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August 26, 2009

Mr. John Nohrstedt
U.S. Army Corps of Engineers
Engineering and Support Center, Huntsville
Attn: CEHNC-FS-IS
4820 University Square
Huntsville, Alabama 35816-1822

SUBJECT: Final Annual Report and Year Two Review – Ash Landfill Operable Unit at Seneca Army Depot Activity; W912DY-08-D-0003, Delivery Order 0001

Dear Mr. Nohrstedt:

Parsons Infrastructure & Technology Group, Inc. (Parsons) is pleased to submit the Final Annual Report and Year Two Review for the second year of annual monitoring at the Ash Landfill Operable Unit at Seneca Army Depot Activity (SEDA) in Romulus, New York. This work was performed in accordance with the Scope of Work for Delivery Order 0001 under Contract W912DY-08-D-0003. This Final Annual Report and Year Two Review provides a review of long-term groundwater monitoring for 2008 and provides recommendations for future long-term monitoring at the site. This document also provides an annual review of the effectiveness of the remedy implemented in 2006. This document recommends the continuation of monitoring on a semi-annual basis for the next year.

The USEPA submitted comments on the Draft subject document on July 16, 2009, and responses to the comments are included in Appendix C of the enclosed Final Annual Report.

Parsons appreciates the opportunity to provide you with the Final Annual Report and Year Two Review for this work. Should you have any questions, please do not hesitate to call me at (617) 449-1405 to discuss them.

Sincerely,

Todd Heino, P.E.
Program Manager

Enclosures

cc: S. Absolom, SEDA
K. Hoddinott, USACHPPM
R. Walton, USAEC
R. Battaglia, USACE, NY

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August 26, 2009

Mr. Julio Vazquez
USEPA Region II
Superfund Federal Facilities Section
290 Broadway, 18th Floor
New York, NY 10007-1866

Mr. Kuldeep K. Gupta, P.E.
New York State Department of Environmental Conservation (NYSDEC)
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, NY 12233-7015

Mr. Mark Sergott
Bureau of Environmental Exposure Investigation, Room 300
New York State Department of Health
547 River Street, Flanigan Square
Troy, NY 12180

SUBJECT: Final Annual Report and Year Two Review – Ash Landfill Operable Unit at Seneca Army Depot Activity; EPA Site ID# NY0213820830 and NY Site ID# 8-50-006

Dear Mr. Vazquez/Mr. Gupta/Mr. Sergott:

Parsons Infrastructure & Technology Group, Inc. (Parsons) is pleased to submit the Final Annual Report and Year Two Review for the second year of annual monitoring at the Ash Landfill Operable Unit at Seneca Army Depot Activity (SEDA) in Romulus, New York (EPA Site ID# NY0213820830 and NY Site ID# 8-50-006). This Final Annual Report and Year Two Review provides a review of long-term groundwater monitoring for 2008 and recommendations for future long-term monitoring at the site. This document also provides an annual review of the effectiveness of the remedy implemented in 2006. This document recommends the continuation of monitoring on a semi-annual basis for the next year.

The USEPA submitted comments on the Draft subject document on July 16, 2009, and responses to the comments are included in Appendix C of the enclosed Final Annual Report.

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Sincerely,

Todd Heino, P.E.
Program Manager

Enclosures
cc: M. Heaney, TechLaw
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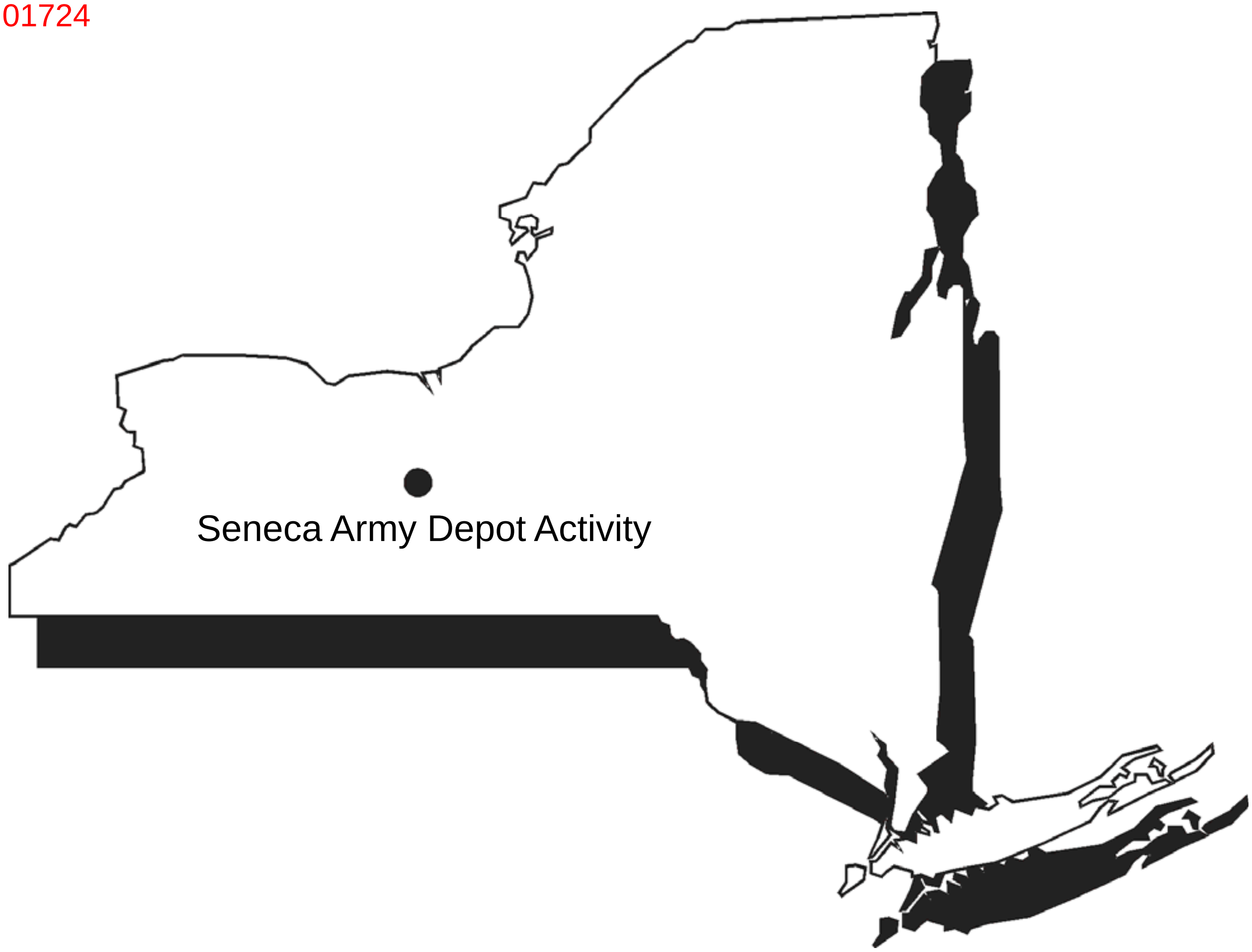

FINAL
ANNUAL REPORT AND YEAR TWO REVIEW
FOR THE ASH LANDFILL OPERABLE UNIT
SENECA ARMY DEPOT ACTIVITY

Contract No. W912DY-08-D-0003
Task Order No. 0001
EPA Site ID# NY0213820830
NY Site ID# 8-50-006

PARSONS

August 2009

FINAL
ANNUAL REPORT AND YEAR 2 REVIEW

FOR THE ASH LANDFILL OPERABLE UNIT
SENECA ARMY DEPOT ACTIVITY, ROMULUS, NEW YORK

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, ENGINEERING AND SUPPORT CENTER
HUNTSVILLE, ALABAMA

and

SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

Prepared by:

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100 High Street
Boston, MA 02110

Contract Number W912DY-08-D-0003
Task Order No. 0001
EPA Site ID# NY0213820830
NY Site ID# 8-50-006
August 2009

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1.0 INTRODUCTION

This Annual Report is for the Ash Landfill Operable Unit (OU), located at the Seneca Army Depot Activity (SEDA or the Depot) in Romulus, New York. This report provides a review of the second year of long-term groundwater monitoring for a full-scale biowall system installed in 2006. This report also provides recommendations for future long-term monitoring at the site. This report is based on an annual review of the effectiveness of the remedy implemented in 2006, which includes the following:

- A comparison of the groundwater data to the long-term groundwater monitoring (LTM) objectives, listed below in **Section 1.1;**
- An evaluation of the need to recharge the biowall, as outlined in the Remedial Design Report (RDR) (Parsons, 2006b) in **Section 3.4**; and
- An assessment of the remedy's compliance with USEPA's "Guidance for Evaluation of Federal Agency Demonstrations (Section 120(h)(3))."

In accordance with the Record of Decision (ROD) for the Ash Landfill OU (Parsons, 2004), the Remedial Design Work Plan (Parsons, 2006a), and the Remedial Design Report (RDR) (Parsons, 2006b), a remedial action (RA) was completed in October and November 2006. The remedial action involved the following:

- Installation of three dual biowall systems (A1/A2, B1/B2, C1/C2) to address volatile organic compounds (VOCs) in groundwater that exceed New York State Department of Environmental Conservation's (NYSDEC's) Class GA groundwater standards;
- Construction and establishment of a 12-inch vegetative cover over the Ash Landfill and the Non-Combustible Fill Landfill (NCFL) to prevent ecological receptors from coming into direct contact with the underlying soils contaminated with metals and polycyclic aromatic hydrocarbons (PAHs);
- Excavation and disposal of Debris Piles A, B, and C; and
- Re-grading of the Incinerator Cooling Water Pond to promote positive drainage.

As part of the RA at the Ash Landfill OU, LTM is being performed as part of the post-closure operations. Groundwater monitoring is required as part of the remedial design, which has been formulated to comply with the ROD. The first of four rounds of groundwater sampling for the first year of LTM was completed between January 3, 2007 and January 4, 2007; the second round was completed between March 15, 2007 and March 17, 2007; the third round was completed between

June 5, 2007 and June 7, 2007; and the last of the four was collected between November 13, 2007 and November 15, 2007.

The analytical and geochemical results were presented in four letter reports, submitted April 12, 2007 (Quarter 1), June 5, 2007 (Quarter 2), September 19, 2007 (Quarter 3), and February 21, 2008 (Quarter 4). The results of the Year 1 LTM were reported and evaluated in the "Annual Report and One-Year Review for the Ash Landfill" (Parsons, 2008). As part of the Year 1 report, the Army recommended that the frequency of LTM events at the Ash Landfill OU be reduced from quarterly to semi-annually, and this recommendation was approved by the U.S. Environmental Protection Agency (USEPA) and the New York Department of Environmental Conservation (NYSDEC). The first round of Year 2 semi-annual monitoring, referred to as Round 5, was completed between June 24, 2008 and June 26, 2008. Round 6 of the semi-annual monitoring was completed between December 11, 2008 and December 15, 2008. The analytical and geochemical results were presented in two letter reports, submitted January 12, 2009 (Round 5) and April 3, 2009 (Round 6). This Annual Report reviews the results of the second year of the LTM program as part of the ongoing evaluation of the remedy and provides conclusions and recommendations about the effectiveness of the remedial action, including the groundwater remedy and the vegetative landfill covers.

1.1 Long-Term Groundwater Monitoring Objectives

Three types of long-term groundwater monitoring are being performed: 1) plume performance monitoring, 2) biowall process monitoring, and 3) off-site compliance monitoring. On-site performance monitoring is being conducted to measure groundwater contaminant concentrations and the effectiveness of the biowall remedy for the Ash Landfill OU. The objectives of performance and compliance monitoring are as follows:

- Confirm that there are no exceedances of groundwater standards for contaminants of concern (COC) at the off-site trigger monitoring well MW-56;
- Document the effectiveness of the biowalls to remediate and attenuate the chlorinated ethene plume; and
- Confirm that groundwater concentrations throughout the plume are decreasing to eventually meet GA standards.

Biowall process monitoring is being conducted at two locations (shown in **Figure 1**) to determine if, and when, any needed maintenance activities should be performed. The first location is within Biowalls B1 and B2 in the segment that runs along the pilot-scale biowalls installed in July 2005. The second location is within Biowall C2, the furthest downgradient biowall. The objectives of biowall process monitoring for operations and maintenance (O&M) activities are as follows:

- Monitor the long-term performance and sustainability of the biowalls;

- Monitor substrate depletion and chemical and geochemical conditions under which the effectiveness of the biowalls may decline; and

- Determine if, and when, the biowalls need maintenance (i.e., need to be recharged with additional organic substrate).

2.0 SITE BACKGROUND

2.1 Site Description

SEDA is a 10,587-acre former military facility located in Seneca County near Romulus, New York, which has been owned by the United States Government and operated by the Department of the Army since 1941. SEDA is located between Seneca Lake and Cayuga Lake in Seneca County and is bordered by New York State Highway 96 on the east, New York State Highway 96A on the west, and sparsely populated farmland on the north and south.

The location of the Ash Landfill OU, also referred to simply as the Ash Landfill, is composed of five solid waste management units (SWMUs). As shown in **Figure 2**, the five SWMUs that comprise the Ash Landfill OU are the Incinerator Cooling Water Pond (SEAD-3), the Ash Landfill (SEAD-6), the Non-Combustible Fill Landfill (NCFL) (SEAD-8), the Debris Piles (SEAD-14), and the Abandoned Solid Waste Incinerator Building (SEAD-15).

Prior to the development of the Ash Landfill OU, the land in this area was used for farming. From 1941 (the date SEDA was constructed) to 1974, uncontaminated trash was burned in a series of burn pits near the abandoned incinerator building (Building 2207). According to a U.S. Army Environmental Hygiene Agency (USAEHA) Interim Final Report, Groundwater Contamination Survey No. 38-26-0868-88 (July 1987), the ash from the refuse burning pits was buried in the Ash Landfill (SEAD-6) from 1941 until the late 1950's or early 1960's.

The incinerator was built in 1974. Between 1974 and 1979, materials intended for disposal were transported to the incinerator. Nearly all of the approximately 18 tons of refuse generated per week on the Depot were incinerated. The source for the refuse was domestic waste from depot activities and family housing. Large items that could not be burned were disposed of at the NCFL (SEAD-8). The NCFL has an area of approximately two acres and is located southeast of the incinerator building (immediately south of the SEDA railroad line). The NCFL was used as a disposal site for non-combustible materials, including construction debris, from 1969 until 1977.

Ash and other residue from the incinerator were temporarily disposed in an unlined cooling pond immediately north of the incinerator building. The cooling pond consisted of an unlined depression approximately 50 feet in diameter and approximately 6 to 8 feet deep. When the pond filled, the fly ash and residues were removed, transported, and buried in the adjacent ash landfill east of the cooling pond. The refuse was dumped in piles and occasionally spread and compacted. No daily or final cover was applied during operation. The active area of the Ash Landfill extended at least 500 feet north of the incinerator building, near a bend in a dirt road, based on an undated aerial photograph of the incinerator during operation. A fire destroyed the incinerator on May 8, 1979, and the landfill was subsequently closed. The landfill was apparently covered with native soils of various thicknesses but has not been closed with an engineered cover or cap. Other areas on the site were used for a grease pit and burning of debris.

2.2 Site Geology/Hydrogeology

The site is underlain by a broad north-to-south trending series of rock terraces covered by a mantle of glacial till. As part of the Appalachian Plateau, the region is underlain by a tectonically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones. At the Ash Landfill site, these rocks (the Ludlowville Formation) are characterized by gray, calcareous shales and mudstones and thin limestones with numerous zones of abundant invertebrate fossils. Locally, the shale is soft, gray, and fissile. Pleistocene age (Late Wisconsin age, 20,000 years before present [bp]) till deposits overlie the shales, which have a thin (2 to 3 feet) weathered zone at the top. The till matrix varies locally, but generally consists of unsorted silt, clay, sand, and gravel. At the Ash Landfill OU, the thickness of the till generally ranges from 4 to 15 feet. At the location of the biowalls, the thickness of the till and weathered shale is approximately 10 to 15 feet.

Groundwater is present in both the shallow till/weathered shale and in the deeper competent shale. In both water-bearing units, the predominant direction of groundwater flow is to the west, toward Seneca Lake. Based on the historical data, the wells at the Ash Landfill site exhibit rhythmic, seasonal water table and saturated thickness fluctuations. The saturated interval is at its thinnest (generally between 1 and 3 feet thick) in the month of September and is the thickest (generally between 6 and 8.5 feet thick) between the months of December and March.

The average linear velocity of the groundwater in the till/weathered shale was calculated during the RI using the following parameters: 1) an average hydraulic conductivity of 4.5×10^{-4} centimeters per second (cm/sec) (1.28 feet per day [ft/day]), 2) an estimated effective porosity of 15% (0.15) to 20% (0.20), and 3) a groundwater gradient of 1.95×10^{-2} foot per foot (ft/ft) (Parsons Engineering Science, Inc. [ES], 1994a). The average linear velocity was calculated to 0.166 ft/day or 60.7 feet per year (ft/yr) at 15% effective porosity and 0.125 ft/day or 45.5 ft/yr at 20% effective porosity. The actual velocity on-site may be locally influenced by more permeable zones possibly associated with differences in the actual porosity of the till/weathered shale.

2.3 Soil and Groundwater Impacts

The nature and extent of the constituents of concern at the Ash Landfill OU were evaluated through a comprehensive remedial investigation (RI) program. It was determined that surface water and sediment were not media of concern and did not require remediation. During the RI, a groundwater contaminant plume, emanating from the northern end of the Ash Landfill, was delineated. The primary constituents of concern at the Ash Landfill are VOCs in groundwater; and are chlorinated and aromatic compounds, semivolatile organic compounds (SVOCs), PAHs, and, to a lesser degree, metals in the soil. Release of the constituents of concern is believed to have occurred during the former activities at the Ash Landfill OU, as described above.

Soil

VOCs, specifically trichloroethene (TCE), were detected in the soil in the “Bend in the Road” area, located northwest of the Ash Landfill. Between 1994 and 1995, the Army conducted a Non-Time Critical Removal Action (NTCRA), also known as an Interim Removal Measure (IRM), to address VOC and PAH soil contamination in areas near the “Bend in the Road”. This area is believed to be the source of the groundwater plume. The NTCRA was successful in reducing risk due to future exposure to these soils and prevented continued leaching of VOCs to groundwater associated with this operable unit. In the years that have passed since the NTCRA, the positive benefits of the NTCRA have been observed in that the concentration of VOCs in groundwater near the original source area has decreased by two orders of magnitude. Further remediation for VOCs in the soil at the “Bend in the Road” was not required.

The other compounds of significance detected in the soils were PAHs and metals. PAHs were detected at concentrations above NYSDEC’s Technical and Administrative Guidance Memorandum (TAGM) values in the NCFL and in the Debris Piles present around the former Ash Landfill. In general, the highest PAH concentrations were detected in the NCFL and small Debris Pile surface soils. The metals detected at elevated concentrations (significantly above TAGMs) in soils were copper, lead, mercury, and zinc. These elevated concentrations were found in the Ash Landfill, the NCFL, and the Debris Piles, and the highest concentrations of metals were detected at the surface of the Debris Piles. These piles are small, localized, surface features that are visibly discernable and do not extend into the subsurface.

Groundwater

The primary potential impact to human health and the environment is a groundwater contaminant plume containing dissolved concentrations of chlorinated solvents, primarily TCE, 1,2-dichloroethene (DCE), and vinyl chloride (VC). The plume originates in the "Bend in the Road" area near the northwestern edge of the Ash Landfill and is approximately 1,100 feet long by 625 feet wide. The nearest exposure points for groundwater are three farmhouse wells, located approximately 1,250 feet from the leading edge of the plume. Two of the farmhouse wells draw water from the till/weathered shale aquifer and the remaining well draws water from the bedrock aquifer. As discussed in Section 4.4 of the RI (Parsons, 1994), plume profiles were constructed for geologic cross sections at the Ash Landfill; based on these profiles it was determined that the plume is vertically restricted to the upper till/weathered shale aquifer and is not present in the deeper competent shale aquifer. As noted above, the source area of the plume was removed by the NTCRA.

2.4 Summary of the Remedial Action

2.4.1 Biowalls

Three biowall pairs were installed to address groundwater contamination on-site, as documented in the Construction Completion Report (Parsons, 2007). The biowalls were constructed by excavating a linear trench down to competent bedrock and backfilling the trench to the ground surface with a mixture of mulch and sand.

