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March 27, 2015

Ms. Gloria Sosa
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U.S. EPA – Region II
290 Broadway, 20th Floor
New York, NY 10007-1866

Dear Ms. Sosa:

**NECCO PARK 2014 ANNUAL REPORT**

Per previous notifications, DuPont is in the process of spinning off its Performance Chemicals businesses into a new entity, The Chemours Company FC LLC (Chemours). This will include remediation obligations at a number of properties including the Necco Park site. Effective February 1st, 2015, Chemours was established as a wholly owned subsidiary of DuPont. As of July 1, 2015, Chemours will exist as a completely separate and independent company.

Enclosed are two copies of the *Remedial Action Post-Construction Monitoring 2014 Annual Report* for the DuPont Necco Park Hydraulic Controls System (HCS), Groundwater Treatment Facility (GWTF), and landfill cap.

This tenth 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 2014 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). System operation uptime for 2014 was 94.4 %, and 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.

Please call me at (716) 278-5496 if you have any questions or comments regarding this submittal.

Sincerely,

Chemours

Paul F. Mazierski
Project Director

Enc. 2014 Annual Report

cc: M. Hinton/NYSDEC
E. Felter/Parsons

PARSONS

# Remedial Action Post-Construction Monitoring
# 2014 Annual Report
## NECCO Park
## Niagara Falls, New York

*Prepared for:*

**THE CHEMOURS FC LLC**

(a wholly owned subsidiary of E.I. du Pont de Nemours and Company)

Buffalo Avenue and 26th Street
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March 2015

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# 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

Per previous notifications, DuPont is in the process of spinning off its Performance Chemicals businesses into a new entity, The Chemours Company FC LLC (Chemours). This will include remediation obligations at a number of properties including the Necco Park site. Effective February 1st, 2015, Chemours was established as a wholly owned subsidiary of DuPont. As of July 1st, 2015, Chemours will exist as a completely separate and independent company.

This Remedial Action Post-Construction Monitoring 2014 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 tenth such report and describes hydraulic and chemistry monitoring conducted in 2014 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).

The Necco Park Remedial Action consists of an upgraded cap over the landfill and a groundwater hydraulic control system (HCS). 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 system operation uptime for 2014 was 94.4%. Summaries of system operations and hydraulic head data were previously provided to the USEPA and the New York State Department of Environmental Conservation in the 2014 Quarterly Data Packages (Parsons 2014a, 2014b, 2014c, and 2015). This Annual Report provides a detailed evaluation of system effectiveness with respect to the performance standards presented in the Necco Park Statement of Work.

Hydraulic monitoring data from 2014 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 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.

Two rehabilitation events were completed in BC recovery wells during 2014. While both utilized vacuum truck and water jetting technologies, they differed in that one utilized high volume / low pressure jetting and the other utilized low volume / high pressure jetting. The high volume technique was completed on April 24, 2014, and the results were insufficient. The high pressure technique was used on June 24th and again on July 1st. After the high pressure cleanings, flow increases were observed indicating this technique provides more benefit. These well rehabilitations for BC recovery wells will continue in 2015 at a biannual schedule.

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 2014, the refined LTGMP sampling program was conducted. The original LTGMP and MNA programs were last completed in 2013 and are scheduled to be completed next in 2018, on the five year schedule.

The 2014 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. The 2014 results indicate:

- Three of the four A-Zone wells sampled were below 2 micrograms per liter and the other well (137A), was 314.9 micrograms per liter.
- 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. All three of the F-zone wells sampled in 2014 resulted in the lowest TVOC concentration observed at each of the three well locations.
- 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 the cases where there were increasing TVOC trends, the concentrations were within historical range or near the source area and/or near a recovery well.

DNAPL was monitored for every month throughout 2014. No DNAPL was identified in any of the wells in 2014; therefore no DNAPL was removed. A total of 8,750 gallons of DNAPL has been removed since initiation of the recovery program in 1989.

The 2014 groundwater elevations, geochemical results and DNAPL monitoring indicate HCS continues to be effective at controlling source area groundwater at the Chemours Necco Park site through 2014. 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 2010 and 2011.

Data on chlorinated ethenes in Necco Park is consistent with lines of evidence required for natural attenuation of contaminants (USEPA, Monitored Natural Attenuation Directive, 1999). Analytical results from 2014, 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 2018 and another full MNA analysis will be completed then.

In 2014 the USEPA completed the second 5-year review report for Necco Park and determined the controls in place are protective of human health and the environment (USEPA, 2014).

# 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 2014 Annual Report presents hydraulic and chemical monitoring results from the tenth year of operation of the hydraulic controls. In addition, this 2014 Annual Report includes historical groundwater chemistry results for assessment of groundwater quality trends.

In 2014 the USEPA completed the second 5-year review report for Necco Park and determined the controls in place are protective of human health and the environment (USEPA, 2014).

# 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 2014 HCS operations.

## 2.1 Operational Summary

Operational information for the HCS is provided in the 2014 Quarterly Data Packages (Parsons 2014a, 2014b, 2014c, and 2015) and summarized in the table below.

| Period | HCS Uptime (%) | HCS Uptime [excluding scheduled maintenance downtime] (%) | Groundwater Treated (Gallons) | DNAPL[1] Removed (Gallons) |
|---|---|---|---|---|
| 1Q14 | 96.0 | 96.0 | 3,683,342 | 0 |
| 2Q14 | 95.3 | 95.3 | 3,789,669 | 0 |
| 3Q14 | 89.3 | 89.3 | 3,660,343 | 0 |
| 4Q14 | 96.9 | 96.9 | 3,291,496 | 0 |
| **2014 Total** | **94.4** | **94.4** | **14,424,850** | **0** |

[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 fully operational throughout 2014, averaging 94.4% total system uptime through December 31, 2014. GWTF downtime has been minimized by continuously monitoring operating conditions and implementing mechanical and procedural changes to the process equipment and the Honeywell Experion® PKS[1] (Process Knowledge System) operating system.

HCS downtime in 2014 resulted from the various unscheduled maintenance typically due to process component malfunction (e.g. pH interlock and/or intermittent power outages, etc). For details on each minor outage, please refer to the quarterly data packages. There were no reportable scheduled maintenance activities in 2014. The following table summarizes HCS reportable downtime in 2014 by component malfunction and scheduled maintenance:

| Reason | Contributing Downtime % | Comments |
|---|---|---|
| Process component malfunction | 5.6% | Unexpected process-related downtime as a result 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).

## 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 2014 is provided in Table 2-2.

## 2.3 Sewer Sampling Summary

A Significant Industrial User (SIU) permit 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. The permit (SIU Permit No. 64) was renewed in May 2014, and is valid until May, 2 2019. The new permit contains minor limit increases for trichlorophenol, hexachloroethane, and 1,2-dichloroethane which were approved by NFWB. There were no exceedences of the permit limits in 2014.

## 2.4 Recovery Well Rehabilitations and Maintenance

Two well rehabilitation events were completed in 2014 and included BC wells RW-4, RW-5, and RW-11. The techniques now include vacuum extraction and pressure water jetting, which were implemented for the rehabilitations beginning in 2012. This technique allowed for safer removal of the sediments, improved pressure control, and allowed larger quantities of water to be withdrawn at a high pumping rate (i.e. over-pumping). In 2014, a first attempt to rehabilitate the wells with a lower-pressure/high volume tool was completed on April 24, 20114. However, the results were less than previously achieved with a high-pressure/low-volume tool. Therefore, during a second rehabilitation event, the higher pressure tool was utilized on June 24 and July 1, and resulted in improved flow rates, similar to past events. Recovery wells in the BC zone will continue to be rehabilitated on a biannual basis with the high pressure techniques, until advised otherwise.

Well painting, labeling and protective casing repairs were performed in 2014 as part of continual site monitoring well maintenance. Approximately 29 well casings were painted/re-labeled, several well caps were repaired or replaced, and a two locks were replaced.

# 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 discuses 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. Long-term hydrographs for select wells and piezometers within each water-bearing zone are included as Figures 3-2 through 3-7.

These water level measurements are also used to generate potentiometric surface-contour maps, which depict groundwater elevation distribution for assessing flow directions and hydraulic gradients. These presentations are used to evaluate the extent and effectiveness of the HCS hydraulic control effect at Necco Park. Quarterly groundwater level measurements collected during 2014 were provided in the Quarterly Data Packages (Parsons 2014a, 2014b, 2014c, and 2015). Potentiometric surface-contour maps for the A-Zone (overburden) and bedrock zones B, C, D, E, and F were also included in the 2014 Quarterly Data Packages. A list of groundwater level monitoring locations is provided in Table 3-1.

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 2014 Quarterly Data Packages. Unless otherwise noted, a Kriging algorithm with a linear semi-variogram model and a slope of 1 was used as the standard method to interpolate groundwater elevations between wells.

## 3.2 Hydraulic Control Assessment

As described in the Post-Construction Monitoring 2008 Annual Report (DuPont CRG 2009), measures were taken in 2008 to improve B/C-Zone hydraulic control in the western portion of Necco Park. These measures included replacement of recovery well RW-10 with a new recovery well (RW-11) installed within a blast fractured bedrock trench (BFBT). Assessment results indicate continued improved hydraulic control through the operation of recovery well RW-11. A detailed discussion of the hydraulic influence of well RW-11 was provided in the Post-Construction Monitoring 2008 Annual Report for the Site (DuPont CRG 2009).

### 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 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. In a few cases, there is an increasing trend from 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 2014 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 (2014 average gradients) and shown in Figure 3-9 (November 13, 2014, gradients). These gradients demonstrate that the predominate 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 2014 (Figure 3-10). Hydraulic controls in the B-Zone and C-Zone were maintained throughout 2014, 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 BFBT and the hybrid recovery well RW-11.

***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. Water level reductions are initially noticed after start-up of RW-10, and then a further reduction is observed once RW-10 was replaced by RW-11. Wells near or in the trench area (201B ,PZ-B, 137B, and 111B) show significant decreases after the transition of groundwater recovery from RW-10 to RW-11. These changes in water levels are notable, not only due to the actual change in water level, but also in context to the set point of RW-11 compared with RW-10. The water level set-up for recovery in RW-11 has been maintained approximately five feet higher than RW-10 (Figure 3-3). Thus, the installation of the BFBT was of such hydraulic significance that lower water levels in and around the BFBT area are achieved even with a higher water level in the actual recovery well. This is due to the change in hydraulic conductivity of the rock formation resulting from BFBT installation. Wells in the eastern section of the site are less affected by the recovery wells; therefore some do not exhibit the same response as those in the west. This is a factor of hydraulic properties and distance from the recovery well and does not indicate a lack of capture. The primary evidence for capture is the water level contour maps, as discussed below.

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. The contour patterns related to the BFBT and RW-11 are relatively wider and shallower than those for RW-4 and RW-5 due to the increased transmissivity in and near the BFBT. The overlay of the source areas lines and the groundwater contours demonstrates that the HCS is hydraulically controlling the source areas.

***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. The southern extent of influence extends to well 137C and is obscured by the CECOS Landfill between the recovery wells and monitoring wells 150C, 160C 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. In 2014, RW-4, RW-5, and RW-11 were rehabilitated. The annual rehabilitations of these recovery wells is a preventative action taken prior to well loss; therefore, the effect is relatively small in the short-term scale of one year.

### 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 associated hydraulic gradients were toward the recovery wells throughout 2014, 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 2014 report provides an update of groundwater chemistry trends in relation to the long-term remedy for groundwater as well as an updated data relevant to the Source Area Criteria. The Source Area Criteria are provided in Table 3-3, with the 2014 results and comparison to criteria provided in Tables 3-4 and 3-5.

Monitoring completed in 2014 represents the seventh year of annual 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 2013 annual sampling event, and the full well list is scheduled to be sampled next in 2018. 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 July 22 and July 28, 2014. TestAmerica of Amherst, New York, completed sampling with oversight by Parsons for DuPont. Samples and associated quality assurance/quality control (QA/QC) samples were analyzed by TestAmerica Laboratories located in North Canton, Ohio.

As described in the Necco Park SAMP, groundwater sampling was conducted using USEPA low-flow sampling methodology and air-driven bladder pumps equipped with disposable Teflon© bladders. The pumps were fitted with dedicated Teflon©-lined high-density polyethylene (HDPE) tubing.

Samples were collected at 26 monitoring well locations during the 2014 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 2014 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 2014 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 2014 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.

Effective solubility is defined as the theoretical upper-level aqueous concentration of a constituent in groundwater in equilibrium with a mixed DNAPL. Effective solubility is equal to pure-phase solubility of a given constituent multiplied by the mole fraction of that component in DNAPL. Use of effective solubility criteria is believed to be more representative of sites with DNAPL that consist of relatively complex mixtures of organic compounds (Feenstra et al. 1991), such as those that are found at the Necco Park site. Calculated solubility criteria for DNAPL compounds evaluated during this study are presented in Table 3-3. A comparison of 2005 through 2014 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 - 2012 in Tables 3-4.

Due to the qualitative nature of using the one percent pure phase solubility in a transient flow field, this solubility criteria was established to be used with other lines of evidence for determining source area extent. The “observed DNAPL” criterion and effective solubility criteria are used as an absolutely measure to identify source area wells. Meanwhile, the 1% pure phase solubility criteria were never intended to have the same weighting as the other criteria. As noted in the November 17, 2011, meeting and associated correspondence between DuPont and the USEPA, the observed DNAPL criteria and the effective solubility criteria have more merit than the 1% pure phase solubility. Meeting the one-percent criteria alone (for example) does not absolutely define a well as a source area well. While the one-percent “rule-of-thumb” may infer DNAPL presence, with more or less certainty depending on the strength of the overall data (Cohen and Mercer 1993), it does not identify the distance upgradient where the DNAPL is located. This is due to such elements as the complexities of groundwater transport and well location in reference to the plume centerline. The one percent “rule-of-thumb” should not be used in isolation to determine DNAPL presence (Kueper., B.H. et al. 2003); therefore, the original (and present) intension of the solubility criteria were to assist in determining source areas in conjunction with other converging lines of evidence.

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 3 to 5 year cycle and therefore 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 2014 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.

Monthly DNAPL observations conducted at A-Zone well locations in 2014 indicated no DNAPL present at the monthly or semi-annual monitoring locations. The most recent DNAPL observation at an A-Zone well was at well 131A in May 2006. This well is located on the landfill.

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 2014 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 indicated no exceedances of the effective solubility criteria; however, the refined sampling program reduced the frequency of some of the wells that typically exceed the criteria. One B well (171B) that did exceed the criteria in the past, was part of the sampling program in 2014. This well was below the effective solubility criteria in 2014.

The only two B/C-Zone wells in the annual program which exceeded the more conservative one percent criteria in 2014 were: 136B and 172B. Exceedance of the one percent solubility criteria at well location 136B for tetrachloroethene represents the western edge of the limit of the B-Zone source area. TVOC concentrations have been between 1,000 micrograms per liter (μg/l) and 3,000 μg/l since 2001. Exceedances of the one percent solubility criteria at well location 172B for HCBD represent the spatial limit of the B-Zone source area. As discussed in Section 3.5, TVOC concentrations have significantly decreased since 2002 at location 172B.

The frequency of observed DNAPL in B/C-Zone wells has decreased over the course of the monitoring program. In 2014, no DNAPL was identified in any of the wells monitored monthly or semi-annually, therefore no DNAPL was removed.

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 ten wells sampled in 2014 exceeded the effective solubility criteria in the D/E/F wells. There was only one well in the D/E/F-Zone that exceeded the more conservative one percent pure-phase criteria (165E). 165E is within the limit of the D/E/F-Zone source area. Exceedance of the criteria at 165E is consistent with the previous sampling results.

Source zone criteria comparison analysis conducted during 2014 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 2014 chemistry results and trends has been completed to assess the effectiveness of the HCS and the former extraction system in reducing organic compound concentrations in groundwater. This analysis used TVOC concentration data from monitoring wells to identify chemistry trends in the flow zone units. The evaluation also serves to identify locations where TVOC concentrations exhibit significant changes (generally, changes greater than an order of magnitude). Where applicable, historic TVOC data were used to assess long-term chemistry trends. 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 former 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. More recently, 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 below 400 μg/l at these locations. Sampling results for well 137A (314.9 μg/l) represents the location of the highest reported A-Zone TVOCs. Other well locations were substantially lower: 145A (0.31 μg/L), 146AR (1.4 μg/L), and 150A (0.81 μg/L). The 2014 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 (<5 μg/l) TVOC concentrations with no true discernable trend. These three wells have been less than 5 μg/l since 2006 or earlier.

### *B-Zone*

Results from the eight LTGMP B-Zone wells indicate TVOC concentrations were generally below 3,000 μg/l; with the only exception 168B (50,090 μg/l), which is a source area well. TVOC concentrations at five of the locations were below 500 μg/l. Five of the eight wells exhibit large decreases in TVOC over time, thereby demonstrating effective groundwater capture by the recovery wells (Appendix B).

Source area limit wells 171B and 172B show a continued overall TVOC declining trend. At well 171B, TVOC concentrations have decreased from over 110,000 μg/l in 2002 to under 300 μg/l in the last three years. At 172B, TVOC concentrations have declined from over 50,000 μg/l in 2002 to under 3,000 μg/l the last four years. These trends are indicative of effective groundwater control, where source area concentrations are being captured by the extraction wells, thereby preventing downgradient transport of VOCs. These wells give supporting evidence to the demonstration of hydraulic control in these areas. Additionally, the concentrations suggest that there is an active natural attenuation component to the VOCs. Biogenic degradation compounds including cis-1,2-dichloroethene (cis-DCE) and vinyl chloride (VC) dominate 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 2014 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 below 2,100 μg/l for the last two years. The TVOC results in 2014 were the lowest observed at this location to date.

Far-field well 146B and 150B also demonstrates the effectiveness of the groundwater control system. Concentrations have decreased by one order of magnitude at 146B since 2000, and greater than two orders of magnitude at 150B. The TVOC concentration at 146B in 2014 was the lowest observed at this location.

Two B-Zone wells (136B and 137B) have no apparent decreasing trend but remain within historical ranges. At locations 136B (west of the source area), the TVOC concentrations are within the 2000 through 2013 range, but appear to be increasing from 2005 through 2014. Due to the high concentrations, this trend may not be meaningful. Future sampling monitoring results will indicate if these trends continue. At well 137B, along the southern source area boundary, there is no apparent increasing or decreasing trend. TVOC concentrations at 137B have ranged from 271.1 μg/l to 2,112 μg/l and were 462.3 μg/l in 2014.

### *C-Zone*

Results from the four C-Zone wells indicate TVOC concentrations were generally below 3,000 μg/l; with the only exception 168C (13,930 μg/l), which is near the limits of source area. TVOC concentrations at two of the locations were below 100 μg/l.

Wells 145C and 168C are used to delineate the C-Zone source area limit. At 145C, concentrations were lowest on record; however, no trend can be discerned due to the large variability in TVOC concentrations. It is worth noting that over the last five years, the TVOC concentrations have declined year to year. Future analytical results will indicate if this is a trend at 145C or a temporary fluctuation. Since this is a source area well, it is expected to take an extended period for concentrations to decline; however, the TVOC concentration observed have dropped three orders of magnitude over the last three years. At downgradient well 168C, the concentration initially decreased after the 2005 start-up but later increased to a 10,000 to 15,000 μg/l range. The concentrations have been slightly decreasing again since 2010.

Wells 146C and 150C are downgradient of the source area under ambient groundwater flow conditions. TVOC concentrations at 146C were over 20 μg/l prior to 2006; however, the concentrations decreased in 2006 and have remained below 15 μg/l until the 2014 sampling event when they increase to 71.6 μg/l. Future sampling results will indicate if TVOC concentrations are increasing or if the 2014 analytical results are anomalous. At location 150C, TVOC result for 2013 show a marked increase to, 463.3 μg/l, most of which was attributed to DCE and VC, which are degradation products of TCE. Analytical results in 2014 show another increase to 2,352 μg/l, again mostly attributed to DCE and VC. Future analytical results will be evaluated to determine if this result is anomalous or is indicative of increased TVOC concentrations.

### *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 D-Zone source area. Well 165D had TVOC concentrations of 13.59 μg/l, which have been declining since the peak of approximately 1,600 μg/l in May 2006.

TVOC concentrations at far-field wells (136D, 145D, and 148D,) ranged from 4.58 μg/l (148D) to 1,336.5 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 2014, the TVOC concentrations in wells 136D and 145D have decreased to 379.2 μg/l – 389.1 μg/l ( duplicate) and 1,336.5 μg/l, respectively. At far field well 148D, the concentrations remained low at approximately 4 μg/l and within the range of concentrations from 1996 to present. There is an upward trend in TVOC concentrations at 148D from 2000 to 2014; 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 wells136D, 145D, 148D, and 165D. 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 of the two wells within the E-Zone source area (146E at 3,531 μg/l and 165E at 30,310 μg/l) and 150E (1,105.3 μg/l) are consistent with previous results. 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. The presence of these degradation compounds is indicative of the occurrence of active natural attenuation processes.

Well 165E is a source area well and therefore the concentrations are high (now typically ranging between 57,550 and 30,310 μg/l, 2012 and 2014). Furthermore the well is located just upgradient of recovery well RW-9. Due to this location and active pumping at RW-9 concentrations are increasing between 2006 and 2014 as the plume is drawn towards, and captured by, the recovery well.

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 for the last six years. 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 486 μg/l (2000) and typically between 500 and 1,300 μg/l in recent years.

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 66.14 μg/L to 9,681 μg/l, and all three locations showed decreasing trends. Each of the three wells (136F, 146F, and 150F) showed the lowest TVOC concentration in 2013 and again in 2014 for their location. Similar to the results from the E-Zone wells TVOC, results for all the F-Zone wells are dominated by biogenic degradation compounds cis-DCE and VC.

In 2014, TVOC concentrations at well 146F, at the edge of the F-Zone source area, were the lowest observed at this location to date and have decreased from a high of 36,700 μg/l in 2000 to 9,681 μg/l in 2014. TVOC concentrations at near source well 136F have also steadily declined since HCS startup from 8,348 μg/l (2005) to 66.14 μg/l (2014), the lowest observed TVOC concentration at 136F to date. TVOC concentrations at location 150F have shown a steady trend lower since 1998, with concentrations decreasing from initially over 4,500 μg/l to 417.5 μg/l in 2014, the lowest observed TVOC concentration at this location to date.

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 Monitored Natural Attenuation (MNA) Assessment

In 2010, DuPont submitted a request to the USEPA for modifications to the LTGMP. DuPont requested that the frequency of MNA sampling be reduced to every five years and that several wells be removed from the annual sampling list. The USEPA agreed (USEPA, July 16, 2010) to the reduction in the number of wells sampled annually, but required MNA monitoring to be completed next in 2013. The 2013 results were then used to evaluate the feasibility of reducing to a five-year time frame for MNA sampling. Based on the 2013 MNA sampling results (discussed in the 2013 Annual Report), future MNA sampling is currently scheduled to be completed on a five year schedule. The next MNA sampling will is scheduled to be completed in 2018. Additionally, USEPA is requiring that all wells included in Table 3-12 of the 2009 Annual Report be sampled on a three- or five-year schedule to monitor source area groundwater chemistry trends.

The concentrations from 2014 generally indicate that MNA remains an active component in the source area and the far-field plume. The primary and secondary indicators of natural attenuation of chlorinate solvent in groundwater are: (1) decreasing concentrations of the primary (TCE) and secondary (DCE) compounds, and (2) geochemical indicators that the natural attenuation conditions are active at the site (USEPA 1998). Trends in concentrations (provided above) suggest that, overall, the plume is depicted as stable or decreasing in the far-field. Outside the source area, concentrations are decreasing over time, and constituents are predominately degradation products (DCE and VC) with lower concentrations of tetrachloroethene and TCE. Within the Source Area, there are stoichiometrically elevated concentrations of DCE and VC to suggest active natural attenuation processes, as well. Furthermore, the geochemical indicators demonstrated that the groundwater was strongly anaerobic (oxidation reduction potential ranging from -582 to -210) and likely sulfate reducing and or methanogenic (with a pH between 6 and 8 standard units). These are optimal ranges for natural attenuation.

## 3.6 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 PDIs. The 2014 monthly DNAPL monitoring results are summarized in Table 3-8.

In 2014, no DNAPL was identified during the monthly or semi-annual monitoring. Therefore, no DNAPL was removed. A total of approximately 8,750 gallons of DNAPL have been recovered since the program was put in place.

## 3.7 Quality Control/Quality Assurance

The 2014 annual groundwater samples were submitted to TestAmerica Laboratories in North Canton, Ohio, for all chemical analyses.

### 3.7.1 Sample Collection

The 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 five delivery groups received at the laboratories between July 23 and July 29, 2014. 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, five daily equipment blank samples, and five trip blanks (volatile organics).

