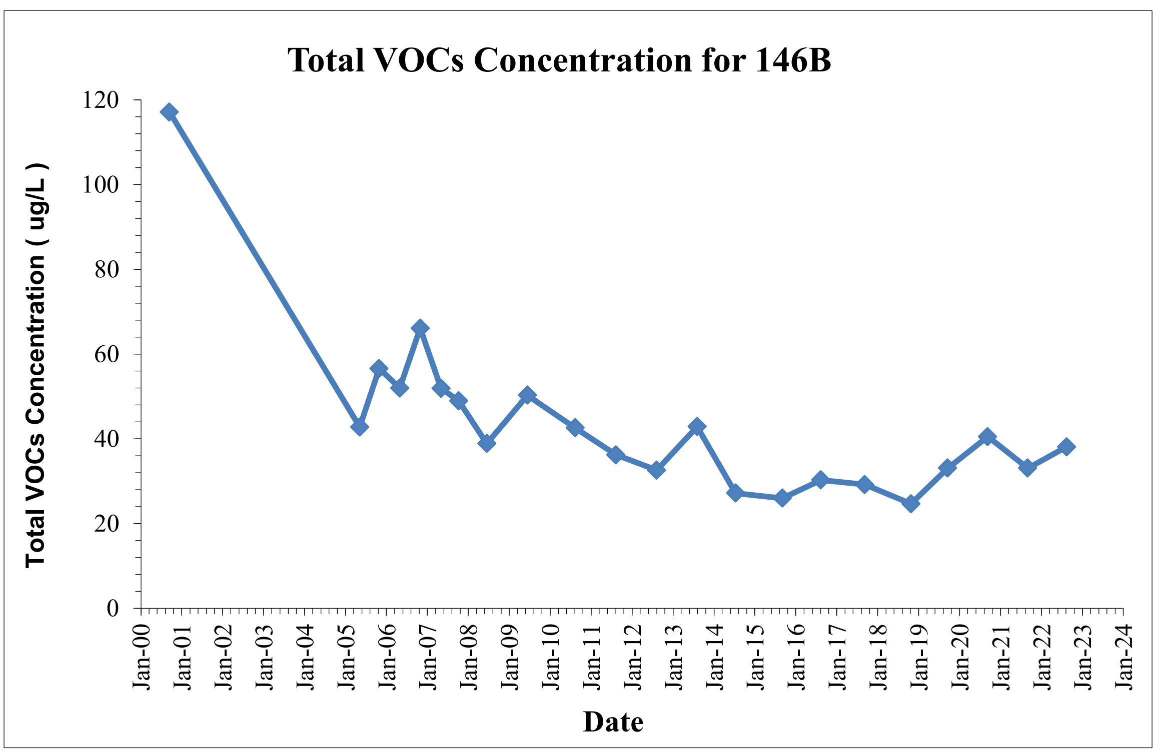

Total VOCs Concentration for 146AR
Total VOCs Concentration (ug/L)
0
5
10
15
20
25
30
35
40
45
50
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

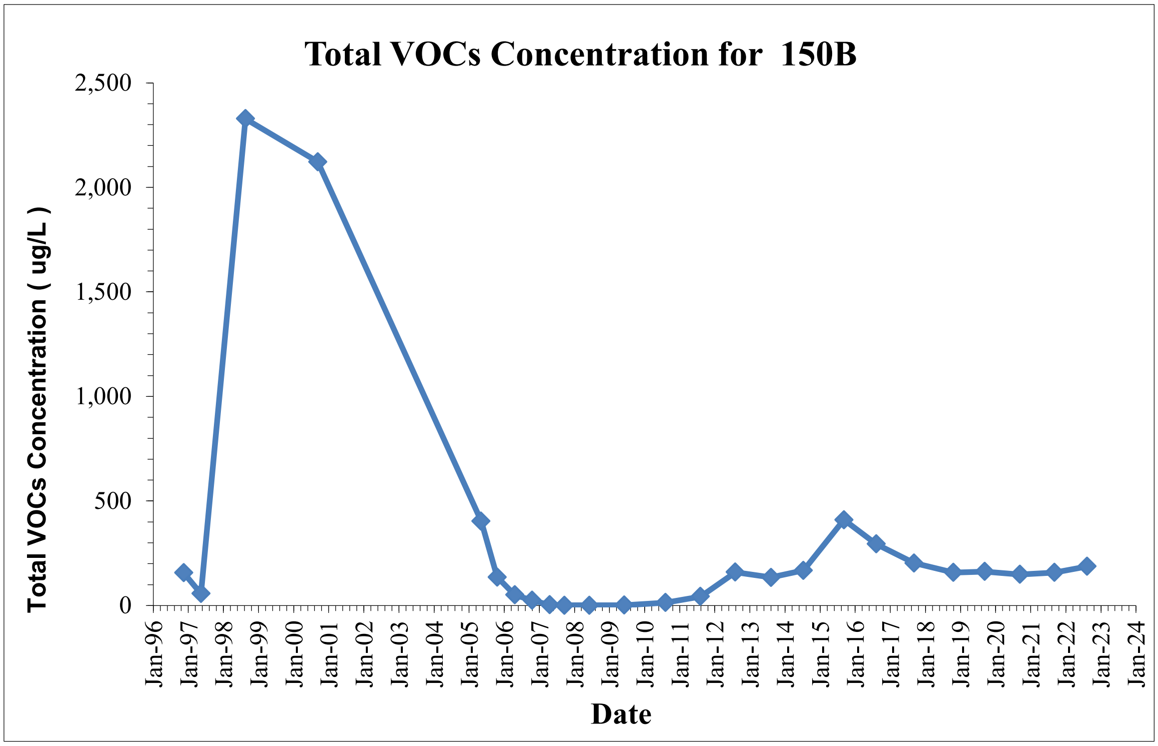

Total VOCs Concentration for 150A
Total VOCs Concentration (ug/L)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