Biowalls A1/A2, B1/B2, and C1/C2 (**Figure 1)** were constructed perpendicular to the chlorinated solvent plume at the locations prescribed in the RDR. The entire length of Biowalls A1/A2 and the northern portion of B1/B2 were combined into a single double-width trench (minimum of 6 feet in width) due to unstable soil conditions, which caused trench widening. All trenches were excavated to competent bedrock. Approximately 2,840 linear feet (lf) of biowalls were constructed in the areas downgradient of the Ash Landfill at depths ranging from 7 feet below ground surface (bgs) to 18.5 feet bgs.

A 12-inch soil cover was placed over the entire length of the biowalls to impede surface water from preferentially flowing into the biowall trenches. Trench spoils were used as the cover material and were compacted with a backhoe. It is anticipated that the mulch backfill within the trenches will settle over time and the cover will eventually settle to ground surface.

2.4.2 Incinerator Cooling Water Pond

The Incinerator Cooling Water Pond (ICWP) was re-graded to meet the surrounding grade to prevent the accumulation of water in this inactive pond, as specified in the RDR. Prior to regrading, the vegetation that had grown on the berms surrounding the ICWP was removed with an excavator. The soil berm was then regraded with a dozer to match the surrounding grade. The ICWP was seeded with a standard meadow mix to promote vegetation and prevent erosion.

2.4.3 Ash Landfill and NCFL Vegetative Cover

A soil cover comprised of mulch, biowall trench spoils meeting the site cleanup criteria, and off-site topsoil was placed over the 2.2 acres of the Ash Landfill. The Ash Landfill was covered with 4,380 cubic yards (cy) of fill to achieve a minimum cover thickness of 12 inches. Biowall trench spoils meeting the site cleanup criteria and off-site topsoil were placed over the 3.4 acre NCFL. The NCFL was covered with 6,015 cy of fill to achieve a minimum cover thickness of 12 inches. The purpose of the covers is to prevent terrestrial wildlife from directly contacting or incidentally ingesting metals-impacted soils.

2.4.4 Debris Pile Removal

During the RA, approximately 200 cy of debris was removed from Debris Piles B and C. Approximately 1,000 cy of debris was removed from within and beyond the staked limits of Debris Pile A. The total volume of debris removed was approximately 1,200 cy (1,548 tons).

2.5 Biowall Technology Description

Solid-phase organic substrates used to stimulate anaerobic biodegradation of chlorinated ethenes include plant mulch and compost. Mulch may be composted prior to emplacement, or the mulch may be mixed with another source of compost, to provide active microbial populations for further degradation of the substrate in the subsurface. Mulch is primarily composed of cellulose and lignin, but "green" plant material is incorporated to provide a source of nitrogen and nutrients for microbial growth. These substrates are mixed with coarse sand and emplaced in a trench or excavation in a permeable reactive biowall configuration. Biodegradable vegetable oils may also be added to the mulch mixture to increase the availability of soluble organic matter. This treatment method relies on the flow of groundwater under a natural hydraulic gradient through the biowall to promote contact with slowly-soluble organic matter. As the groundwater flows through the organic matter within the biowall, a treatment zone is established not only within the biowall, but downgradient of it, as the organic matter migrates with the groundwater and anaerobic microbial processes are established.

Degradation of the organic substrate by microbial processes in the subsurface provides a number of breakdown products, including metabolic acids (e.g., butyric and acetic acids). The breakdown products and acids produced by degradation of mulch in a saturated subsurface environment provide secondary fermentable substrates for generation of hydrogen, the primary electron donor utilized in anaerobic reductive dechlorination of chlorinated ethenes. Thus, a mulch biowall has the potential to stimulate reductive dechlorination of chlorinated ethenes for many years. If needed, mulch biowalls can be periodically recharged with fluid substrates (e.g., vegetable oils) to extend the life of the biowall. Vegetable oil is a substrate that is readily available to microorganisms as a carbon source to enable them to establish and continually develop their population. Used in combination with the mulch, it has the potential to increase the duration of organic carbon release.

Reductive dechlorination is the most important process for natural biodegradation of the more highly chlorinated solvents (EPA, 1998), as shown in **Figure 3**. Complete dechlorination of TCE and the other chlorinated solvents present in the groundwater is the goal of anaerobic biodegradation using the mulch biowall technology.

Biodegradation causes measurable changes in groundwater geochemistry that can be used to evaluate the effectiveness of substrate addition in stimulating biodegradation. For anaerobic reductive dechlorination to be an efficient process, the groundwater typically must be sulfate-reducing or methanogenic. Thus, groundwater in which anaerobic reductive dechlorination is occurring should have the following geochemical signature:

- Depleted concentrations of dissolved oxygen (DO), nitrate, and sulfate;
- Elevated concentrations of methane, carbon dioxide, chloride, and alkalinity; and
- Reduced oxidation reduction potential (ORP).

3.0 LONG-TERM MONITORING DATA ANALYSIS AND GROUNDWATER REMEDY EVALUATION

3.1 Sample Collection

Four rounds of sampling were conducted during the first year of LTM, as follows:

- The first quarter was completed between January 3, 2007 and January 4, 2007;
- The second quarter was completed between March 15, 2007 and March 17, 2007;
- The third quarter was completed between June 5, 2007 and June 7, 2007; and
- The fourth quarter was completed between November 13, 2007 and November 15, 2007.

Two rounds of sampling were conducted during the second year of LTM, as follows:

- Round five was completed between June 24, 2008 and June 26, 2008; and
- Round six was completed between December 11, 2008 and December 15, 2008.

Groundwater samples were collected using low flow sampling techniques during each of the six sampling rounds. Bladder pumps were used to purge the wells and collect the samples during these rounds. Sampling procedures, sample handling and custody, holding times, and collection of field parameters were conducted in accordance with the "Final Sampling and Analysis Plan for Seneca Army Depot Activity (SAP)" (Parsons, 2005).

Fourteen monitoring wells were sampled and they were classified into three groups, listed in **Table 1**: eleven on-site plume performance monitoring wells, one off-site compliance monitoring well, and five biowall process monitoring wells. The off-site performance monitoring well, MW-56, was monitored on a semi-annual basis, and was monitored in January 2007, June 2007, June 2008, and December 2008. The well locations are shown on **Figure 4**.

The five biowall process monitoring wells include three wells that are also plume performance wells (MWT-23, MWT-28, and MWT-29). All five biowall process wells (MWT-26, MWT-27, MWT-28, MWT-29, and MWT-23) are either within or immediately upgradient or downgradient of the biowalls and are used to assess when and if the biowalls may require additional substrate. The Annual Report – Year 1 recommended that groundwater samples collected from monitoring wells PT-17 and MWT-

7 be analyzed for additional geochemical parameters that are included for the process monitoring wells, in order to better monitor the progress of the treatment zone.

At each well, groundwater samples were collected and submitted to TestAmerica Laboratories, Inc in Buffalo, New York. The wells that were in the plume performance group and the off-site performance monitoring well, MW-56, were analyzed for VOCs by USEPA SW846 Method 8260B. The samples from the five wells in the process monitoring group and the two wells in the plume performance group, PT-17 and MWT-7, were submitted to TestAmerica for the following analyses:

- VOCs by USEPA SW846 Method 8260B
- Sulfate by USEPA Method 300.1
- Total organic carbon (TOC) by USEPA SW846 Method 9060A

The samples from the five wells in the process monitoring group and the two wells in the plume performance group, PT-17 and MWT-7, were also submitted to Microseeps, Inc. located in Pittsburgh, Pennsylvania for analysis for methane, ethane, and ethene (MEE) by AM20GAX, Microseeps' version of Method RSK 175. In the field, the following geochemical parameters were measured and recorded for each groundwater sample: pH, oxidation-reduction potential (ORP), conductivity, and temperature were measured using the Horiba U-22 multi-parameter instrument; dissolved oxygen (DO) was measured with a YSI 55 meter; and turbidity was measured with a Lamotte 2020 turbidity meter. In addition, a HACH® DR/850 Colorimeter was used in the field at the five process wells and at the two wells in the plume performance group, PT-17 and MWT-7, to measure manganese and ferrous iron by USEPA Method 8034 and USEPA Method 8146, respectively. A summary of the samples collected is presented in **Table 1**.

3.1.1 Groundwater Elevations

Historic groundwater elevations and groundwater elevations from the two years of LTM round are presented in **Figure 5;** these data show that groundwater levels were relatively high during the sixth sampling event.

3.2 Geochemical Data

Biodegradation causes measurable changes in groundwater geochemistry that can be used to evaluate the effectiveness of substrate addition in stimulating biodegradation. For anaerobic reductive dechlorination to be an effective process, the groundwater typically must be sulfate-reducing or methanogenic. Geochemical parameters collected in the field that also serve as water quality indicators, such as ORP, DO, and conductivity, were recorded for all the wells in the LTM program. Analysis for geochemical parameters (TOC, sulfate, and methane/ethene/ethane) was completed for the five wells in the biowall process monitoring group and PT-17 and MWT-7, as indicated in **Section 3.1**. Anaerobic reductive dechlorination may occur if the following geochemical signatures are identified according to USEPA guidance on natural attenuation of chlorinated Solvents (USEPA, 1998):

- Depleted concentrations of DO and sulfate;
- Elevated concentrations of methane;
- Reduced ORP; and
- Distribution of soluble organic substrate in groundwater (TOC).

Geochemical indicator parameter results are shown on **Table 2**. Comparisons of geochemical parameters for biowall locations MWT-26 (upgradient of Biowall B1) to MWT-28 (in Biowall B2) for Year 2 are summarized below to evaluate the biowall process performance, demonstrating the change in geochemistry across the B1/B2 Biowall pair. **Table 2** is organized with the wells listed in the direction of groundwater flow, with the most upgradient well listed first and the most downgradient well listed last.

Dissolved Oxygen

Dissolved oxygen (DO) is the most favored electron acceptor used by microbes for the biodegradation of organic carbon, and its presence can inhibit the biodegradation of chlorinated ethenes. DO levels are depleted (less than 2 milligrams per liter [mg/L]) in the sampled wells located in and downgradient of Biowalls B1/B2 in both Year 2 events, shown in **Table 2**. This indicates that DO is depleted due to the presence of the biowall substrate. The depletion of DO enhances the potential for anaerobic degradation of chlorinated ethenes in the aquifer.

Sulfate

Sulfate is used as an electron acceptor during sulfate reduction, competing with anaerobic reductive dechlorination for available substrate (electron donor). Sulfate levels lower than 20 mg/L are desired to prevent inhibition of reductive dechlorination of chlorinated ethenes (USEPA, 1998). The sulfate levels detected in the biowalls are orders of magnitude lower than the concentration of sulfate detected upgradient of Biowalls B1/B2 at MWT-26, shown in **Table 2**. Sulfate concentrations at MWT-29, located downgradient of Biowall B2, are higher than the sulfate levels detected in the biowalls, but much lower than the upgradient sulfate concentrations. The data shown in **Table 2** indicate that the availability of this electron acceptor is diminished and conditions for anaerobic dechlorination are enhanced in the biowalls and the area immediately downgradient.

Methane

The presence of methane in groundwater is indicative of strongly reducing methanogenic conditions. An increase in the concentrations of methane is an indication that reducing conditions are optimal for anaerobic reductive dechlorination to occur. Methane was detected in the well upgradient of Biowall B1/B2 (MWT-26) at a concentration of 10 μg/L in Round 6. The methane concentrations increased by three orders of magnitude at all of the process wells located in biowalls compared to the upgradient level, and increased by two orders of magnitude in the process well located immediately downgradient of Biowall B2, shown in **Table 2**. This data demonstrate that there is an increase in the level of methanogenic activity within the biowalls and in downgradient areas, compared to upgradient locations.

Oxidation-Reduction Potential

ORP indicates the level of electron activity and indicates the tendency for the groundwater to accept or transfer electrons. Low ORP, less than -100 millivolts (mV), is a condition common for anaerobic reductive dechlorination to occur (USEPA, 1998). During the Round 6 monitoring event, ORP values upgradient of Biowall A1/A2 were significantly higher than the ORP values observed at the wells within the biowalls, which were less than or close to -100 mV, shown in **Table 2**. The levels of ORP within Biowalls B1/B2 and C2 indicate conditions are sufficiently reducing within the biowalls to support sulfate reduction, methanogenesis, and anaerobic reductive dechlorination.

Total Organic Carbon

The presence of organic substrate is necessary to stimulate and sustain anaerobic degradation processes, including reductive dechlorination. Organic carbon is an energy source for anaerobic bacteria and drives reductive dechlorination. Levels of TOC greater than 20 mg/L are typically sufficient to maintain sulfate reducing and methanogenic conditions (USEPA, 1998). TOC levels are greater in the biowalls compared to the upgradient concentrations, shown in **Table 2**. The concentration of TOC decreased to just below the threshold value of 20 mg/L at the well located immediately downgradient of Biowall B2 (MWT-29). There is a decrease in concentrations of TOC as readily degraded organics (vegetable oil and cellulose) within the mulch mixture are consumed; however, the TOC levels remain sufficiently high to provide an energy source for anaerobic bacteria in the biowall treatment zones to sustain conditions supportive of anaerobic degradation processes. As discussed in the **Section 3.3** below, the change in TOC concentrations appears to have little impact on the efficiency at which chlorinated organics are degraded within the biowalls and does not indicate that the mulch requires recharging.

In summary, monitoring data for wells within the biowalls during the second year of LTM indicate the following:

- Concentrations of TOC remain elevated, ranging from 20.1 mg/L to 53.5 mg/L;
- ORP within the biowalls remains low at -126 mV to -95 mV;
- Sulfate remains less than 48.3 mg/L, with a small increase in sulfate in the B2 Biowall. This level is still substantially lower than background concentrations (up to 541 mg/L at MWT-26 in Round 6); and
- Methane concentrations have increased to 15 mg/L or higher.

Therefore, highly anaerobic conditions remain within the biowalls and sufficient levels of organic carbon are being sustained for effective anaerobic degradation of chlorinated ethenes.

3.3 Chemical Data Analysis and Groundwater Remedy Evaluation

Table 3 summarizes chlorinated ethenes detected in groundwater during the six rounds of LTM. **Table 3** is organized with the wells listed in the direction of groundwater flow, with the most upgradient well listed first and the most downgradient well listed last. A complete presentation of the groundwater data is provided in **Appendix A**. **Figure 4** presents the chlorinated ethene data for the six rounds. The discussion below focuses on data collected during Year 2 (Rounds 5 and 6) of the LTM program, and addresses how the remedial action objectives are being achieved.

Achievement of first performance monitoring objective:

- *Confirm that there are no exceedances of groundwater standards for contaminants of concern (COC) at the off-site trigger monitoring well MW-56;*

Concentrations of chlorinated ethenes near the site boundary (PT-24) and at the off-site well, MW-56, remain low or non-detect, with no significant increase (i.e., approaching regulatory standards) in the concentration of cis-DCE or VC. VC was not detected in any of the rounds at MW-56, TCE was either not detected or was detected at an estimated concentration well below the Class GA groundwater standard (5 μg/L), and cis-DCE was detected below the Class GA groundwater standard (5 μg/L), shown in **Table 3**. The second year of LTM confirmed that there were no exceedances of COC groundwater standards at MW-56.

Achievement of second performance monitoring objective:

- *Document the effectiveness of the biowalls to remediate and attenuate the chlorinated ethene plume;*

Concentrations of chlorinated ethenes at well MWT-26 (between Biowall A and Biowall B1) have steadily declined in each monitoring event to concentrations of 1.9 μg/L of TCE, 1.0 μg/L of cis-DCE, and less than 0.75 μg/L (non-detect) of VC (all below regulatory standards). Concentrations at MWT-24, located downgradient of Biowall C2, similarly show an overall decline, with some seasonal variations, in cis-DCE (from 210 μg/L in the first quarter to 52 μg/L in the sixth round), and a substantial decline in VC (from 45 μg/L in the second quarter to 3.6 μg/L in the sixth round). TCE has consistently been below the Class GA groundwater standard (5 μg/L) at MWT-24 through the first five rounds, with a slight increase to 6.0 μg/L in Round 6. The slight increase is likely due to seasonal fluctuation (e.g., effects of desorption during a period with frequent precipitation events and subsequent high water levels).

Upgradient of the biowalls at monitoring well PT-18A, TCE remains above the Class GA groundwater standard (5 μg/L). Concentrations of TCE at PT-18A are variable, ranging from 2,700 µg/L in the first quarter to 220 µg/L in the fifth round, but rebounding to 1,400 µg/L in the sixth round. Concentrations of TCE at well MWT-25 have consistently decreased, from 50 µg/L in the first quarter to below the Class GA groundwater standard at a concentration of 3.2 µg/L in Round 6 (**Table 3**).

Concentrations of TCE within the biowalls (MWT-27, MWT-28, and MWT-23) remain below detection limits or below 1.0 µg/L, which is an expected performance measure. However, it is just as significant that concentrations of DCE or VC are not elevated within the biowalls. This suggests complete mineralization of chlorinated ethenes, involving multiple anaerobic degradation processes. Ethene is only slightly elevated within the biowalls, but this is not unusual. Ethene is not produced by anaerobic oxidation of cis-DCE or VC, or by abiotic transformation of chlorinated ethenes by reduced iron sulfides. In addition, ethene may be further reduced under highly anaerobic conditions and is volatile (may off-gas) relative to other biogenic gases (carbon dioxide and methane) produced within the biowalls. Therefore, the biowalls are operating as expected with no loss of performance. TOC concentrations remain sufficiently elevated to promote effective degradation of chlorinated ethenes within the biowalls.

The changes in groundwater concentrations of TCE, DCE, and VC as the groundwater passes through the biowalls are shown in **Figures 6A** through **6F** for Rounds 1, 2, 3, 4, 5, and 6, respectively. The figures show that the concentrations of TCE in groundwater are reduced to concentrations below the detection limit within the biowalls. The concentration of TCE does rebound with distance downgradient of Biowalls C1/C2, and the increase may be due to residual TCE that is desorbing from aquifer sediments or that is diffusing out of low permeability sediments. These results indicate that when groundwater is intercepted and treated by the biowalls, a measurable (albeit slower) improvement in downgradient water quality will occur.

Anaerobic degradation of TCE may also occur downgradient of the biowalls in the aquifer formation due to soluble organic carbon released from the biowalls. It is notable that concentrations of cis-DCE and VC are highest downgradient of the biowalls, and not within the biowalls. This suggests that sequential biotic reductive dechlorination of chlorinated organics is the primary degradation process in the downgradient reaction zones, with low levels of TCE being released by desorption from the aquifer matrix or from back diffusion of contaminated groundwater from low permeability sediments. A further indication of biotic reductive dechlorination is the elevated concentration of ethene (19 µg/L) observed at well location MWT-29 during the Round 6 monitoring event (compared to the upgradient concentration of 0.028 µg/L). Further downgradient, TCE was detected at MWT-7 (310 feet from C1/C2) at a concentration of 410 µg/L in Round 6; additional rounds of data will be evaluated to determine long-term trends in this area.

Achievement of third performance monitoring objective:

- *Confirm that groundwater concentrations throughout the plume are decreasing to eventually meet GA standards.*

In general, concentrations of TCE, cis-DCE, and VC decreased over the six sampling events (with some seasonal variation) at the wells within and downgradient of the biowalls. Time plots for monitoring wells MWT-25, MWT-26, MWT-27, MWT-29, MWT-22, PT-22, MWT-23, MWT-24, and PT-24 are presented in **Figures 7A** through **7I**, respectively. The plots show an overall decreasing trend for COCs, even though **Figure 7F** (PT-22) shows a seasonal increase during the Round 6 sampling event, likely due to desorption during a period of high water levels. **Figure 7E** (MWT-22) shows that cis-DCE may increase initially as TCE decreased, and that VC increases as concentrations of cis-DCE decrease, specifically in wells near the biowalls. This increase is expected when sequential reductive dechlorination is occurring. However, the concentrations of cis-DCE and VC are expected to diminish over time as the higher chlorinated compounds (TCE and cis-DCE) are depleted. The time plots of the downgradient wells (MWT-29, MWT-22, MWT-24, and PT-24) show that the TCE concentrations measured in the wells in the vicinity of the biowalls and downgradient of the biowalls are decreasing.