***In-House Data Collection***

The quality of the data set was evaluated by the URS 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 DuPont Data Deliverable Review [DDR] 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 DuPont, referred to as the DDR, 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 DDR 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 sample analyses were completed within the USEPA recommended holding times. The semi-volatile compound phenol was detected at low concentrations in several equipment blanks. Several wells had phenol concentrations in the same range as the blanks (less than five times the analytical result for the blanks), and were B-qualified as unreliable detections. The volatile compound methylene chloride was detected at low concentrations in several laboratory prep blanks. Several well samples had methylene chloride concentrations in the same range as the blanks (less than ten times the analytical results for the blanks) and were B-qualified as unreliable detections. The 2,4,5-trichlorophenol detection in the sample from 137B was J qualified due to low matrix spike recovery.

The semi-volatile analysis included a targeted tentatively identified compound reported as TIC 1. All positive results reported for TIC 1 should be considered estimated concentrations. The analytical results provide a total of 3-methylphenol and 4-methylphenol due to the inability of the laboratory instrumentation to separate the two under the chromatographic conditions used for sample analysis.

A number of samples required dilutions for analysis for volatiles and semi-volatiles, resulting in elevated reporting limits for the affected analytes. As a result of the dilutions, some volatile and semi-volatile surrogate recoveries could not be determined (diluted out) or were recovered outside the laboratory control window.

The chloride results for wells 150A, 150B, 150F, 150C, 150E, and 171B were J qualified as estimated detections because the associated matrix spike was recovered above the control limit windows. These detections may be biased high.

Relative percent difference (RPD) between field duplicate pairs that exceeded 30 percent were J-qualified as estimated. 2,4,5-trichlorophenol and dissolved barium from field samples from 137A, 136D, and two duplicate samples were qualified.

All analytes reported between the method detection limit (MDL) and practical quantitation limit (PQL) were J qualified as estimated concentrations.

### 3.7.2 Independent Data Validation

In addition to the in-house evaluation, a minimum of 10% of the sample locations and associated field and laboratory QC samples were submitted for independent data validation by Environmental Standards, Inc., of Valley Forge, Pennsylvania. The wells were selected for validation based on their importance to the program (key perimeter wells) and include well locations 136D, 146E, and associated QC samples, 136DMS (matrix spike), 135DMSD (matrix spike duplicate), BLIND1 (field blind duplicate sample of 136D), EB1-072214, EB1-072214MS, EB1-072214MSD, and TB1-072214. A copy of the Data Validation Summary report is included in Appendix C as an electronic file.

When appropriate, validation qualifiers were applied to samples due to field duplicate imprecision, low matrix spike duplicate recovery, continuing calibration verification drift, quantitation of TIC results, and quantitation below the PQL. No sample results were qualified as unusable.

Validation qualifiers were applied to carbon tetrachloride analytical results associated with the continuing calibration verification (CCV) with a high (greater than 20%) drift, coupled with a decrease in instrument sensitivity. The method detection limits (MDLs) and reporting limits (RLs) may be higher than reported and the results that were below the detection limit were flagged “UJ”. Detected results for 2,4,5-trichlorophenol in a field sample and duplicate were flagged with a “J” due to a recovery below the QC limit in the associated MSD analysis. The same two samples would have been “J” qualified due to unacceptable precision and sample representativeness between the sample and duplicate. The reported positive results for TICs were considered estimated and flagged with a “J”. TIC concentrations were calculated using an assumed relative response factor of 1.0. All positive results reported with concentrations between the laboratory's associated MDLs and RLs were considered estimated and were flagged with a "J".

# 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 October 15, 2014 are provided in Appendix D. No leachate seeps or settlement was identified, and all aspects of the landfill that were inspected were found acceptable.

As documented in the 2013 Annual report two AT wells, installed through the landfill cap, were abandoned by pulled casing and grouting techniques. Since these wells were booted to the cap, a small section of the cap was cut to remove the casing. Temporarily, grout was used to prevent water from infiltration through the cap. More permanent liner repairs are scheduled for summer 2015.

# 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 extraction. The A-Zone is dewatering vertically from the hydraulic depression created by the HCS. 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 and the associated B-Zone BFBT in 2008 has led to improved A-, B-, and C-Zone hydraulic control in the southwestern part of the site. The increases in flow zone transmissivities by *in-situ* blasting have resulted in an increase in recovery well pumping rates, an increase in the extent of hydraulic influence, and measureable drawdowns in distant wells. Water levels within and surrounding the BFBT at RW-11 decreased after the transition from RW-10 to RW-11. This is direct evidence of the increased capture zone resulting from installation of the BFBT. Between 2008 and 2009, there was also significant improvement in the hydraulic control of the A-Zone as shown in a comparison of previous to 2014 A-Zone potentiometric contours. This improvement, likely due to the BFBT, was maintained during 2014.

### 5.1.2 Recommendations

Based on the site history, years of monitoring, and observations made in 2014, the following procedures are recommended:

- Rehabilitate RW-4, RW-5, RW-11 on an semi-annual basis
- Monitor RW-11 yield and total depth to develop an understanding of the proper maintenance schedule needed for this location
- Review and present options for continual or permanent rehabilitation or modification of RW-5

## 5.2 Groundwater Chemistry Monitoring

### 5.2.1 Conclusions

The 2014 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 2014 would not change the A-Zone and B/C-Zone source area limits as delineated in the SAR.

- Analytical results for 2014 (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 2014 sampling results represent the 13th 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 and 2011.

## 5.3 MNA Conclusions and Recommendations

MNA sampling was not completed in 2014 as agreed to by the USEPA. The next sampling event for MNA monitoring is scheduled to be completed in 2018. Analytical results from 2014, such as concentrations of degradation products and geochemical conditions, continue to support the recommendation that MNA assessments be conducted every five years.

## 5.4 DNAPL Monitoring and Recovery

### 5.4.1 Conclusions

Results of the 2014 DNAPL monitoring and historical recovery efforts indicate the following:

- Monitoring for the presence of DNAPL was completed monthly during 2014.
- No DNAPL was identified and therefore, no DNAPL was removed during 2014.
- Approximately 8,750 gallons of DNAPL have been recovered since the recovery program was initiated in 1989.

### 5.4.2 Recommendation

Continue DNAPL monitoring and recover DNAPL where encountered, and review long-term monitoring data for potential monitoring reduction.

## 5.5 Landfill Cap

### 5.5.1 Conclusions and Recommendations

With establishment of a continuous vegetative cover, the landfill cap construction is complete and will be now be maintained in accordance with the CMMP. At the two AT-Zone well abandonment locations that were through the cap, it is recommended that the temporary grout plugs be replaced with formal cap repairs, as scheduled for summer of 2015.

# 6.0 REFERENCES

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# TABLES

# Table 2-1
## HCS Recovery Well Performance Summary - 2014
Remedial Action Post-Construction Monitoring - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| General Water Qua | 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 | 24,343 | 89.6% | 74,528 | 85.5% | 267,774 | 90.6% | 490,314 | 93.5% | 432,547 | 95.8% |
| February | 15,206 | 99.3% | 80,942 | 96.1% | 238,004 | 95.6% | 461,569 | 98.8% | 348,866 | 99.3% |
| March | 12,800 | 99.4% | 83,106 | 98.7% | 231,046 | 97.4% | 533,792 | 100.0% | 388,505 | 99.6% |
| April | 19,055 | 98.2% | 86,363 | 83.6% | 193,428 | 98.1% | 542,216 | 100.0% | 447,412 | 100.0% |
| May | 16,299 | 99.5% | 100,282 | 98.3% | 156,440 | 83.3% | 530,807 | 100.0% | 421,981 | 100.0% |
| June | 14,396 | 97.2% | 83,765 | 87.0% | 173,970 | 90.3% | 461,826 | 97.4% | 347,242 | 97.4% |
| July | 29,954 | 92.1% | 275,969 | 83.5% | 165,473 | 88.5% | 419,334 | 96.6% | 316,122 | 96.5% |
| August | 39,223 | 92.8% | 288,234 | 82.4% | 170,377 | 92.2% | 478,723 | 99.9% | 373,739 | 99.9% |
| September | 24,420 | 83.1% | 219,028 | 69.6% | 119,556 | 81.3% | 423,412 | 90.5% | 316,779 | 90.5% |
| October | 30,879 | 98.4% | 244,747 | 91.8% | 114,491 | 94.7% | 476,711 | 100.0% | 399,501 | 99.1% |
| November | 34,270 | 98.7% | 177,970 | 90.9% | 138,036 | 95.9% | 402,575 | 99.9% | 228,880 | 99.9% |
| December | 29,631 | 99.5% | 174,454 | 93.6% | 186,925 | 91.8% | 432,551 | 99.6% | 279,875 | 99.6% |
| 2014 TOTAL / AVG. | 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 - 2014

Remedial Acton Post-Construction Monitoring - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| **General Water Quality** | | **B/C INFLUENT** | | | | **D/E/F INFLUENT** | | | | **COMBINED EFFLUENT** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Analyte** | | 3/11/14 | 4/9/14 | 7/21/14 | 11/13/14 | 3/11/14 | 4/9/14 | 7/21/14 | 11/13/14 | 3/11/14 | 4/9/14 | 7/21/14 | 11/13/14 |
| **Field Parameters** | | | | | | | | | | | | | |
| SPECIFIC CONDUCTANCE | µmhos/cm | 8278 | 7320 | 7239 | 9327 | 4073 | 3825 | 3561 | 3640 | 2874 | 2635 | 3323 | 3809 |
| TEMPERATURE | °C | 9.4 | 9.4 | 14.2 | 13.6 | 11.7 | 11.6 | 14.6 | 12.2 | 9.8 | 9.5 | 14.8 | 13.1 |
| COLOR | ns | cloudy | grey | slight | grey | cloudy | none | cloudy | clear | cloudy | slight | none | clear |
| ODOR | ns | slight | slight | slight | strong | slight | slight | none | strong | slight | slight | slight | slight |
| PH | std units | 5.02 | 5.65 | 5.32 | 5.67 | 7.05 | 6.98 | 6.66 | 6.85 | 7.49 | 7.82 | 7.32 | 7.18 |
| REDOX | mv | 2 | -111 | -68 | -95 | -229 | -272 | -207 | -203 | -47 | -146 | -142 | -159 |
| TURBIDITY | ntu | 43.1 | 35 | 53.1 | 94 | 31.8 | 11.85 | 50.9 | 33.2 | 50.3 | 23.1 | 10.69 | 40.2 |
| **Volatile Organics** | | | | | | | | | | | | | |
| 1,1,2,2-TETRACHLOROETHANE | µg/l | 3100 | 2700 | 2900 | 2600 | 1200 | 1100 | 1400 | 1400 | 460 | 440 | 610 | 440 |
| 1,1,2-TRICHLOROETHANE | µg/l | 3200 | 2400 | 3400 | 2600 | 2100 | 2100 | 2300 | 2500 | 340 | 340 | 400 | 260 |
| 1,1-DICHLOROETHENE | µg/l | 380 J | 400 | 810 | 1200 | 280 J | 300 | 300 J | 280 J | <2.7 | <1.4 | <3.8 | <6.4 |
| 1,2-DICHLOROETHANE | µg/l | 420 J | 340 | 490 J | 440 J | 150 J | 160 J | 180 J | 170 J | 17 | 17 | 28 | 12 J |
| CARBON TETRACHLORIDE | µg/l | 1600 | 1700 | 1300 | 1800 | 910 | 1100 | 1100 | 1200 | <1.9 | 3.6 J | <2.6 | <2.4 |
| CHLOROFORM | µg/l | 17000 | 13000 | 14000 | 12000 | 3600 | 3600 | 3600 | 3700 | 81 | 98 | 190 | 53 |
| CIS-1,2-DICHLOROETHENE | µg/l | 5200 | 4900 | 11000 | 11000 | 9900 | 9900 | 10000 | 9800 | 110 | 120 | 160 | 60 |
| METHYLENE CHLORIDE | µg/l | 2500 | 1600 | 2700 | 3100 | 5100 | 4300 | 4400 | 4600 | 120 | 95 | 94 | 38 |
| TETRACHLOROETHENE | µg/l | 5200 | 5100 | 4500 | 6400 | 1000 | 1000 | 1000 | 1300 | 5.6 J | 7.9 | 32 | 7.0 J |
| TRANS-1,2-DICHLOROETHENE | µg/l | 350 J | 320 | 650 | 640 J | 650 | 670 | 700 | 660 | <2.7 | 1.6 J | <3.8 | <3.7 |
| TRICHLOROETHENE | µg/l | 15000 | 12000 | 15000 | 15000 | 5800 | 6000 | 5800 | 6200 | 29 | 37 | 76 | 26 |
| VINYL CHLORIDE | µg/l | 1100 | 1300 | 2800 | 3200 | 1600 | 2000 | 1900 | 1900 | <3.1 | <1.6 | <4.4 | <4.1 |
| TOTAL VOLATILES | µg/l | **55,050** | **45,760** | **59,550** | **59,980** | **32,290** | **32,230** | **32,680** | **33,710** | **1,163** | **1,160** | **1,590** | **896** |

< 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 - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| Well ID | Zone | Well ID | Zone | Well ID | Zone |
|---|---|---|---|---|---|
| 53 | A | 159B | B | 203D | D |
| General Water Quality | 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 | 130G | G |
| 192A | A | 141C | C | 136G | G |
| 193A | A | 145C | C | 141G | G |
| 194A | A | 146C | C | 143G | G |
| D-9 | A | 149C | C | TRW-6 | B/C |
| D-11 | A | 150C | C | TRW-7 | B/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.

# Table 3-2
# 2014 Average A-Zone to B-Zone Vertical Gradients
Remedial Action Post-Construction Monitoring - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| Well Pair | | A | B | C | D | |
|---|---|---|---|---|---|---|
| | | 2014 Average A-Zone Head | 2014 Average B-Zone Head | A-Zone Mid-Point of Well Screen | B-Zone Fracture Elevation[1] | Vertical Gradtient[2,3] (B-A) / (C-D) |
| 111A | 111B | 572.23 | 570.92 | 573.94 | 561.80 | -0.11 |
| 119A | 119B | 573.67 | 572.68 | 571.63 | 556.90 | -0.07 |
| 129A | 129B | 573.60 | 571.03 | 570.10 | 557.80 | -0.21 |
| 137A | 137B | 571.42 | 571.16 | 570.10 | 561.30 | -0.03 |
| 145A | 145B | 571.55 | 568.90 | 564.19 | 546.30 | -0.15 |
| 150A | 150B | 571.46 | 570.33 | 564.69 | 553.18 | -0.10 |
| 159A | 159B | 577.30 | 573.07 | 580.62 | 562.90 | -0.24 |
| 163A | 163B | 572.94 | 572.84 | 572.49 | 564.96 | -0.01 |
| 168A | 168B | 570.28 | 567.23 | 555.22 | 544.90 | -0.30 |

**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 - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| Contaminant | 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 2014 Annual Sampling

Remedial Action Post-Construction Monitoring - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| Well ID | Flow Zone | Analyte | Criteria (ppb) | 2005 | | 2006 | | 2007 | | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 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 |
| | | Hexachlorobenzene | 0.22 | BC | 4.0 | 31 J | 3.4 J | NS | 1.4 J | BC | < 0.4 | < 2.5 | <0.95 | BC | BC |
| 105C | C | Carbon Tetrachloride | 40,000 | NS | NS | NS | BC | NS | BC | BC | BC | NS | NS | NS | BC |
| | | Hexachlorobutadiene | 1,180 | 1,700 | BC | 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 |
| | | Tetrachloroethene | 4,500 | 32,000 | 35,000 | NS | 36,000 | NS | 37,000 J | 32,000 | 13,000 | NS | NS | NS | 24,000 |
| | | Trichloroethene | 44,000 | 280,000 | 190,000 | NS | 190,000 | NS | 160,000 | 140,000 | 74,000 | NS | NS | NS | 190,000 |
| 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 |
| 137C | C | Tetrachloroethene | 4,500 | 8,500 | 22,000 | NS | 7,900 | NS | BC | BC | BC | NS | NS | NS | BC |
| 105D | D | Carbon Tetrachloride | 40,000 | 150,000 | 83,000 | NS | 170,000 | NS | 190,000 | BC | 200,000 | NS | NS | NS | 360,000 |
| | | Chloroform | 80,000 | 98,000 | 35,000 | NS | 80,000 | NS | 90,000 | 96,000 | 120,000 | NS | NS | NS | 160,000 |
| | | Tetrachloroethene | 4,500 | 12,000 | 57,000 | NS | 11,000 | NS | 13,000 J | 12,000 | 16,000 | NS | NS | NS | 22,000 |
| | | Trichloroethene | 44,000 | 120,000 | 51,000 | NS | 110,000 | NS | 120,000 | 130,000 | 180,000 | NS | NS | NS | 250,000 |
| 137D | D | Tetrachloroethene | 4,500 | 5,100 | 4,900 | NS | BC | NS | 7,200 | 5,300 J | 4,700 | NS | NS | NS | BC |
| | | Trichloroethene | 44,000 | 64,000 | 76,000 | NS | BC | NS | 91,000 | 70,000 | 76,000 | NS | NS | NS | BC |
| | | Hexachlorobenzene | 0.22 | 3.0 | 11.0 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| 139D | D | Hexachlorobutadiene | 1,180 | 1,200 | BC | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |

BC: Below Criteria
NS: Not Sampled
Note: Only one well in the current monitor program has ever exceeded effective solubility limit, other locations are sampled less frequently
"<" = compound not identified above the detection limit.

## Table 3-5

## 1% of Pure-Phase Solubility Concentration Exceedances for DNAPL Compounds - 2005 through 2014 Annual Sampling

Remedial Action Post-Construction Monitoring - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| Well ID | Flow Zone | Analyte | Criteria (ppb) | 2005 | | 2006 | | 2007 | | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 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 |
| 136B | B | Tetrachloroethene | 1,500 | BC | BC | BC | BC | BC | BC | 1,500 | 1,600 | BC | BC | 2,000 | 1,500 | 1,500 |
| 139B | B | Tetrachloroethene | 1,500 | NS | NS | NS | 2000 J | NS | 4,600 | 3,100 | 3,200 | NS | NS | NS | 2,900 | NS |
| | | Hexachlorobutadiene | 20 | 78 | BC | 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 |
| 171B | B | Hexachlorobutadiene | 20 | 2,100 | 130 | BC | BC | BC | BC | BC | BC | BC | BC | BC | BC | 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 |
| 172B | B | Hexachlorobutadiene | 20 | 140 | 89 | 140 J | 110 | BC | 110 | 54 | 170 | 210 | 20 | 130 | 45 | 120 |
| | | Tetrachloroethene | 1,500 | 1,800 | 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 |
| | | Carbon Tetrachloride | 8,000 | 25,000 | BC | NS | BC | NS | BC | BC | BC | NS | NS | NS | BC | NS |
| | | Chloroform | 80,000 | 250,000 | 180,000 | NS | 120,000 | NS | 90,000 | 82,000 | BC | NS | NS | NS | 100,000 | 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 |
| | | Trichloroethene | 11,000 | 280,000 | 190,000 | NS | 190,000 | NS | 160,000 | 140,000 | 74,000 | NS | NS | NS | 190,000 | 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 |
| 137C | C | Tetrachloroethene | 1,500 | 8,500 | 22,000 | NS | 7,900 | NS | 2,200 | 2,700 | BC | NS | NS | NS | BC | NS |
| | | Trichloroethene | 11,000 | BC | 19,000 | NS | 16,000 | NS | 20,000 | 70,000 | BC | NS | NS | NS | BC | NS |
| 168C | C | Hexachlorobutadiene | 20 | 330 | 64.0 | 54 J | NS | 44 J | BC | BC | NS | <27 | 21 J | BC | BC | BC |
| 105D | D | Hexachlorobutadiene | 20 | 95.0 | BC | NS | NS | NS | NS | NS | N/S | 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 |
| | | Chloroform | 80,000 | 98,000 | BC | NS | 80,000 | NS | 90,000 | 96,000 | 120,000 | NS | NS | NS | 160,000 | 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 |
| | | 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 |
| | | Trichloroethene | 11,000 | 120,000 | 51,000 | NS | 110,000 | NS | 120,000 | 130,000 | 180,000 | NS | NS | NS | 250,000 | NS |
| 137D | D | Tetrachloroethene | 1,500 | 5,100 | 4,900 | NS | BC | NS | 7,200 | 5,300 | 4,700 | NS | NS | NS | BC | NS |
| | | Trichloroethene | 11,000 | 64,000 | 76,000 | NS | 27,000 | NS | 91,000 | 70,000 | 76,000 | NS | NS | NS | BC | NS |
| 139D | D | Hexachlorobenzene | 0.11 | 38.0 | 11.0 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| | | Tetrachloroethene | 1,500 | 1,900 | BC | NS | BC | NS | BC | BC | BC | NS | NS | NS | BC | 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 |
| | | Tetrachloroethene | 1,500 | BC | BC | BC | BC | BC | BC | BC | BC | 2,000 | BC | BC | BC | BC |
| | | Trichloroethene | 11,000 | BC | BC | BC | BC | BC | BC | BC | BC | 11,000 | 12,000 | 12,000 | BC | BC |

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

# Table 3-6
# Chemical Monitoring List
# Long-Term Monitoring

Remedial Action Post-Construction Monitoring - 2014 Annual Report
DuPont 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 - 2014 Annual Report
DuPont Necco Park

| 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

## 2014 DNAPL Recovery Summary

Remedial Action Post-Construction Monitoring - 2014 Annual Report
DuPont Necco Park, Niagara Falls, New York

| Well ID | Frequency | 27-Jan | | 19-Feb | | 5-Mar | | 9-Apr | | 13-May | | 20-Jun | | 21-Jul | | 25-Aug | | 25-Sep | | 17-Oct | | 13-Nov | | 23-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 | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **RW-5** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **RW-11** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **TRW-6** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **TRW-7** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **PZ-A** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-117A** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-123A** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-129A** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-190A** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **D-23** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **PZ-B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-160B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-161B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-167B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-168B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-169B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-170B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-171B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-172B** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-129C** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-160C** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-161C** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-162C** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-168C** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **204C** | Monthly | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | |
| **VH-131A** | emi-annual | na | | na | | na | | 0.0 | | na | | na | | na | | na | | 0.0 | | na | | na | | na | |
| **VH-139A** | emi-annual | na | | na | | na | | 0.0 | | na | | na | | na | | na | | 0.0 | | na | | na | | na | |
| **VH-139C** | emi-annual | na | | na | | na | | 0.0 | | na | | na | | na | | na | | 0.0 | | na | | na | | na | |
| **CECOS52SR** | emi-annual | na | | na | | na | | 0.0 | | na | | na | | na | | na | | 0.0 | | na | | na | | na | |
| **CECOS18SR** | emi-annual | na | | na | | na | | 0.0 | | na | | na | | na | | na | | 0.0 | | na | | na | | na | |
| **CECOS-53** | emi-annual | na | | na | | na | | 0.0 | | na | | na | | na | | na | | 0.0 | | na | | na | | na | |

na - not applicable/not taken
GALS - gallons purged

# FIGURES

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| | |
|---|---|
| Created by: JWS | Date:<br>03-29-11 |
| Checked by: RBP | Date:<br>03-29-11 |
| Approved by: DDT | Date:<br>03-29-11 |
| Project Manager: DDT | Date:<br>03-29-11 |
| Job number: 445356.02020 | |

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

U:/Necco/HydroGeo/Mapping/gis/Necco_Site_location_map.srf

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| | |
|---|---|
| Created by: JWS | Date: 02-27-12 |
| Checked by: JWS | Date: 02-27-2012 |
| Project Manager: Eric Felter | Date: 02-12-2012 |
| | |
| Project Number: 445357.02023 | |