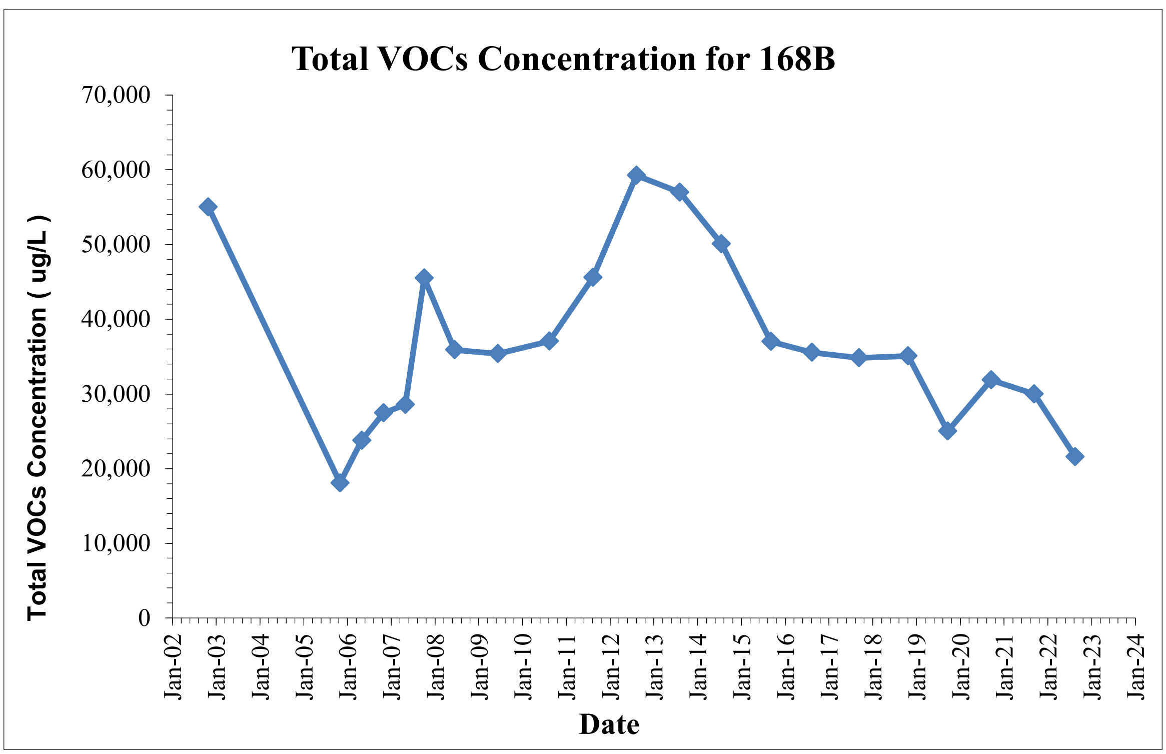

Total VOCs Concentration for 136B
Total VOCs Concentration (ug/L)
3,000
2,500
2,000
1,500
1,000
500
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

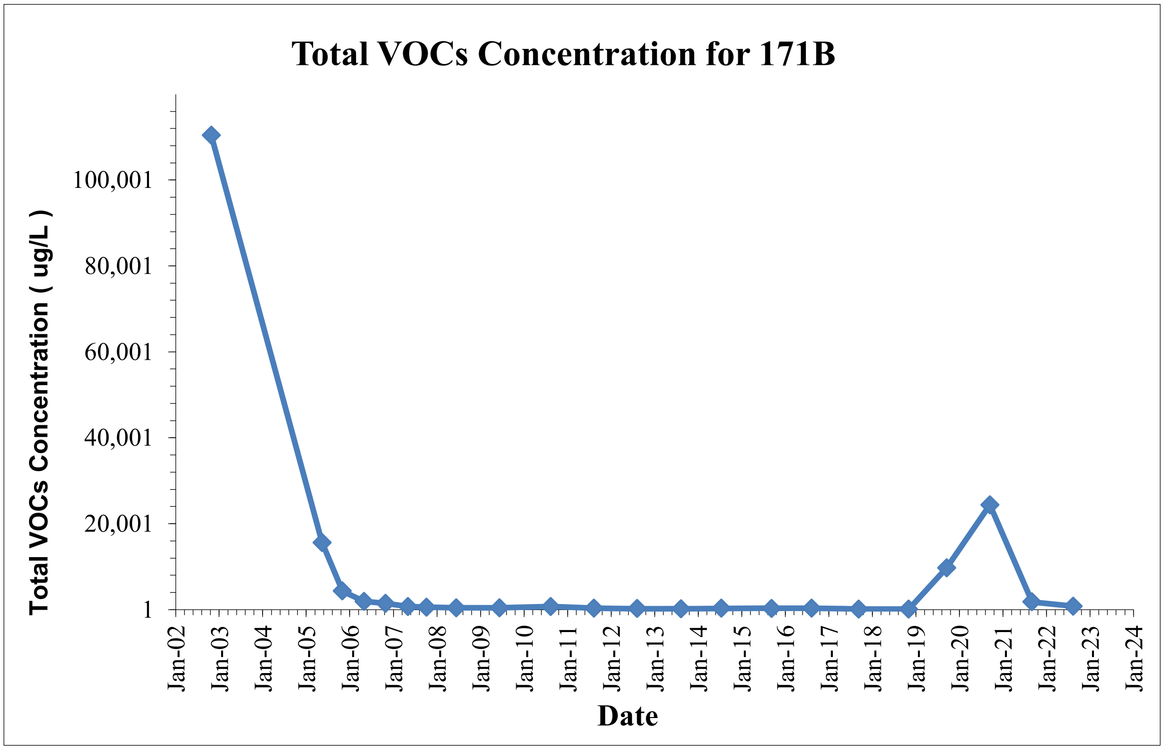

Total VOCs Concentration for 137B
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

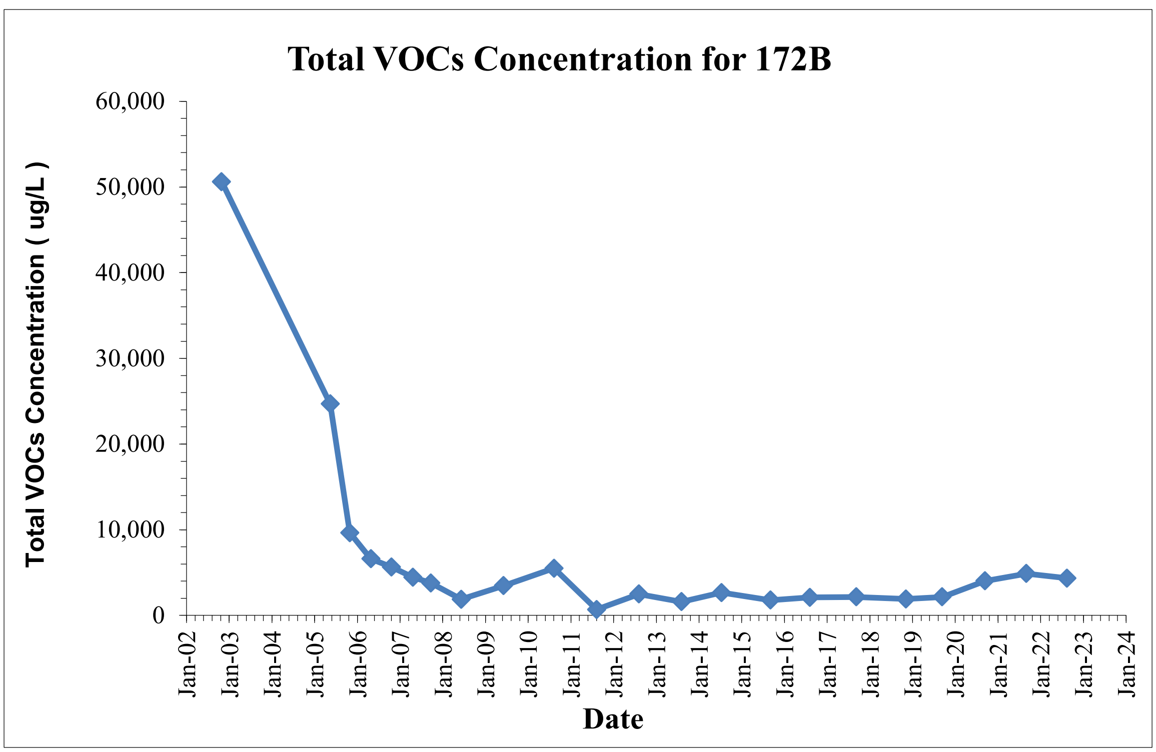

Total VOCs Concentration for 145B
Total VOCs Concentration (ug/L)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