An exponential regression, which matches the rate of decay typical for biological processes, has been calculated for the monitoring wells as a means of calculating an estimate of the time it will take for the concentrations of chlorinated organics to meet their respective GA groundwater standards. **Table 4** summarizes the trend for each contaminant in each well and provides an estimate of the date that the standards will be achieved based on the exponential regressions. This table shows that with the exception of the PT-18A (source area well), PT-17, and MWT-7, all concentrations at the wells have either reached the Class GA groundwater standard or are expected to reach their respective standards by 2022. These dates are intended to provide an indication of the timeframe required for concentrations to reach acceptable levels, and are not meant as a time commitment for the remedy.

There may be limiting factors in reaching the groundwater standards by the specified date, such as desorption and back diffusion from low permeability sediments, which may drive the actual time required to reach compliance. As an example, the trend estimates for PT-22 and MWT-24 have changed since the evaluation completed as part of the Year 1 Annual Report (Parsons, 2008); and the change is likely due to desorption effects on the groundwater observed during Round 6 when groundwater levels were higher. The time plots with the regression lines are included as **Appendix B**.

Time plots of the data for PT-18A, PT-17, and MWT-7 (**Figures 8A**, **B**, and **C**, respectively) include historic data prior to the installation of the biowalls. **Figures 8A** and **8B** indicate that there is an overall decreasing trend for the COCs at PT-18A and PT-17, respectively, even though more recent data has been variable and increases in some instances. The concentrations of TCE at PT-18A (located upgradient of the biowalls), MWT-7, and PT-17 (both located well downgradient of Biowall C2) do not appear to have been impacted by the biowall system and dates to achieve compliance cannot be estimated due to the natural variation in concentrations over time. Concentrations at these wells are within historical levels and that the Army will continue to evaluate any impact from the biowall on this portion of the plume.

Other Compounds

Non-chlorinated organics were detected in the groundwater, and the data are presented in **Appendix A**. Toluene and ethyl benzene were detected within Biowall B1 (MWT-27), Biowall B2 (MWT-28), and Biowall C2 (MWT-23) during the first four sampling events in Year 1. The maximum concentration of toluene was 580 µg/L at MWT-23 in Quarter 4, and the maximum concentration of ethyl benzene was 1.3 J µg/L at MWT-23 in Quarter 3. The frequency and concentrations of toluene and ethyl benzene detected during Rounds 5 and 6 in Year 2 decreased significantly. During Year 2, toluene was detected at MWT-27, MWT-28, and MWT-23 with a maximum concentration of 300 µg/L observed at MWT-23 during Round 5. Ethyl benzene was detected in Rounds 5 and 6 at MWT-23 with a maximum concentration of 0.85 J µg/L detected during Round 5, which is below the Class GA groundwater standard. Neither toluene nor ethyl benzene is a historic contaminant of concern, and the detections of toluene and ethyl benzene are not believed to be associated with historic site operations or with degradation products of reductive dechlorination. The higher detections of toluene were observed in two isolated wells (MWT-28 and MWT-23), and were not detected at significant concentrations downgradient of these wells. The Army will continue to monitor the concentrations during subsequent monitoring events.

Ketones were detected in the monitoring wells at the site, with higher concentrations detected in the wells located within the biowalls (data listed in **Appendix A)**. The maximum detections of acetone and methyl ethyl ketone were observed at well MWT-28 in Biowall B2 during the first quarter sampling event, at concentrations of 2,600 J µg/L and 4,900 J µg/L, respectively,. Concentrations of ketones have decreased significantly in the Year 2 sampling events. The maximum concentration of acetone was 26 J µg/L at MWT-27 in Round 6 (the concentration in the associated duplicate was below the detection limit), and the maximum concentration of methyl ethyl ketone was 12 µg/L at MWT-23 in Round 5. Ketones are produced by fermentation reactions in the biowalls, but are readily degradable under aerobic conditions and were not detected within 100 feet of the site boundary.

3.4 Biowall Recharge Evaluation

The RDR calls for a recharge evaluation at the end of the first year of quarterly monitoring. The evaluation completed at the end of Year 1 concluded that recharge was not required and a recharge evaluation be performed again at the end of Year 2. A recharge evaluation, defined on Figure 7-3 of the RDR and presented below, is the determination of the need to recharge a biowall segment. The evaluation consists of the following:

- Determining the need to recharge a biowall segment requires a review of chemical concentrations and geochemical parameters by an experienced professional. A specific, absolute set of conditions or parameter values are not appropriate to determine the need to recharge. Rather, a lines-of-evidence approach will be used that correlates a decrease in the efficiency of the system to degrade chloroethenes to geochemical evidence that indicates the cause is due to substrate depletion.

- The following parameters will be evaluated on an annual basis using at least two consecutive rounds of sampling data in order to determine if recharge of the biowalls is necessary:
  - COC concentrations in the wall (e.g., MWT-27, MWT-28, and MWT-23). If COC concentrations have rebounded by greater than 50% for any single sampling event, this will indicate that recharge should be considered. Concentrations within the biowalls, not at downgradient locations, will be used to make this evaluation so that the effectiveness of the wall itself is being measured without the interference of effects such as desorption and mixing.
  - Geochemical parameters, specifically ORP, TOC, and DO, in the wall (e.g., at MWT-27, MWT-28, and MWT-23). Benchmark values will be used initially to evaluate anaerobic conditions in the groundwater. These benchmarks are:
    - ORP < -100 mV
    - TOC > 20 mg/L
    - DO < 1.0 mg/L

Parameters described in the bullets above are intended to be used as guidelines and will be considered in the evaluation if, and when, a depletion of bioavailable organic substrate results in a rebound in geochemical redox conditions under which effective biodegradation does not occur.

A recharge evaluation indicates that recharging the biowalls is not necessary at this time. **Section 3.2** presents the geochemical data and the analytical data, showing that the geochemical parameters are positive indicators that reductive dechlorination is occurring.

This table below shows that the geochemical parameters for wells located within the biowalls meet the benchmark values and groundwater conditions remain highly reducing as expected.

	Benchmark Value	**MWT-27 (Qs 1, 2, 3, 4, Rs 5, 6)**	**MWT-28 (Qs 1, 2, 3, 4, Rs 5, 6)**
ORP (mV)	< -100	-158, -145, -141, -166, -133, -126	-150, -113, -131, -151, -91, -95
TOC (mg/L)	> 20	2050, 1350, 755, 167, 89, 54	1775, 171, 309, 92, 49, 28
DO (mg/L)	< 1.0	0.25, 0.08, 0, 0.06, 0.18, 0.13	0.16, 0.09, 0, 0.08, 0.15, 0.10

	Benchmark Value	**MWT-23 (Qs 1, 2, 3, 4, Rs 5, 6)**
ORP (mV)	< -100	-122, -109, -87, -144, -129, -104
TOC (mg/L)	> 20	260, 210, 303, 151, 29, 20
DO (mg/L)	< 1.0	0.26, 0.35, 0, 0.12, 0.15, 0.20

The ability of the biowalls to sustain a high degree of reductive dechlorination is further established by a review of the change in concentrations at MWT-27 (Biowall B1), MWT-28 (Biowall B2), and MWT-23 (Biowall C2), summarized in the following table.

		TCE (μg/L)	cis-DCE (μg/L)	VC (μg/L)
MWT-27	Q1	ND	ND	ND
	Q2	ND	ND	ND
	Q3	ND	ND	ND
	Q4	ND	ND	ND
	R5	ND	ND	ND
	R6	ND	ND	ND
MWT-28	Q1	ND	ND	ND
	Q2	ND	ND	ND
	Q3	ND	ND	ND
	Q4	ND	ND	ND
	R5	ND	ND	ND
	R6	ND	ND	ND
MWT-23	Q1	ND	60	23
	Q2	ND	11	4.8
	Q3	ND	3.1	ND
	Q4	ND	3.6 J	3.65
	R5	ND	ND	ND
	R6	0.4	2.4	2.8

The analytical data shows that concentrations at MWT-27 and MWT-28 have remained below detections limits, and at MWT-23 concentrations were either below the detection limit or decreasing since the first quarterly sampling event. Based on a review of the analytical and geochemical data, the biowalls do not need to be recharged and the biowall system continues to meet the long-term monitoring objectives established in the RDR (Parsons, 2006b).

3.5 Soil Remedy Evaluation

Part of the remedial action was installing a 12-inch vegetative cover over the Ash Landfill and the NFCL. The covers have been inspected and field observations noted that the landfills are vegetated with grass and clover. At the NCFL, visual observations noted a small amount of soil erosion and the presence of deer trails; however, the erosion and the trails cut less than 6 inches into the cover. Therefore, underlying soil has not been exposed to the environment. The Army will continue to monitor the integrity of the covers and ensure that the vegetative covers have not been breached and that the underlying soil is not exposed.

3.6 Land Use Controls (LUCs)

The remedy for the Ash Landfill OU requires the implementation and maintenance of land use controls (LUCs) at the two sites. The LUC requirements are detailed in the "Land Use Control Remedial Design for SEAD 27, 66, 64A, *Final*" (2006). The selected LUCs for the Ash Landfill OU are as follows:

- Prevent access to or use of the groundwater until cleanup levels are met;
- Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells and impermeable reactive barriers;
- Prohibit excavation of the soil or construction of inhabitable structures (temporary or permanent) above the area of the existing groundwater plume; and
- Maintain the vegetative soil layer over the ash fill areas and the NCFL to limit ecological contact.

As part of the LTM program, the Army inspected the site to determine that the LUCs are being maintained. While performing the groundwater sampling, it was confirmed that no prohibited facilities have been constructed and no access to or use of groundwater was evident. As discussed in **Section 3.5** above, the vegetative covers are limiting ecological contact with the underlying soil.

3.7 Operating Properly and Successfully

The implemented design has met the requirements for "operating properly and successfully" (OPS) as outlined in Section 12(h)(s) of the USEPA "Guidance for Evaluation of Federal Agency Demonstrations." Parsons submitted a letter on behalf of the Army to USEPA, dated June 6, 2008, declaring that the Army has determined that the remedy meets the OPS requirements. The Army submitted a letter under separate cover on February 26, 2009 further certifying that the "information, data and analysis provided in Parsons' June 6, 2008 letter was true and accurate." On March 11, 2009, the USEPA transmitted a letter to the Army approving the Army's OPS demonstration. The data for Year 2 of the LTM program are consistent with the Year 1 data and demonstrates that the remedy is still OPS, as described below.

The remedial action is operating "properly".

The USEPA guidance describes that "a remedial action is operating 'properly' if it is operating as designed." The Construction Completion Report (CCR) (Parsons, 2007) details that the construction of the vegetative covers were installed as designed, meeting or exceeding the 12-inch of soil requirement as a cover. **Section 3.5** above describes that the covers are intact and effectively prevent ecological contact with the underlying soil; therefore, the vegetative covers are operating properly.

The CCR also details the construction of the biowalls; deviation from the design resulted in the placement of additional mulch in the biowalls, which were thicker than designed. As this is an enhancement of the design, it is fair to say that the biowalls were constructed as designed. The geochemical data presented and discussed in **Section 3.1** indicates that anaerobic conditions favorable to reductive dechlorination have been established in the areas of the biowalls, which was the expectation of the design of the biowall system.

The remedial action is operating "successfully".

A remedial action may receive USEPA's designation of operating successfully (1) if "a system will achieve the cleanup levels or performance goals delineated in the decision document" and (2) if the remedy is protective of human health and the environment. The data presentation in **Section 3.3** above demonstrates that concentrations of VOCs are decreasing and will eventually meet the Class GA groundwater standards. The time plots presented in **Figure 7** (**A** through **I**) show a decreasing trend for the COCs; **Table 4** summarizes the trends in concentrations and provides a time estimate based on exponential regressions of the time plots. The time estimates are not exact dates that Class GA groundwater standards will be achieved; rather they serve to demonstrate that the concentrations in groundwater will eventually meet the groundwater standards.

Recent inspection of the vegetative covers at the Ash Landfill and the NCFL indicate that the covers are preventing ecological receptors from contacting the underlying soil. The LUCs have been maintained and no one is accessing the groundwater; therefore, there is no threat to human health. Based on a review of the site data, inspection of the condition of the vegetative covers, and confirmation that the LUCs are being maintained, the Army believes that the remedial action is operating successfully.

Based on an assessment of the design and construction of the remedial action, as well as an evaluation of the geochemical and analytical data from the two years of groundwater monitoring, the Army believes that the remedial action at the Ash Landfill meets the requirements to be designated as "operating properly and successfully".

4.0 LONG-TERM MONITORING CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Based on the results of the long-term monitoring at the Ash Landfill since the installation of the full-scale biowalls, the Army has made the following conclusions:

- TCE within the biowalls remains below or close to the limits of detection;
- TCE, cis-DCE, and VC are present in the groundwater at the site at concentrations above respective Class GA groundwater standards;

- Chemical results indicate that the chlorinated ethenes are decreasing as they pass through the biowall systems;

- Geochemical parameters indicate that anaerobic treatment zones have been established within and downgradient of the biowalls, and that conditions suitable for reductive dechlorination to occur have been sustained;

- Concentrations of chlorinated ethenes at the off-site well (MW-56) are below Class GA groundwater standards;

- Additional monitoring is required to determine trends in concentrations of COCs at PT-18A, PT-17, MWT-7, PT-22, and MWT-24;

- Recharge of the biowalls is not necessary at this time; and

- The remedial action continues to meets the requirements of the USEPA's "operating properly and successfully" designation.

4.2 Recommendations

Based on the first two years of long-term monitoring, the Army recommends continuing the semi-annual frequency of monitoring based on the process detailed in the RDR in Figure 7-3, included in this annual report as **Figure 9**. The recommendations for LTM during year three of monitoring are as follows:

- Biowall process monitoring wells (MWT-26, MWT-27, MWT-28, MWT-29, and MWT-23) will be monitored on a semi-annual basis. Each year a recharge evaluation will be completed. As stated in the RDR (Parsons, 2006b), after recharge is conducted, MWT-26, MWT-27, and MWT-29 would be excluded from the LTM program, as detailed in **Figure 9**. MWT-28 and MWT-23 will continue to be monitored as part of the performance monitoring wells to supplement data that will be used to determine whether additional biowall recharge is required. The recharge evaluation conducted each year after the first biowall recharge is completed would review the chemical and geochemical data at MWT-28 and MWT-23, and determine if the contaminant increase is a result of poor biowall performance or due to other issues such as seasonal variations, recent precipitation events, or desorption.

- Performance monitoring wells (PT-17, PT-18A, PT-22, PT-24, MWT-7, MWT-22, MWT-24, and MWT-25) will continue to be monitored on a semi-annual basis in a manner consistent with the Year 2 LTM program. The concentrations of COCs, specifically TCE, detected in the wells located downgradient of the source area (near PT-18A) showed decreasing trends over the two years of LTM events.

- The off-site performance monitoring well (MW-56) will continue to be monitored on a semi-annual basis.

- The vegetative covers at the Ash Landfill and the NCFL will be inspected annually to ensure that they remain intact and protective of ecological receptors.

- The frequency of monitoring will be reviewed in the annual report submitted after the completion of the third year of LTM, based on the process outlined in **Figure 9**. The need to recharge the biowalls will be evaluated after the completion of the seventh sampling event in June 2009.

5.0 REFERENCES

Parsons, 1994. Remedial Investigation Report at the Ash Landfill Site, Final, July 1994.

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TABLES

Table 1
Groundwater Sample Collection
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Monitoring Wells	**Monitoring Well Group**			**Laboratory Analysis**			
	On-Site Plume	**Biowall Process**	**Off-Site Performance**	VOC 8260B	TOC 9060A	MEE RSK-175	Sulfate EPA 300.1
PT-18A	X (all)			X			
MWT-25	X (all)			X			
MWT-26		X (all)		X	X	X	X
MWT-27		X (all)		X	X	X	X
MWT-28	X (all)	X (all)		X	X	X	X
MWT-29	X (all)	X (all)		X	X	X	X
MWT-22	X (all)			X			
PT-22	X (all)			X			
MWT-23	X (all)	X (all)		X	X	X	X
MWT-24	X (all)			X			
PT-17	X (all)			X	X (5,6)	X (5,6)	X (5,6)
MWT-7	X (all)			X	X (5,6)	X (5,6)	X (5,6)
PT-24	X (all)			X			
MW-56			X (1,3,5,6)	X			

Note:
All samples were analyzed for field parameters including pH, ORP, dissolved oxygen, conductivity, temperature, and turbidity.
(all) - This well was sampled in all four quarters of the LTM.
(1,3,5,6) - This well was sampled in Quarters 1 and 3, and Rounds 5 and 6 of the LTM program.
(5,6) - These wells were sampled in Rounds 5 and 6 of the LTM program.

Table 2
Groundwater Geochemical Data
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Upgradient → Downgradient