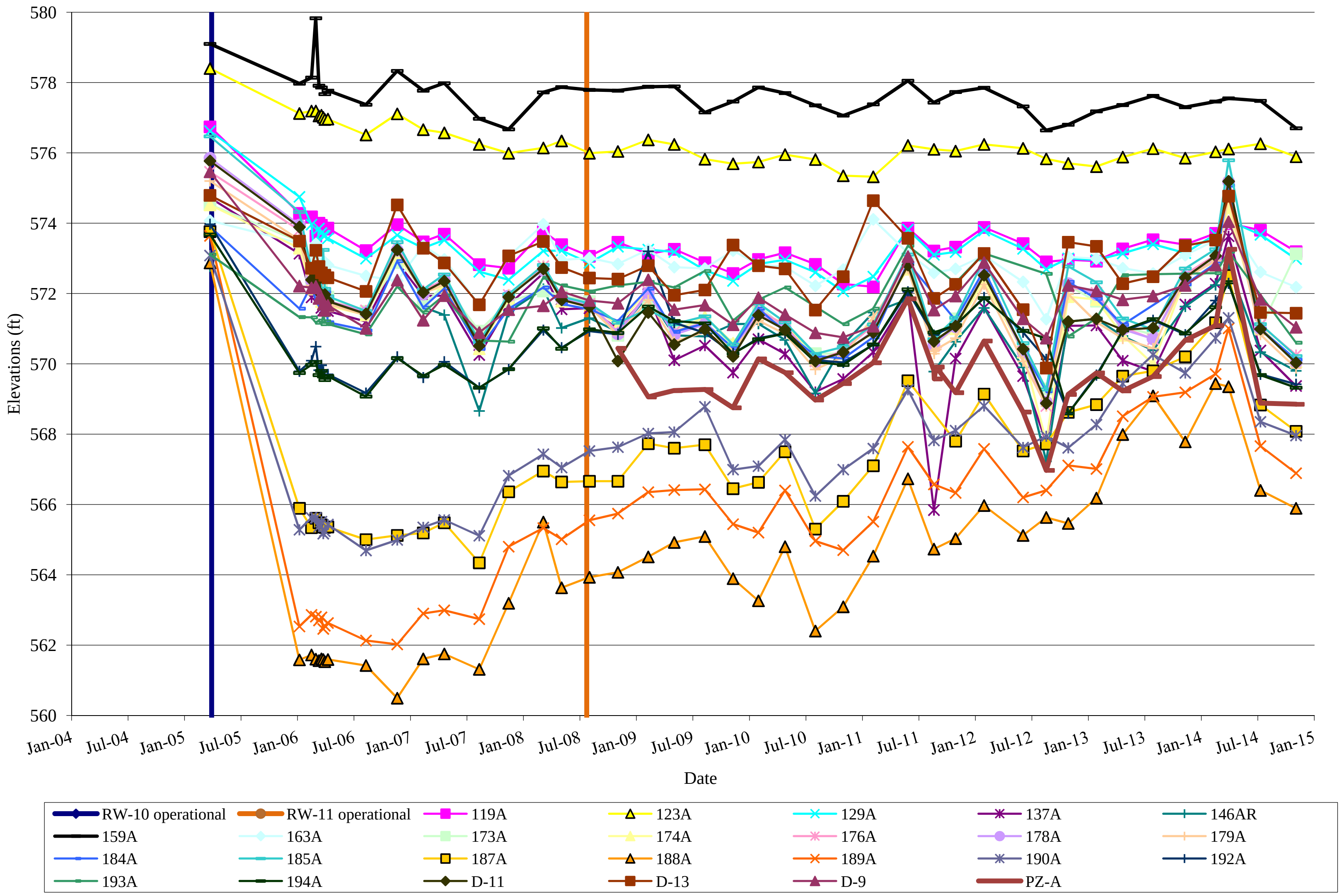
## LEGEND

| | |
|---|---|
| ✦ 2010 REVISED CHEMICAL MONITORING | ┿ RAIL ROADS |
| ⬠ RECOVERY WELLS | ▨ GROUT CURTAIN |
| ◆ MONITORING WELL | |

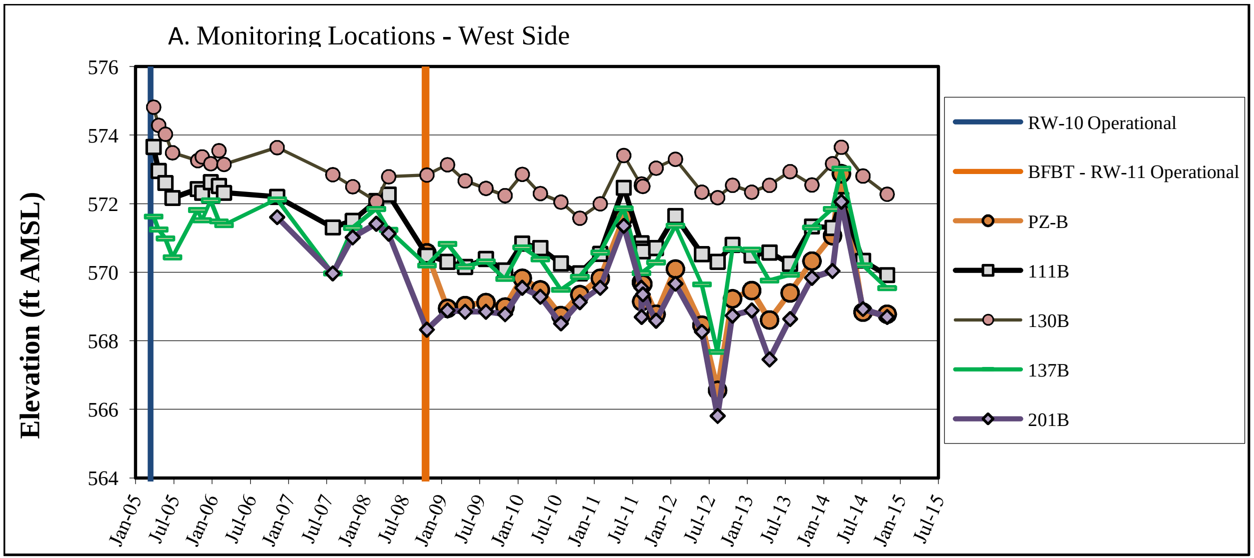
FIGURE 3-1
WELL AND PIEZOMETER LOCATIONS
DUPONT NECCO PARK SITE
NIAGARA FALLS, NY

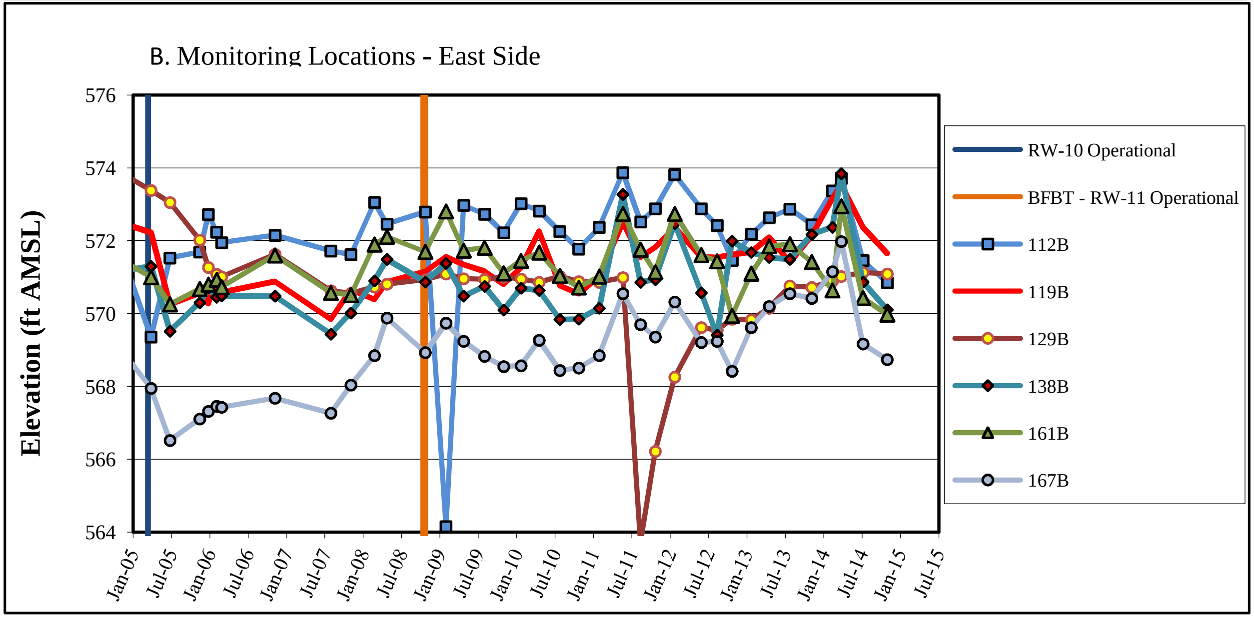
U:\Necco\hydrogeo\Maps\gis\basemap.mxd

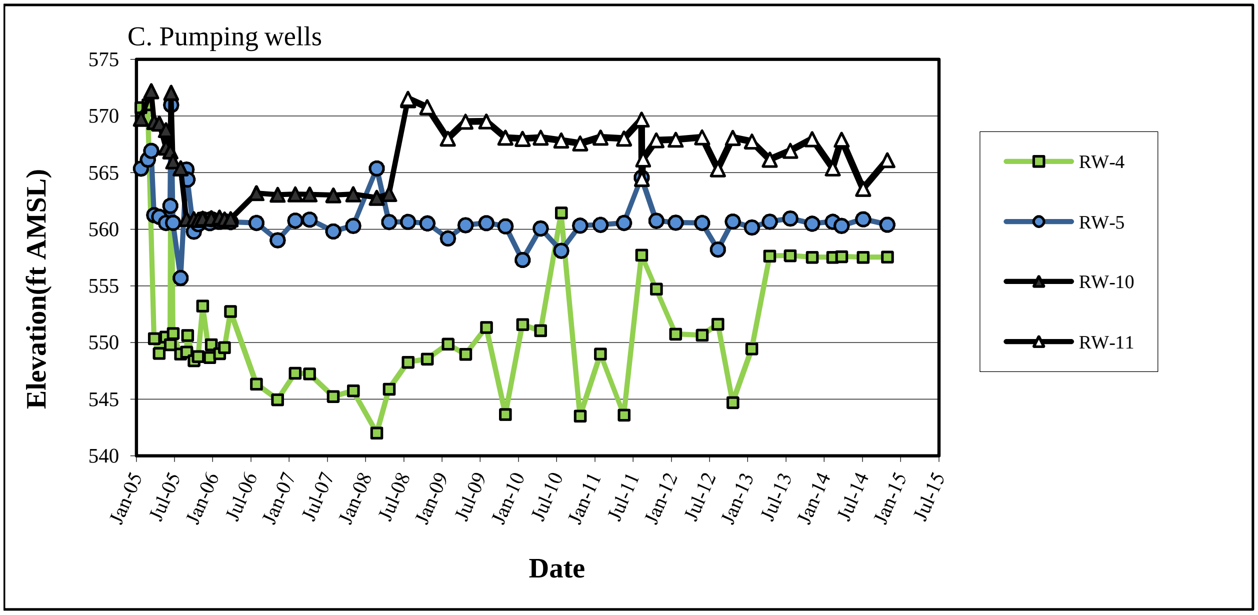
Figure 3-2
Select A-Zone Monitoring Wells
Groundwater Elevations 2005 Through 4th Quarter 2014
DuPont Necco Park



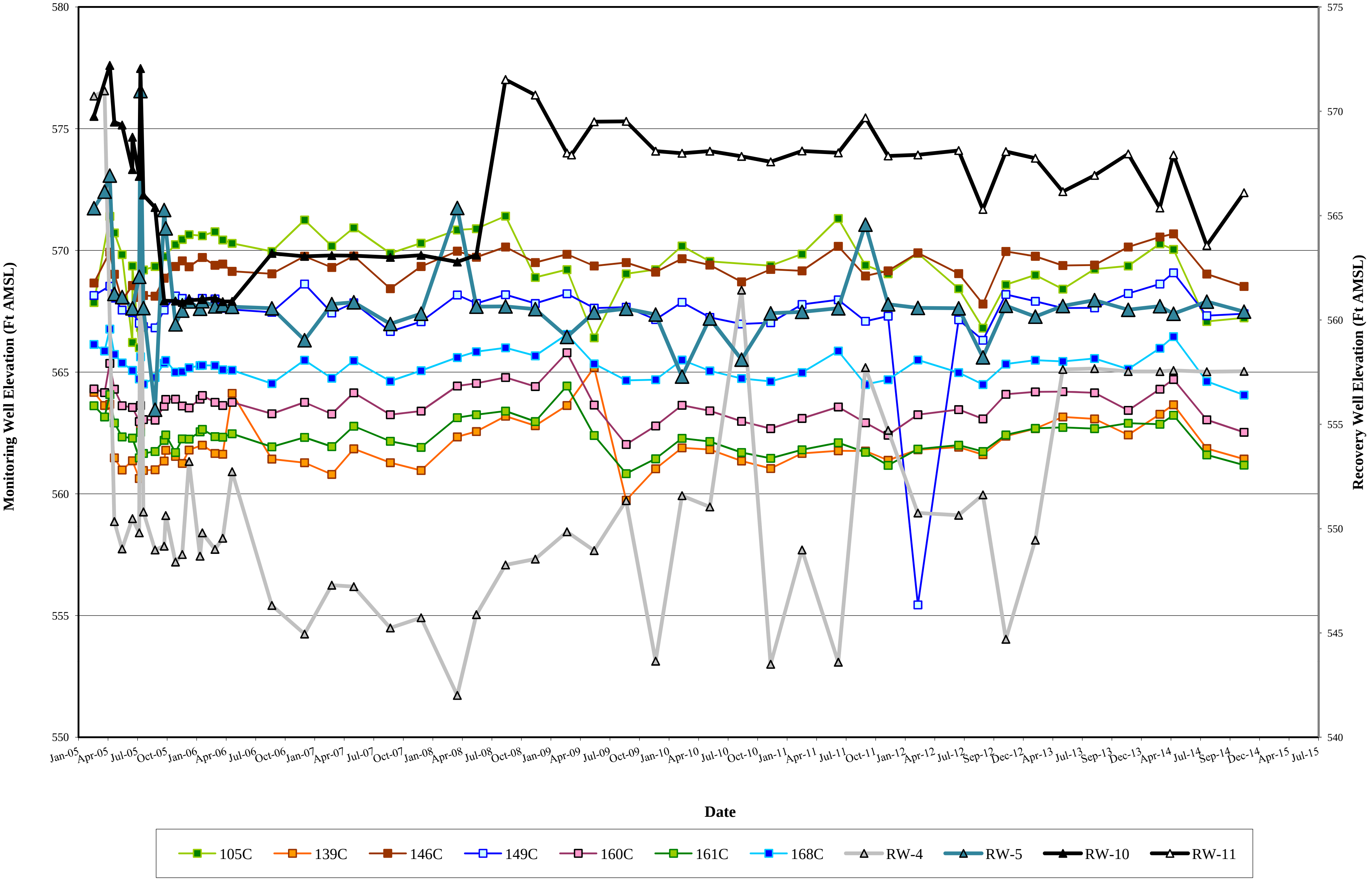
# Figure 3-3
## Select B-Zone Monitoring Wells
## Groundwater Elevations 2005 through 4th Quarter 2014





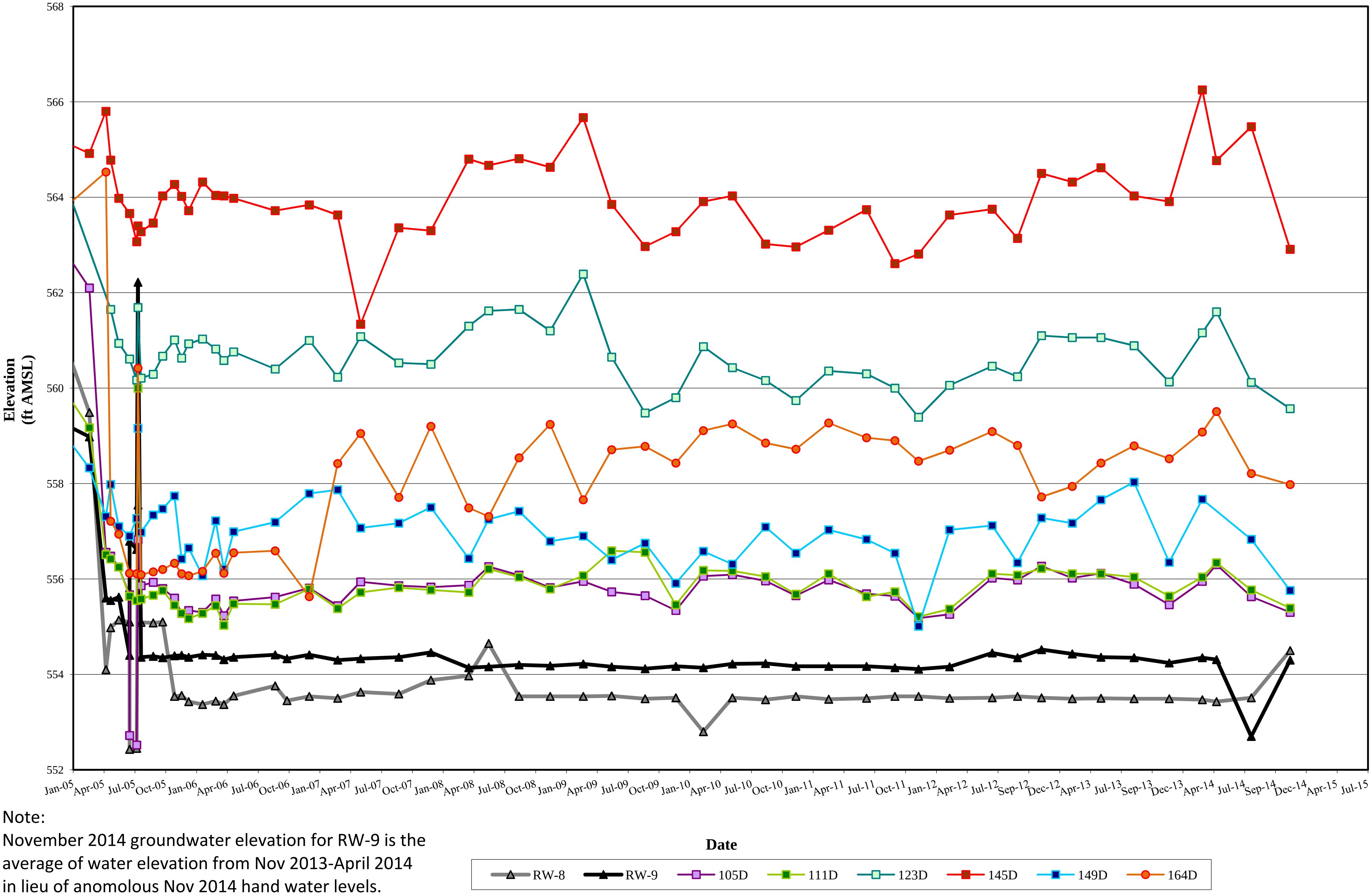


# Figure 3-4
## Select C-Zone Monitoring Wells
## Groundwater Elevations 2005 Through 4th Quarter 2014
## DuPont Necco Park



Necco 2014 C Zone Water Elev Trends.xlsx

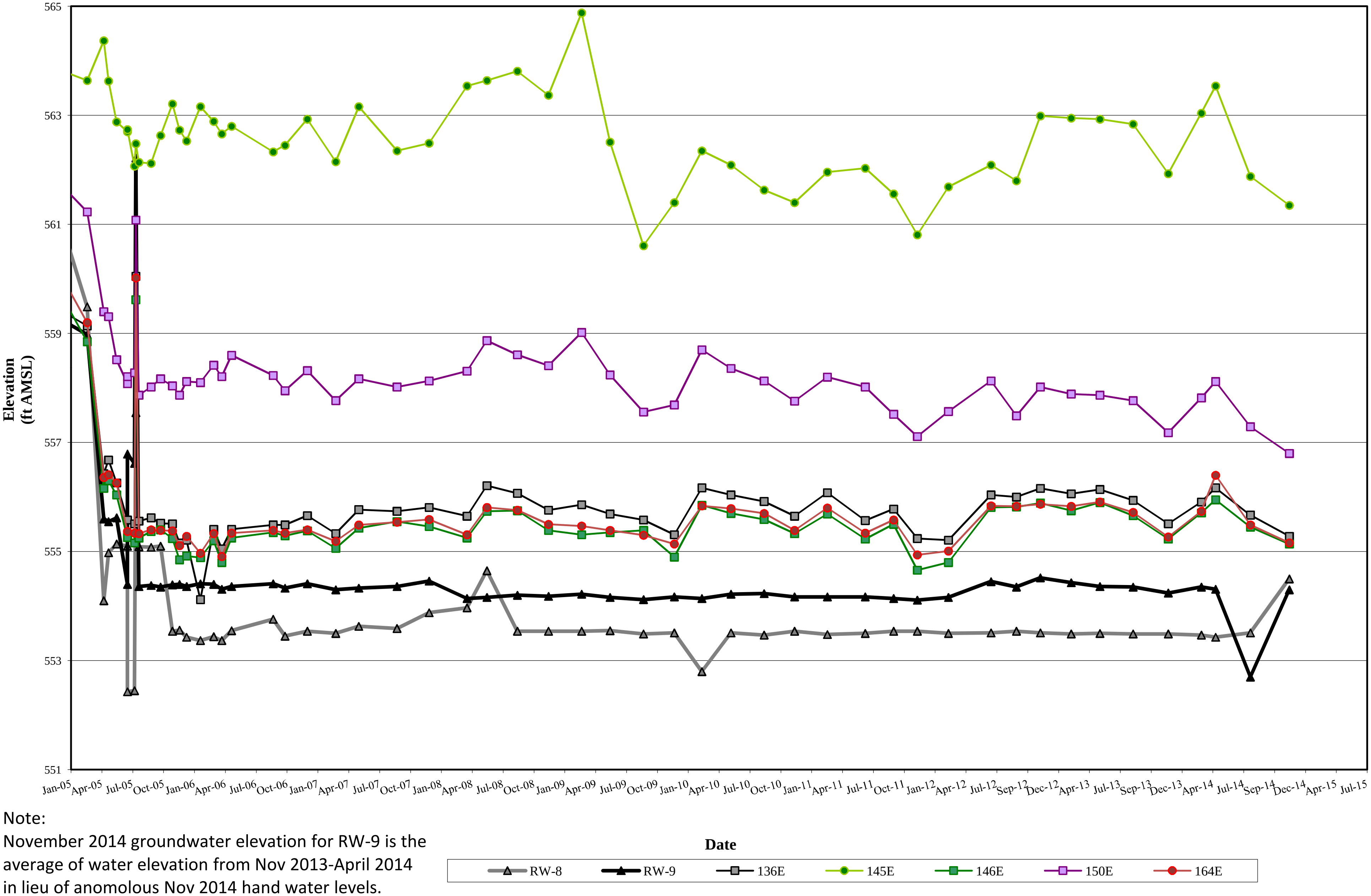
## Figure 3-5
## Select D-Zone Monitoring Wells
## Groundwater Elevations 2005 through 4th Quarter 2014
## DuPont Necco Park



Note:
November 2014 groundwater elevation for RW-9 is the average of water elevation from Nov 2013-April 2014 in lieu of anomolous Nov 2014 hand water levels. Reason for November 2014 anomalies in RW-8 and RW-9 is unknown.

Necco 2014 D Zone Water Elev Trends.xlsx

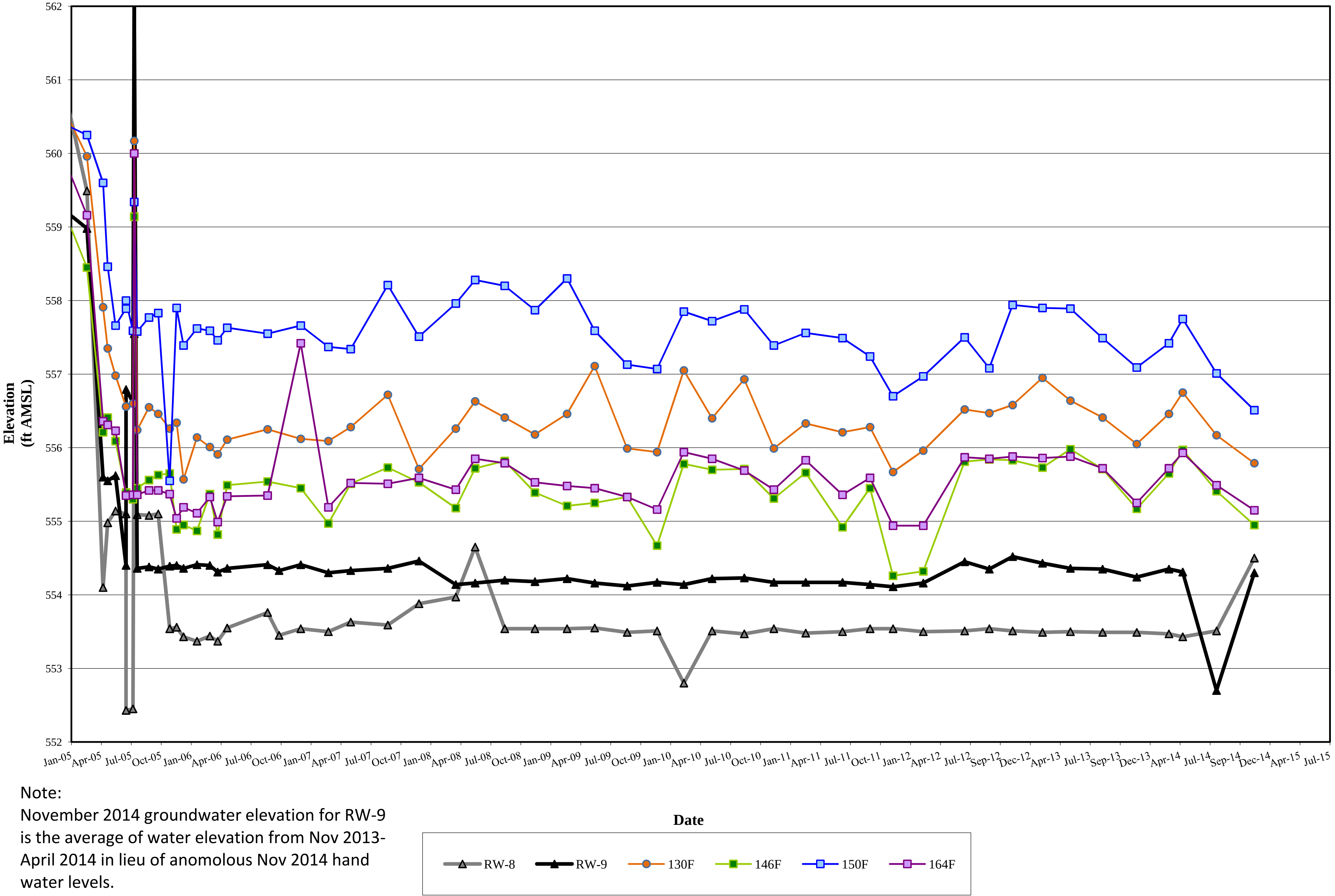
## Figure 3-6
## Select E-Zone Monitoring Wells
## Groundwater Elevations 2005 Through 4th Quarter 2014
## DuPont Necco Park



Note:
November 2014 groundwater elevation for RW-9 is the average of water elevation from Nov 2013-April 2014 in lieu of anomolous Nov 2014 hand water levels. Reason for November 2014 anomalies in RW-8 and RW-9 is unknown.