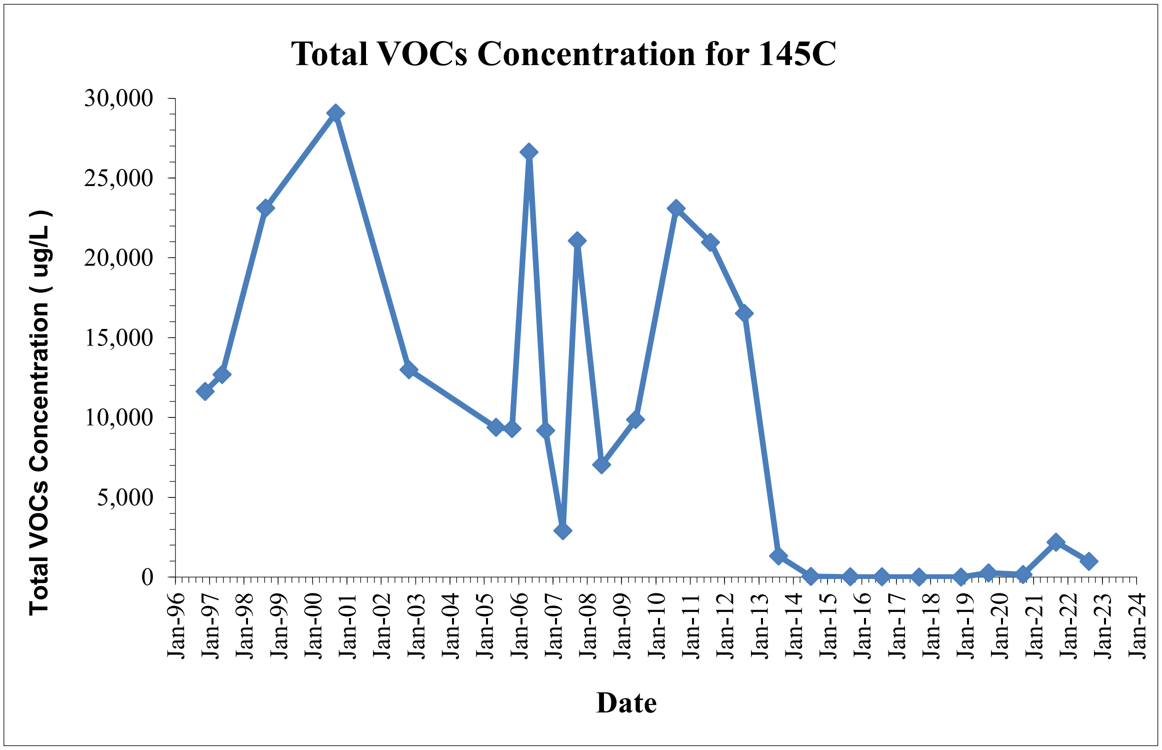

Total VOCs Concentration for 146B
Total VOCs Concentration (ug/L)
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

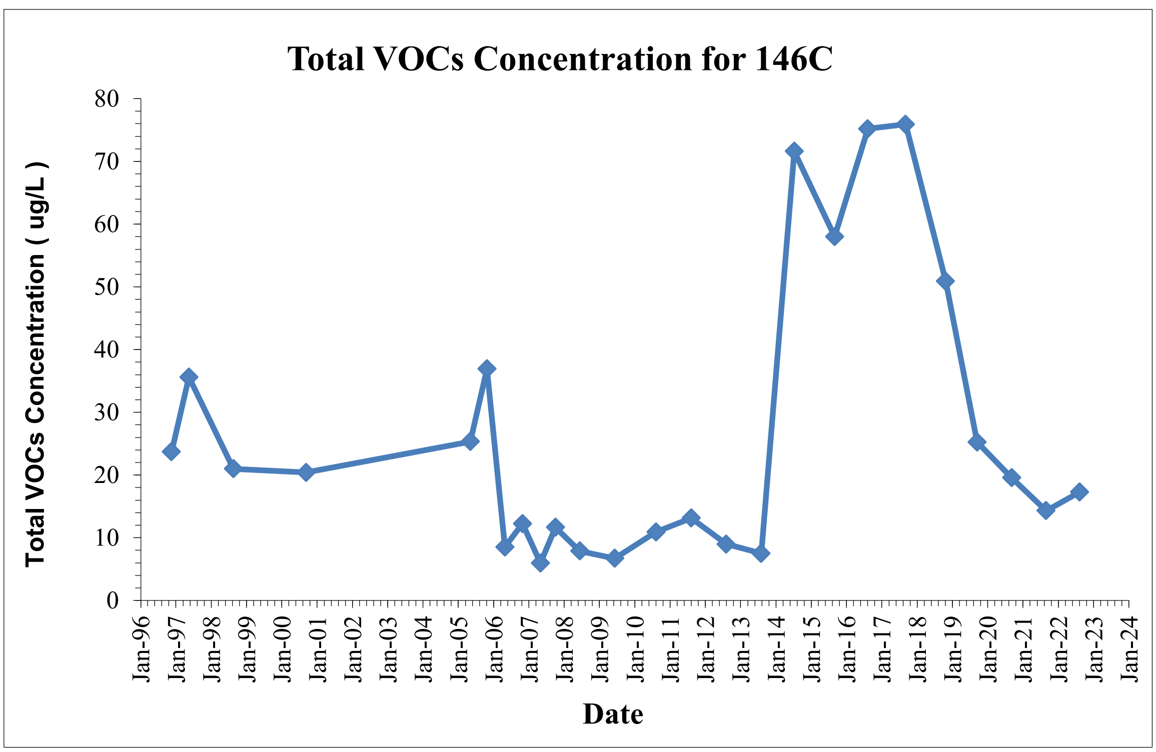

Total VOCs Concentration for 150B
Total VOCs Concentration (ug/L)
2,500
2,000
1,500
1,000
500
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

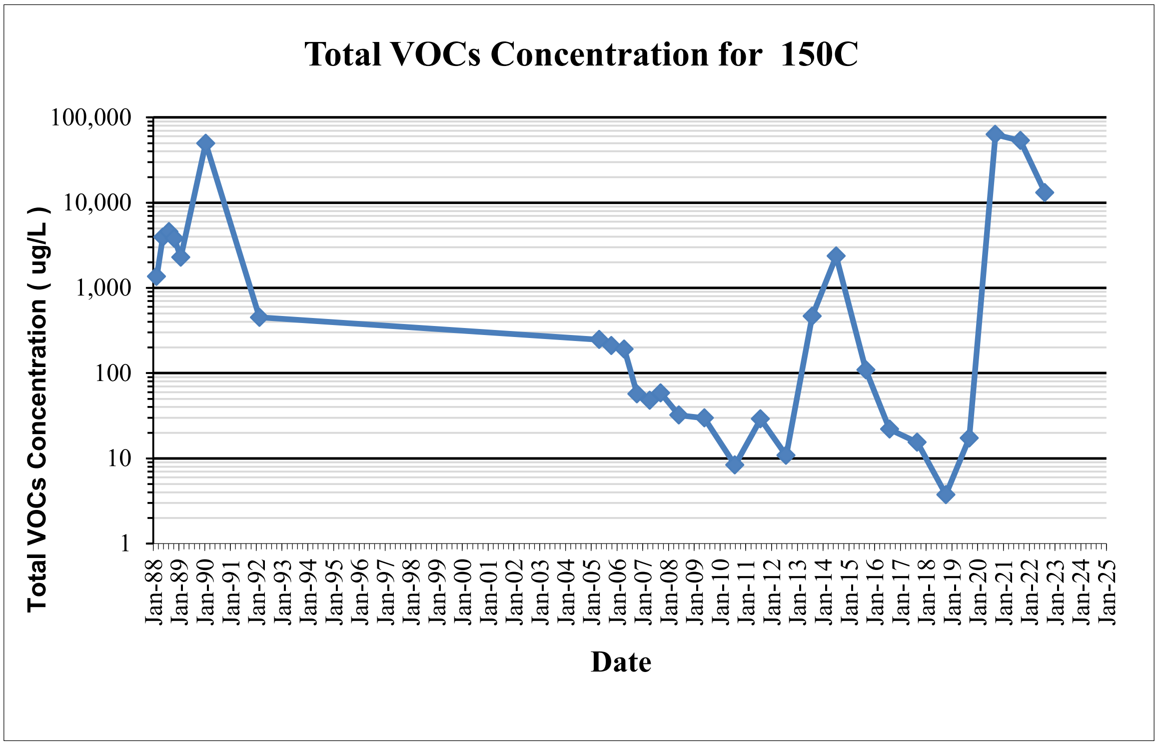

Total VOCs Concentration for 168B
Total VOCs Concentration (ug/L)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