Well ID	Location Description	Sample ID	Sample Round	pH	Turbidity (NTU)	Specific Conductance (mS/cm)	DO (mg/L)	ORP (mV)	TOC (mg/L)	Sulfate (mg/L)	Ethane (ug/L)	Ethene (ug/L)	Methane (ug/L)	Manganese (ug/L)	Ferrous Iron (ug/L)
PT-18A	upgradient of walls	ALBW20059	1Q2007	6.63	141	1.69	1.33	93							
		ALBW20074	2Q2007	6.44	110	2.87	0.76	-177							
		ALBW20088	3Q2007	6.71	5	1.66	0	-23							
		ALBW20103	4Q2007	6.41	0.0	1.25	0.04	-5							
		ALBW20117	5R2008	6.36	1.9	1.75	0.22	-10						8.2	> 3.3
		ALBW20132	6R2008	6.58	0.56	2.04	1.76	83							
MWT-25	upgradient of Biowall A	ALBW20064	1Q2007	8	9.6	0.29	2.83	63							
		ALBW20079	2Q2007	7.27	14	2.2	2.8	52							
		ALBW20093	3Q2007	7.36	6.2	2.43	4.14	100							
		ALBW20108	4Q2007	6.9	0	1.2	0.21	65							
		ALBW20123	5R2008	6.91	0.52	1.47	0.15	-41						1.4	0.75
		ALBW20138	6R2008	6.69	1.32	1.36	2.91	90							
MWT-26	**upgradient of Biowalls B1/B2**	ALBW20066	1Q2007	6.89	10	2.01	1.84	-3	3.9 J	958	ND	ND	ND		
		ALBW20081	2Q2007	7.26	9	1.9	0.48	-135	15.2	738	0.4	7.8	210	2.1	> 3.3
		ALBW20095	3Q2007	6.89	2.2	1.94	0.21	-170	10.3	473	1	13	390	3.1	> 3.3
		ALBW20111	4Q2007	7.08	50	1.9	0.89	-40	6.1	1060	0.16	0.4	44	0.0	1.09
		ALBW20126	5R2008	7.05	0.67	1.88	0.31	-71	5.6	600	0.82	2.9	210	1.3	0.81
		ALBW20141	6R2008	7.01	28.7	1.58	3.54	60	4.4	541	0.046	0.028	10	0.6	0.22
MWT-27	**in Biowall B1**	ALBW20067	1Q2007	6.34	120	5.31	0.25	-158	2050 J	ND	ND	ND			
		ALBW20082	2Q2007	6.65	87	4.37	0.08	-145	1350	ND	0.15	2.7	15,000	> 22	> 3.3
		ALBW20096	3Q2007	6.59	154	3.35	0	-141	754.5	1.9 J	0.0805	0.33	13,500	> 22	> 3.3
		ALBW20112	4Q2007	6.43	58	5.76	0.06	-166	167	31.7	ND	0.014 J	13,000	> 22	2.19
		ALBW20127	5R2008	6.49	40	3.07	0.18	-133	88.9	ND	2.3	0.049	13,000	> 22	3.23
		ALBW20142	6R2008	5.95	24.5	2.59	0.13	-126	53.5	24	1.6	0.13	15,000	> 22	3.05
MWT-28	**in Biowall B2**	ALBW20068	1Q2007	7.5	163	0.61	0.16	-150	1775 J	1.7	ND	ND	12,500 J		
		ALBW20083	2Q2007	6.6	21	2.3	0.09	-113	171	ND	0.67	0.48	19,000	7.5	> 3.3
		ALBW20098	3Q2007	6.56	100	2.74	0	-131	309	ND	0.01 J	0.057	11,000	> 22	> 3.3
		ALBW20113	4Q2007	6.48	10	1.72	0.08	-151	92	ND	0.014 J	ND	11,000	> 22	2.15
		ALBW20128	5R2008	6.31	14	2.16	0.15	-91	49.2	ND	0.65	0.044	12,000	> 22	> 3.3
		ALBW20144	6R2008	5.76	17	1.58	0.10	-95	27.9	48.3	2	0.12	19,000	5.3	1.98
MWT-29	**downgradient of Biowall B2**	ALBW20070	1Q2007	6.49	7.2	2.1	0.33	-76	25.1 J	113	ND	ND	ND		
		ALBW20084/5	2Q2007	6.8	1.7	2.21	0.39	-53	36.7	173	25	150	8,100	7.5	> 3.3
		ALBW20099	3Q2007	6.64	1.8	1.68	0.11	-79	15.7	151	13	160	2,800	8.1	2.84
		ALBW20114	4Q2007	7.04	12.2	1.88	0.21	-101	20.9	289	19	200	2,600	8.6	> 3.3
		ALBW20129/30	5R2008	6.44	2.7	1.85	0.17	-115	14.1	173.5	14.5	140	3,100	0.0	> 3.3
		ALBW20145	6R2008	6.57	3.69	1.58	1.32	67	13.6	312	14	19	2,700	3.3	0.20
MWT-22	downgradient of Biowall B2	ALBW20071	1Q2007	7.7	4.5	0.13	0.09	-80							
		ALBW20075	2Q2007	6.72	41	2.16	0.3	-65							
		ALBW20100	3Q2007	6.45	2.7	2.03	0.05	-107							
		ALBW20115	4Q2007	6.53	7.5	1.81	0.18	-132							
		ALBW20121	5R2008	6.38	14	2.21	0.3	-34						18.2	> 3.3
		ALBW20136	6R2008	6.44	8.17	1.86	0.57	-19							
PT-22	between Biowalls B and C	ALBW20060	1Q2007	7.70	4.5	0.13	0.09	-80							
		ALBW20086	2Q2007	6.78	7	1.18	0.78	-54							
		ALBW20089	3Q2007	6.67	0	1.44	0.09	-97							
		ALBW20104	4Q2007	6.73	5.1	1.26	0.17	-166							
		ALBW20118	5R2008	6.69	7.4	1.38	0.29	-119						0.3	1.38
		ALBW20133	6R2008	6.79	1.96	1.20	0.69	-37							
MWT-23	**in Biowall C2**	ALBW20065	1Q2007	7.2	5	0.2	0.26	-122	260 J	ND	ND	ND	12,000		
		ALBW20080	2Q2007	6.51	30	1.8	0.35	-109	210	ND	45	5.9	23,000	5.4	2.73
		ALBW20094	3Q2007	6.3	69.3	1.82	0	-87	303	ND	4.1	0.28	18,000	> 22	2.99
		ALBW20109	4Q2007	6.32	21	2.21	0.12	-144	151	2.8	0.58	0.35	16,000	> 22	2.32
		ALBW20125	5R2008	6.27	29	1.54	0.15	-129	28.4	ND	0.53	0.048	18,000	> 22	> 3.3
		ALBW20140	6R2008	6.44	32	1.86	0.20	-104	20.1	6.3	4.6	1.2	19,000	> 22	2.75
MWT-24	downgradient of Biowalls C1/C2	ALBW20063	1Q2007	7.02	10	0.762	0.27	-160							
		ALBW20078	2Q2007	6.91	59	1.08	0.32	-146							
		ALBW20092	3Q2007	6.8	5.4	1.48	0.03	-115							
		ALBW20107	4Q2007	6.81	134	1.32	0.41	-114							
		ALBW20122	5R2008	6.65	45	1.21	0.35	-43						9.1	1.54
		ALBW20137	6R2008	6.40	10	1.31	0.09	40							
PT-17[1]	downgradient of biowalls	ALBW20058	1Q2007	8	3.8	92	0.23	-111							
		ALBW20073	2Q2007	7.1	14	0.729	0.76	-151							
		ALBW20087	3Q2007	6.99	0.4	0.732	0.9	-157							
		ALBW20102	4Q2007	7.12	8.7	2	NS	-24							
		ALBW20116	5R2008		70		0.24		6	15.2	98	66	5700		
		ALBW20131	6R2008	6.68	0.85	0.796	0.30	26	2.6	45.8	6.9	6.6	380	2.8	0.43
MWT-7	immed. Upgradient of ZVI wall	ALBW20062	1Q2007	6.8	19.6	0.581	0.01	62							
		ALBW20077	2Q2007	6.95	8	0.763	0.76	52							
		ALBW20091	3Q2007	6.91	4	0.586	0.19	22							
		ABLW20106	4Q2007	6.88	0	0.9	0.16	14							
		ALBW20120	5R2008	6.85	15	0.974	0.43	37	2.3	29.1	6.7	2	400	0.2	0.09
		ALBW20135	6R2008	6.85	7.37	0.859	0.28	66	29.1	3	11	0.27	670	0.8	0.16
PT-24	downgradient of ZVI wall	ALBW20061	1Q2007	8.1	10	70	0.37	-59							
		ALBW20076	2Q2007	7.58	0	0.464	2.2	-59							
		ALBW20090	3Q2007	7.22	1.3	0.557	0.13	-80							
		ALBW20105	4Q2007	7.35	9.7	2.38	0.19	-46							
		ALBW20119	5R2008	6.99	4.3	0.9	0.16	-104						0.5	0.55
		ALBW20134	6R2008	6.84	5.8	0.656	0.11	-10							
MW-56	off-site well	ALBW20072	1Q2007	6.85	3.3	0.462	0.37	-102							
		ALBW20101	3Q2007	6.9	0	0.603	NS	-65							
		ALBW20124	5R2008	6.73	2	0.763	0.18	-132						0.4	1.18
		ALBW20139	6R2008	6.85	6	0.545	0.81	-125							

Notes:
ND = Non-detect.
NS = Not sampled; water level was below the indicator probe.
> = The concentration exceeded the range of the Hach DR/850 Colorimeter field kit.
1Q2007 - First round of LTM (January 2007)
2Q2007 - Second round of LTM (March 2007)
3Q2007 - Third round of LTM (June 2007)
4Q2007 - Fourth round of LTM (November 2007)
5R2008 - Fifth Round of LTM (June 2008)
6R2008 - Sixth Round of LTM (December 2008)
Empty cells indicate that the specified analysis was not completed for that well. The bolded wells are the five wells included in the biowall process monitoring group.
Analysis of TOC, sulfate, methane, ethane, and ethene were completed for the biowall process wells only.

Table 3
Chlorinated Organics in Groundwater
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Upgradient

Sample Identification		Sample Date	PCE ug/L	TCE ug/L	1,1-DCE ug/L	cis-DCE ug/L	trans-DCE ug/L	VC ug/L	1,1-DCA ug/L
PT-18A	upgradient of walls	3-Jan-07	1 U	2000	0.64 J	220	1.6	2.4	1 U
		17-Mar-07	1 U	1000	0.73 J	170	1.4	2.9	1 U
		5-Jun-07	1 U	1100	1.4	430	3.3	3.3	1 U
		15-Nov-07	1 U	2700	2.1	720	3.4	8.2	1 U
		24-Jun-08	1 U	220	1 U	200	0.9 J	1.4	1 U
		12-Dec-08	0.36 U	1400	1.3	510	2.4	4.6	0.75 U
MWT-25	upgradient of Biowall A	3-Jan-07	1 U	50	1 U	41	0.56 J	1.6	1 U
		17-Mar-07	1 U	55	1 U	84	1.2	9.6	1 U
		6-Jun-07	1 U	28	1 U	36	0.5 J	2.1	1 U
		15-Nov-07	1 U	26	1 U	17	1 U	0.64 J	1 U
		24-Jun-08	1 U	19	1 U	17	1 U	1 U	1 U
		15-Dec-08	0.36 U	3.2	0.29 U	0.63 J	0.13 U	0.24 U	0.75 U
MWT-26	**upgradient of Biowalls B1/B2**	3-Jan-07	1 U	10	1 U	19	0.6 J	2	1 U
		17-Mar-07	1 U	11	1 U	17	1	6.1	1 U
		5-Jun-07	1 U	3.2	1 U	11	0.7 J	4.4	1 U
		15-Nov-07	1 U	2.8	1 U	2.8	1 U	1 U	1 U
		24-Jun-08	1 U	1.7	1 U	3.3	1 U	1 U	1 U
		15-Dec-08	0.36 U	1.9	0.29 U	1	0.13 U	0.24 U	0.75 U
MWT-27	**in Biowall B1**	3-Jan-07	20 U	20 UJ	20 UJ	49 J	20 UJ	20 UJ	20 UJ
		16-Mar-07	20 U	20 U	20 U	20 U	20 U	20 U	20 U
		5-Jun-07	20 U	20 U	20 U	20 U	20 U	20 U	20 U
		15-Nov-07	10 U	10 U	10 U	10 U	10 U	10 U	10 U
		24-Jun-08	4 U	4 U	4 U	4 U	4 U	4 U	4 U
		15-Dec-08	3.6 U	1.8 U	2.9 U	1.6 U	1.3 U	2.4 U	7.5 U
MWT-28	**in Biowall B2**	3-Jan-07	20 U	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
		16-Mar-07	20 U	20 U	20 U	20 U	20 U	20 U	20 U
		5-Jun-07	20 U	20 U	20 U	20 U	20 U	20 U	20 U
		15-Nov-07	5 U	5 U	5 U	5 U	5 U	5 U	5 U
		25-Jun-08	4 U	4 U	4 U	4 U	4 U	4 U	4 U
		15-Dec-08	3.6 U	1.8 U	2.9 U	1.6 U	1.3 U	2.4 U	7.5 U
MWT-29	**downgradient of Biowall B2**	3-Jan-07	2 U	22	2 U	280	6.5	140	2 U
		16-Mar-07	4 U	19	4.5 U	220	7.8	165	4.5 U
		5-Jun-07	2 U	7.6	2 U	100	2.1	81	2 U
		14-Nov-07	1 U	4.4	1 U	96	0.83 J	74	1 U
		25-Jun-08	1 U	3.25	1 U	84	0.65 J	73.5	1 U
		15-Dec-08	0.36 U	6.6	0.29 U	91	0.6 J	80	0.75 U
MWT-22	downgradient of Biowall B2	3-Jan-07	2 U	5.2	2 U	130	2.7	98	2 U
		17-Mar-07	4 U	3.8 J	4 U	90	4 U	64	4 U
		6-Jun-07	1 U	6.5	1 U	120	3.2	81	1 U
		14-Nov-07	1 U	2.6	1 U	99	0.85 J	180	1 U
		25-Jun-08	5 U	3 J	5 U	68	5 U	42	5 U
		15-Dec-08	1.8 U	5.9	1.4 U	160	0.65 U	140	3.8 U
PT-22	between Biowalls B and C	3-Jan-07	1 U	11	1 U	57	0.86 J	22	1 U
		15-Mar-07	1 U	16	1 U	41	0.51 J	13	1 U
		5-Jun-07	1 U	8.5	1 U	61	0.72 J	32	1 U
		14-Nov-07	1 U	9.7	1 U	30	0.67 J	11	1 U
		26-Jun-08	1 U	4.1	1 U	26	0.57 J	13	1 U
		15-Dec-08	0.36 U	35	0.29 U	52	0.41 J	1.3	0.75 U
MWT-23	**in Biowall C2**	3-Jan-07	4 U	4 U	4 U	60	4 U	23	4 U
		16-Mar-07	4 U	4 U	4 U	11	4 U	4.8	4 U
		6-Jun-07	2 U	2 U	2 U	3.1	2 U	2 U	2 U
		16-Nov-07	7 U	7 U	2.55 U	3.8 J	7 U	3.7 J	7 U
		25-Jun-08	1 U	1 U	1 U	1 U	1 U	1 U	1 U
		12-Dec-08	0.36 U	0.41 J	0.29 U	2.4	0.13 U	2.8	0.75 U
MWT-24	downgradient of Biowalls C1/C2	3-Jan-07	1 U	0.94 J	1 U	210	2.1	19	0.81 J
		15-Mar-07	1 U	1 U	1 U	68	0.88 J	45	0.83 J
		5-Jun-07	2 U	2 U	2 U	19	2 U	22	1.1 J
		13-Nov-07	1 U	1.6	1 U	6.7	1 U	3.8	1 U
		26-Jun-08	5 U	5 U	5 U	31	5 U	5 U	5 U
		12-Dec-08	0.36 U	6	0.29 U	52	0.13 U	3.6	0.75 U
PT-17	downgradient of biowalls	2-Jan-07	1 U	6	1 U	62	1 U	21	1 U
		15-Mar-07	2 U	11	2 U	26	2 U	21	2 U
		5-Jun-07	1 U	3.4	1 U	43	0.77 J	9.9	1 U
		13-Nov-07	1 U	15	1 U	27	0.54 J	22	1 U
		26-Jun-08	1 U	8.5	1 U	21	1 U	23	1 U
		11-Dec-08	0.36 U	9.2	0.29 U	24	0.46 J	10	0.75 U
MWT-7	immed. Upgradient of ZVI wall	4-Jan-07	1 U	490	1 U	35	1 U	0.51 J	1 U
		15-Mar-07	1 U	440	1 U	42	1 U	9.7	1 U
		5-Jun-07	1 U	410	1 U	61	1 U	18	1 U
		13-Nov-07	1 U	510	1 U	90	1 U	24	1 U
		25-Jun-08	1 U	440	1 U	90	1 U	12	1 U
		15-Dec-08	0.36 U	410	0.29 U	79	0.13 U	13	0.75 U
PT-24	downgradient of ZVI wall	2-Jan-07	1 U	4	1 U	54	0.86 J	0.6 J	0.68 J
		15-Mar-07	1 U	2.8	1 U	38	0.81 J	1 U	1 U
		5-Jun-07	1 U	3.1	1 U	60	1.6	2.6	0.75 J
		13-Nov-07	1 U	3.8	1 U	39	1 U	1 U	0.56 J
		26-Jun-08	1 U	2.4	1 U	48	1.1	1.9	0.69 J
		12-Dec-08	0.36 U	2.2	0.29 U	34	0.36 J	0.26 J	0.75 U
MW-56	off-site well	4-Jan-07	1 U	1 U	1 U	1.2	1 U	1 U	1 U
		6-Jun-07	1 U	1 U	1 U	1.7	1 U	1 U	1 U
		26-Jun-08	1 U	1 U	1 U	1.3	1 U	1 U	1 U
		11-Dec-08	0.36 U	0.33 J	0.29 U	0.4 J	0.13 U	0.24 U	0.75 U

Downgradient

Note:
1) Sample duplicate pairs were collected at MWT-28 in Jan-07, at MWT-29 in Mar-07 and Jun-08, at MWT-27 in Jun-07 and Dec-08, and at MWT-23 in Nov-07.
If an analyte was detected in the sample but not detected in the duplicate (or vice versa), the non-de

Wells in blue represent five performance monitoring wells
U = compound was not detected
J = the reported value is an estimated concentration
Shading indicates concentration detected above its Class GA groundwater standard.

Table 4
Groundwater Trends
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Sampled Wells	Location			TCE	cis-1,2-DCE	VC
PT-18A[1]	upgradient of walls	Sample Date:	12-Dec-08	1400	510	4.6
		Trend:		Decreasing	Increasing	Increasing
		Est. Date[2]:				
MWT-25	upgradient of Biowall A	Sample Date:	15-Dec-08	3.2	0.63 J	0.24 U
		Trend:		Compliant	Compliant	Compliant
		Est. Date[2]:		11/23/2007	11/19/2008	8/11/2006
MWT-26	upgradient of Biowalls B1/B2	Sample Date:	15-Dec-08	1.9	1	0.24 U
		Trend:		Compliant	Compliant	Compliant
		Est. Date[2]:		11/15/2006	8/18/2007	4/17/2008
MWT-27[3]	in Biowall B1	Sample Date:	15-Dec-08	1.8 U	1.6 U	2.4 U
		Trend:		Compliant	Compliant	Non-detect
		Est. Date[2]:		10/28/2008	6/28/2007	3/22/2009
MWT-28	in Biowall B2	Sample Date:	15-Dec-08	1.8 U	1.6 U	2.4 U
		Trend:		Compliant	Compliant	Non-detect
		Est. Date[2]:		1/23/2006	1/23/2006	10/19/2006
MWT-29	downgradient of Biowall B2	Sample Date:	15-Dec-08	6.6	91	80
		Trend:		Decreasing	Decreasing	Decreasing
		Est. Date[2]:		11/15/2006	7/15/2012	11/20/2022
MWT-22	downgradient of Biowall B2	Sample Date:	15-Dec-08	5.9	160	140
		Trend:		Decreasing	Decreasing	Increasing
		Est. Date[2]:		3/5/2007	4/25/2015	5/21/2003
PT-22	between Biowalls B and C	Sample Date:	15-Dec-08	35	52	1.3
		Trend:		Increasing	Decreasing	Compliant
		Est. Date[2]:		9/4/2009	4/18/2029	9/26/2007
MWT-23	in Biowall C2	Sample Date:	12-Dec-08	0.41 J	2.4	2.8
		Trend:		Compliant	Compliant	Decreasing
		Est. Date[2]:		3/6/2007	1/7/2007	3/11/2005
MWT-24	downgradient of Biowalls C1/C2	Sample Date:	12-Dec-08	6	52	3.6
		Trend:		Increasing	Decreasing	Decreasing
		Est. Date[2]:		10/20/2010	8/8/2009	7/12/2008
PT-17[1]	downgradient of biowalls	Sample Date:	11-Dec-08	9.2	24	10
		Trend:		Decreasing	Increasing	No Trend
		Est. Date[2]:				
MWT-7[1]	immed. Upgradient of ZVI wall	Sample Date:	15-Dec-08	410	79	13
		Trend:		Decreasing	Increasing	Decreasing
		Est. Date[2]:				
PT-24	downgradient of ZVI wall	Sample Date:	12-Dec-08	2.2	34	0.26 J
		Trend:		Compliant	Decreasing	Compliant
		Est. Date[2]:		10/21/2007	3/29/2013	7/9/2005
MW-56	off-site well	Sample Date:	11-Dec-08	0.33 J	0.4 J	0.24 U
		Trend:		Compliant	Compliant	Compliant
		Est. Date[2]:				

Notes:

1. The concentration of TCE at these wells has not been impacted by the biowall system and dates to achieve compliance cannot be estimated at this time due to the natural variation in concentrations over time.
2. The date that the groundwater standard will be achieved is estimated based on an exponential regression of the time plots for each well. The dates are rough estimates that indicate that the groundwater concentrations will eventually reach the GA standard and are not intended to represent a definitive timeframe for achieving the GA standards.
3. The concentrations presented were an average of the sample and its associated duplicate.