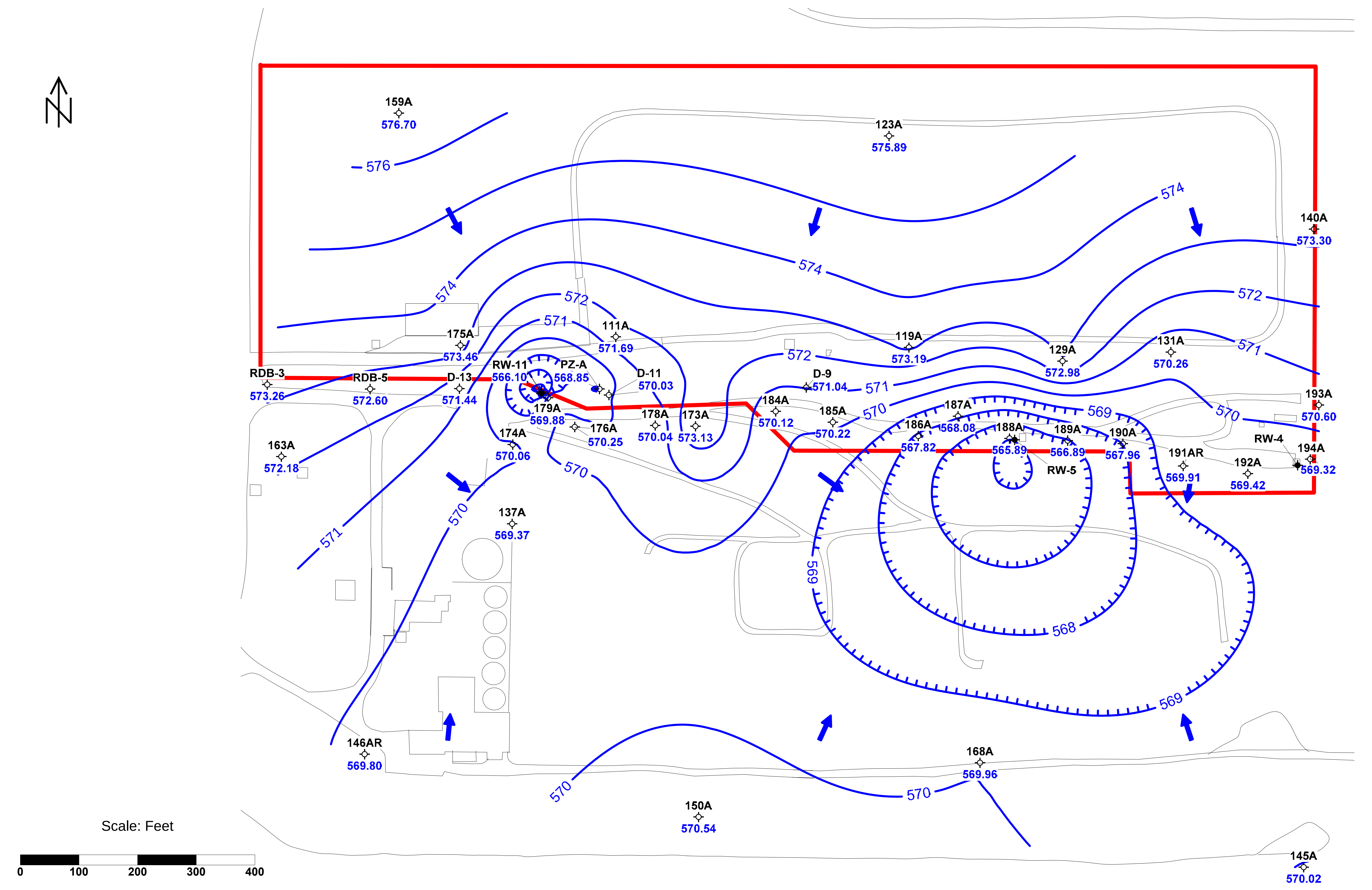
Necco 2014 E Zone Water Elev Trends.xlsx

# Figure 3-7
# Select F-Zone Monitoring Wells
# Groundwater Elevations 2005 Through 4th Quarter 2014
# DuPont Necco Park



Note:
November 2014 groundwater elevation for RW-9 is the average of water elevation from Nov 2013-April 2014 in lieu of anomolous Nov 2014 hand water levels.
Reason for November 2014 anomalies in RW-8 and RW-9 is unknown.

Necco 2014 F Zone Water Elev Trends.xlsx



**Contour Interval = 1 foot** **Elevation datum feet AMSL** **191AR was installed in October 2013 as a replacement for 191A. Survey information is approximate.**

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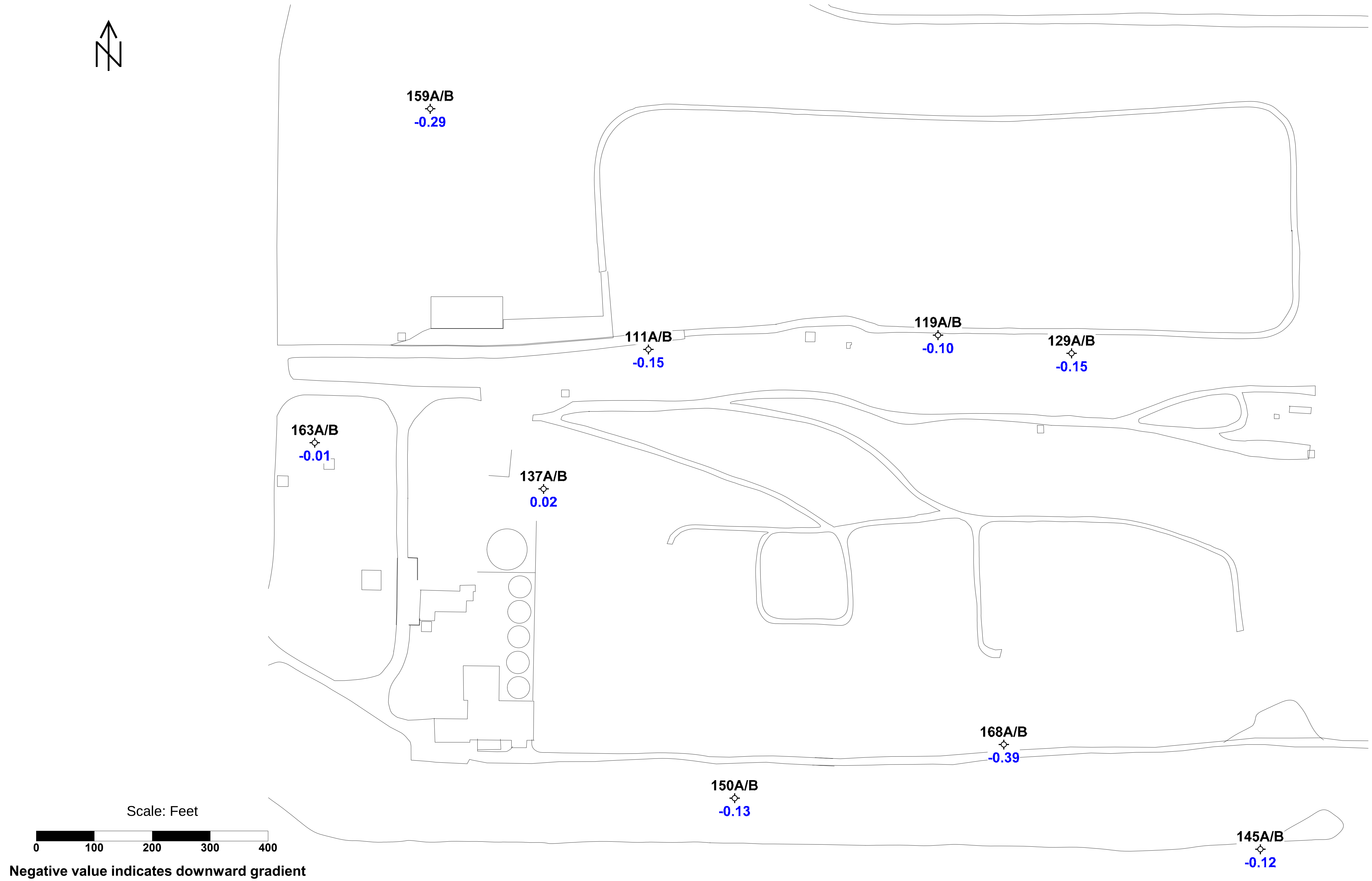
Checked by: JWS Date: 12-01-14
Project Manager: EAF Date: 12-01-14
Job number: 448576.02050

**LEGEND**

| | | | |
|---|---|---|---|
| **3B** | **Well ID** | | **Potentiometric Contour** |
| ✧ | **Monitoring Well** | | **Structure** |
| ✦ | **Pumping Well** | | **Road** |
| | | | **Source Area Extent** |

## Figure 3-8
## Potentiometric Surface Map
## DuPont Necco Park: A-Zone
## November 13, 2014



**Negative value indicates downward gradient**

**Elevation datum feet AMSL**

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| | |
|---|---|
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| Project Manager: EAF | Date:<br>12-01-14 |
| | |

Job number: 448576.02050

**LEGEND**

**150A/B** **Well ID**

✧ **Monitoring Well**

✦ **Pumping Well**

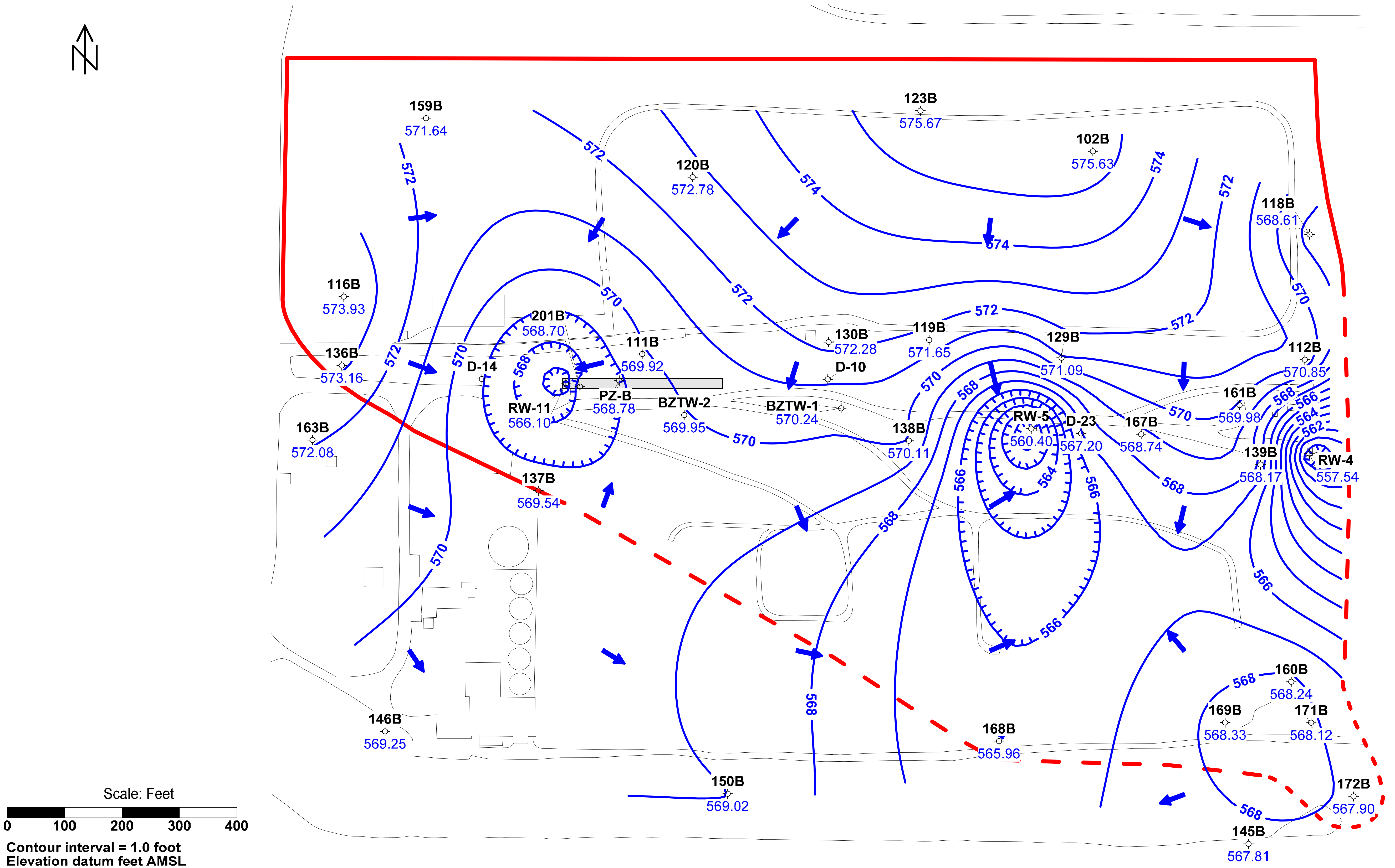
☐ **Structure**

═ **Road**

-0.10 **Vertical Hydraulic Gradient**

## Figure 3-9
## Vertical Gradient: A-Zone to B-Zone
## DuPont Necco Park
## November 13, 2014

**//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2014-11-13 NEC Contour Tool/2014-11-13 - ABvgrad - F3.srf**



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, D-10, TRW-6, and TRW-7 were not used in the contouring.

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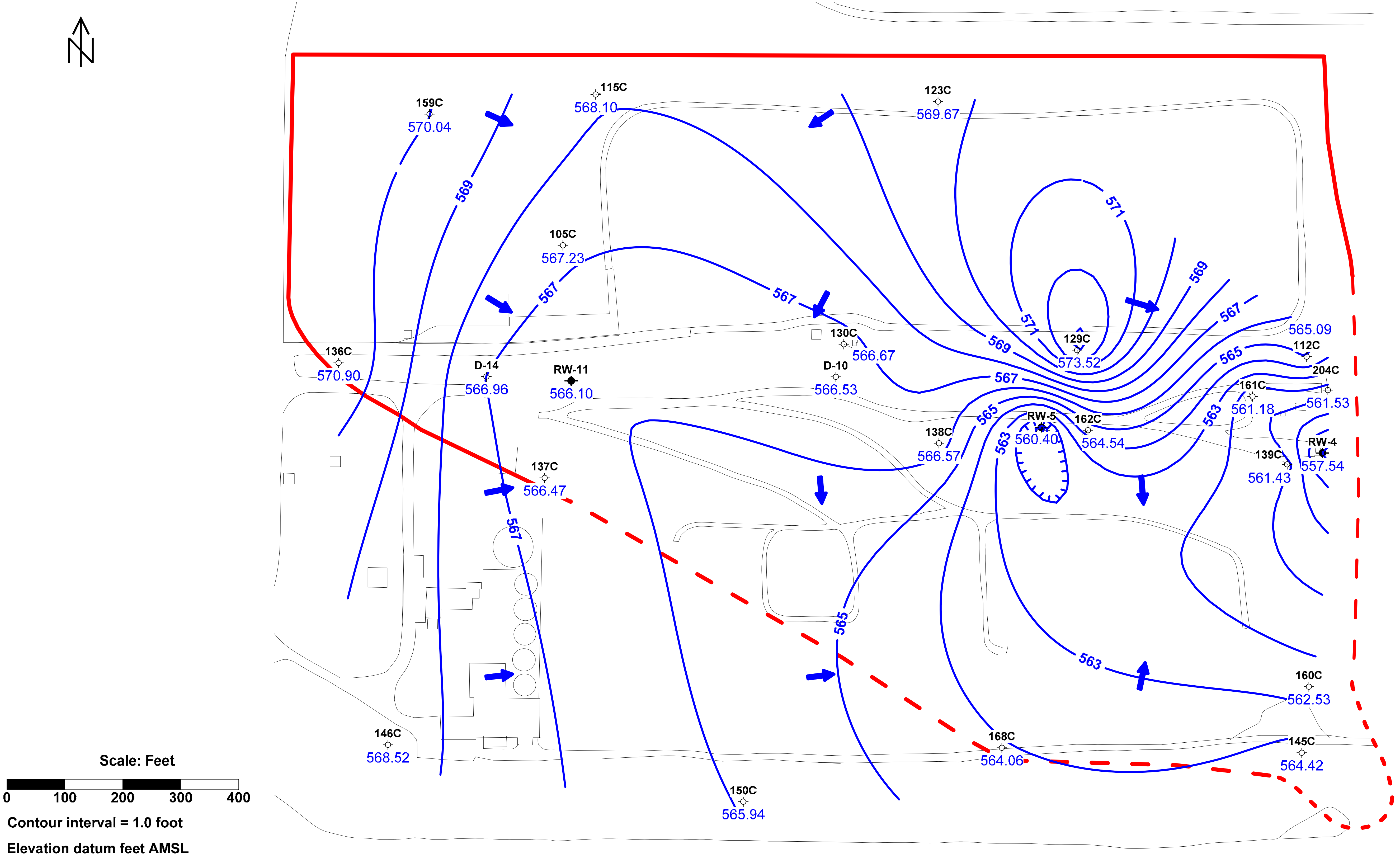
| Project Manager: EAF | Date:<br>12-01-14 |
| | |
| Job number: 448576.02050 | |

**LEGEND**

3B Well ID
⌖ Monitoring Well
✦ Pumping Well
Potentiometric Contour
Structure
Road
Source Area Extent
▨ Bedrock Fractured Blast Trench

## Figure 3-10
## Potentiometric Surface Map
## DuPont Necco Park: B-Zone
## November 13, 2014

\\nybuf03fs01\DupontS\Necco\HydroGeo\Hydro\GW_contours\2014-11-13 NEC Contour Tool\2014-11-13 - PZ B - F5.srf



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| | |
|---|---|
| Created by: RBP | Date: 11-21-14 |
| Checked by: JWS | Date: 12-01-14 |
| Project Manager: EAF | Date: 12-01-14 |

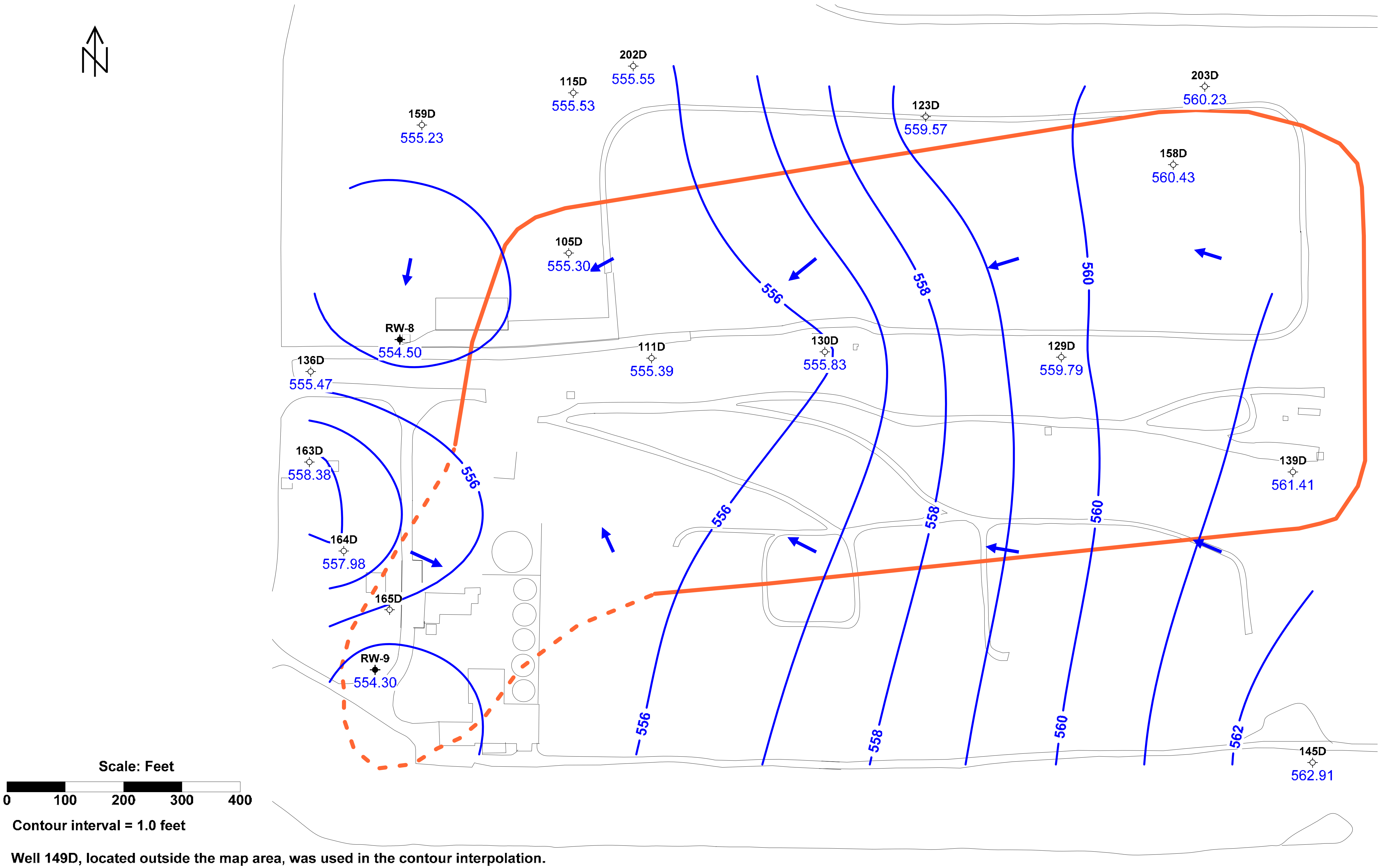
Job number: 448576.02050

**LEGEND**

| | | | |
|---|---|---|---|
| 3B | Well ID | ╱ | Potentiometric Contour |
| ⌖ | Monitoring Well | ▭ | Structure |
| ✦ | Pumping Well | ═ | Road |
| - - - | Source Area Extent | | |

# Figure 3-11
# Potentiometric Surface Map
# DuPont Necco Park: C-Zone
# November 13, 2014

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2014-11-13 NEC Contour Tool\2014-11-13 - PZ C - F7.srf



Contour interval = 1.0 feet

Well 149D, located outside the map area, was used in the contour interpolation.
Well 148D located downgradient was not used in the interpolation.
Well 165D was not used in the contour interpolation.
RW-9 water level is the average of water elevation from Nov 2013-April 2014, used in lieu of anomolous Nov 2014 hand water levels.