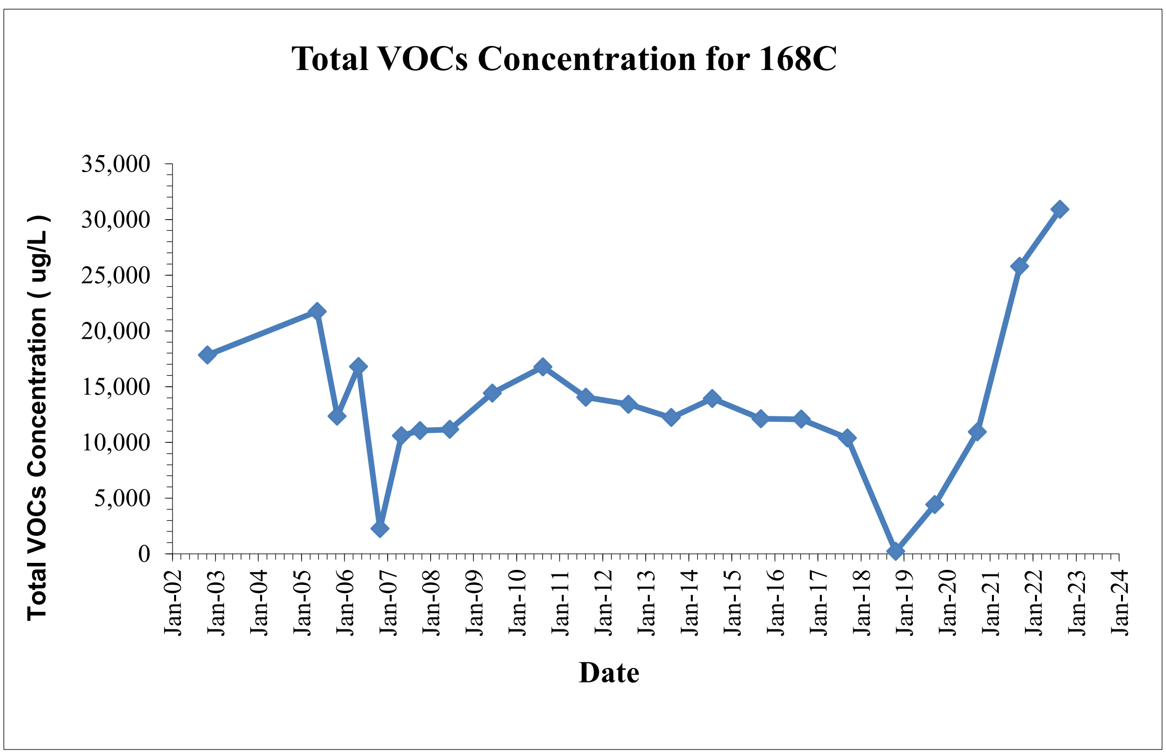

Total VOCs Concentration for 171B
Total VOCs Concentration (ug/L)
100,001
80,001
60,001
40,001
20,001
1
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

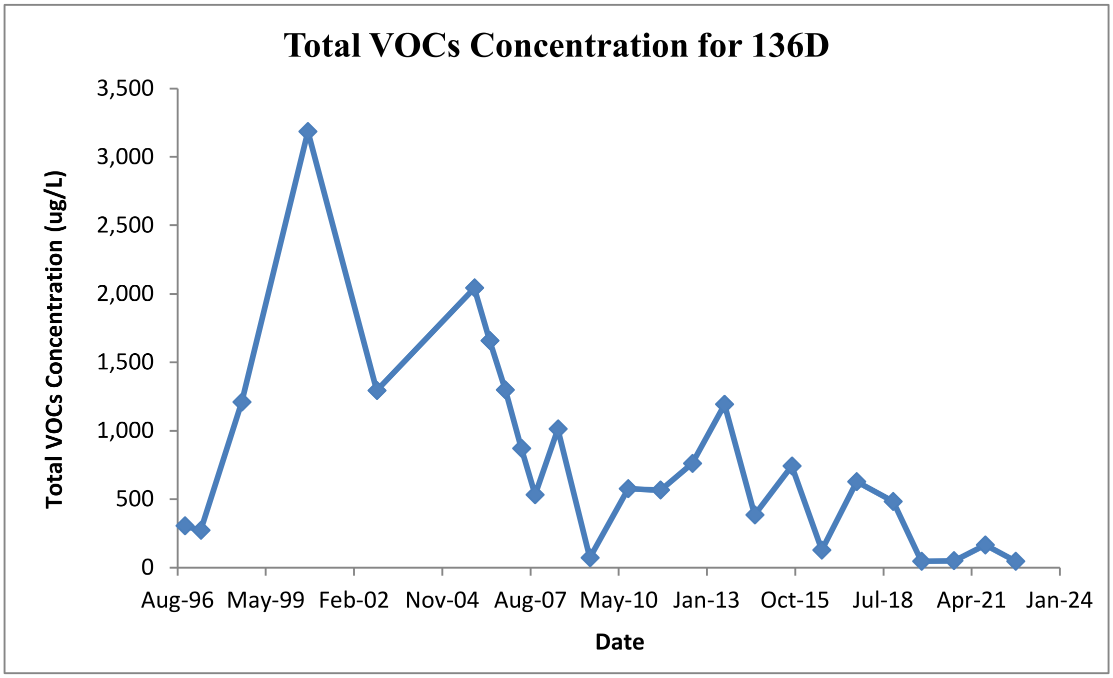

Total VOCs Concentration for 172B
Total VOCs Concentration (ug/L)
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