U = compound was not detected

J = the reported value is an estimated concentration

FIGURES

LEGEND:

PAVED ROAD
DIRT ROAD
GROUND CONTOUR AND ELEVATION
TREE
WETLAND & DESIGNATION
BRUSH
CHAIN LINK FENCE
UTILITY POLE
APPROXIMATE LOCATION OF FIRE HYDRANT
FUEL OR UNDERGROUND STORAGE TANK
SURVEY MONUMENT (SEAD-1 EL.630.90')
MONITORING WELL AND DESIGNATION (PT-22)
RAILROAD TRACKS
WATER MAIN
POST CONSTRUCTION AS BUILT GROUND ELEVATION CONTOUR (670)
PILOT STUDY BIOWALL (2005)
SINGLE BIOWALL (2006)
DOUBLE-WIDE BIOWALL (2006)
ZERO VALENT IRON WALL (1998)

100 0 100 200
(feet)

PARSONS

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT
ASH LANDFILL
ANNUAL REPORT

DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	744538-01400

FIGURE 1
ASH LANDFILL
SITE PLAN

SCALE	DATE	REV
1" = 200'	MAY 2009	–

FILE: P:\PIT\PROJECTS\HUNTSVILLE NEW CONTRACT W912DY-08-D-0003\TO#01 - LTM ASH LANDFILL\ANNUAL REPORT\FIGURES\AR FIGURE 1.DWG, DATE: 05/07/2009 03:08:06PM

LEGEND:

- PAVED ROAD
- DIRT ROAD
- GROUND CONTOUR AND ELEVATION
- TREE
- WETLAND & DESIGNATION
- BRUSH
- CHAIN LINK FENCE
- UTILITY POLE
- APPROXIMATE LOCATION OF FIRE HYDRANT
- FUEL OR UNDERGROUND STORAGE TANK
- SURVEY MONUMENT (SEAD-1 EL.630.90')
- MONITORING WELL AND DESIGNATION (PT-22)
- RAILROAD TRACKS
- WATER MAIN
- APPROXIMATE EXTENT OF IRM SOIL TREATMENT
- APPROXIMATE AREA REQUIRING LAND USE CONTROLS

NOTE:
FIGURE SHOWS PRE-CONSTRUCTION CONDITIONS

100 0 100 200
(feet)

PARSONS

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT
ASH LANDFILL
ANNUAL REPORT

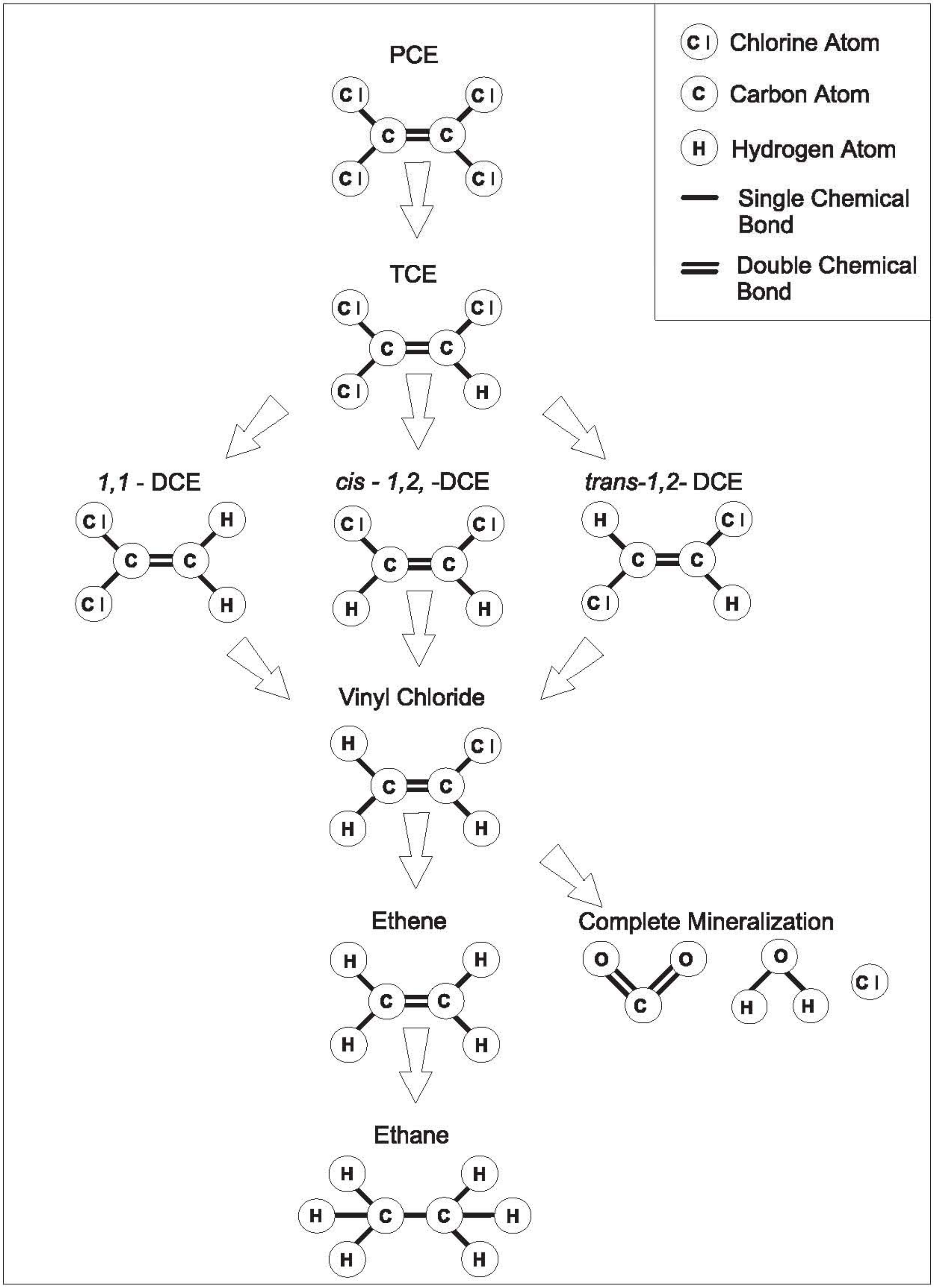
DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	744538-01400

FIGURE 2
ASH LANDFILL
HISTORIC SITE MAP

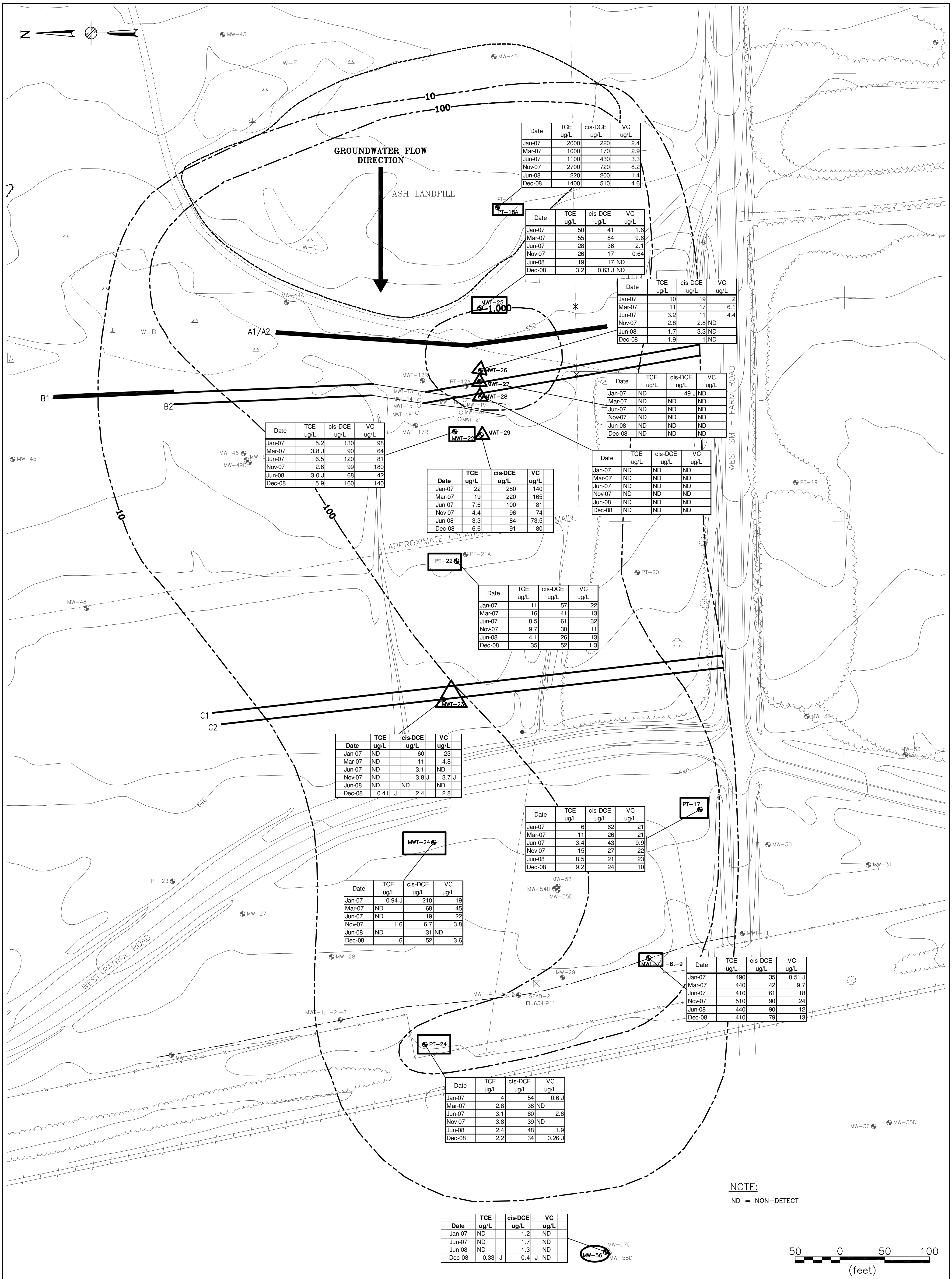
SCALE	DATE	REV
1" = 200'	MAY 2009	

FILE: P:\PIT\PROJECTS\HUNTSVILLE NEW CONTRACT W912DY-08-D-0003\TO#01 - LTM ASH LANDFILL\ANNUAL REPORT\FIGURES\AR FIGURE 2.DWG, DATE: 05/07/2009 03:09:56PM

Figure 3
Reductive Dechlorination of Chlorinated Ethenes
Ash Landfill Annual Report
Seneca Army Depot Activity



(USEPA, 1998)



Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	2000	220	2.4
Mar-07	1000	170	2.9
Jun-07	1100	430	3.3
Nov-07	2700	720	8.2
Jun-08	220	200	1.4
Dec-08	1400	510	4.6

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	50	41	1.6
Mar-07	55	84	9.6
Jun-07	28	36	2.1
Nov-07	26	17	0.64
Jun-08	19	17	ND
Dec-08	3.2	0.63 J	ND

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	10	19	2
Mar-07	11	17	6.1
Jun-07	3.2	11	4.4
Nov-07	2.8	2.8	ND
Jun-08	1.7	3.3	ND
Dec-08	1.9	1	ND

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	ND	49 J	ND
Mar-07	ND	ND	ND
Jun-07	ND	ND	ND
Nov-07	ND	ND	ND
Jun-08	ND	ND	ND
Dec-08	ND	ND	ND

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	ND	ND	ND
Mar-07	ND	ND	ND
Jun-07	ND	ND	ND
Nov-07	ND	ND	ND
Jun-08	ND	ND	ND
Dec-08	ND	ND	ND

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	5.2	130	98
Mar-07	3.8 J	90	64
Jun-07	6.5	120	81
Nov-07	2.6	99	180
Jun-08	3.0 J	68	42
Dec-08	5.9	160	140

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	22	280	140
Mar-07	19	220	165
Jun-07	7.6	100	81
Nov-07	4.4	96	74
Jun-08	3.3	84	73.5
Dec-08	6.6	91	80

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	11	57	22
Mar-07	16	41	13
Jun-07	8.5	61	32
Nov-07	9.7	30	11
Jun-08	4.1	26	13
Dec-08	35	52	1.3

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	ND	60	23
Mar-07	ND	11	4.8
Jun-07	ND	3.1	ND
Nov-07	ND	3.8 J	3.7 J
Jun-08	ND	ND	ND
Dec-08	0.41 J	2.4	2.8

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	6	62	21
Mar-07	11	26	21
Jun-07	3.4	43	9.9
Nov-07	15	27	22
Jun-08	8.5	21	23
Dec-08	9.2	24	10

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	0.94 J	210	19
Mar-07	ND	68	45
Jun-07	ND	19	22
Nov-07	1.6	6.7	3.8
Jun-08	ND	31	ND
Dec-08	6	52	3.6

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	490	35	0.51 J
Mar-07	440	42	9.7
Jun-07	410	61	18
Nov-07	510	90	24
Jun-08	440	90	12
Dec-08	410	79	13

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	4	54	0.6 J
Mar-07	2.8	38	ND
Jun-07	3.1	60	2.6
Nov-07	3.8	39	ND
Jun-08	2.4	48	1.9
Dec-08	2.2	34	0.26 J

Date	TCE ug/L	cis-DCE ug/L	VC ug/L
Jan-07	ND	1.2	ND
Jun-07	ND	1.7	ND
Jun-08	ND	1.3	ND
Dec-08	0.33 J	0.4 J	ND

LEGEND:

- PAVED ROAD
- DIRT ROAD
- GROUND CONTOUR AND ELEVATION (650)
- TREE
- WETLAND & DESIGNATION (W-B)
- MONITORING WELL AND DESIGNATION (PT-22)
- RAILROAD TRACKS
- BRUSH
- CHAIN LINK FENCE
- UTILITY POLE
- APPROXIMATE LOCATION OF FIRE HYDRANT
- FUEL OR UNDERGROUND STORAGE TANK
- SURVEY MONUMENT (SEAD-1 EL.630.90')
- ABANDONED MONITORING WELL (MWT-16)
- APPROXIMATE LOCATION OF WATER MAIN
- PILOT STUDY BIOWALL (2005)
- SINGLE BIOWALL (2006)
- DOUBLE-WIDE BIOWALL (2006)
- ZERO VALENT IRON WALL (1998)
- GROUNDWATER ISOCONTOUR (UG/L) BASED ON JANUARY 2000 DATA (10)
- OFF-SITE PERFORMANCE MONITORING WELL IN L.T.M. PROGRAM (MW-56)
- ON-SITE PLUME PERFORMANCE MONITORING WELL IN L.T.M. PROGRAM (PT-22)
- BIOWALL PROCESS MONITORING WELL IN L.T.M. PROGRAM (MWT-26)

SENECA ARMY DEPOT ACTIVITY

PARSONS

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT
ASH LANDFILL
ANNUAL REPORT

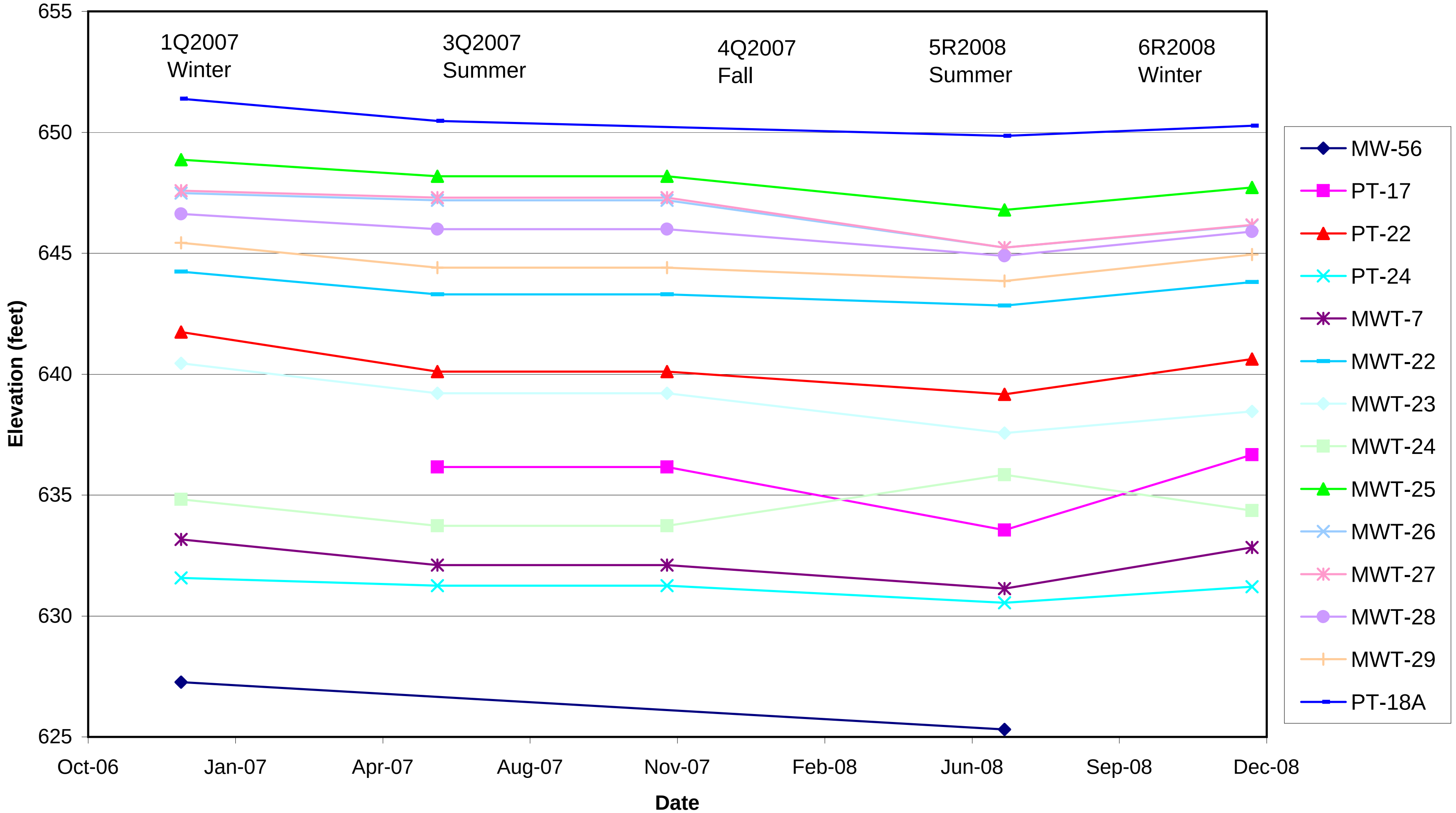
DEPT. ENVIRONMENTAL ENGINEERING | Dwg. No.

FIGURE 4
CHLORINATED ETHENES CONCENTRATIONS IN GROUNDWATER

SCALE 1" = 100' | DATE MAY 2009 | REV –

FILE: P:\PIT\PROJECTS\HUNTSVILLE NEW CONTRACT W912DY-08-D-0003\TO#01 – LTM ASH LANDFILL\ANNUAL REPORT\FIGURES\FIGURE 4.DWG, DATE: 05/14/2009 01:10:15PM

Figure 5
Groundwater Elevations
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



Note: Groundwater levels were measured on the following dates: December 12-15, 2006, June 4, 2007, November 7, 2007, June 23, 2008, and December 23, 2008. Groundwater elevations were not measured at well MW-56 during 3Q2007, 4Q2007, and 6R2008, at PT-17 during 1Q2007, and at PT-18A during 4Q2007.