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|---|---|
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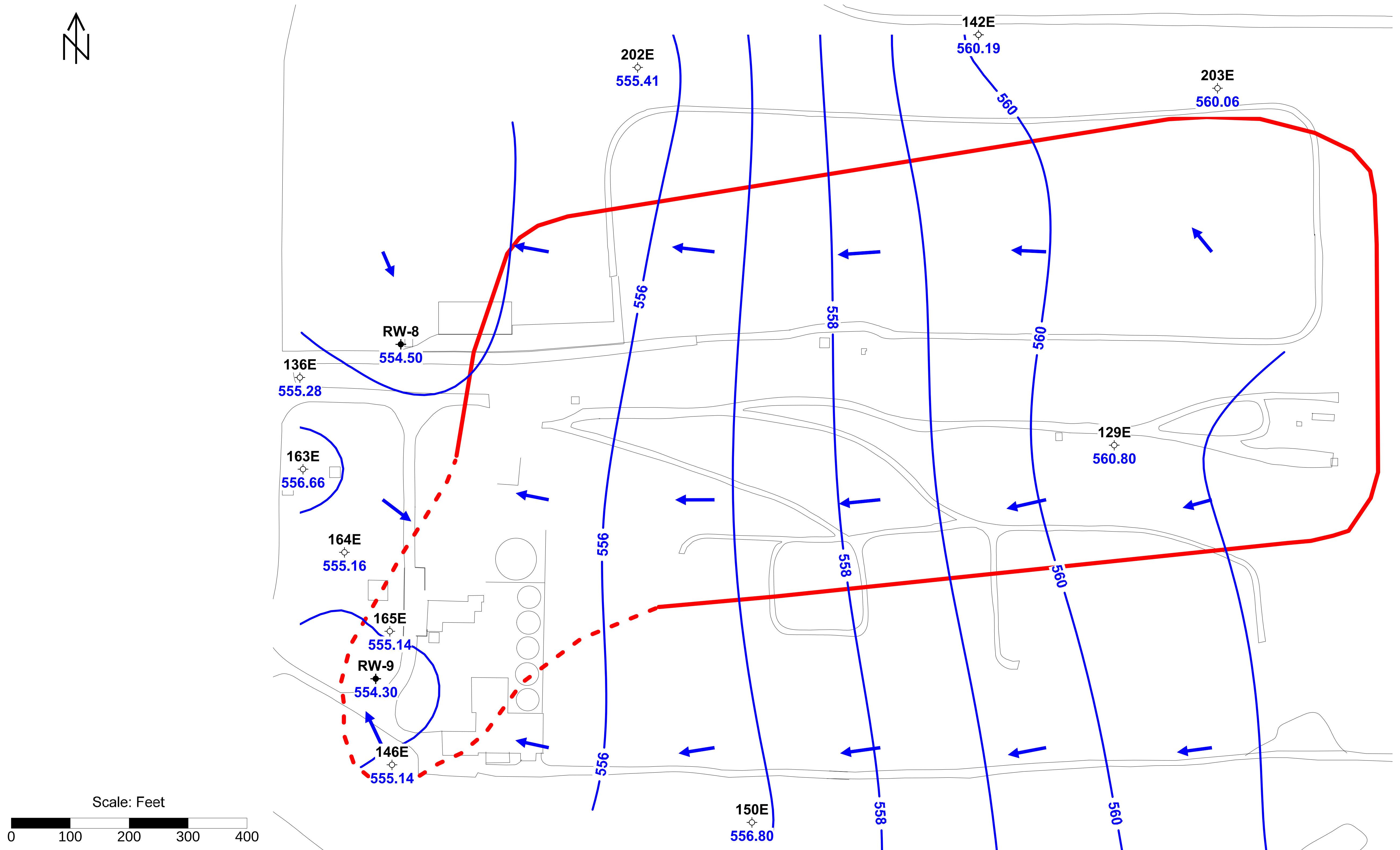
| Checked by: JWS | Date: 12-01-14 |
| Project Manager: EAF | Date: 12-01-14 |
| | |
| Job number: 448576.02050 | |

**LEGEND**

| | | | |
|---|---|---|---|
| 3B | **Well ID** | | **Potentiometric Contour** |
| ⌖ | **Monitoring Well** | ▭ | **Structure** |
| ✦ | **Pumping Well** | | **Road** |
| | | - - - ━ | **Source Area Extent** |

## Figure 3-12
## Potentiometric Surface Map
## DuPont Necco Park: D-Zone
## November 13, 2014

//nybuf03fs01/Dupont$/Necco/HydroGeo/Hydro/GW_contours/2014-11-13 NEC Contour Tool/2014-11-13 - PZ D - F9.srf



**Contour interval = 1.0 foot**

**Elevation datum feet AMSL**

**RW-9 water level is the average of water elevation from Nov 2013-April 2014, used in lieu of anomolous Nov 2014 hand water levels.**

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|---|---|
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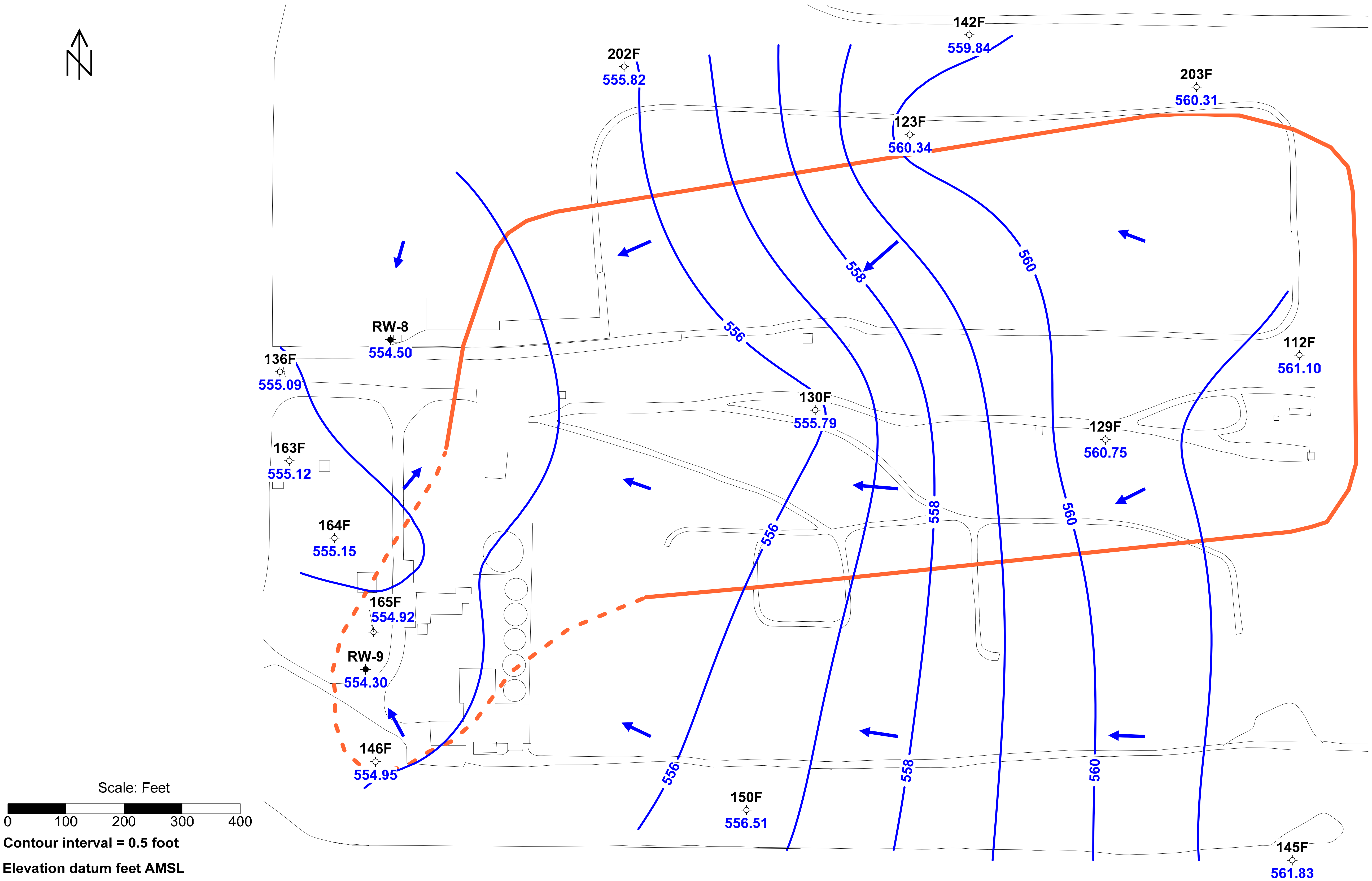
| Checked by: JWS | Date: 12-01-14 |
| Project Manager: EAF | Date: 12-01-14 |
| Job number: 448576.02050 | |

**LEGEND**

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

# Figure 3-13
# Potentiometric Surface Map
# DuPont Necco Park: E-Zone
# November 13, 2014

\\nybuf03fs01\Dupont$\Necco\HydroGeo\Hydro\GW_contours\2014-11-13 NEC Contour Tool\2014-11-13 - PZ E - F11.srf



Contour interval = 0.5 foot

Elevation datum feet AMSL
148F located downgradient was not used in the interpolation.
RW-9 water level is the average of water elevation from Nov 2013-April 2014, used in lieu of anomolous Nov 2014 hand water levels.

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| | |
|---|---|
| Created by: RBP | Date: 11-21-14 |
| Checked by: JWS | Date: 12-01-14 |
| Project Manager: EAF | Date: 12-01-14 |

Job number: 448576.02050

**LEGEND**

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

## Figure 3-14
## Potentiometric Surface Map DuPont Necco Park: F-Zone
## November 13, 2014

# APPENDIX A
# 2014 ANNUAL GROUNDWATER SAMPLING RESULTS

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# APPENDIX A
## 2014 Analytical Results - Monitoring Wells

| | Location | 136B | 136D | 136D | 136F | 137A | 137B | 137B | 145A | 145B | 145C | 145D | 146AR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date | 7/28/2014 | 7/22/2014 | 7/22/2014 | 7/28/2014 | 7/23/2014 | 7/23/2014 | 7/23/2014 | 7/23/2014 | 7/23/2014 | 7/22/2014 | 7/23/2014 | 7/24/2014 |
| **LabAnalyte** | **Units** | FS | FS | FIELD DUP | FS | FS | FS | FIELD DUP | FS | FS | FS | FS | FS |
| **Field Parameter** | | | | | | | | | | | | | |
| DEPTH TO WATER | Feet | 8.11 | 23.93 | 23.93 | 21.71 | 8.24 | 8.12 | 8.12 | 5.15 | 6.6 | 9.73 | 12.37 | 6.45 |
| DISSOLVED OXYGEN | MG/L | 0.69 | 0.98 | 0.98 | 1.01 | 0.68 | 0.85 | 0.85 | 0.8 | 1.45 | 6.59 | 0.63 | 0.12 |
| PH | STD UNITS | 8.61 | 7.6 | 7.6 | 7.81 | 13.61 | 13.61 | 13.61 | 7.12 | 10.51 | 9.04 | 9.34 | 9.63 |
| REDOX | MV | -245 | -63 | -63 | -82 | -6 | 13 | 13 | -15 | -9 | 12 | -377 | -208 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 1338 | 1367 | 1367 | 972 | 632 | 652 | 652 | 1520 | 12650 | 1650 | 2640 | 1114 |
| TEMPERATURE | DEGREES C | 14.07 | 12.83 | 12.83 | 14.14 | 16.68 | 13.71 | 13.71 | 11.08 | 14.85 | 15.61 | 16.47 | 18.28 |
| TURBIDITY QUANTITATIVE | NTU | 55.8 | 8.64 | 8.64 | 18.5 | 3.69 | 15.4 | 15.4 | 15.9 | 5.56 | 35.9 | 8.49 | 4.71 |
| **Volatile Organics** | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | UG/L | <7.2 | 8.5 | 7.6 J | <0.45 | <0.90 | <0.72 | <1.4 | <0.18 | <3.6 | <0.18 | <3.6 | <0.18 |
| 1,1,2-Trichloroethane | UG/L | <11 | 8.3 | 8.1 | <0.68 | <1.4 | <1.1 | <2.2 | <0.27 | <5.4 | 0.53 J | <5.4 | <0.27 |
| 1,1-Dichloroethene | UG/L | 12 J | 2.9 J | 3.2 J | <0.48 | 9.8 | 12 | 11 | <0.19 | 9.4 J | 0.31 J | 5.5 J | 0.21 J |
| 1,2-Dichloroethane | UG/L | <8.8 | 8.1 | 7.9 J | 2.8 | 3.3 J | 3.9 J | 3.7 J | <0.22 | <4.4 | <0.22 | 10 J | <0.22 |
| Carbon Tetrachloride | UG/L | <5.2 | <1.0 UJ | <1.0 UJ | <0.33 | <0.65 | <0.52 | <1.0 | <0.13 | <2.6 | <0.13 | <2.6 | <0.13 |
| Chloroform | UG/L | <6.4 | 8.4 | 8.3 | <0.40 | <0.80 | 1.1 J | <1.3 | <0.16 | 17 J | <0.16 | <3.2 | <0.16 |
| cis-1,2 Dichloroethene | UG/L | 640 | 150 | 150 | 2.6 | 71 | 120 | 110 | 0.31 J | 760 | 36 | 350 | 0.19 J |
| Methylene Chloride | UG/L | 19 J | <2.6 | <2.6 | 0.85 B | 41 | 42 | 40 | <0.33 | <6.6 | 1.7 B | 350 | <0.33 |
| Tetrachloroethene | UG/L | 1500 | <2.3 | <2.3 | <0.73 | 47 | 68 | 67 | <0.29 | <5.8 | 0.70 J | <5.8 | <0.29 |
| trans-1,2-Dichloroethene | UG/L | 18 J | 14 | 14 | 1.4 J | 5.8 | 8.3 | 8.4 | <0.19 | 84 | 1.3 | 11 J | <0.19 |
| Trichloroethene | UG/L | 310 | 18 | 19 | 0.64 J | 87 | 130 | 120 | <0.17 | 81 | 2 | <3.4 | <0.17 |
| Vinyl Chloride | UG/L | 19 J | 160 | 170 | 59 | 50 | 77 | 73 | <0.22 | 120 | 4.4 | 610 | 1 |
| **Semivolatile Organics** | | | | | | | | | | | | | |
| 2,4,5-Trichlorophenol | UG/L | 2800 | 20 J | 7.7 J | 0.70 J | 3.3 J | 10 J | 9.6 | <0.29 | <1.1 | <0.29 | <1.4 | 1.1 J |
| 2,4,6-Trichlorophenol | UG/L | 540 J | 3.4 J | 1.6 J | 0.41 J | 1.7 J | 2.6 J | 2.7 J | <0.23 | <0.91 | <0.23 | <1.1 | 0.42 J |
| 3- And 4- Methylphenol | UG/L | <76 | 0.80 J | <0.76 | 0.77 J | 16 J | 12 J | 13 J | <0.76 | <3.0 | 3.0 J | 11 J | <0.76 |
| Hexachlorobenzene | UG/L | <8.1 | <0.081 | <0.081 | <0.081 | <0.20 | <0.081 | <0.081 | <0.081 | <0.32 | <0.081 | <0.41 | <0.081 |
| Hexachlorobutadiene | UG/L | <26 | <0.26 | <0.26 | <0.26 | 2.6 J | 1.4 J | 1.7 J | <0.26 | <1.0 | <0.26 | <1.3 | <0.26 |
| Hexachloroethane | UG/L | <18 | <0.18 | <0.18 | <0.18 | <0.45 | <0.18 | <0.18 | <0.18 | <0.72 | <0.18 | <0.90 | <0.18 |
| Pentachlorophenol | UG/L | 6600 | 2.8 J | 0.51 J | <0.26 | 2.7 J | 16 J | 16 J | <0.26 | <1.0 | <0.26 | <1.3 | 0.34 J |
| Phenol | UG/L | <57 | <0.57 | <0.57 | 0.78 B | 51 | 26 | 33 | <0.57 | <2.3 | <0.57 | 22 J | <0.57 |
| Tentativley Identified Compound | UG/L | | 3.4 J | 7.0 J | 1.8 J | 34 J | 12 J | 14 J | | 39 J | 18 J | 850 J | 0.85 J |
| **Inorganics** | | | | | | | | | | | | | |
| Chloride, total | UG/L | 170000 | 160000 | 160000 | 290000 | 470000 | 450000 | 420000 | 64000 | 4300000 | 390000 | 11000000 | 310000 |
| Barium, dissolved | UG/L | 59 J | 50 J | 51 J | 16 J | 4700 J | 2700 | 2700 J | 34 J | 31 J | 39 J | 1300 | 12 J |
| **Total VOCs** | UG/L | 2518 | 379.2 | 389.1 | 66.14 | 314.9 | 462.3 | 433.1 | 0.31 | 1071.4 | 46.94 | 1336.5 | 1.4 |

< Non detect at stated reporting limit. J Estimated concentration.
UJ Undetected-estimated reporting limit. NS Not sampled.

# APPENDIX A

## 2014 Analytical Results - Monitoring Wells

| | Location | 146B | 146C | 146E | 146F | 148D | 150A | 150B | 150C | 150E | 150F | 165D | 165E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Date | 7/24/2014 | 7/24/2014 | 7/22/2014 | 7/24/2014 | 7/23/2014 | 7/25/2014 | 7/25/2014 | 7/25/2014 | 7/25/2014 | 7/25/2014 | 7/24/2014 | 7/24/2014 |
| LabAnalyte | Units | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS | FS |
| **Field Parameter** | | | | | | | | | | | | | |
| DEPTH TO WATER | Feet | 7.25 | 6.88 | 20.68 | 20.91 | 9.23 | 5.52 | 6.52 | 9.96 | 18.02 | 18.87 | 12.56 | 22.22 |
| DISSOLVED OXYGEN | MG/L | 0.04 | 0.07 | 1.12 | 0.2 | 0.87 | 0.09 | 0.1 | 0.09 | 0.24 | 0.11 | 0.25 | 0.93 |
| PH | STD UNITS | 11.52 | 8.45 | 7.29 | 6.89 | 10.86 | 7.64 | 11.97 | 7.94 | 6.54 | 6.28 | 9.01 | 7.13 |
| REDOX | MV | -302 | -233 | -261 | -314 | -183 | -161 | -384 | -340 | -331 | -171 | -165 | -306 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 862 | 1126 | 3810 | 11230 | 980 | 1366 | 1385 | 7210 | 17500 | 24200 | 1116 | 1359 |
| TEMPERATURE | DEGREES C | 14.88 | 17.18 | 12.52 | 13.24 | 13.73 | 13.31 | 12.51 | 13.15 | 13.2 | 13.08 | 15.17 | 12.44 |
| TURBIDITY QUANTITATIVE | NTU | 0.72 | 2.22 | 3.82 | 6.12 | 4.29 | 7.04 | 0.81 | 1.99 | 1.71 | 8.47 | 12.1 | 2.32 |
| **Volatile Organics** | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | UG/L | <0.26 | <0.18 | <15 | <23 | <0.18 | <0.18 | <0.60 | <6.0 | <7.2 | <7.2 | <0.18 | 1700 |
| 1,1,2-Trichloroethane | UG/L | <0.39 | <0.27 | <22 | 61 J | <0.27 | <0.27 | <0.90 | <9.0 | <11 | <11 | <0.27 | 850 |
| 1,1-Dichloroethene | UG/L | 3.8 | 6.5 | 140 | 200 | <0.19 | <0.19 | 2.2 J | 56 | <7.6 | <7.6 | 1 | 210 J |
| 1,2-Dichloroethane | UG/L | <0.31 | <0.22 | <18 | <28 | <0.22 | <0.22 | <0.73 | <7.3 | <8.8 | <8.8 | 1.3 | 140 J |
| Carbon Tetrachloride | UG/L | <0.19 | <0.13 | <11 UJ | <16 | <0.13 | <0.13 | <0.43 | <4.3 | <5.2 | <5.2 | <0.13 | 370 J |
| Chloroform | UG/L | <0.23 | <0.16 | 82 J | 60 J | <0.16 | <0.16 | <0.53 | 11 J | <6.4 | <6.4 | 0.24 J | 1300 |
| cis-1,2 Dichloroethene | UG/L | 17 | 32 | 1200 | 4700 | 3 | 0.48 J | 90 | 1000 | 590 | 7.5 J | 3.4 | 16000 |
| Methylene Chloride | UG/L | <0.47 | <0.33 | <27 | 480 | <0.33 | <0.33 | 1.6 B | 210 B | 32 B | <13 | <0.33 | 2500 |
| Tetrachloroethene | UG/L | <0.41 | <0.29 | <24 | <36 | 0.58 J | <0.29 | 7.7 | <9.7 | <12 | <12 | <0.29 | 310 J |
| trans-1,2-Dichloroethene | UG/L | 1.1 J | 9.1 | 130 | 380 | <0.19 | <0.19 | 14 | 88 | 14 J | <7.6 | 0.70 J | 330 J |
| Trichloroethene | UG/L | 1.4 | 6 | 250 | 200 | 1 | <0.17 | 15 | 27 J | 9.3 J | <6.8 | 0.25 J | 2600 |
| Vinyl Chloride | UG/L | 3.9 | 18 | 1800 | 3600 | <0.22 | 0.33 J | 37 | 960 | 460 | 410 | 6.7 | 4000 |
| **Semivolatile Organics** | | | | | | | | | | | | | |
| 2,4,5-Trichlorophenol | UG/L | 16 | 3.4 J | 7.7 J | 210 | <0.29 | <0.29 | 30 J | <2.9 | <7.1 | <1.4 | 46 | 930 |
| 2,4,6-Trichlorophenol | UG/L | 3.8 J | 4.3 J | 4.5 J | 32 J | <0.23 | <0.23 | <0.91 | <2.3 | <5.7 | <1.1 | <0.57 | 88 J |
| 3- And 4- Methylphenol | UG/L | 3.1 J | <0.76 | 5.1 J | 70 J | 18 J | <0.76 | 6.0 J | 8.1 J | 29 J | 9.2 J | 9.1 J | <38 |
| Hexachlorobenzene | UG/L | <0.081 | <0.081 | <0.081 | <1.6 | <0.081 | <0.081 | <0.32 | <0.81 | <2.0 | <0.41 | <0.20 | <4.1 |
| Hexachlorobutadiene | UG/L | <0.26 | 0.41 J | <0.26 | <5.1 | <0.26 | <0.26 | <1.0 | <2.6 | <6.4 | <1.3 | <0.64 | 130 J |
| Hexachloroethane | UG/L | <0.18 | <0.18 | <0.18 | <3.6 | <0.18 | <0.18 | <0.72 | <1.8 | <4.5 | <0.90 | <0.45 | 21 J |
| Pentachlorophenol | UG/L | 20 J | <0.26 | 0.40 J | <5.1 | <0.26 | <0.26 | <1.0 | <2.6 | <6.4 | <1.3 | 1.1 J | 38 J |
| Phenol | UG/L | <0.57 | <0.57 | <0.57 | 390 | 10 | <0.57 | 48 | 8.9 J | 560 | 69 | 4.2 J | 30 J |
| Tentativley Identified Compound | UG/L | 2.1 J | 7.0 J | 180 J | 2600 J | | | 8.7 J | 420 J | 5300 J | 1400 J | 13 J | |
| **Inorganics** | | | | | | | | | | | | | |
| Chloride, total | UG/L | 140000 | 180000 | 500000 | 3600000 | 200000 | 130000 J | 680000 J | 1900000 J | 8000000 J | 9400000 J | 360000 | 530000 |
| Barium, dissolved | UG/L | 14 J | 37 J | 29 J | 33 J | 32 J | 44 J | 700 | 35 J | 64 J | 59 J | 16 J | 140 J |
| **Total VOCs** | UG/L | 27.2 | 71.6 | 3531 | 9681 | 4.58 | 0.81 | 167.5 | 2352 | 1105.3 | 417.5 | 13.59 | 30310 |

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

UJ Undetected-estimated reporting limit. NS Not sampled.

## APPENDIX A

## 2014 Analytical Results - Monitoring Wells

| | Location | 168B | 168C | 171B | 172B |
|---|---|---|---|---|---|
| | Date | 7/28/2014 | 7/28/2014 | 7/25/2014 | 7/22/2014 |
| **LabAnalyte** | **Units** | FS | FS | FS | FS |
| **Field Parameter** | | | | | |
| DEPTH TO WATER | Feet | 11.49 | 13.14 | 11.02 | 8.52 |
| DISSOLVED OXYGEN | MG/L | 0.28 | 0.74 | 0.12 | 0.88 |
| PH | STD UNITS | 6.81 | 6.12 | 6.19 | 6.64 |
| REDOX | MV | -202 | -228 | -222 | -164 |
| SPECIFIC CONDUCTANCE | UMHOS/CM | 29160 | 54520 | 15000 | 8950 |
| TEMPERATURE | DEGREES C | 13.9 | 13.2 | 13.01 | 12.4 |
| TURBIDITY QUANTITATIVE | NTU | 12.4 | 6.05 | 20.6 | 13.3 |
| **Volatile Organics** | | | | | |
| 1,1,2,2-Tetrachloroethane | UG/L | <180 | 1400 | <3.0 | 770 |
| 1,1,2-Trichloroethane | UG/L | 430 J | 1500 | <4.5 | 37 J |
| 1,1-Dichloroethene | UG/L | 350 J | 240 | <3.2 | 8.5 J |
| 1,2-Dichloroethane | UG/L | 640 J | 150 J | <3.7 | <8.8 |
| Carbon Tetrachloride | UG/L | <130 | 310 | <2.2 | 36 J |
| Chloroform | UG/L | <160 | 760 | <2.7 | 140 |
| cis-1,2 Dichloroethene | UG/L | 19000 | 940 | 130 | 920 |
| Methylene Chloride | UG/L | 16000 | 4700 | <5.5 | 42 B |
| Tetrachloroethene | UG/L | <290 | 430 | <4.8 | 220 |
| trans-1,2-Dichloroethene | UG/L | 270 J | 210 | 16 J | 72 |
| Trichloroethene | UG/L | 400 J | 2900 | <2.8 | 290 |
| Vinyl Chloride | UG/L | 13000 | 390 | 150 | 120 |
| **Semivolatile Organics** | | | | | |
| 2,4,5-Trichlorophenol | UG/L | <5.7 | <5.7 | <1.4 | <1.1 |
| 2,4,6-Trichlorophenol | UG/L | <4.6 | <4.6 | <1.1 | <0.91 |
| 3- And 4- Methylphenol | UG/L | 190 J | <15 | <3.8 | <3.0 |
| Hexachlorobenzene | UG/L | <1.6 | <1.6 | <0.41 | <0.32 |
| Hexachlorobutadiene | UG/L | <5.1 | 10 J | 1.3 J | 120 |
| Hexachloroethane | UG/L | <3.6 | <3.6 | <0.90 | 22 J |
| Pentachlorophenol | UG/L | <5.1 | <5.1 | <1.3 | <1.0 |
| Phenol | UG/L | 110 B | 40 B | <2.9 | <2.3 |
| Tentativley Identified Compound | UG/L | 12000 J | 14000 J | 180 J | 21 J |
| **Inorganics** | | | | | |
| Chloride, total | UG/L | 16000000 | 17000000 | 7500000 J | 58000 |
| Barium, dissolved | UG/L | 310 | 320 | 34 J | 22 J |
| **Total VOCs** | UG/L | 50090 | 13930 | 296 | 2655.5 |

< Non detect at stated reporting limit. J Estimated concentration.
UJ Undetected-estimated reporting limit. NS Not sampled.