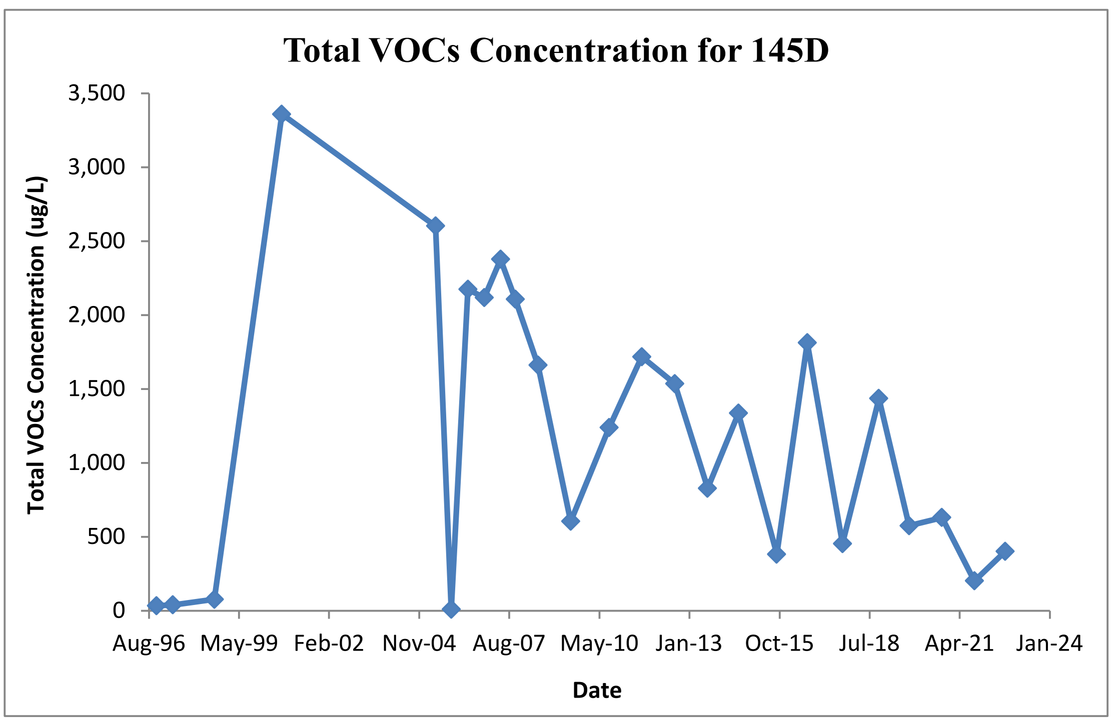

Total VOCs Concentration for 145C
Total VOCs Concentration (ug/L)
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Jan-17 Jan-18 Jan-19 Jan-20 Jan-21 Jan-22 Jan-23 Jan-24
Date

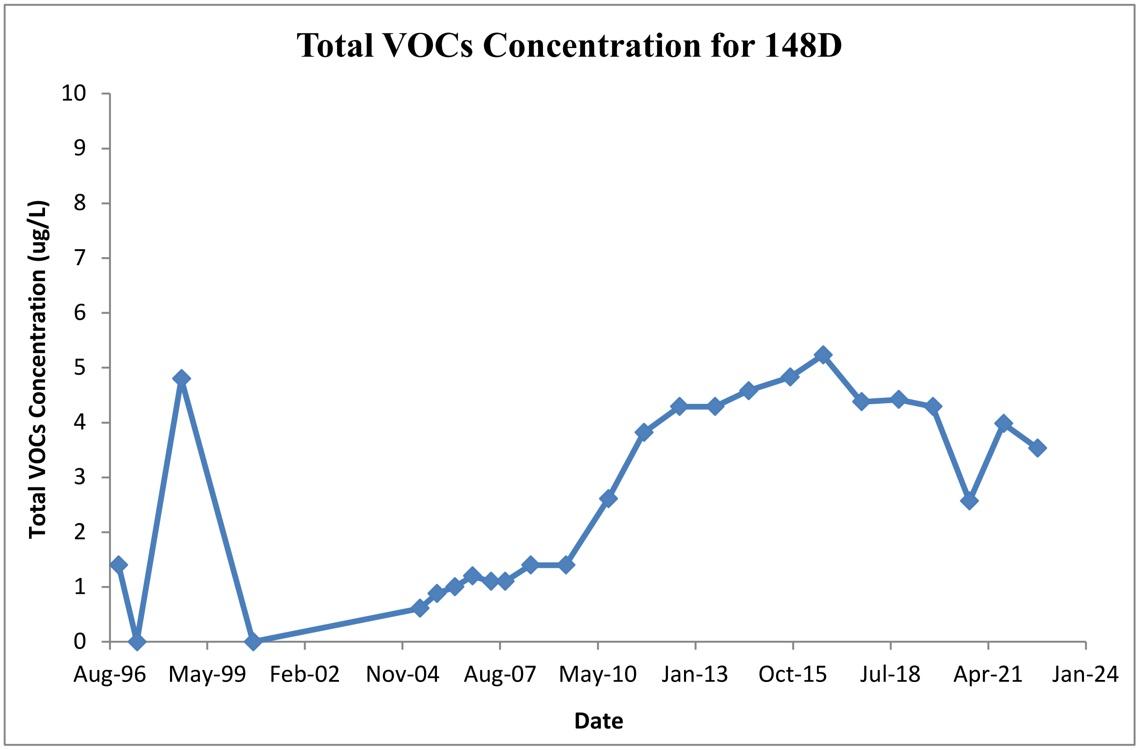

Total VOCs Concentration for 146C
Total VOCs Concentration (ug/L)
80
70
60
50
40
30
20
10
0
Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12 Jan-13 Jan-14 Jan-15 Jan-16 Jan-17 Jan-18 Jan-19 Jan-20 Jan-21 Jan-22 Jan-23 Jan-24
Date

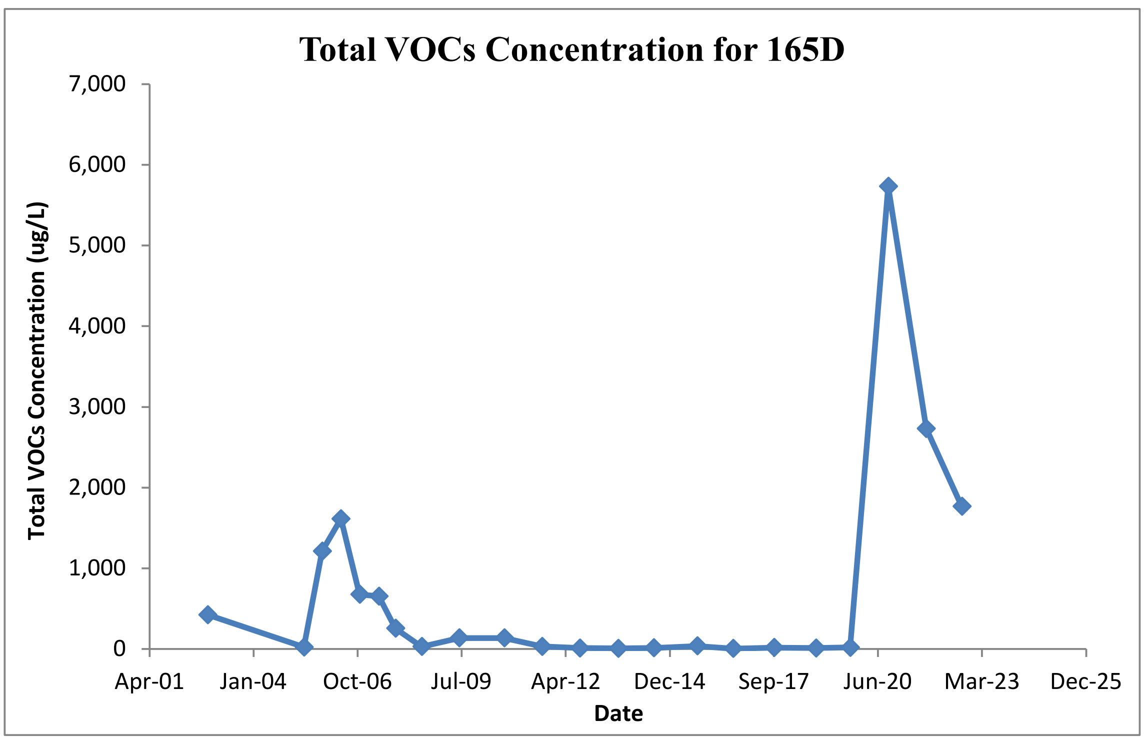

Total VOCs Concentration for 150C
100,000
10,000
1,000
100
10
1
Total VOCs Concentration (ug/L)
Jan-88
Jan-89
Jan-90
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Jan-25
Date