Figure 6A
Concentrations of VOCs Along the Biowalls - Quarter 1, 2007
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

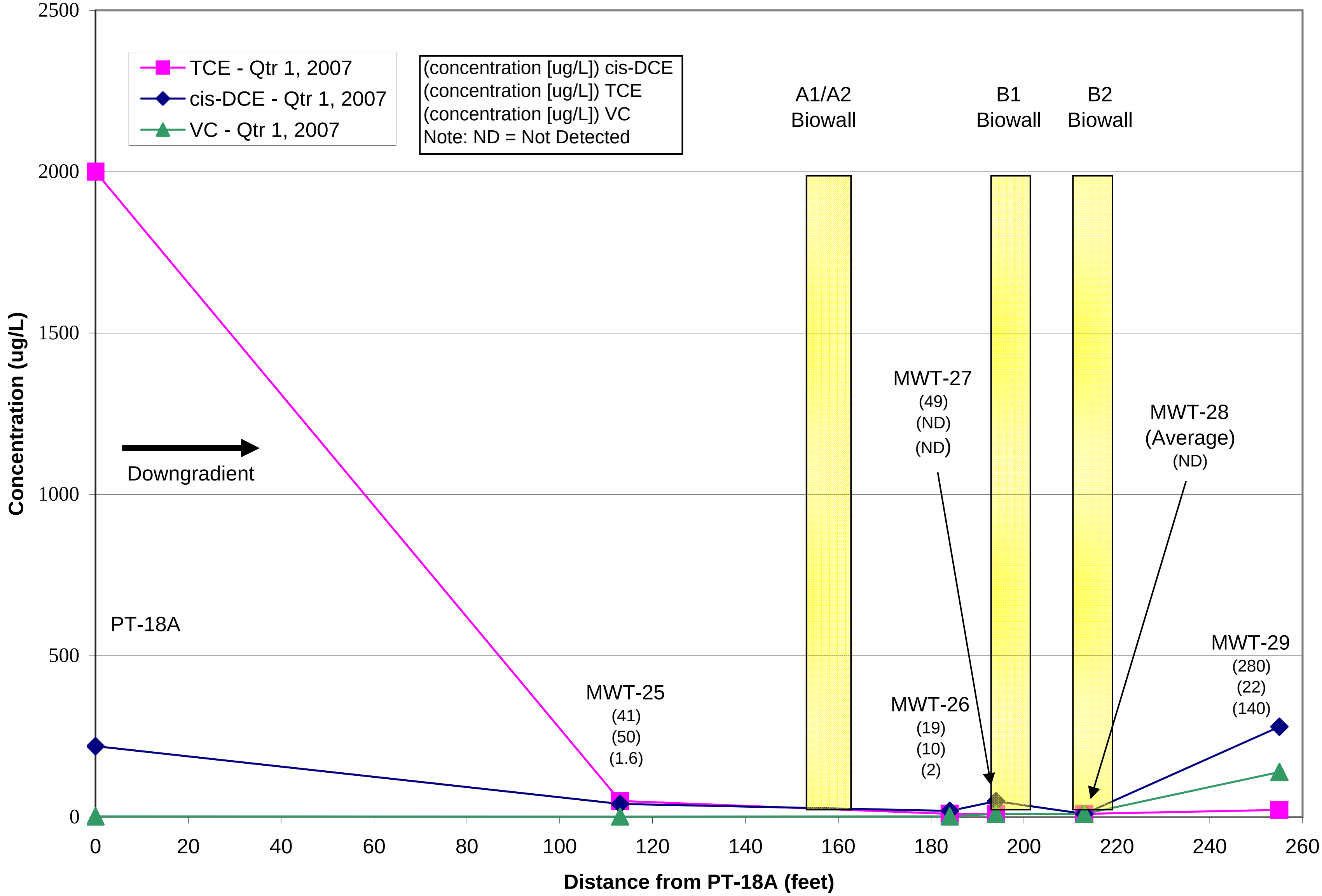


Figure 6B
Concentrations of VOCs Along the Biowalls - Quarter 2, 2007
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

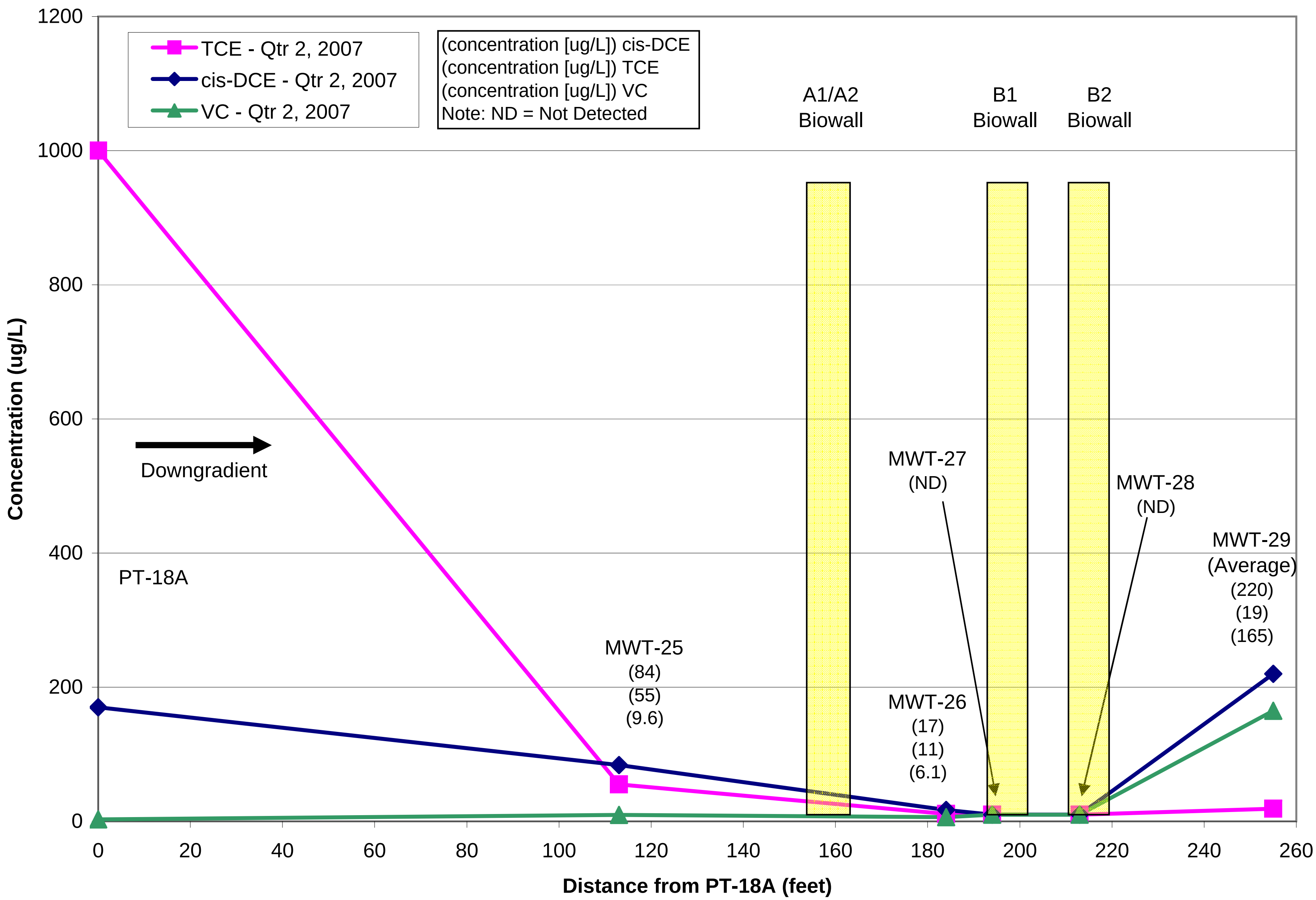


Figure 6C
Concentrations of VOCs Along the Biowalls - Quarter 3, 2007
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

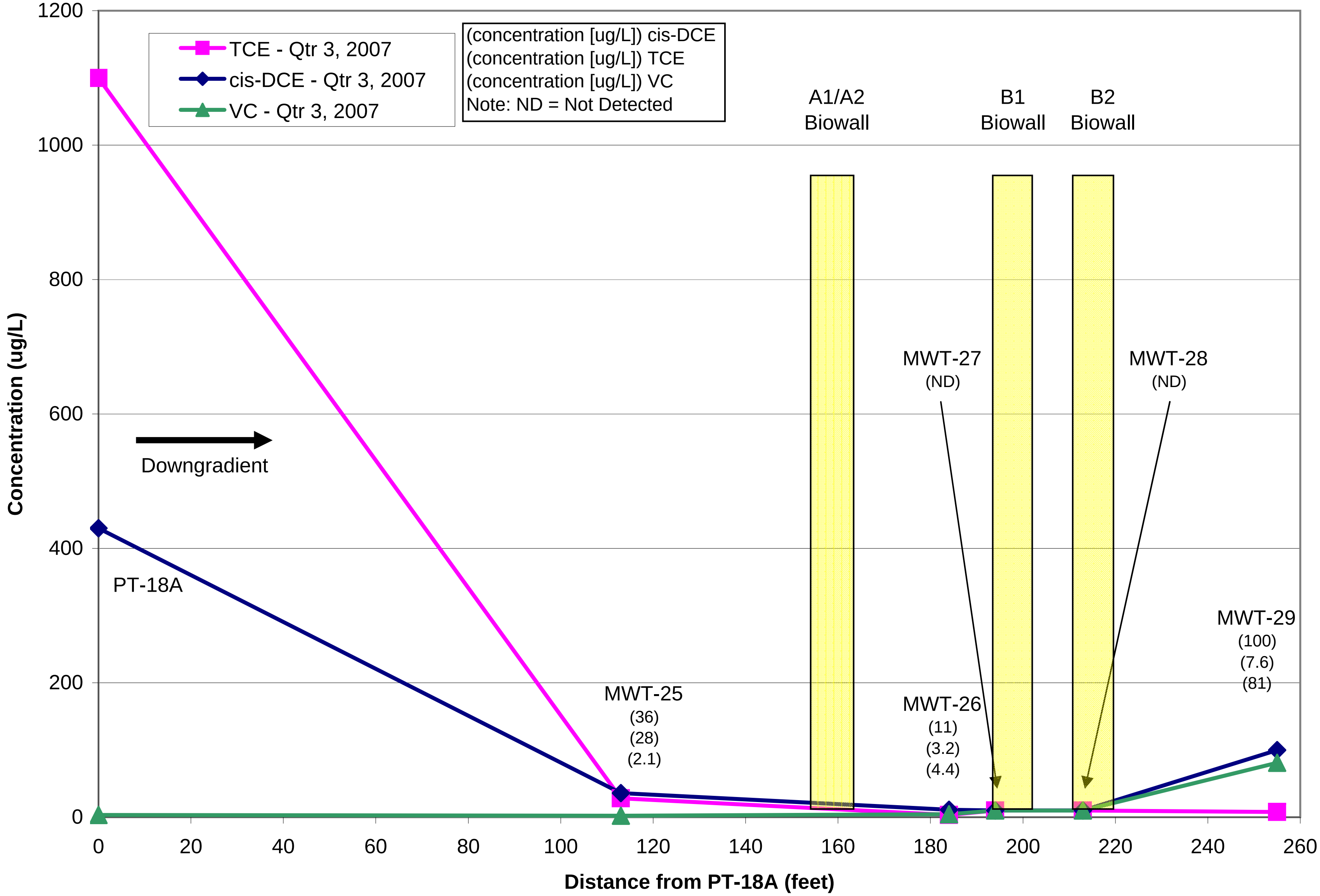
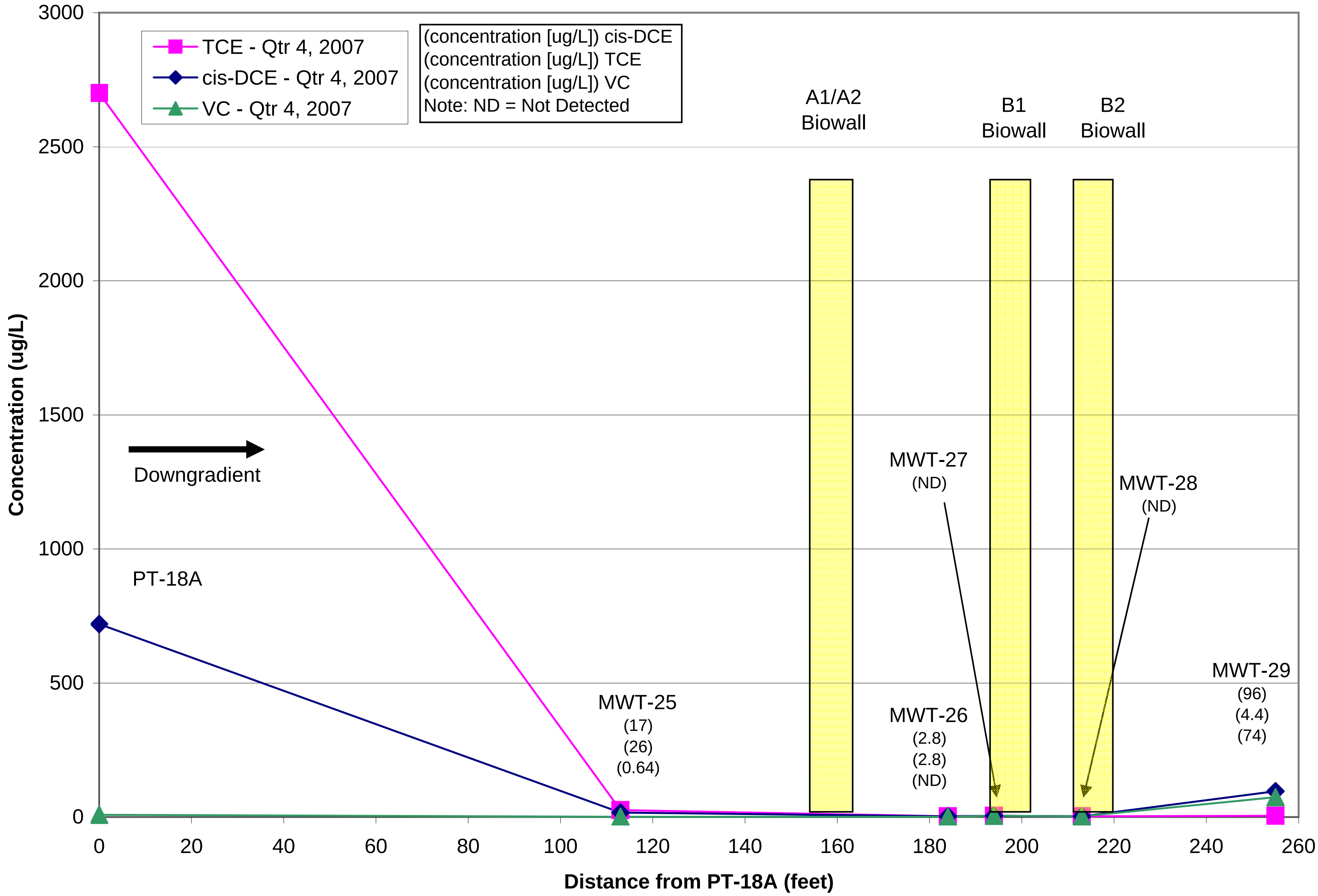


Figure 6D
Concentrations of VOCs Along the Biowalls - Quarter 4, 2007
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



P:\PIT\Projects\Huntsville New Contract W912DY-08-D-0003\TO#01 - LTM Ash Landfill\Annual Report\Figures\AR Figure 6 - Biowall Concen.xls-Dwngrd Wells LTM Rnd 4 5/7/2009

Figure 6E
Concentrations of VOCs Along the Biowalls - Round 5, 2008
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

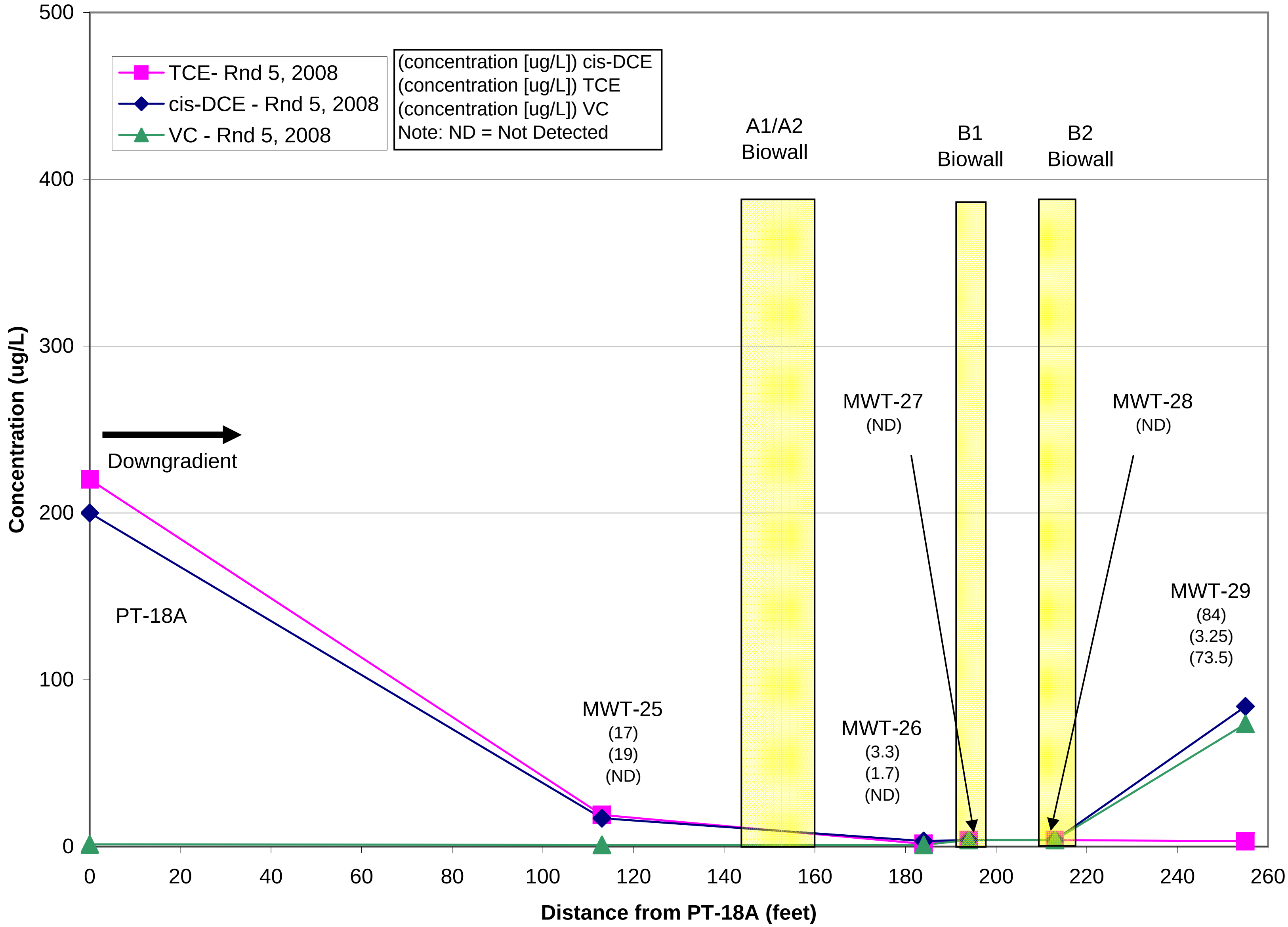


Figure 6F
Concentrations of VOCs Along the Biowalls - Round 6, 2008
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

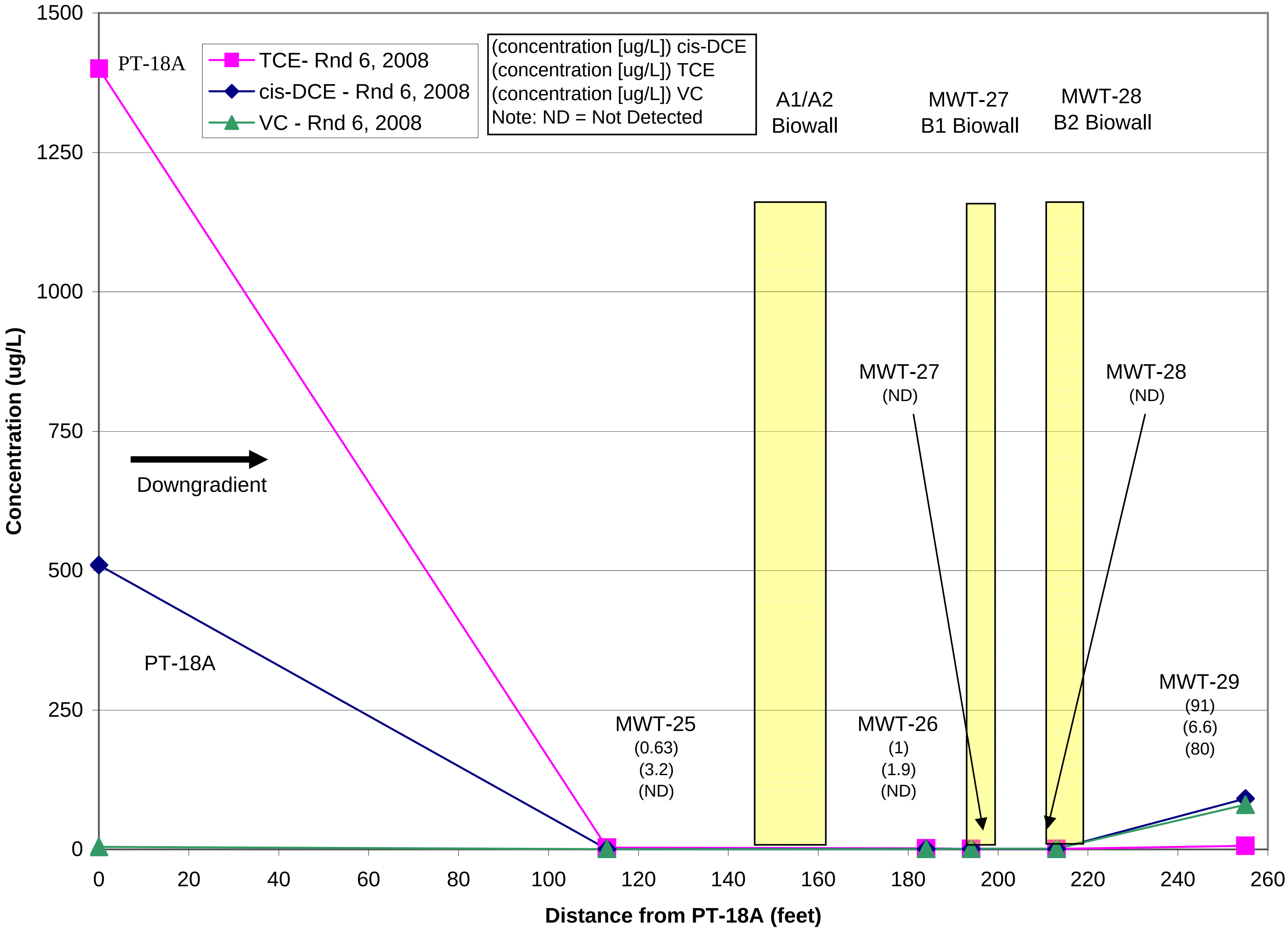


Figure 7A
Concentrations of Chlorinated Organics Over Time at MWT-25
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