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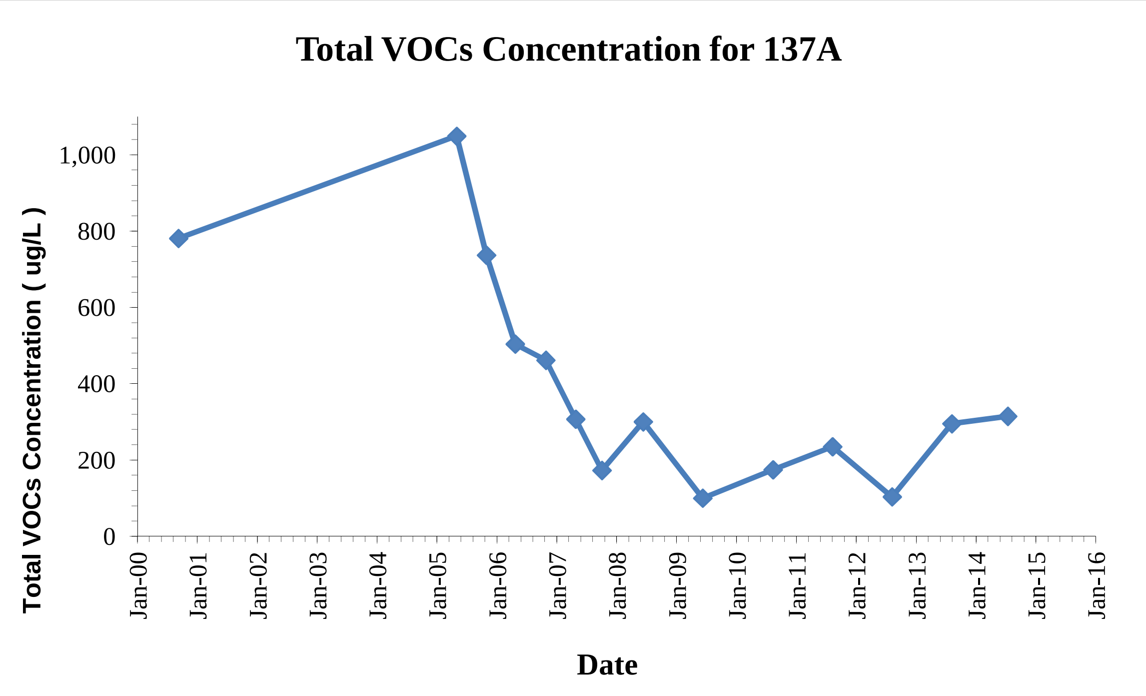
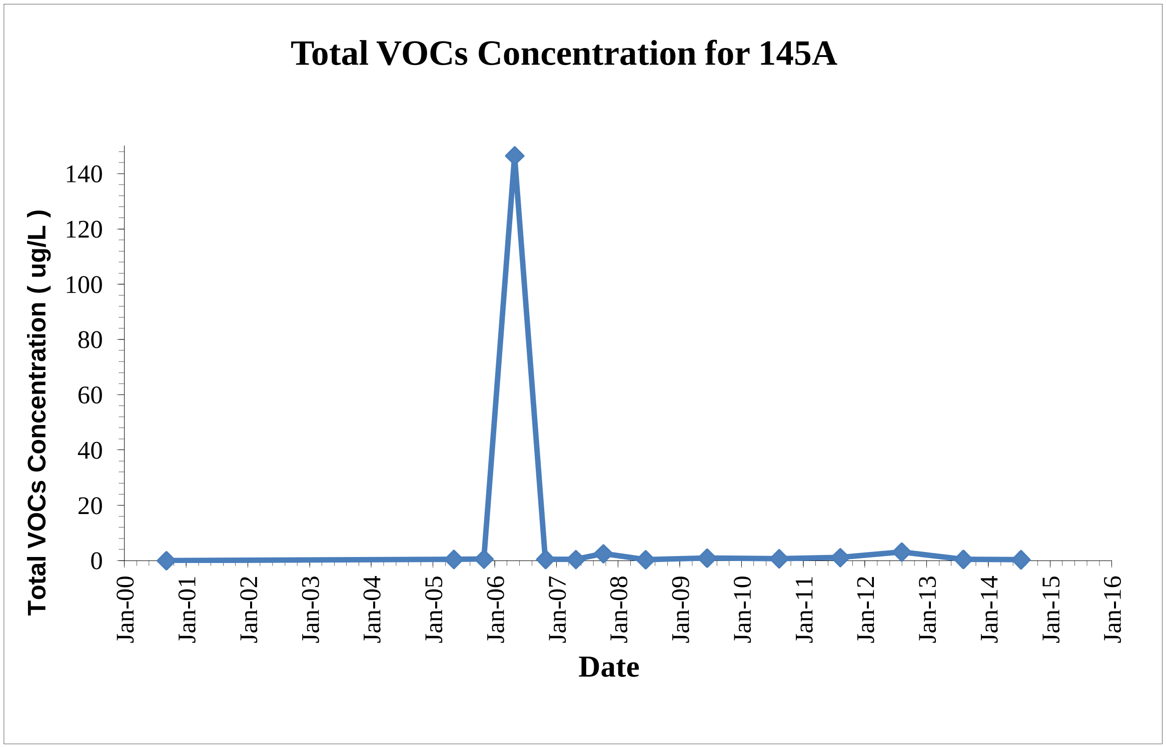
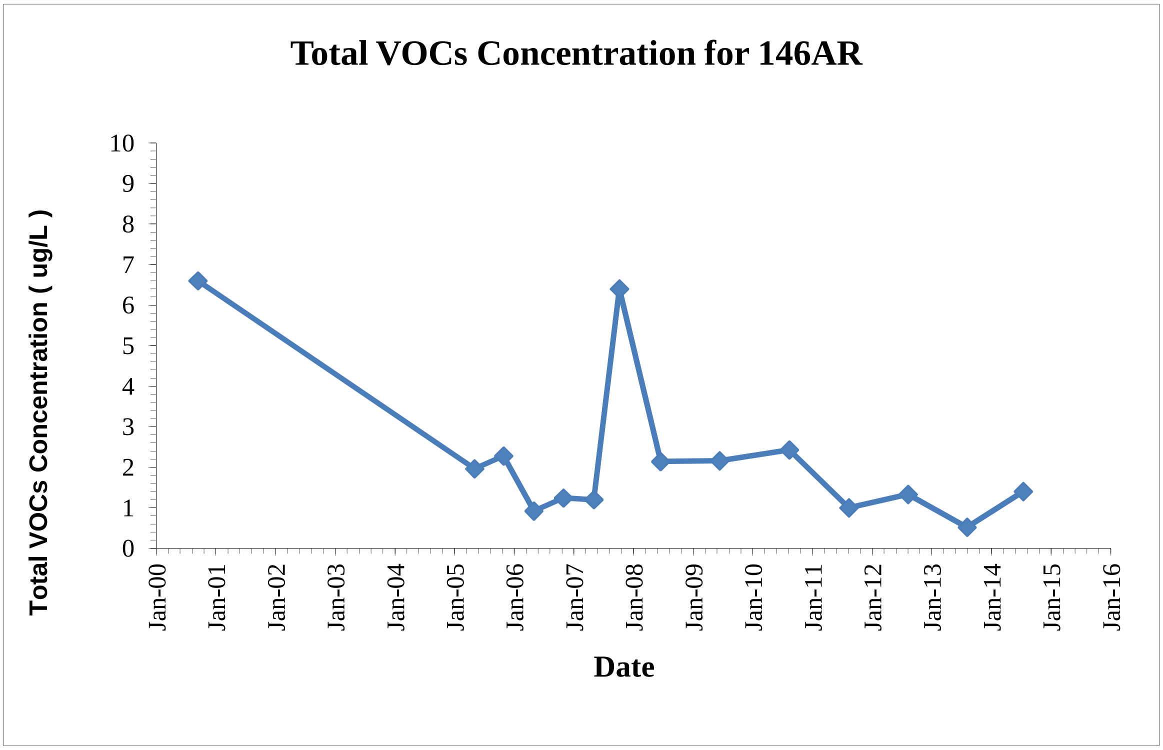
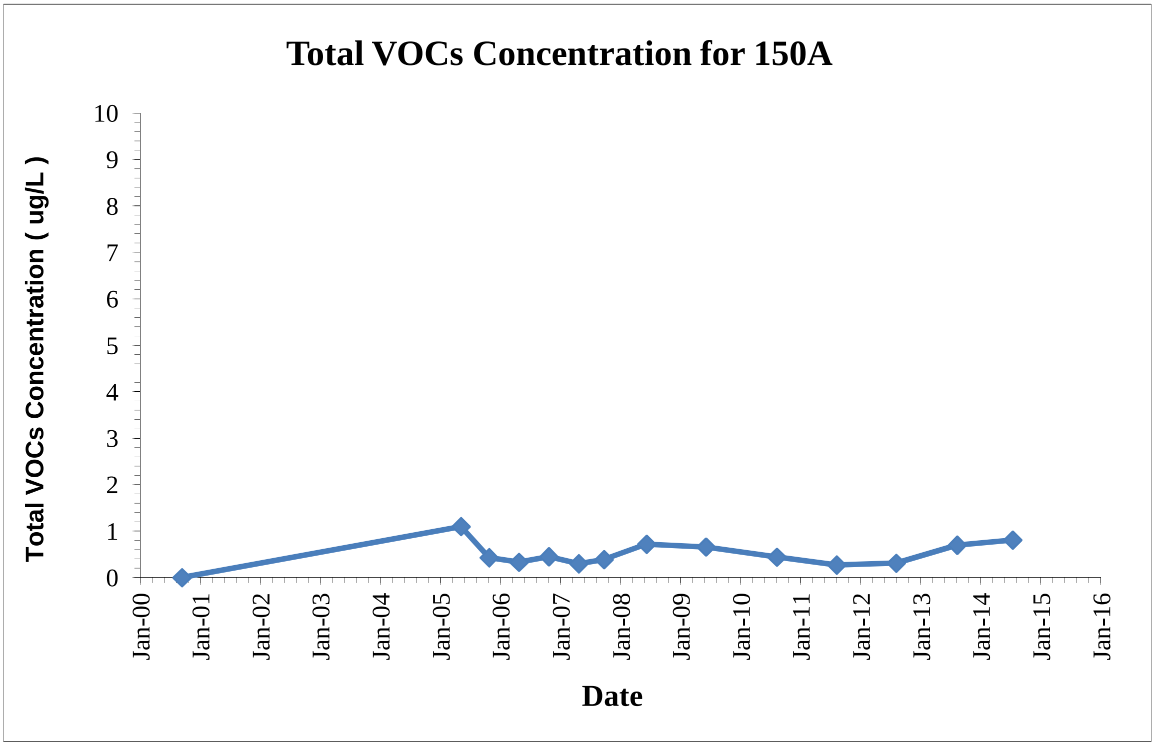
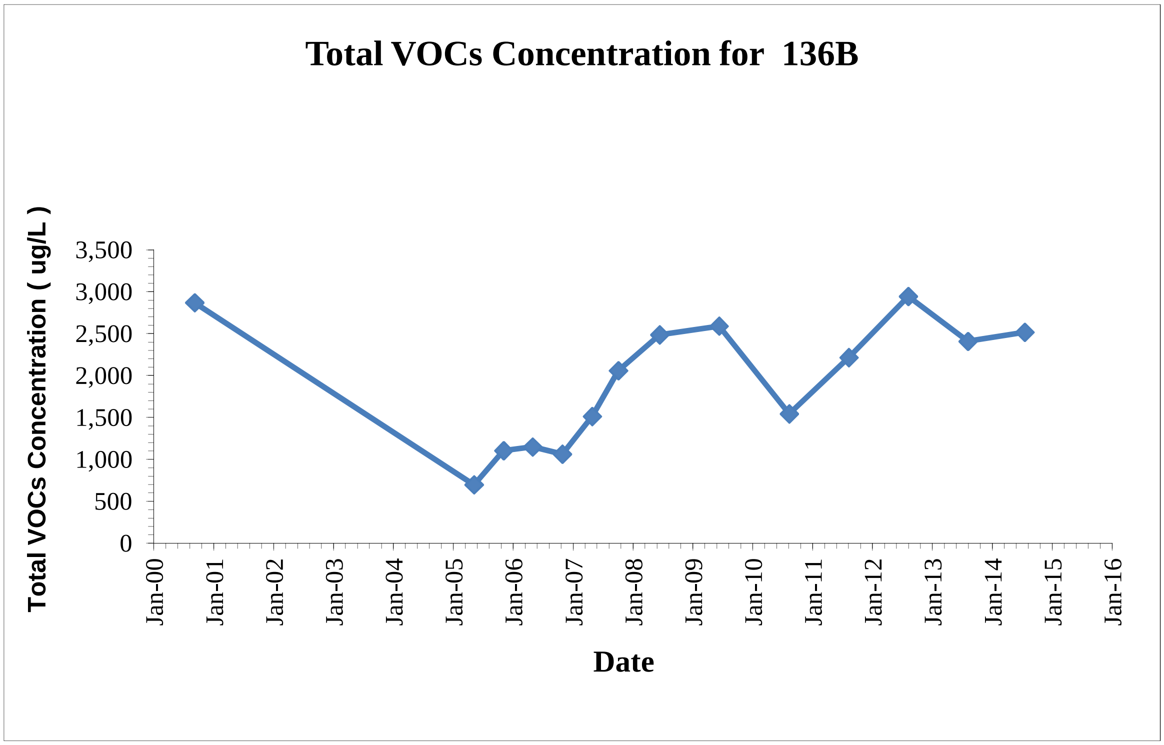
# APPENDIX B
# TVOC TREND PLOTS

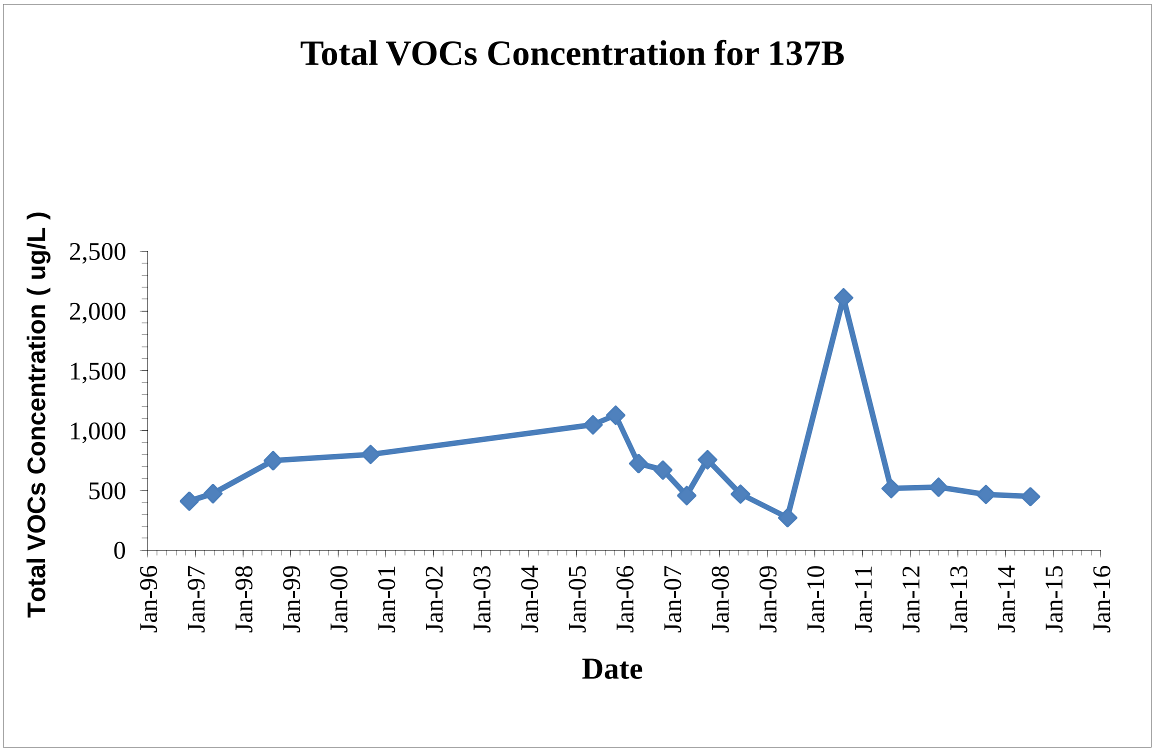

Total VOCs Concentration for 137A
Total VOCs Concentration ( ug/L )
1,000
800
600
400
200
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

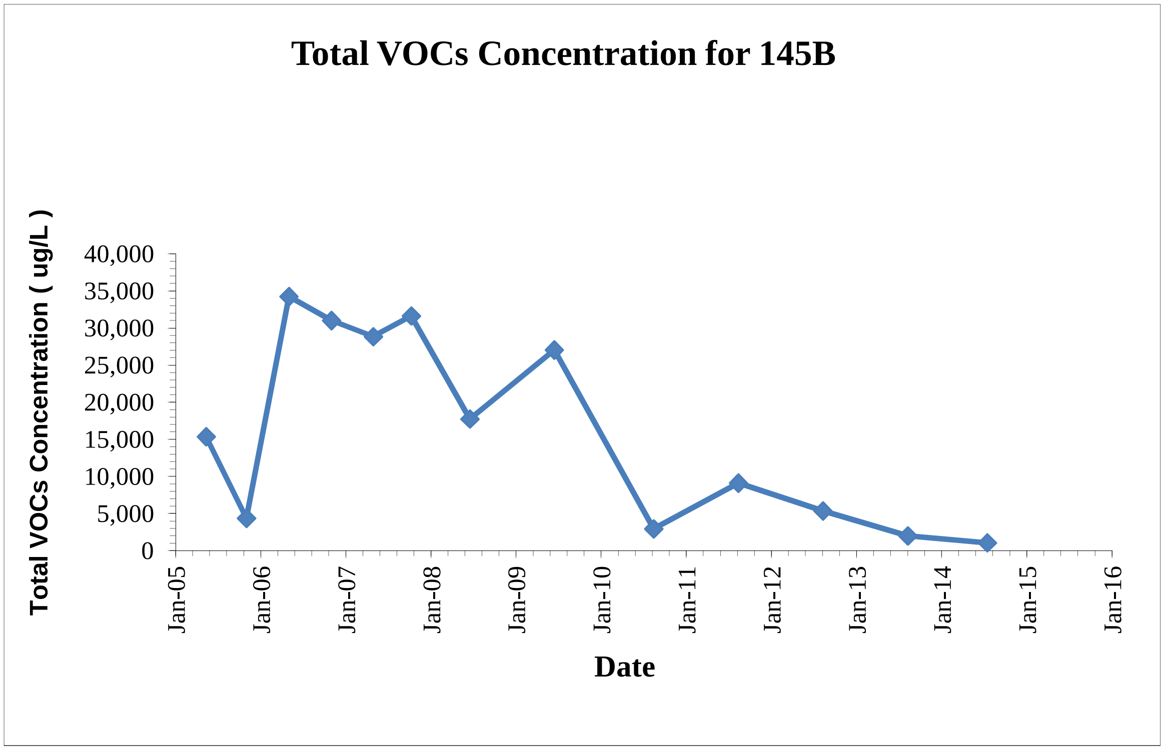

Total VOCs Concentration for 145A
Total VOCs Concentration ( ug/L )
140
120
100
80
60
40
20
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

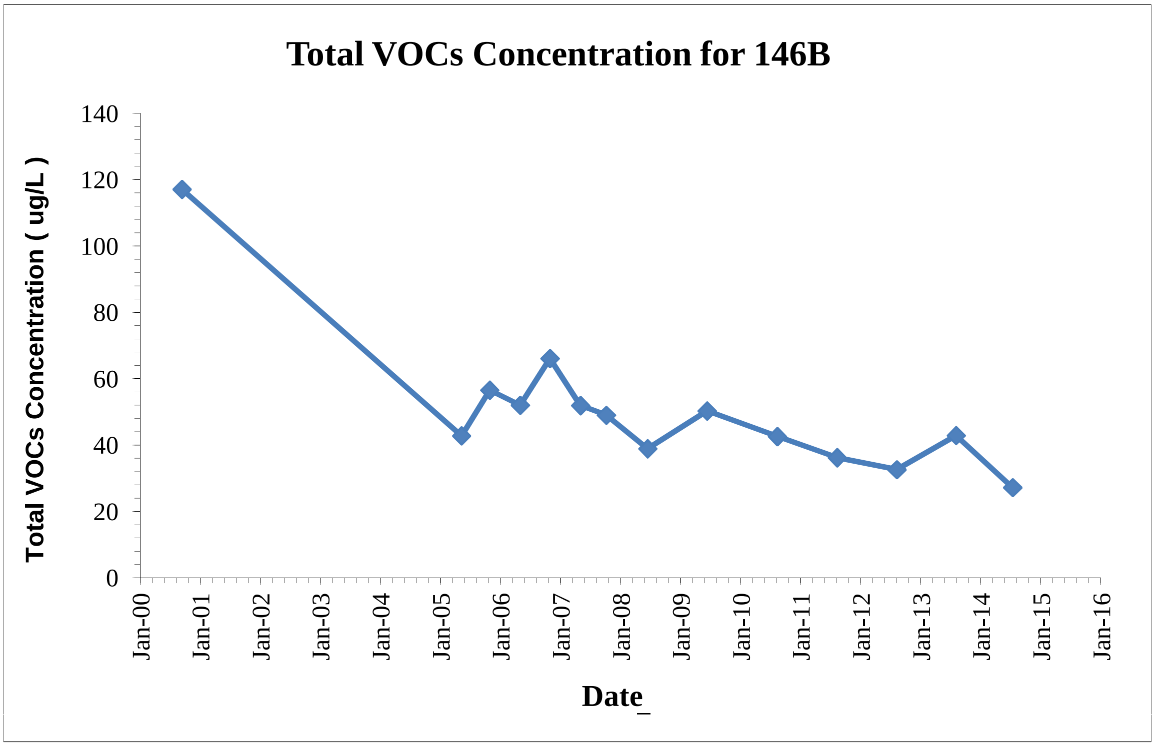

Total VOCs Concentration for 146AR
Total VOCs Concentration ( ug/L )
10
9
8
7
6
5
4
3
2
1
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

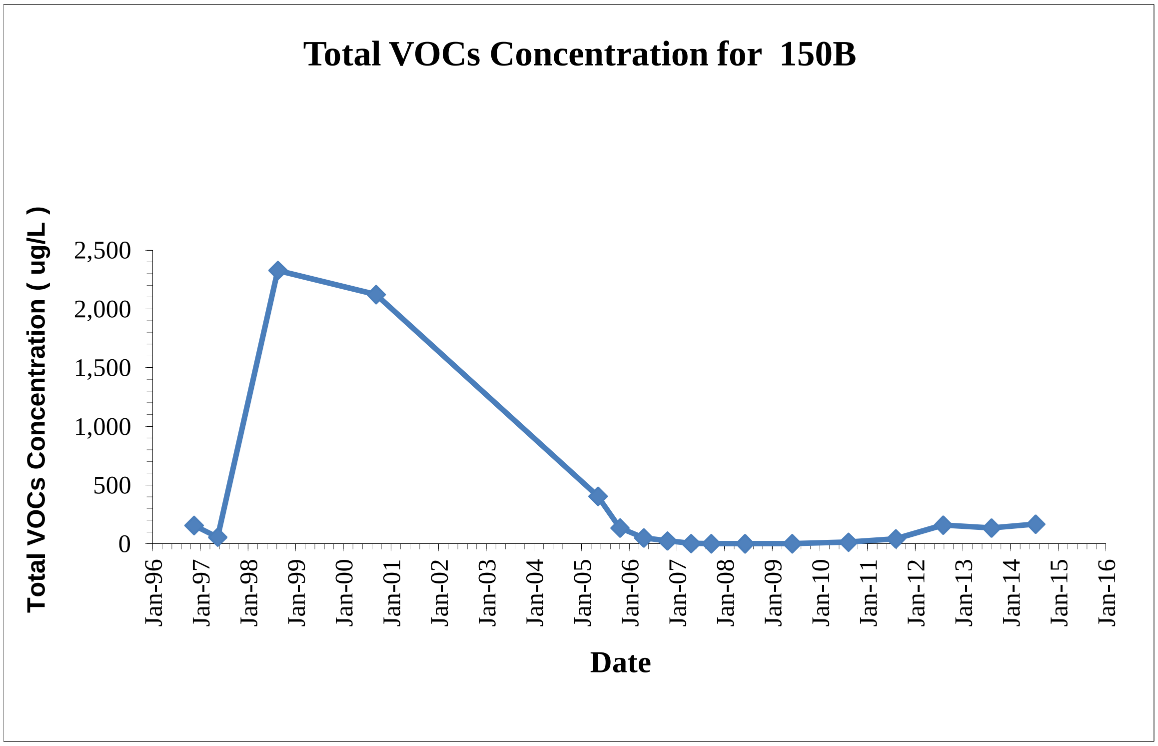

Total VOCs Concentration for 150A
Total VOCs Concentration ( ug/L )
10
9
8
7
6
5
4
3
2
1
0
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date