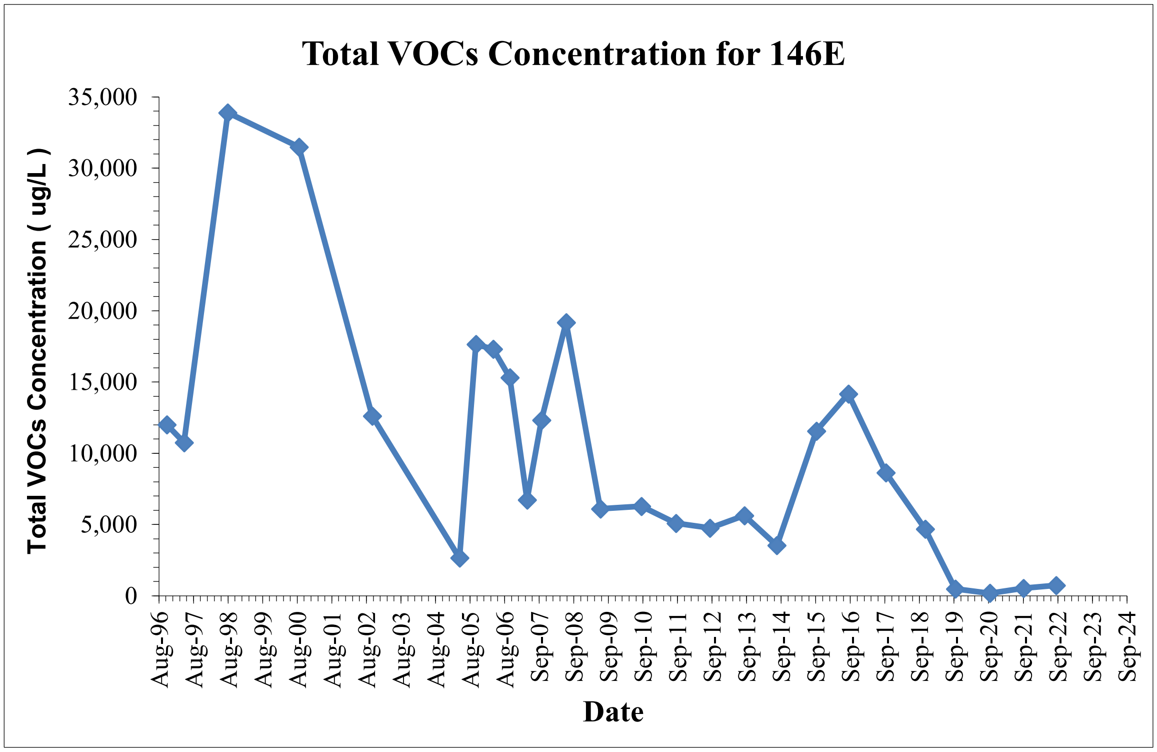

Total VOCs Concentration for 168C
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Total VOCs Concentration (ug/L)
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date

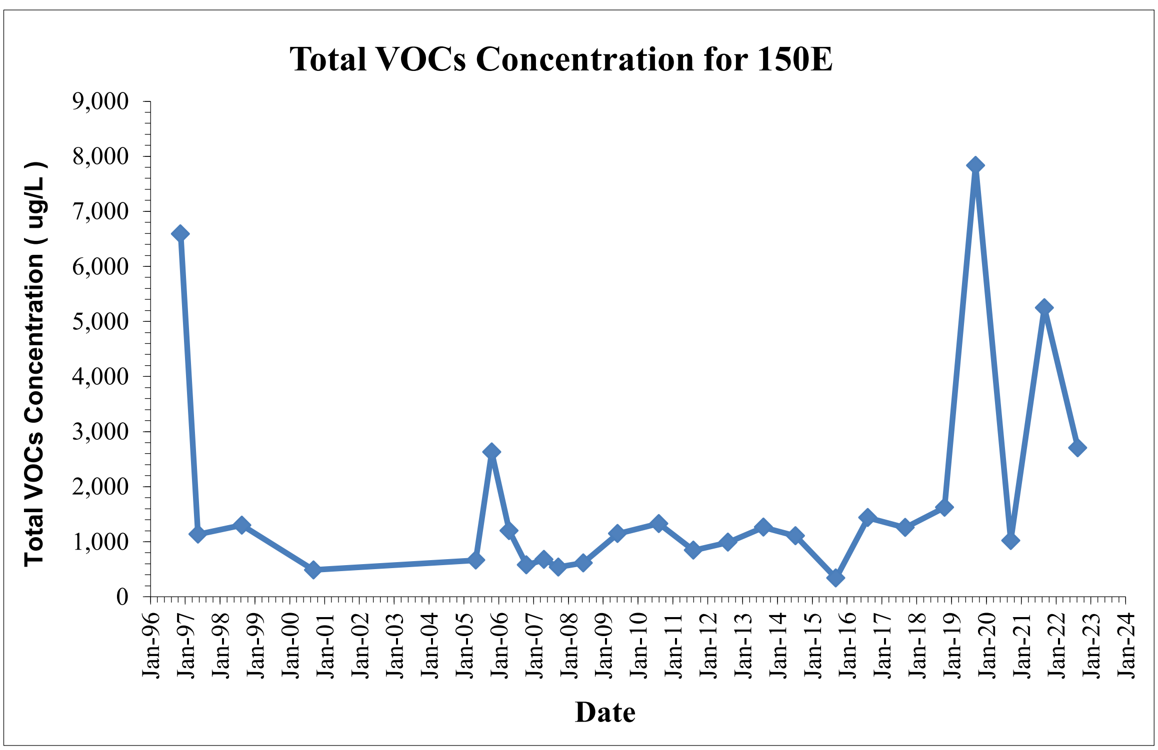

Total VOCs Concentration for 136D
Total VOCs Concentration (ug/L)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Aug-96
May-99
Feb-02
Nov-04
Aug-07
May-10
Jan-13
Oct-15
Jul-18
Apr-21
Jan-24
Date