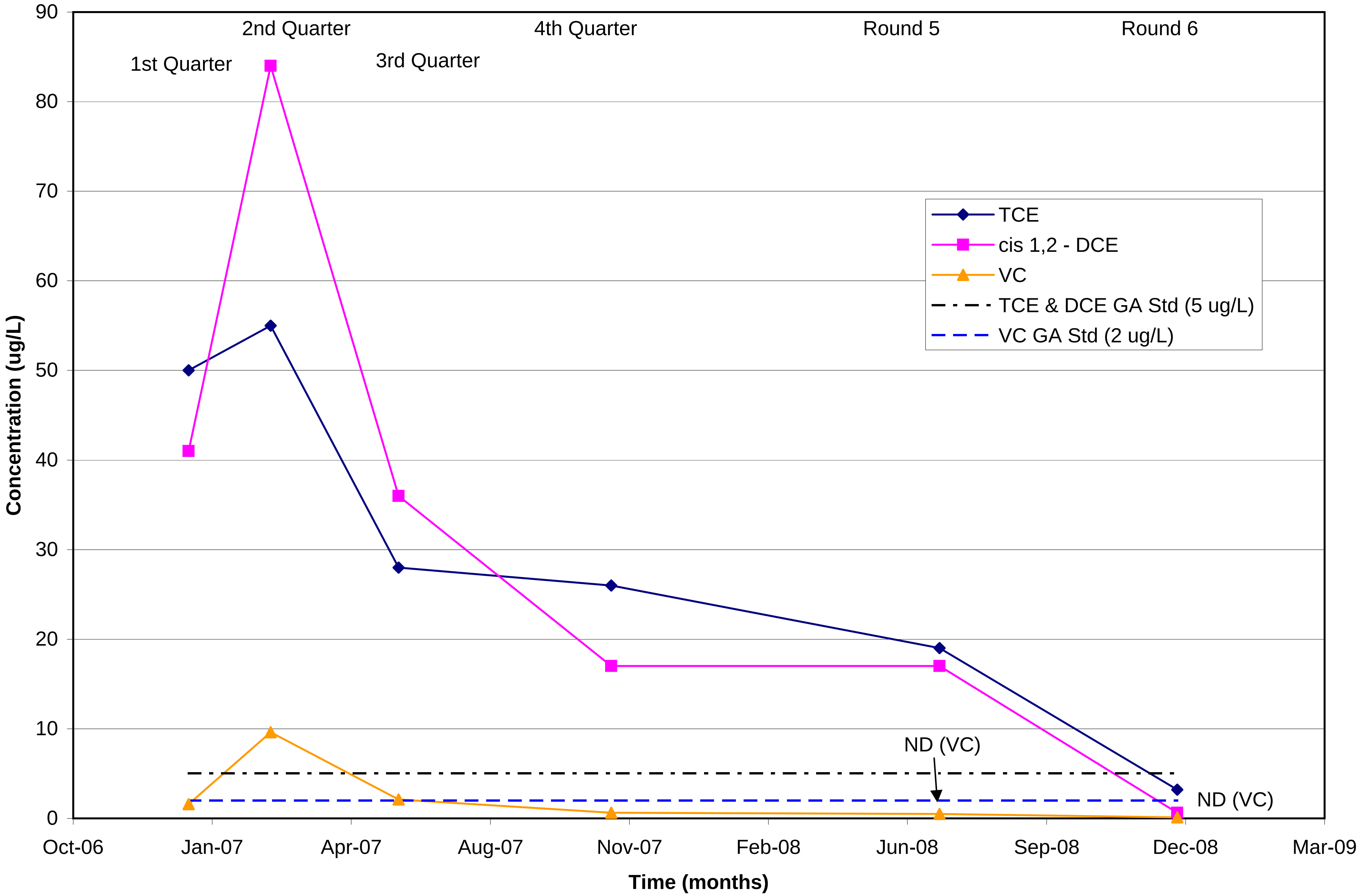
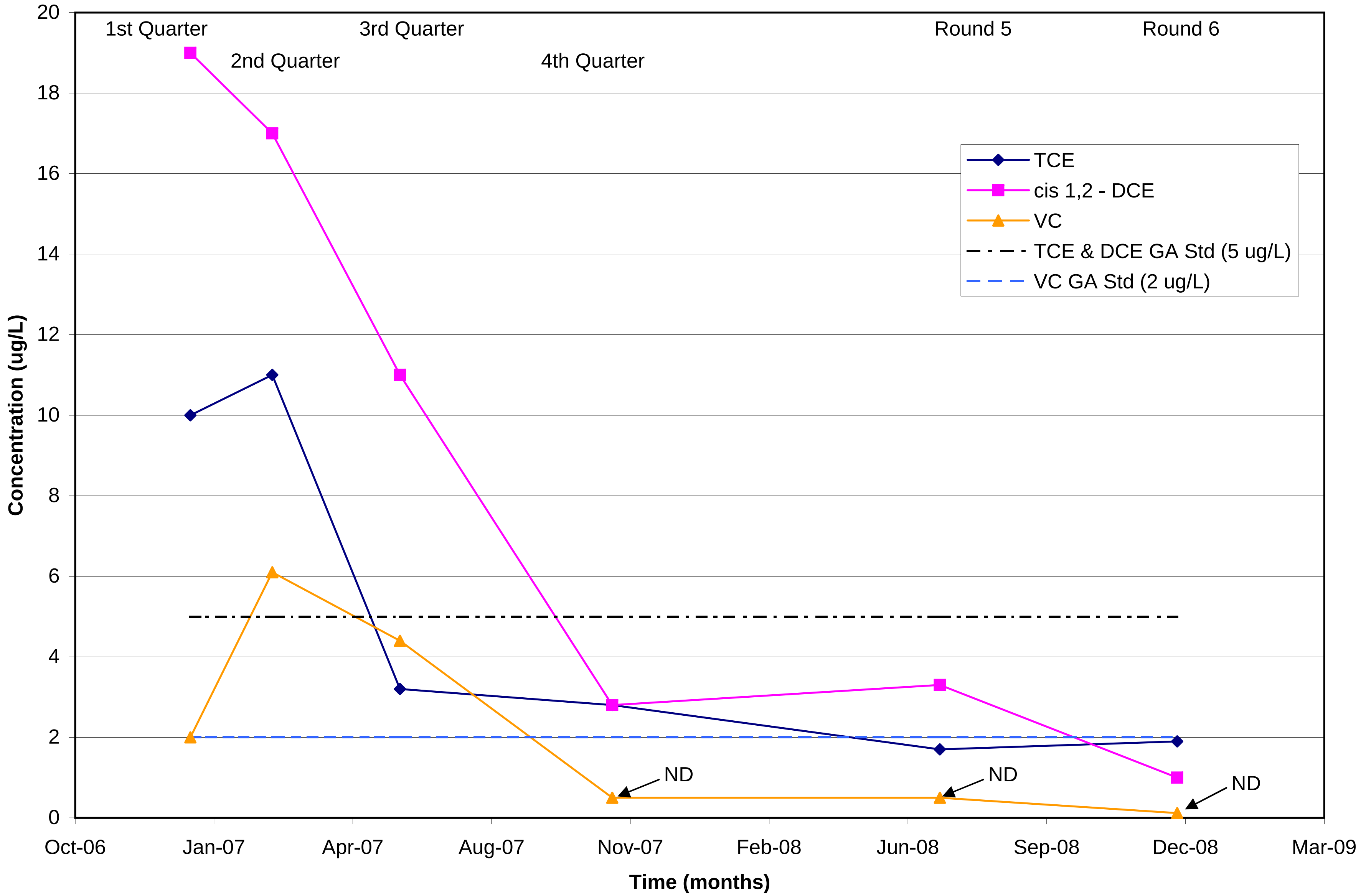
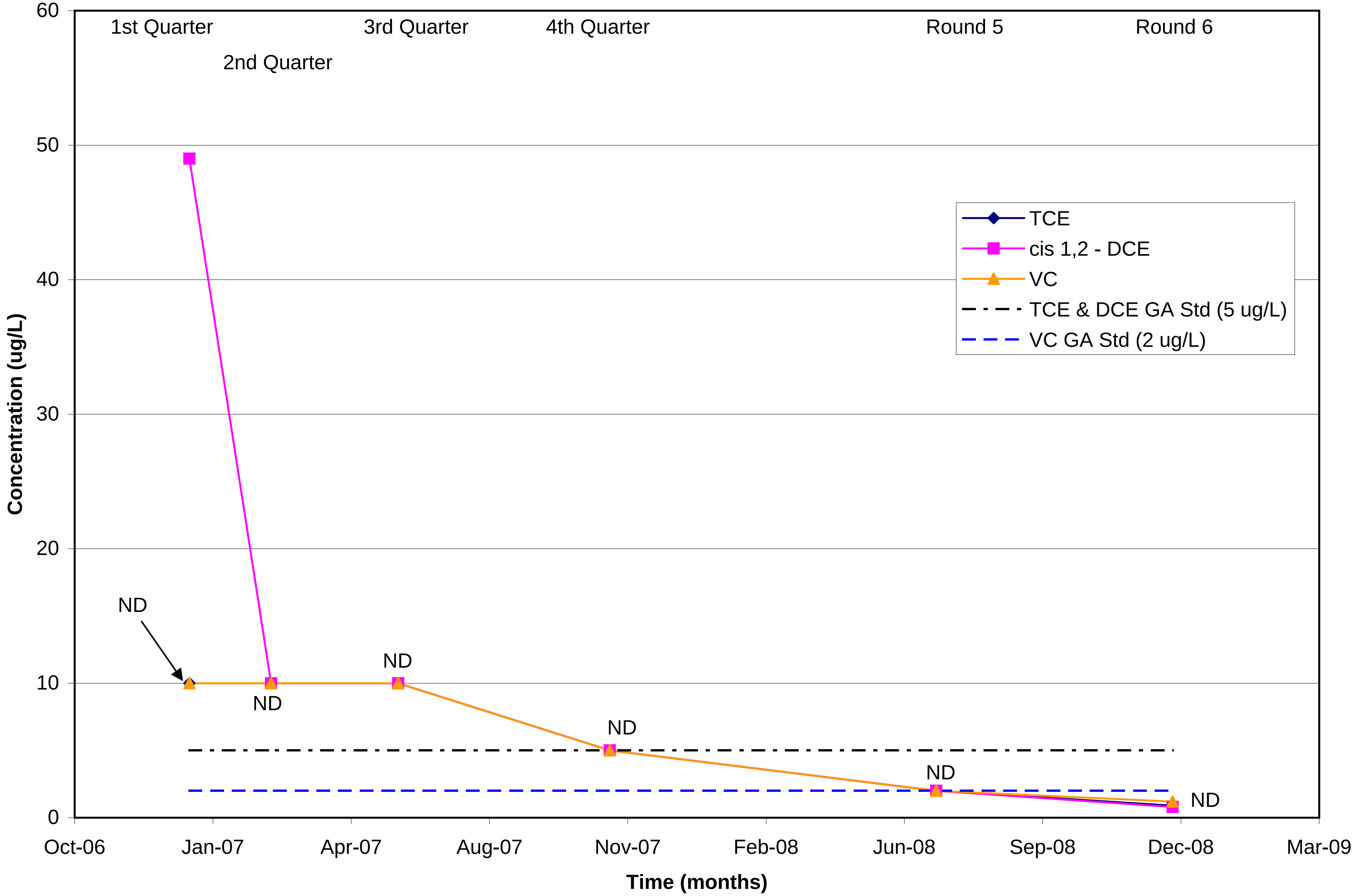


Figure 7B
Concentrations of Chlorinated Organics Over Time at MWT-26
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



ND = not detected.

Figure 7C
Concentrations of Chlorinated Organics Over Time at MWT-27
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



Note:
Round 3 and Round 6 data is the average of the sample and its duplicate.
ND = not detected.

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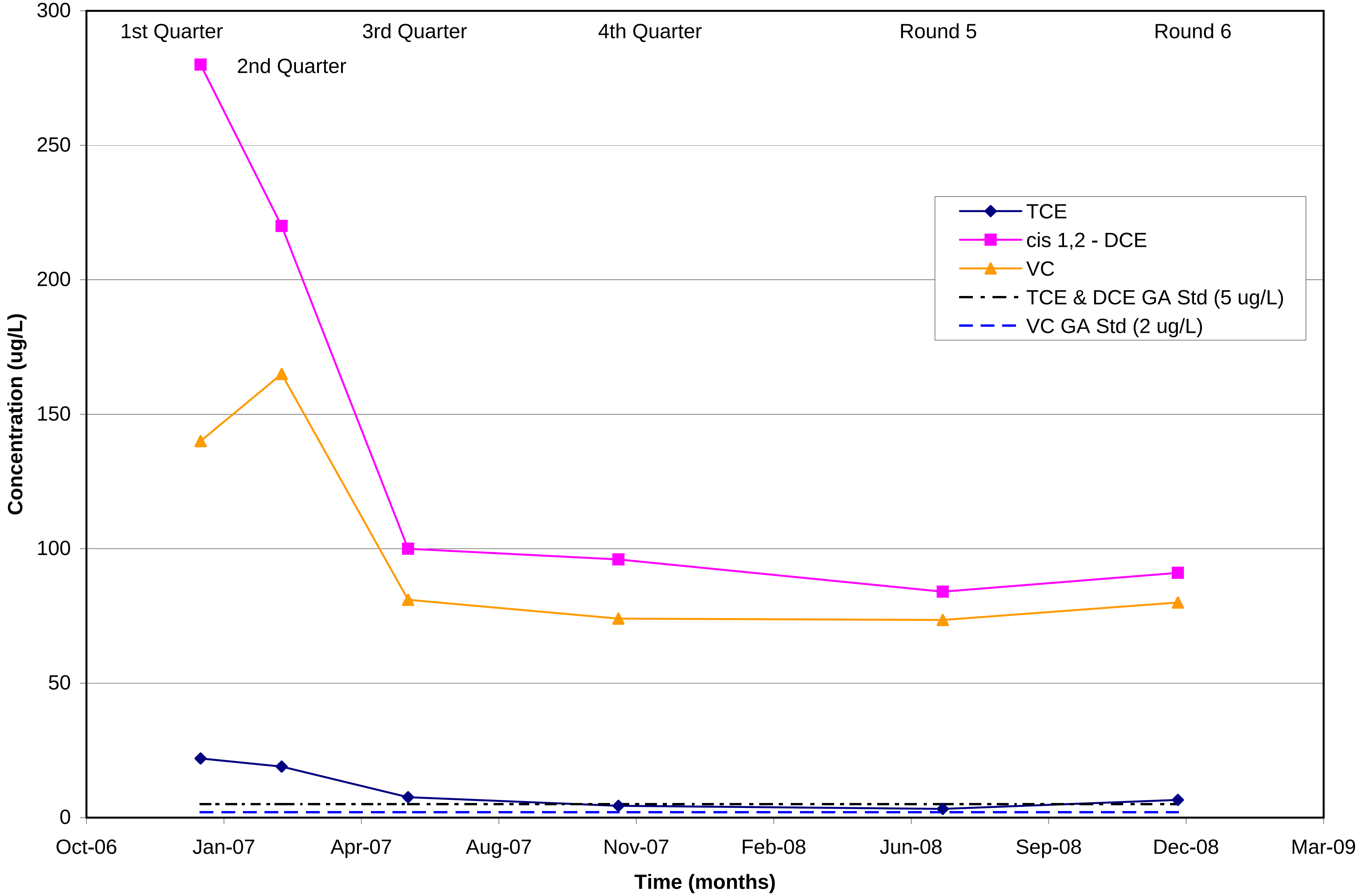
Figure 7D
Concentrations of Chlorinated Organics Over Time at MWT-29
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



Note:
Round 2 and Round 5 data is the average of the sample and its duplicate.

Figure 7E
Concentrations of Chlorinated Organics Over Time at MWT-22
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

P:\PIT\Projects\Huntsville New Contract W912DY-08-D-0003\TO#01 - LTM Ash Landfill\Annual Report\Figures\AR Figure 7 - Well Concentrations Over Time.xls MWT-22 5/7/2009

Figure 7F
Concentrations of Chlorinated Organics Over Time at PT-22
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