Total VOCs Concentration for 136B
Total VOCs Concentration ( ug/L )
3,500
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
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
Date


Total VOCs Concentration for 145B
Total VOCs Concentration ( ug/L )
40,000
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
Date


Total VOCs Concentration for 146B
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
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
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Jan-10
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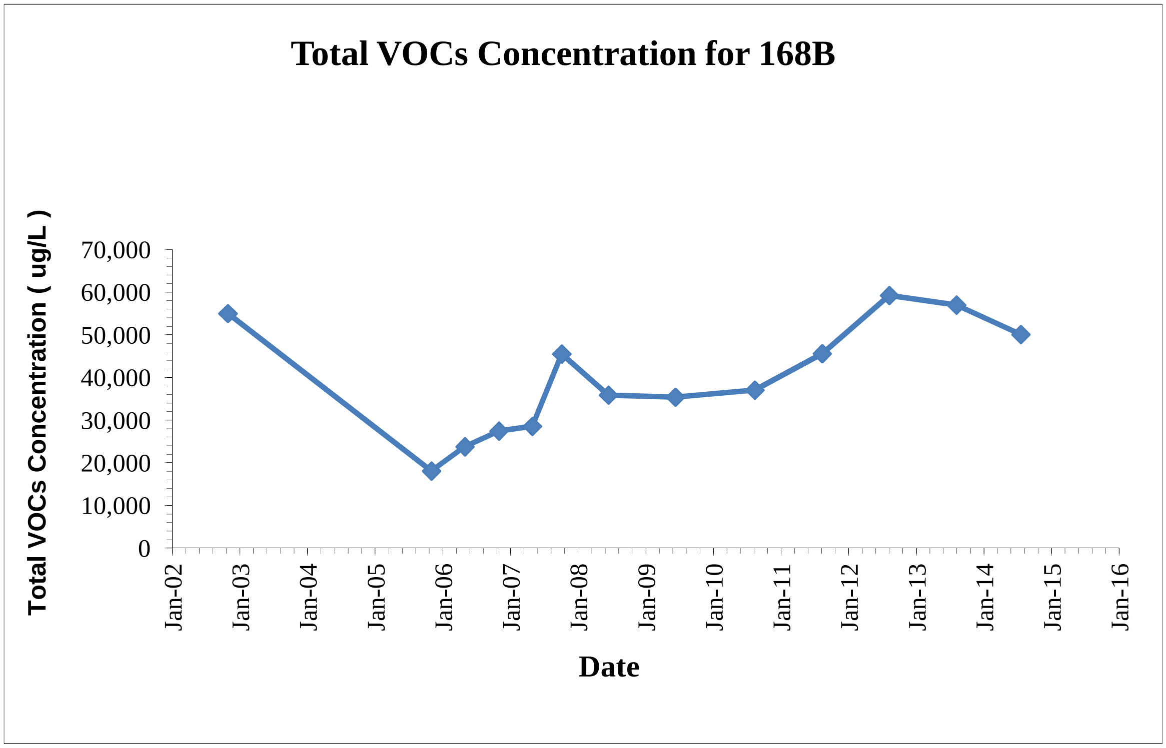
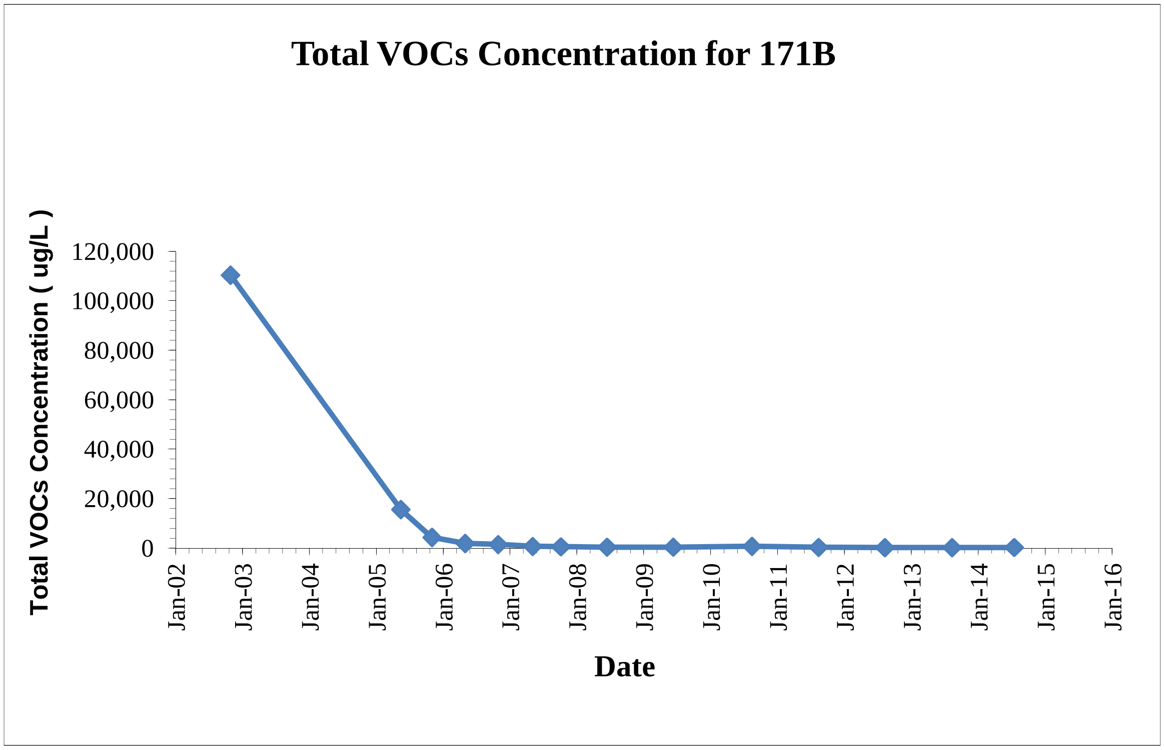
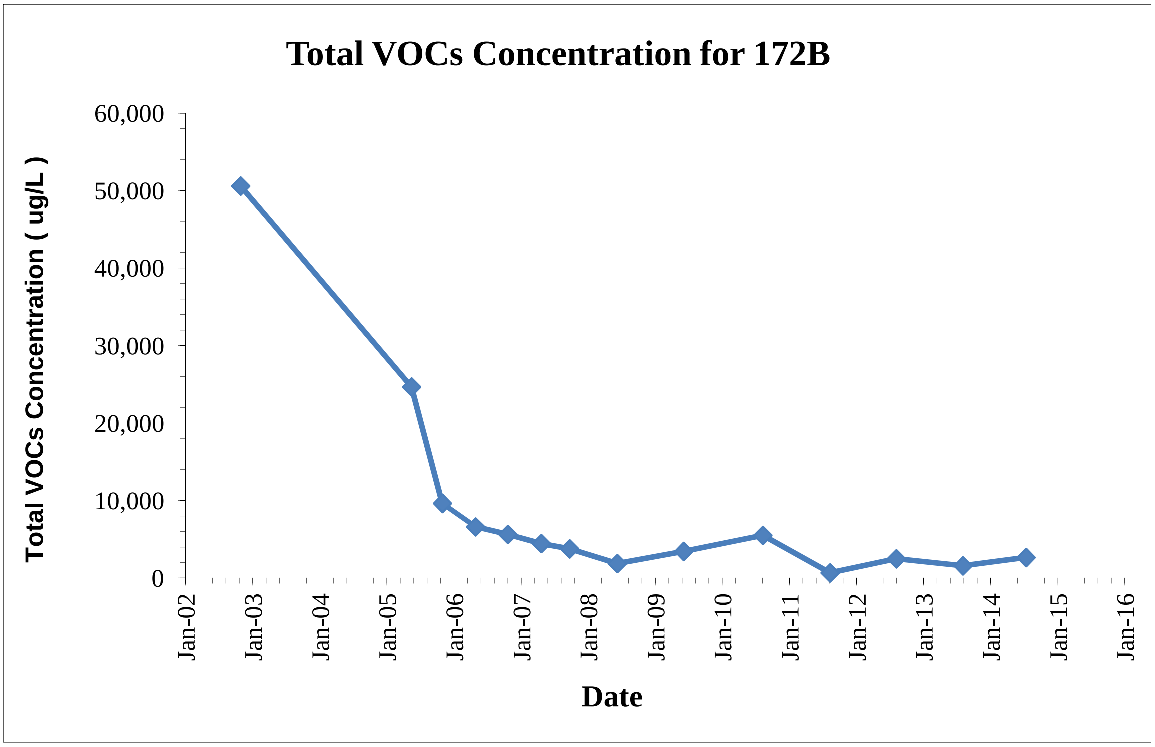
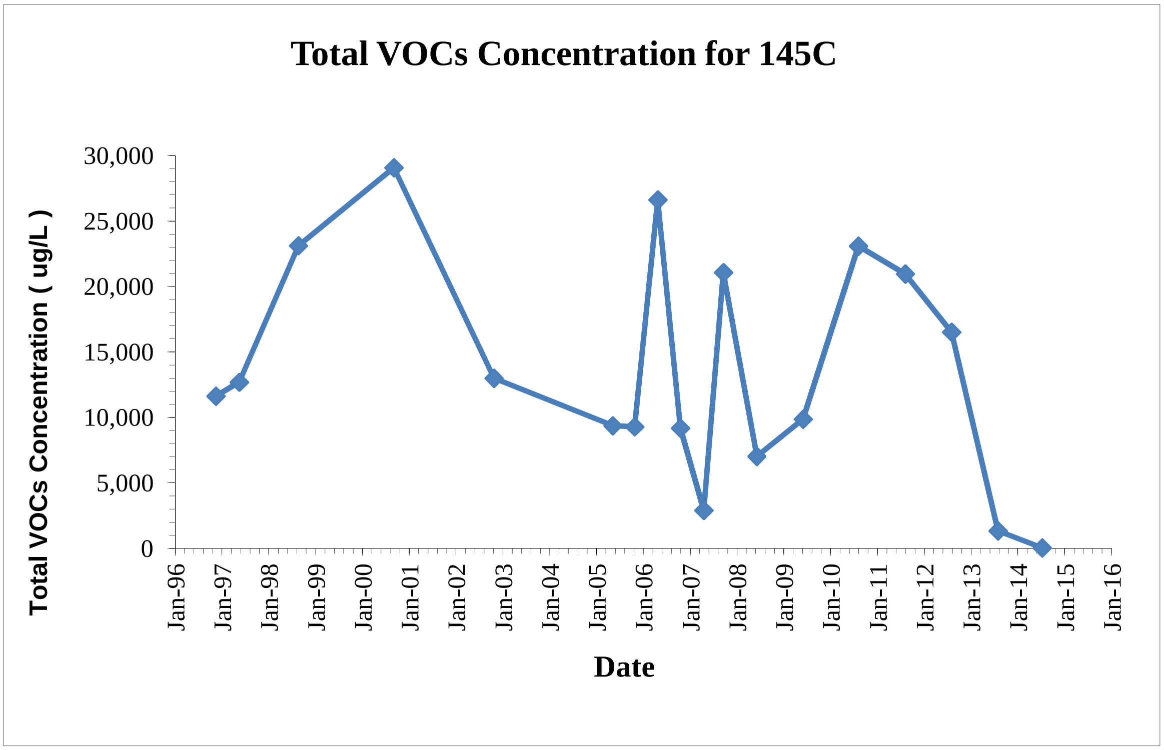
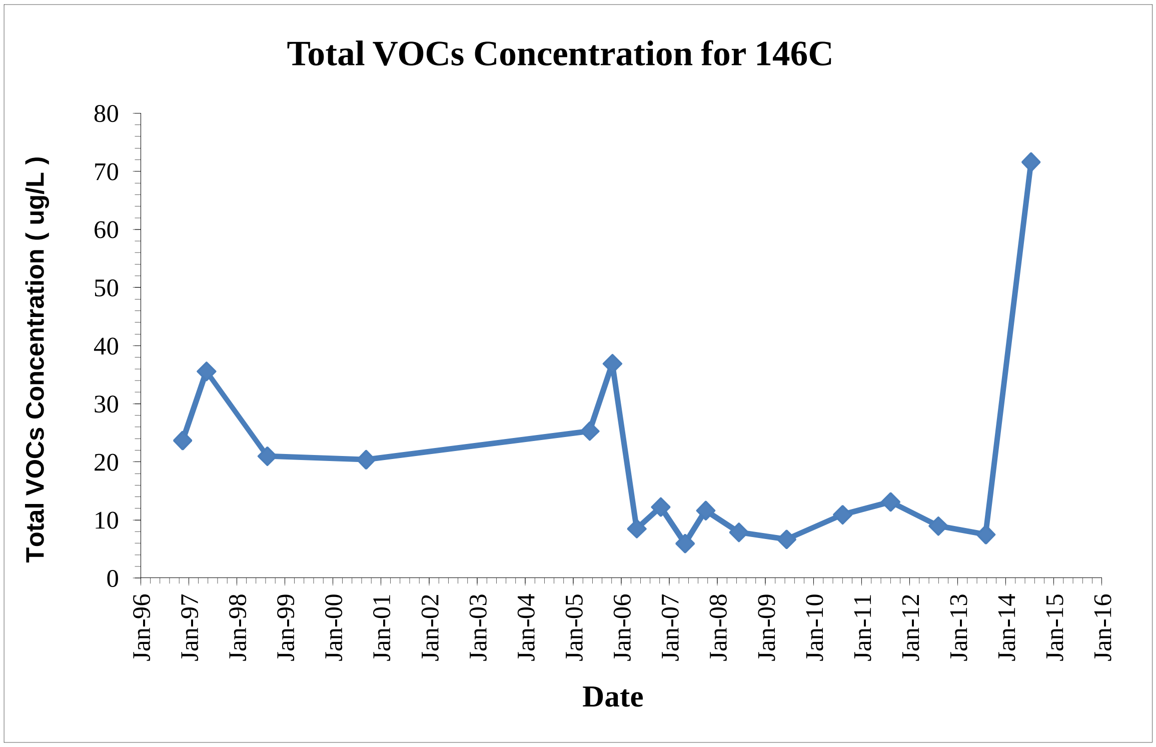
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

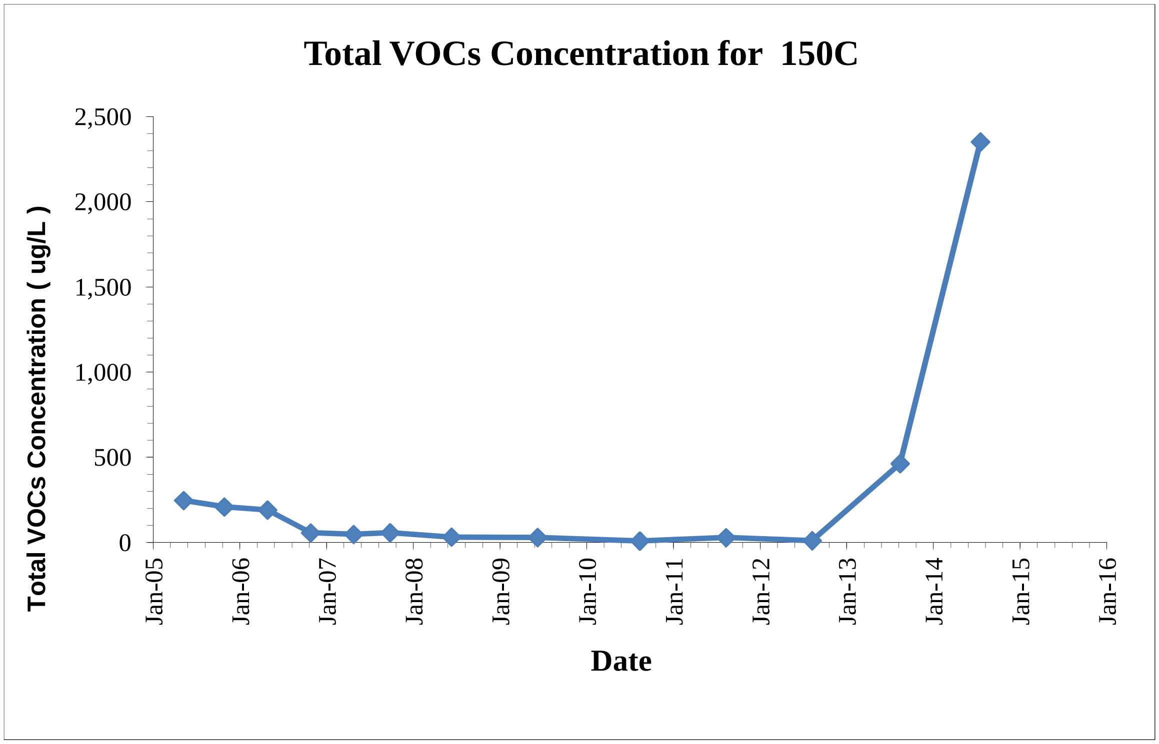

Total VOCs Concentration for 168B
Total VOCs Concentration ( ug/L )
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

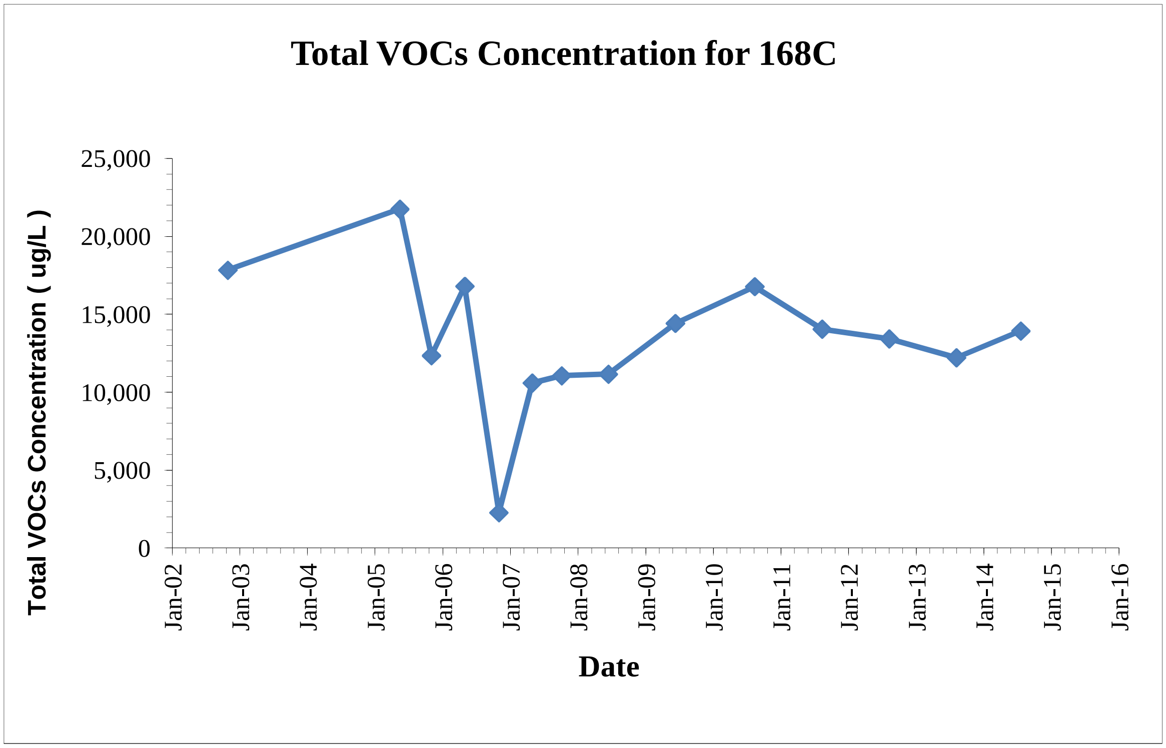

Total VOCs Concentration for 171B
Total VOCs Concentration ( ug/L )
120,000
100,000
80,000
60,000
40,000
20,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date


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
Date

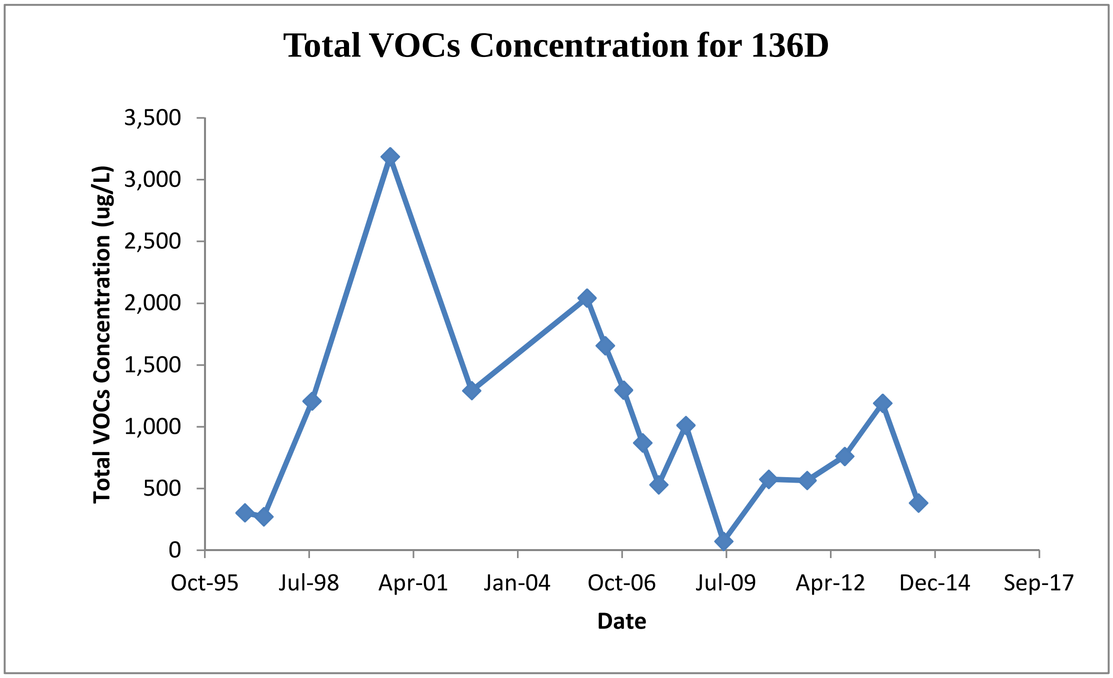

Total VOCs Concentration for 145C
Total VOCs Concentration ( ug/L )
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

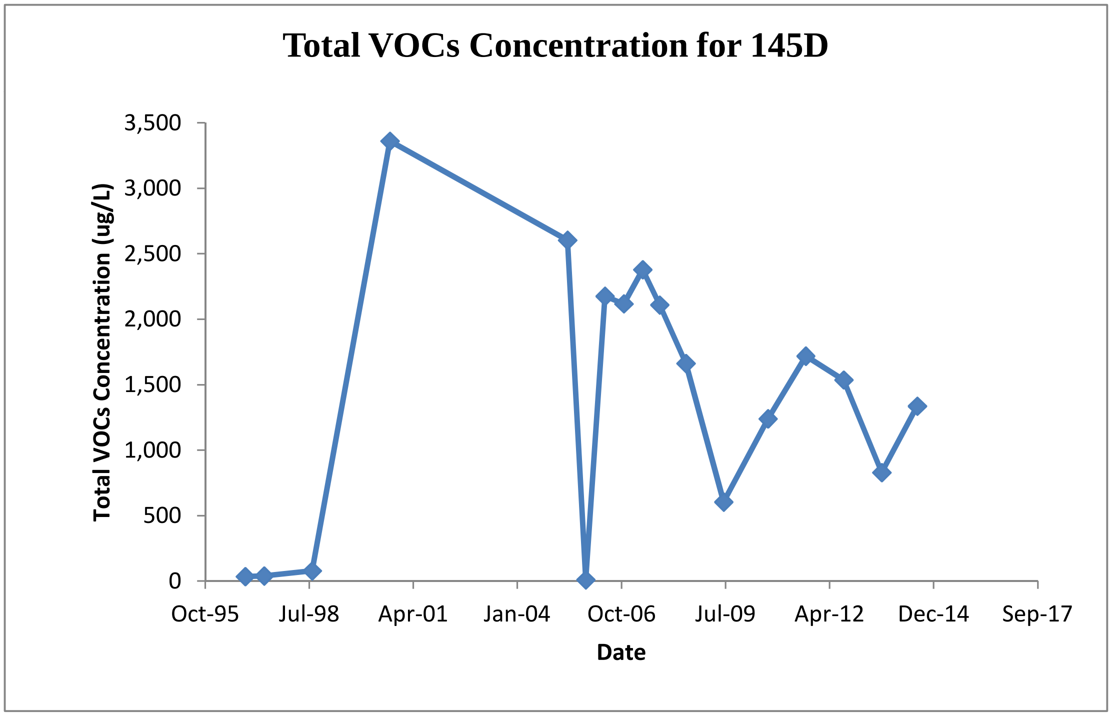

Total VOCs Concentration for 146C
Total VOCs Concentration ( ug/L )
80
70
60
50
40
30
20
10
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date