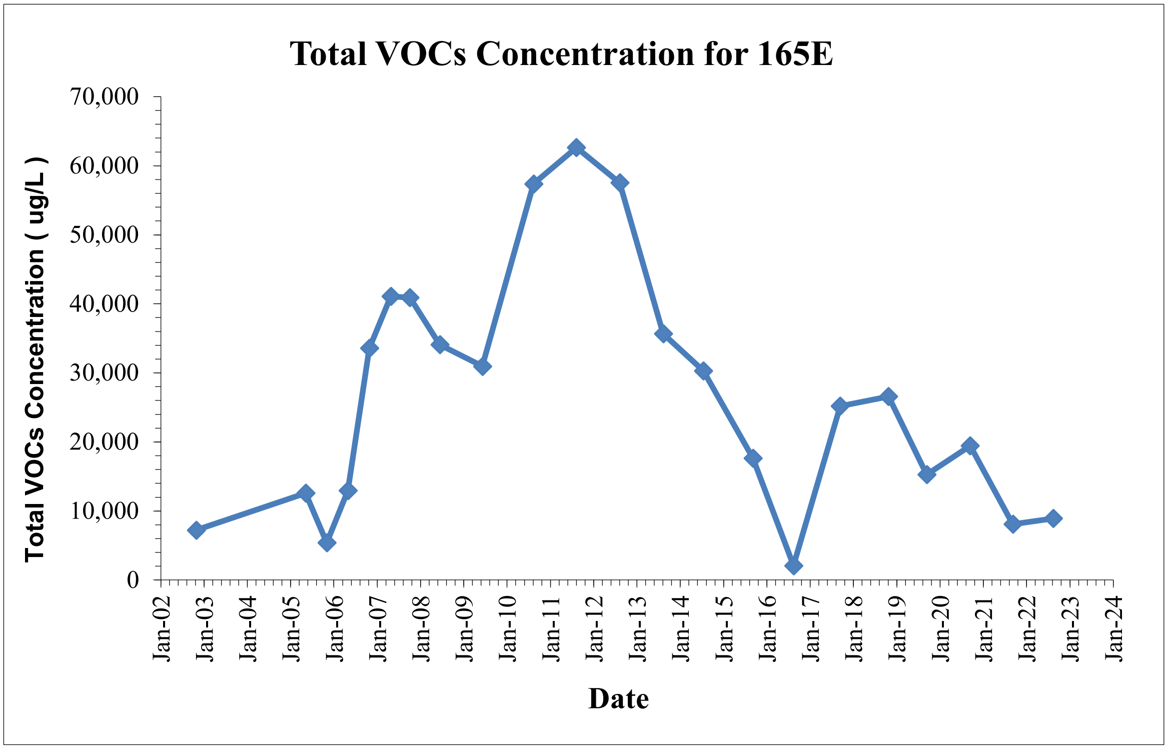

Total VOCs Concentration for 145D
Total VOCs Concentration (ug/L)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Aug-96
May-99
Feb-02
Nov-04
Aug-07
May-10
Jan-13
Oct-15
Jul-18
Apr-21
Jan-24
Date

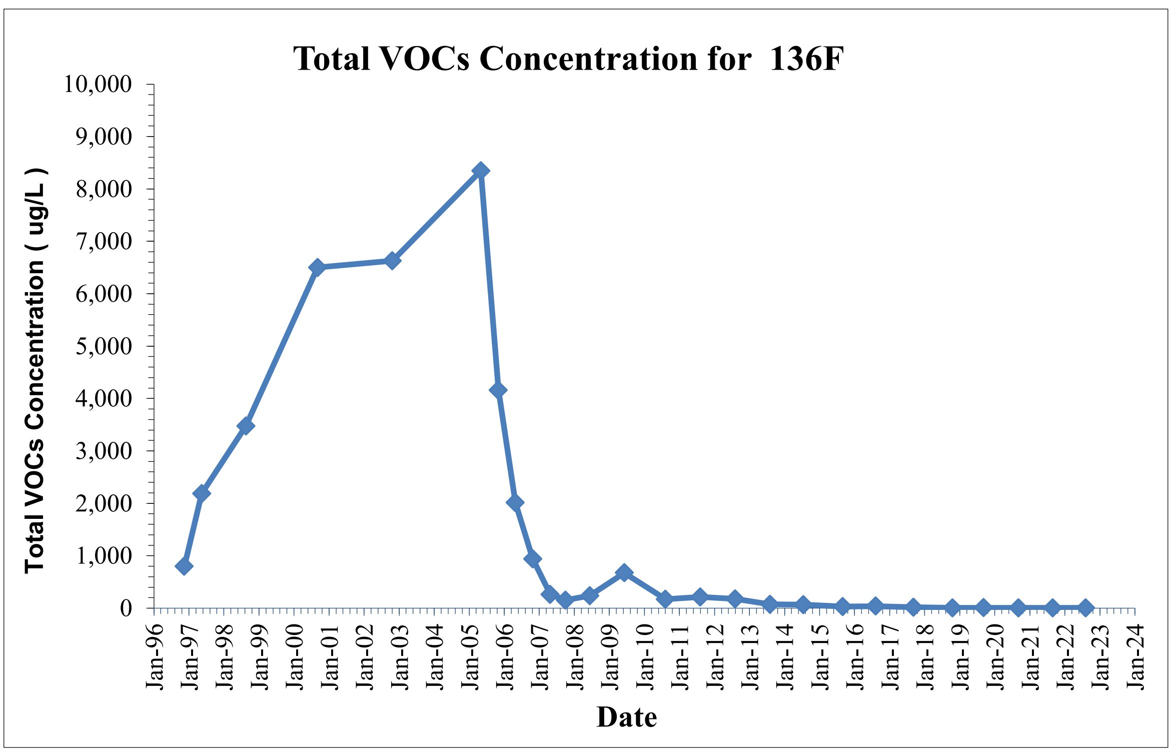

Total VOCs Concentration for 148D
10
9
8
7
6
5
4
3
2
1
0
Total VOCs Concentration (ug/L)
Aug-96
May-99
Feb-02
Nov-04
Aug-07
May-10
Jan-13
Oct-15
Jul-18
Apr-21
Jan-24
Date

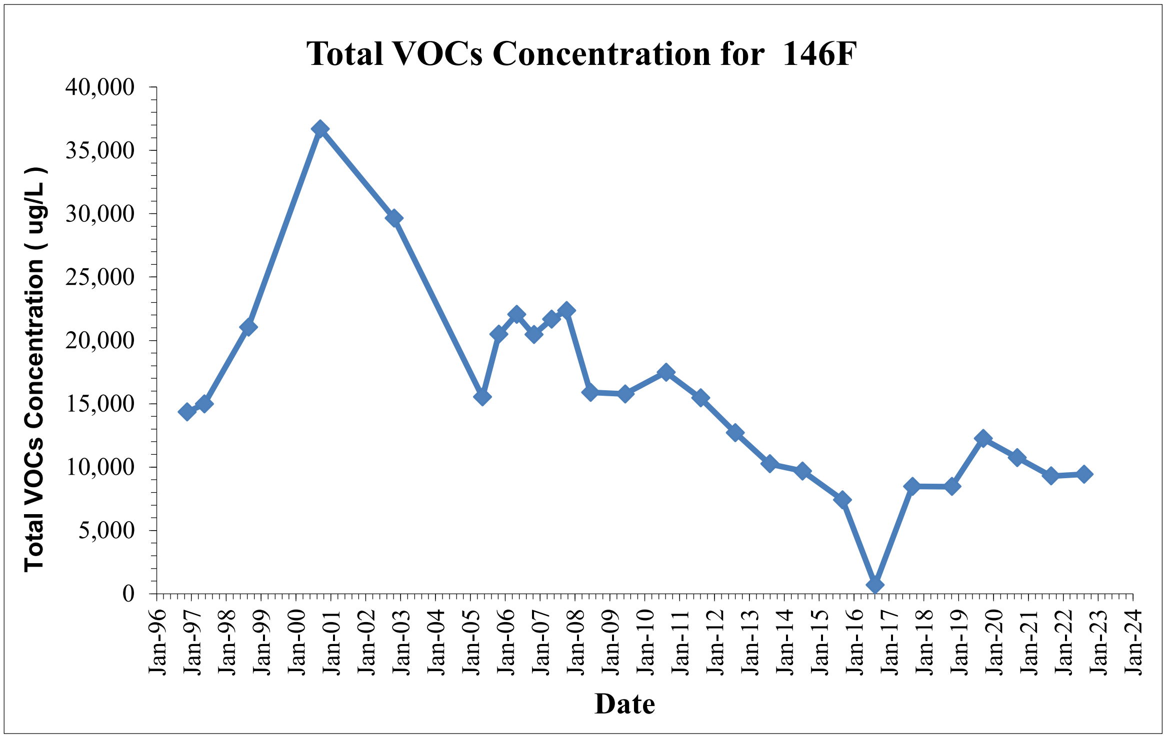

Total VOCs Concentration for 165D
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Total VOCs Concentration (ug/L)
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Dec-25
Date


Total VOCs Concentration for 146E
Total VOCs Concentration (ug/L)
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Aug-96
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Sep-20
Sep-21
Sep-22
Sep-23
Sep-24
Date


Total VOCs Concentration for 150E
Total VOCs Concentration (ug/L)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
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
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date


Total VOCs Concentration for 165E
Total VOCs Concentration (ug/L)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
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
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date


Total VOCs Concentration for 136F
Total VOCs Concentration (ug/L)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
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
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Jan-24
Date


Total VOCs Concentration for 146F
Total VOCs Concentration (ug/L)
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
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Jan-21
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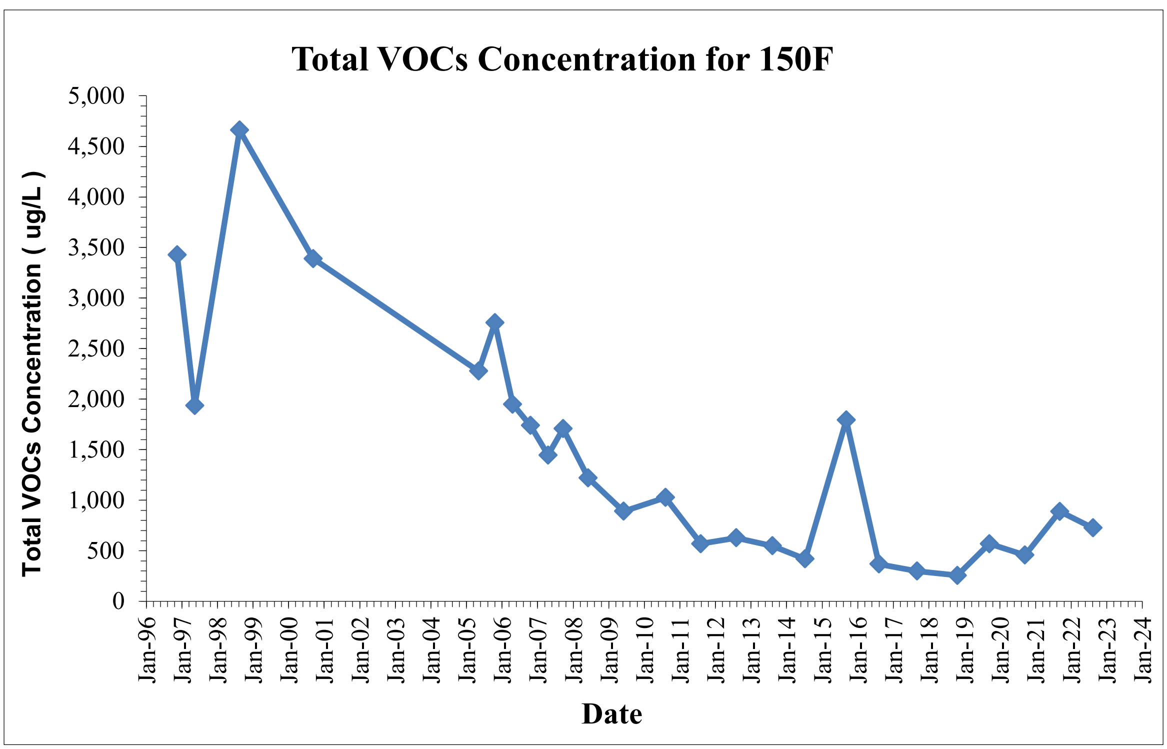
Jan-23
Jan-24
Date


Total VOCs Concentration for 150F
Total VOCs Concentration (ug/L)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
Jan-96
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Jan-23
Jan-24
Date

APPENDIX C

LANDFILL CAP INSPECTION RESULTS (DECEMBER 2022)

EXHIBIT A
CAP AND SURFACE WATER DRAINAGE
INSPECTION CHECKLIST
NECCO PARK

DATE: 12-21-2022
INSPECTOR: Gerald Shepard
WITNESSES: Not Required

EMERGENCY CONTACT: Timothy J. Pezzino

Phone # 716-570-6846

CONDITION: (Check) (Not Acceptable or Not Present require comments below)

	Acceptable	Not Acceptable	Present	Not Present	Remarks
1) Vegetative Cover, Ditches, Culverts	X				
a) Sediment Build-Up/Debris	X				
b) Pooling or Ponding	X				
c) Slope Integrity	X				
d) Overall Adequacy	X				
e) Culvert Condition	X				
2) Access Roads	X				
3) Landfill Cover System					
a) Erosion Damage	X				
b) Leachate Seeps				X	
c) Settlement				X	
d) Stone Aprons	X				
e) Vegetation	X				
f) Animal Burrows			X		
4) Slope Stability					
a) Landfill Top Soil	X				
b) Landfill Side Slope	X				
5) Gas Vents	X				
6) Monitoring Wells	X				

COMMENTS:
DESCRIPTION OF CONDITION: 3B) No Leachate Seeps Present.
3c) No settling on Land Fill or Side Slopes.
3F) Very Small mice + mole Burrows on Land Fill cap and Side Slopes.

DESCRIPTION OF CONCERN:

DESCRIPTION OF REMEDY:

Continued to next page

EXHIBIT B
CAP AND SURFACE WATER DRAINAGE
MAINTENANCE CHECKLIST
NECCO PARK

DATE: 12-21-2022
INSPECTOR: Gerald Shepard
WITNESSES: Not Required

EMERGENCY CONTACT: Timothy J. Pezzino

Phone # 716-570-6846

Maintenance Performed (Check)	Item	Performed by:	Remarks
	1) Vegetative Cover:		
	a) Seeding		
	b) Fertilizing		
	c) Topsoil Replaced		
	d) Removal of Undesirable Vegetation		
	2) Drainage Ditches		
	a) Sediment Removal		
	b) Fill		
	c) Regrading		
	d) Stone Apron Repair		
	e) Vegetative Cover Placement		
	f) Liner Replacement		
	3) Access Road		
	a) Excavation		
	b) Fill		
	c) Grading		
	d) Stone Paving		
	4) Landfill Cap		
	a) Excavation		
	b) Cover Materials		
	- topsoil		
	- barrier protection layer		
	- drainage composite		
	- geomembrane		
	- geotextile		
	c) Testing		
	d) Barrier Protection Layer		
X	e) Vegetative Cover	Contractor-Napier	
	5) Gas Vents		
	- Pipes		
	- Bedding and Adjacent Media		
	6) Other		

DESCRIPTION OF MAINTENANCE ACTIVITIES: 4E) Brush hogged and line trimmed landfill cap, side slopes, and ditch ~ 3 cuttings completed.

Continued to next page