Total VOCs Concentration for 150C
Total VOCs Concentration ( ug/L )
2,500
2,000
1,500
1,000
500
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
Date

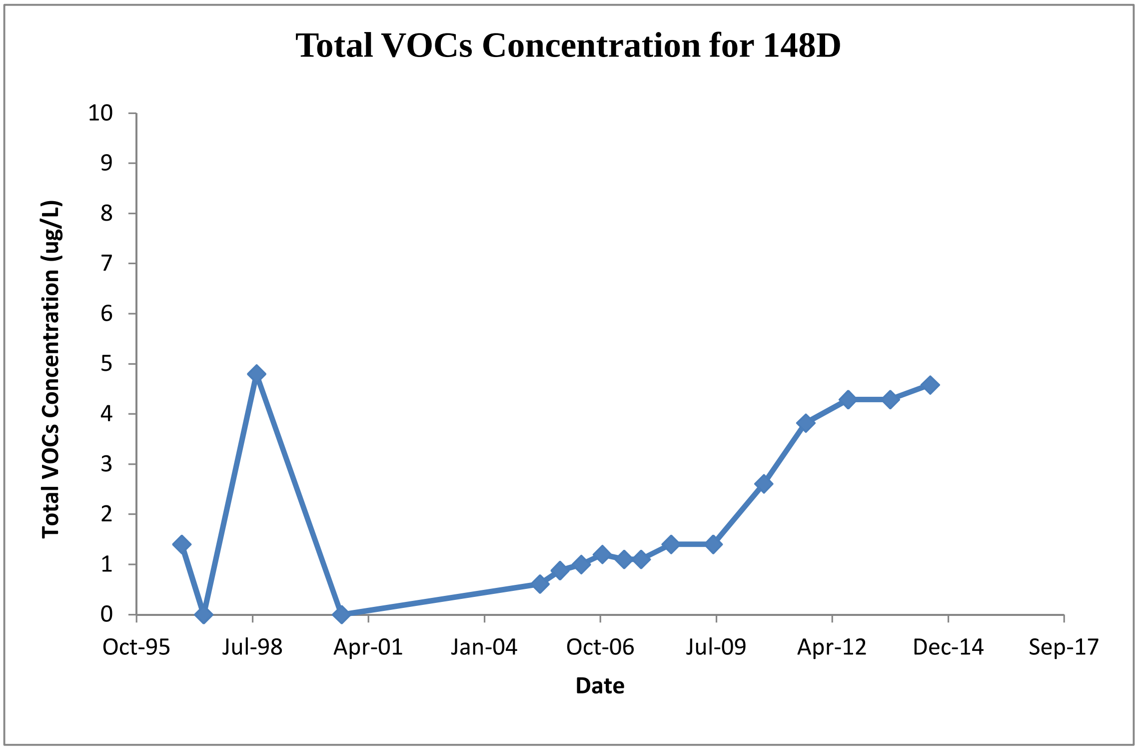

Total VOCs Concentration for 168C
Total VOCs Concentration ( ug/L )
25,000
20,000
15,000
10,000
5,000
0
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Date

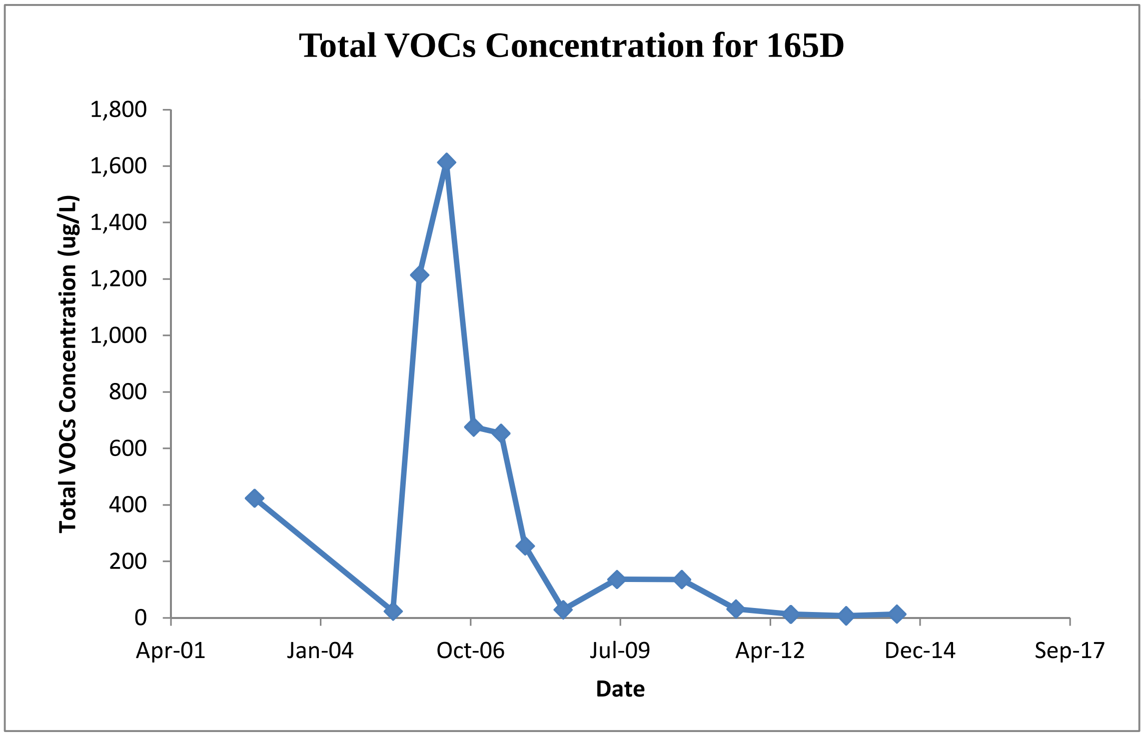
## Appendix B
## D-Zone TVOC Graphs

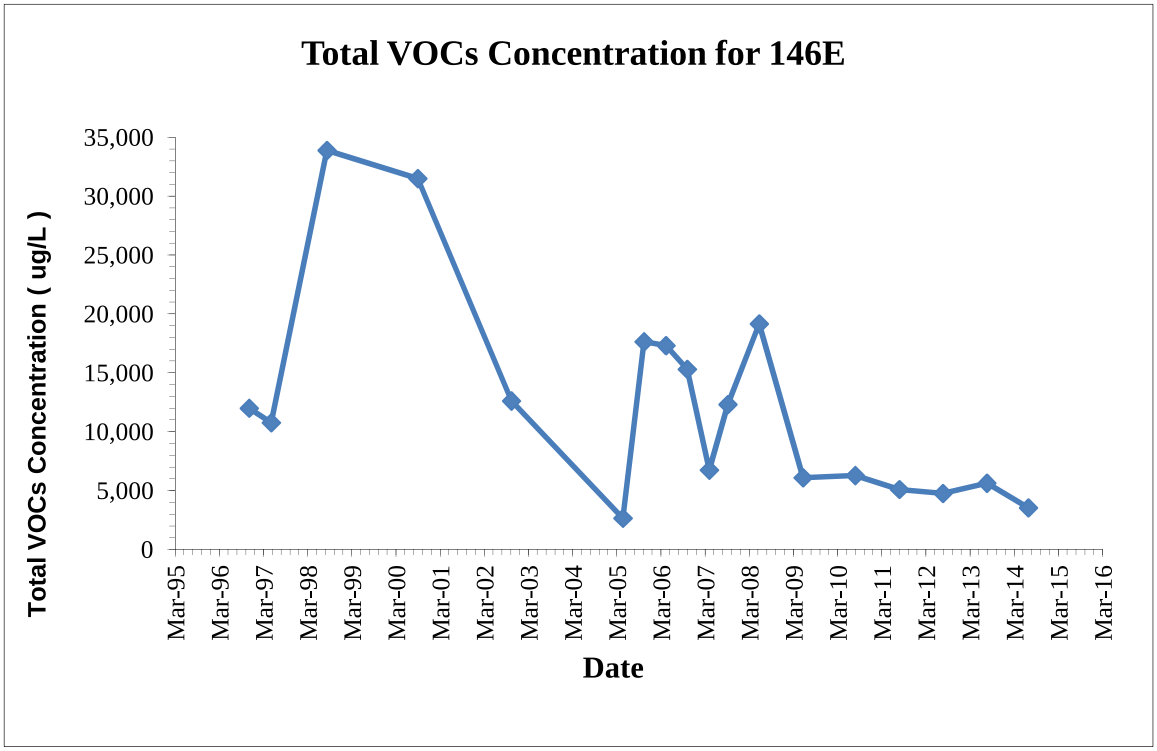




## Appendix B
## D-Zone TVOC Graphs






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
Mar-95
Mar-96
Mar-97
Mar-98
Mar-99
Mar-00
Mar-01
Mar-02
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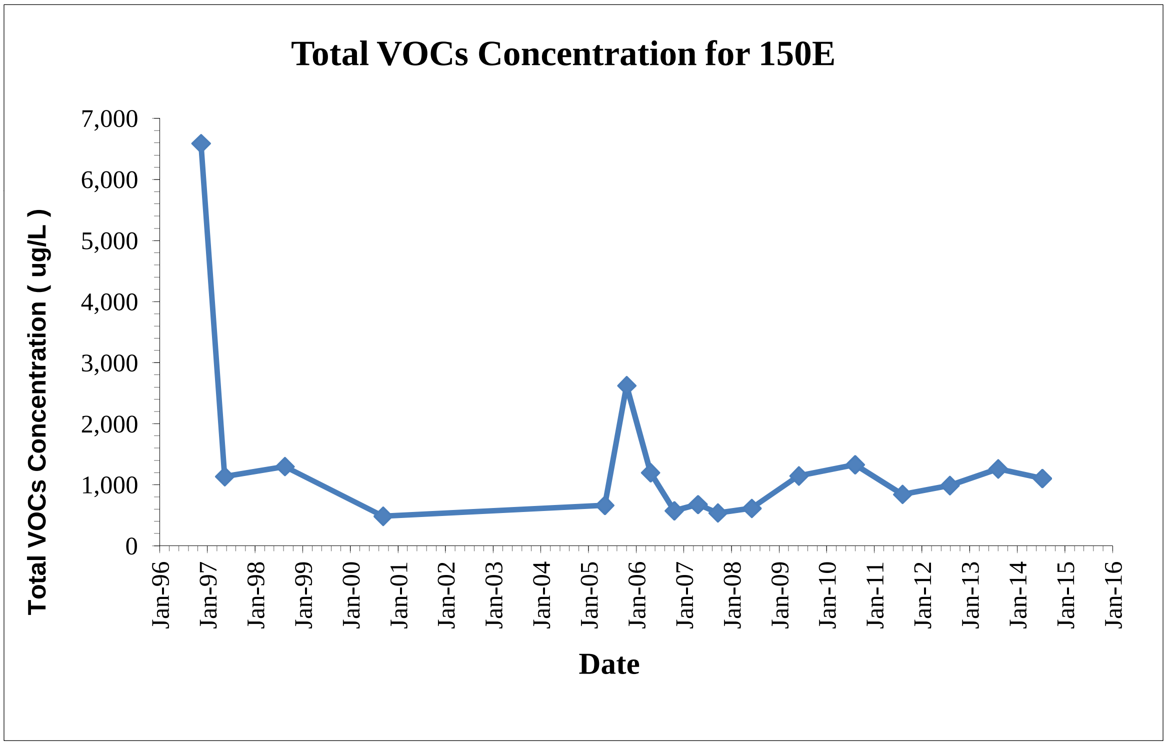
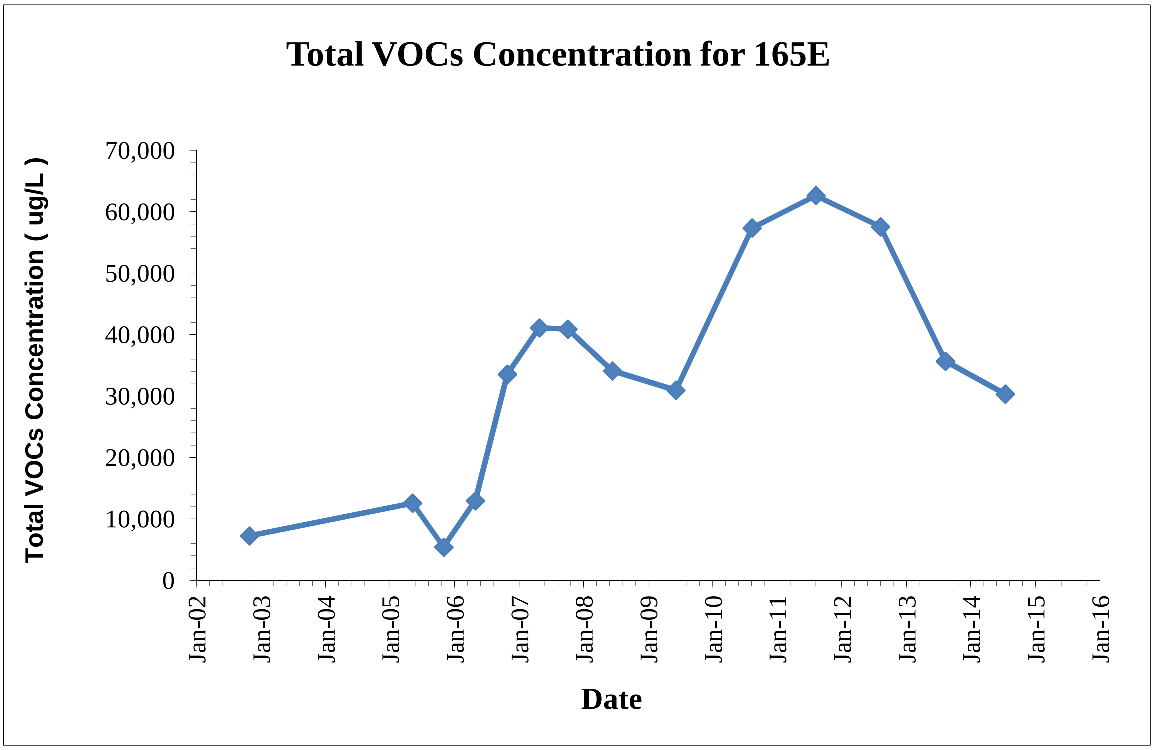
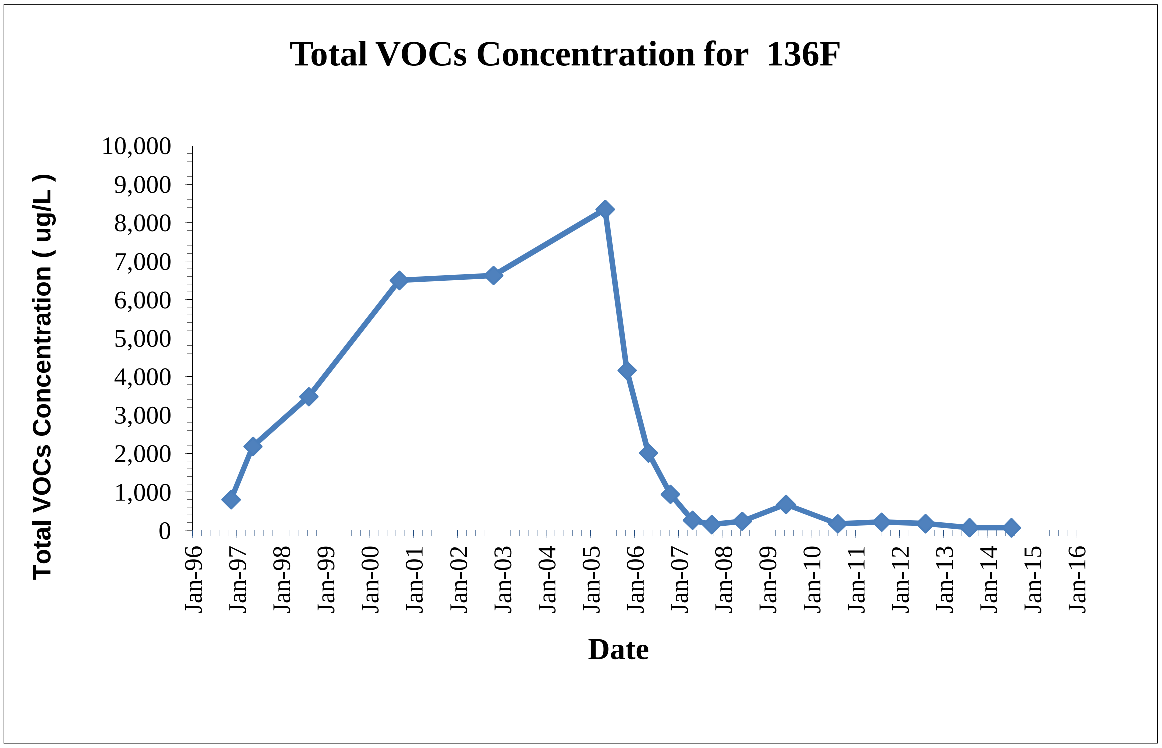
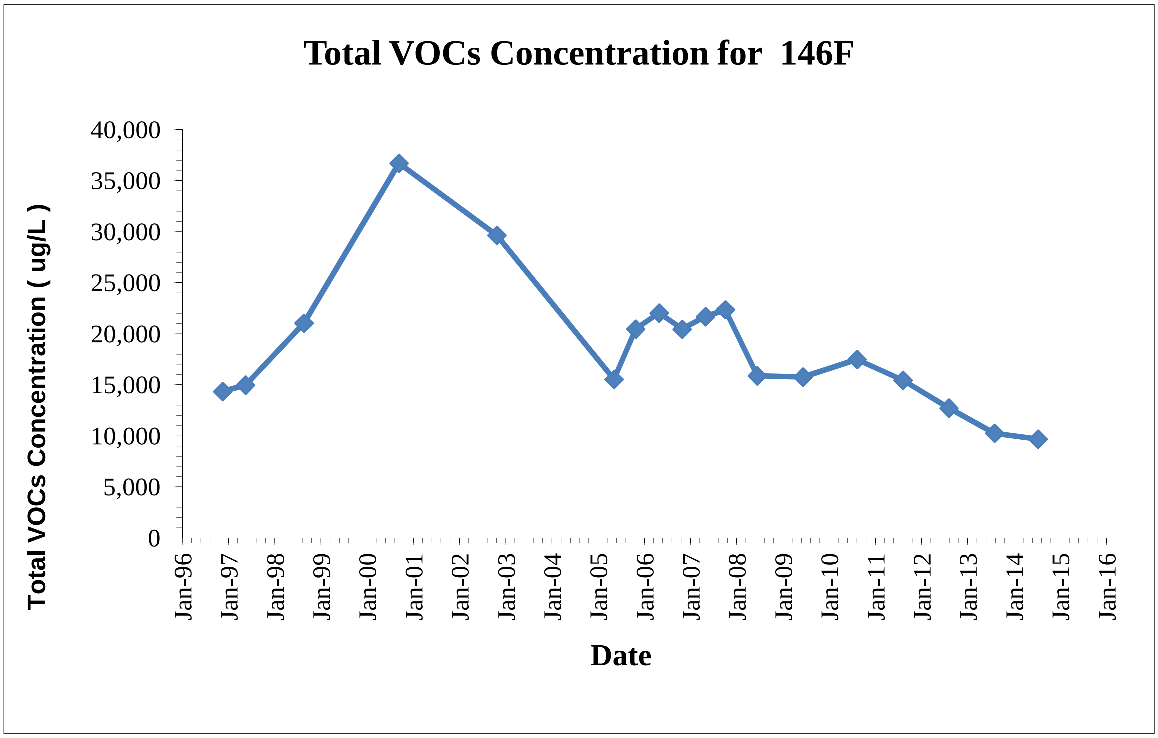
Mar-13
Mar-14
Mar-15
Mar-16
Date


Total VOCs Concentration for 150E
Total VOCs Concentration ( ug/L )
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
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
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
Date


Total VOCs Concentration for 146F
Total VOCs Concentration ( ug/L )
40,000
35,000
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
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Jan-11
Jan-12
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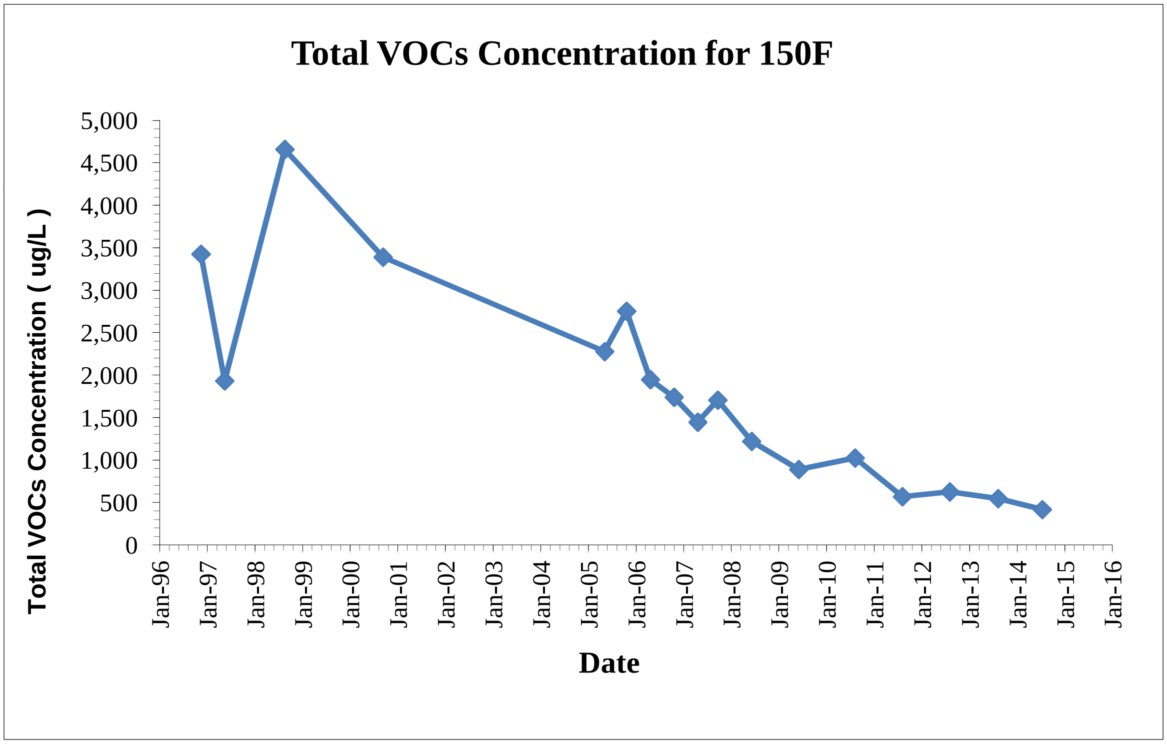
Jan-14
Jan-15
Jan-16
Date


Total VOCs Concentration for 150F
Total VOCs Concentration ( ug/L )
5,000
4,500
4,000
3,500
3,000
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
Date

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# APPENDIX C

# DATA VALIDATION SUMMARY LABORATORY REPORTS (CD ONLY)

# APPENDIX D

# LANDFILL CAP INSPECTION RESULTS (NOVEMBER 2014)

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EXHIBIT A
CAP AND SURFACE WATER DRAINAGE
INSPECTION CHECKLIST
NECCO PARK

DATE: 10-15-14
INSPECTOR: Gerald Shepard
WITNESSES: Dylan Boberg

EMERGENCY CONTACT: Timothy Pezzino
Phone # (716) 278-5170

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: 3A) 2 small Rills on South Side Slope 4ft Long x 2inch wide x 4-6" deep. 3b) No Leachate Seeps present. 3c) No Settling on Landfill or side slopes. 3F) very small mice + mole Burrows on Landfill + Side Slopes

DESCRIPTION OF CONCERN:

DESCRIPTION OF REMEDY: 3A, F) Thoroghly Scarify rills + small holes with shovel 2inches deep, place BPL backfill soil (Below 6"inch depth) meeting original cap specs and compact to Firm state. Top soil (above 6in depth) Lightly compacted and vegetate, both to meet original Landfill specs. This Remedy will be completed when Regular Cap Maintenance is performed.

EXHIBIT B
CAP AND SURFACE WATER DRAINAGE
MAINTENANCE CHECKLIST
NECCO PARK

DATE: 10-15-14
INSPECTOR: Gerald Shepard
WITNESSES: Dylan Boberg

EMERGENCY CONTACT: Timothy Pezzino
Phone # (716) 278-5170

| 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 | Mowcon/Contractor | |
| | 5) Gas Vents | | |
| | - Pipes | | |
| | - Bedding and Adjacent Media | | |
| | 6) Other | | |

DESCRIPTION OF MAINTENANCE ACTIVITIES: Brush Hogged + Line trimmed LandFill October 3, 2014