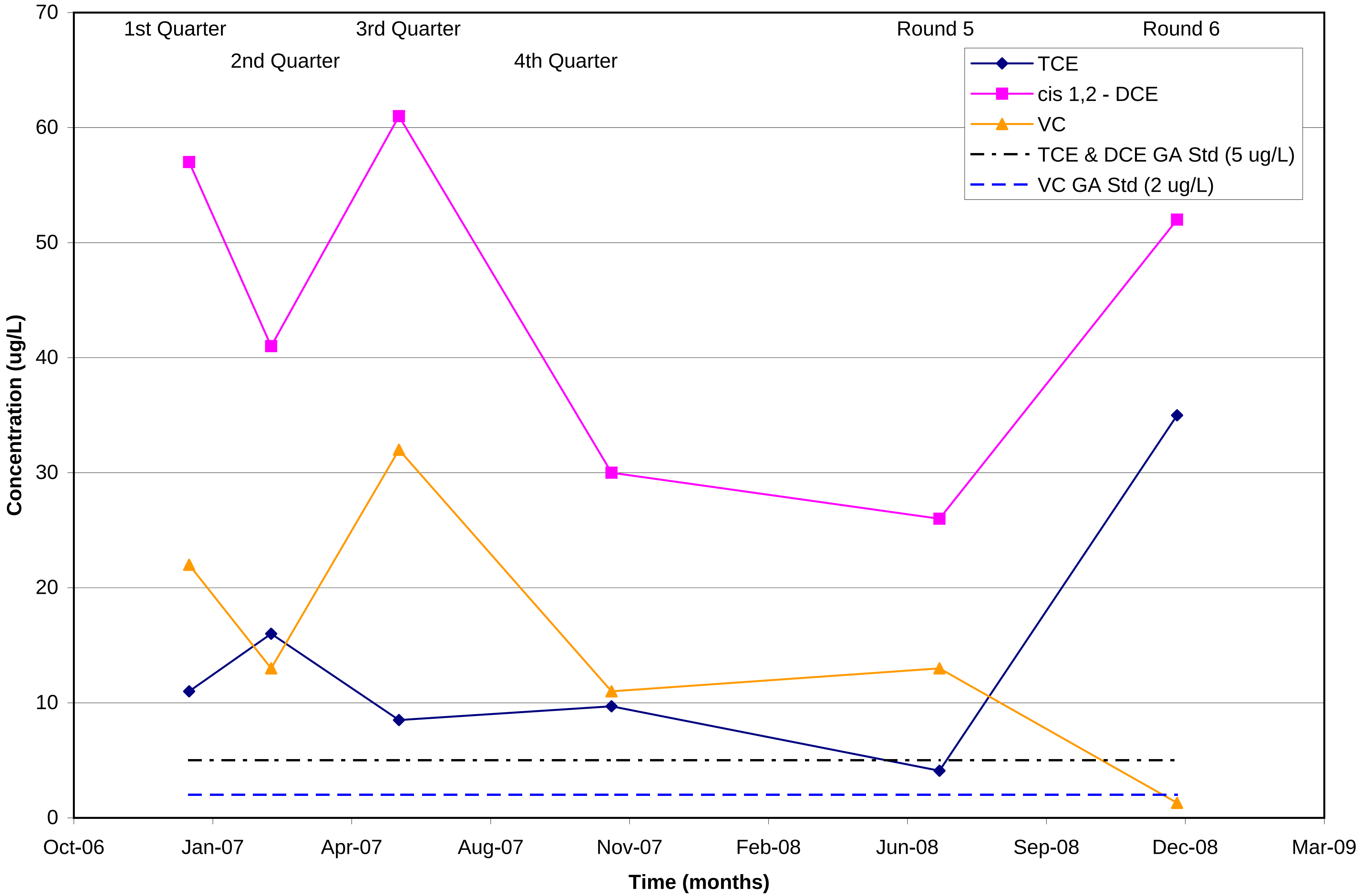
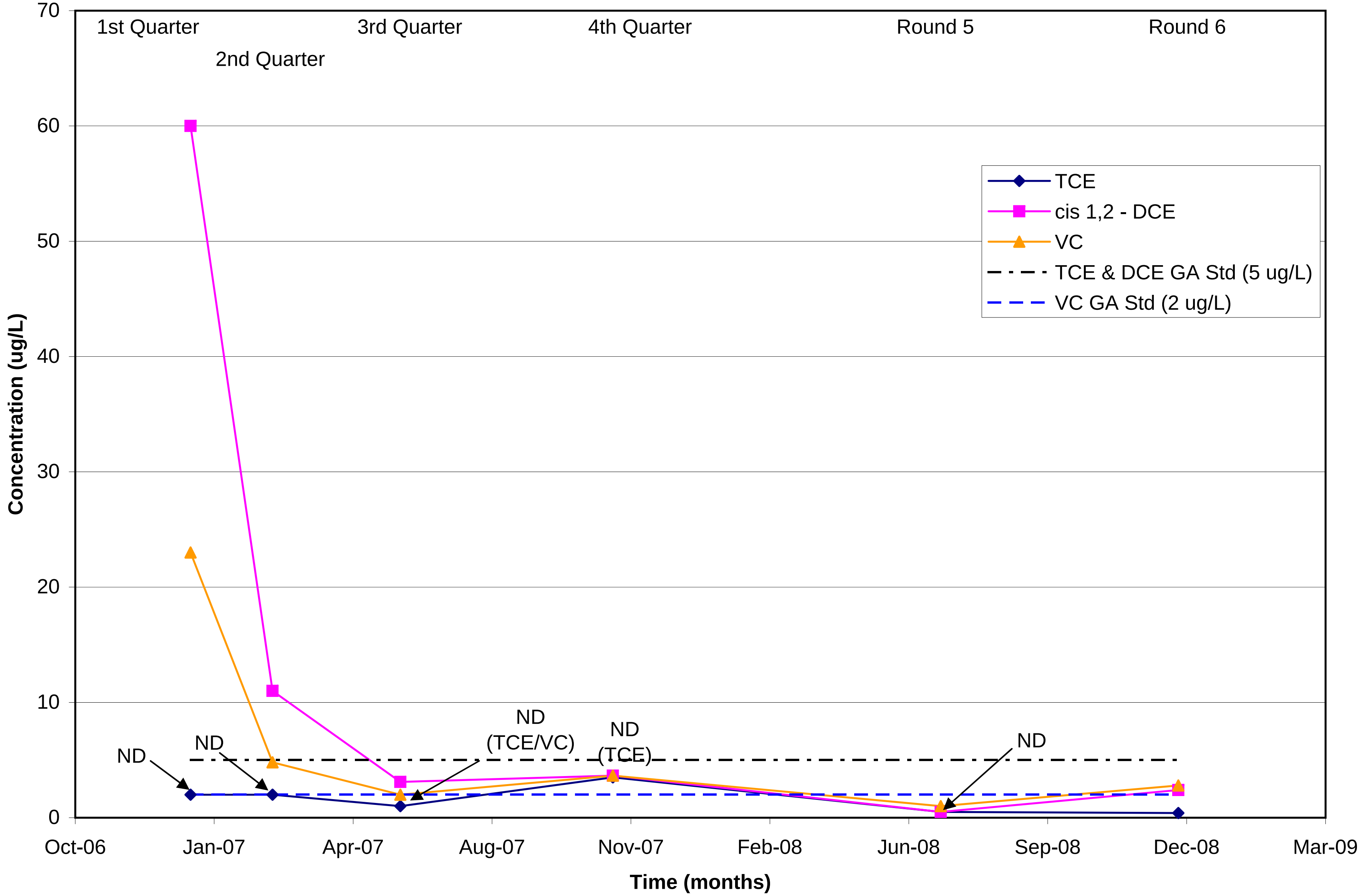


Figure 7G
Concentrations of Chlorinated Organics Over Time at MWT-23
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



Note:
Round 4 data is the average of the sample and its duplicate.
ND = not detected.

Figure 7H
Concentrations of Chlorinated Organics Over Time at MWT-24
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

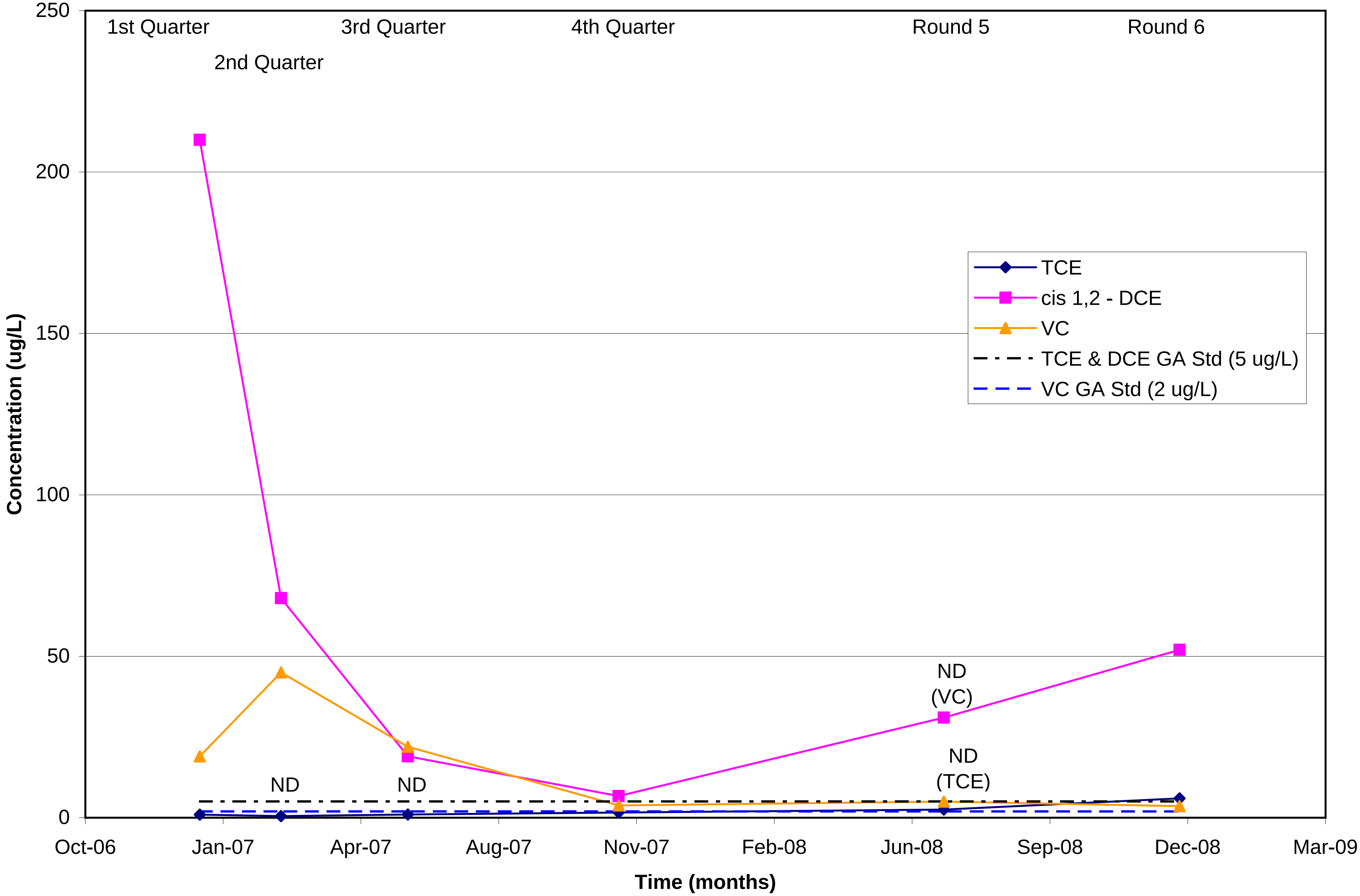
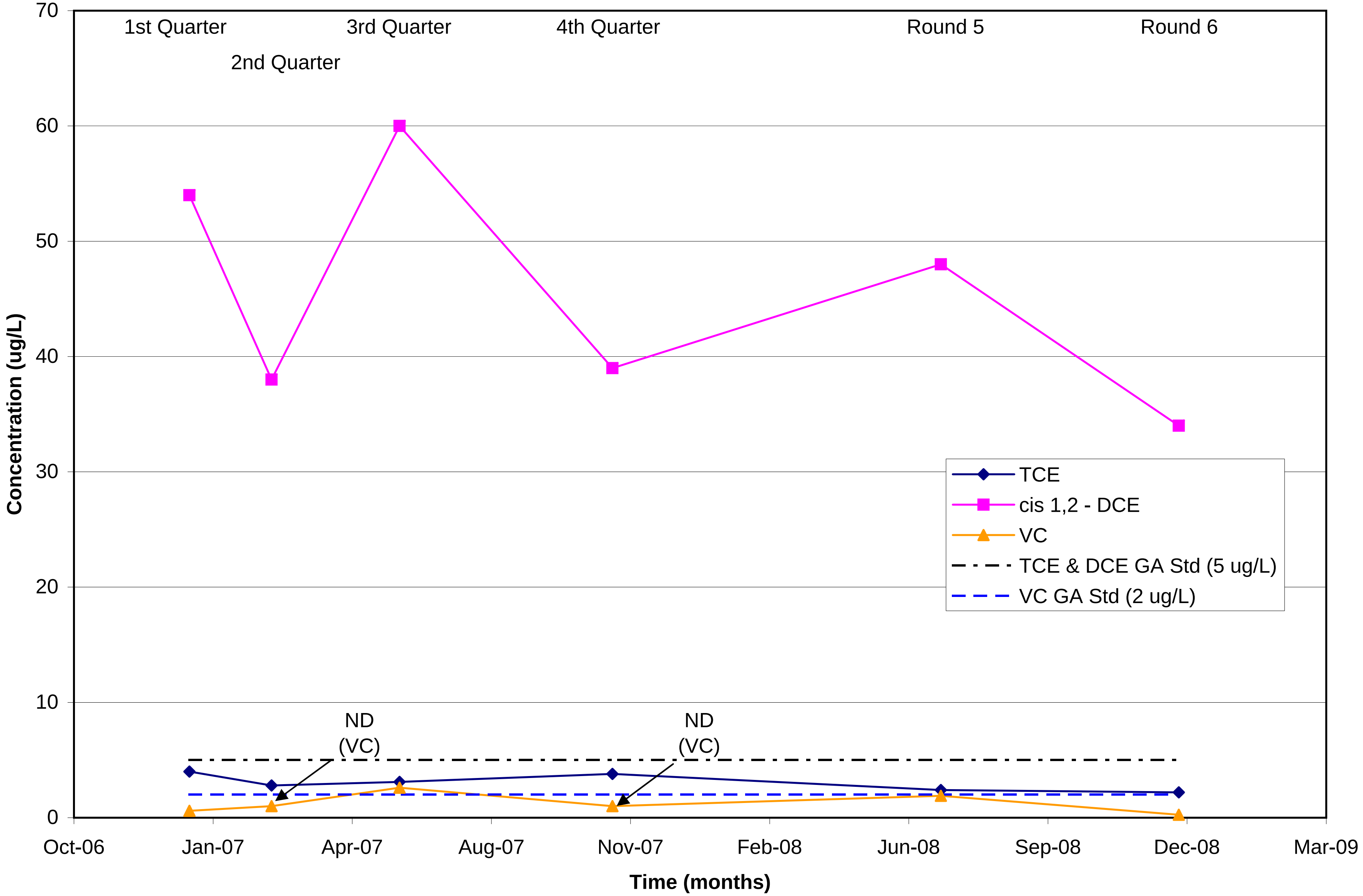


Figure 7I
Concentrations of Chlorinated Organics Over Time at PT-24
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



ND = not detected.

P:\PIT\Projects\Huntsville New Contract W912DY-08-D-0003\TO#01 - LTM Ash Landfill\Annual Report\Figures\AR Figure 7 - Well Concentrations Over Time.xls PT-24 5/7/2009

Figure 8A
Historic Concentrations of Chlorinated Organics at PT-18
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

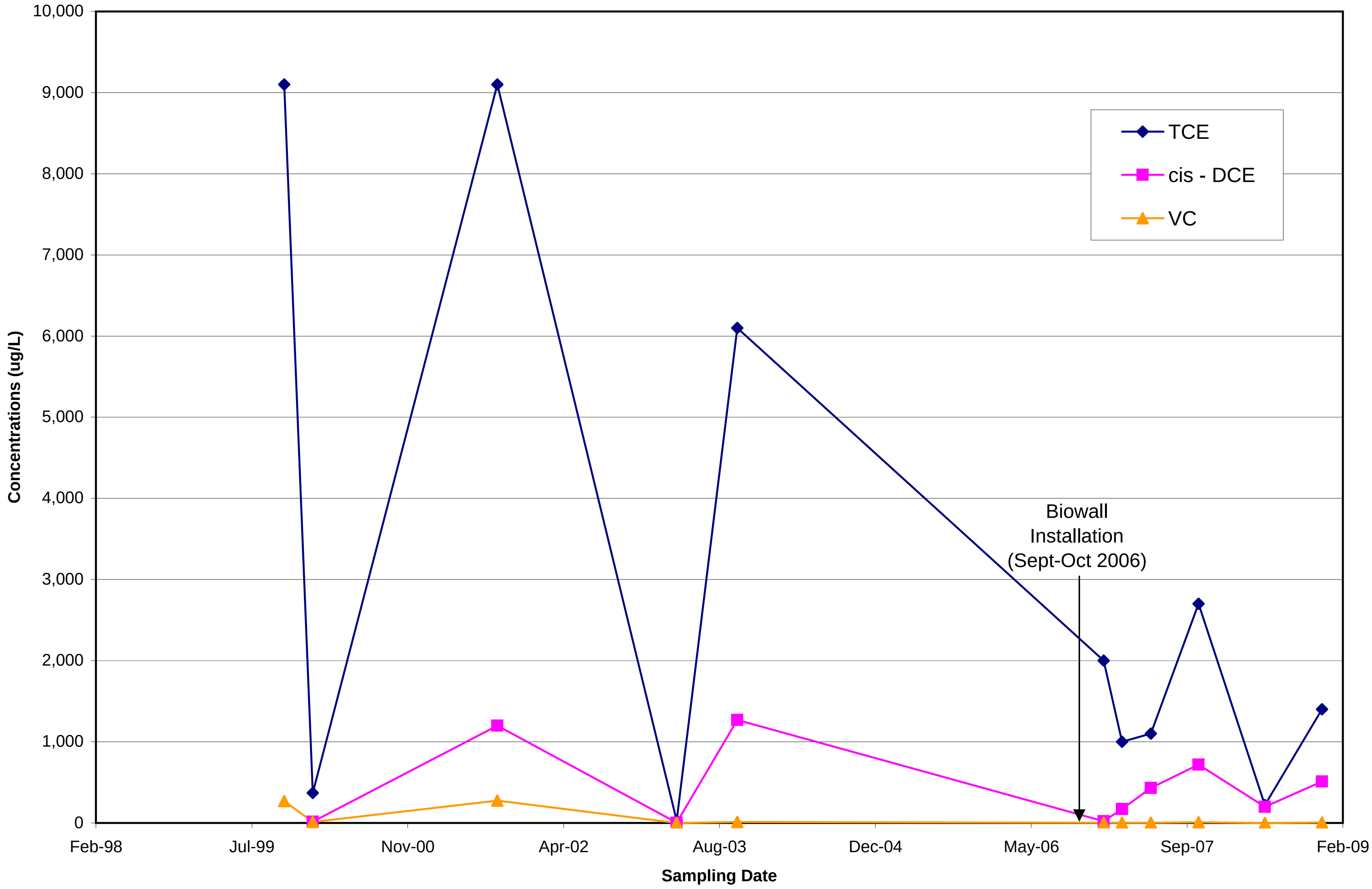


Figure 8B
Historic Concentrations of Chlorinated Organics at PT-17
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

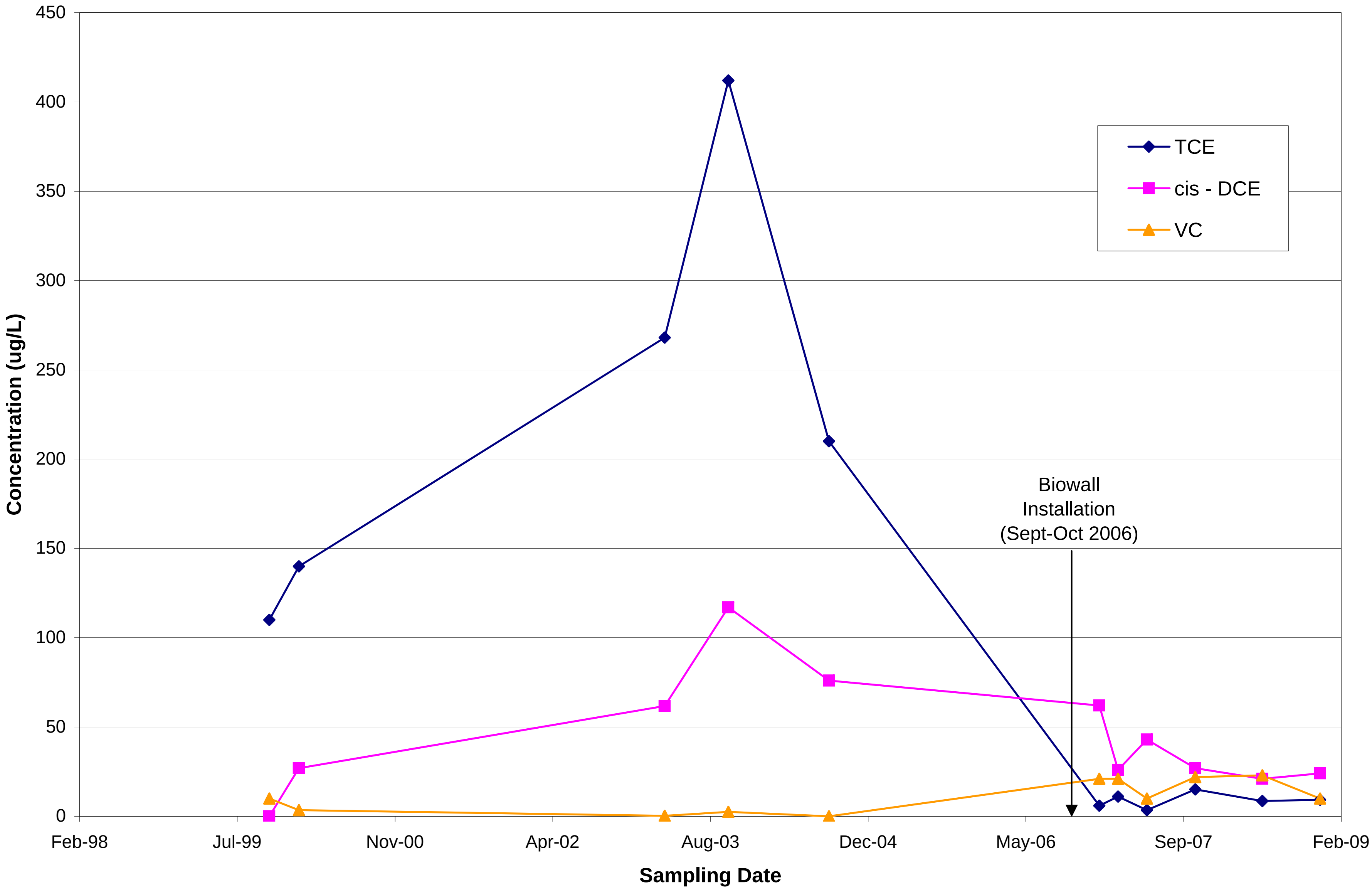
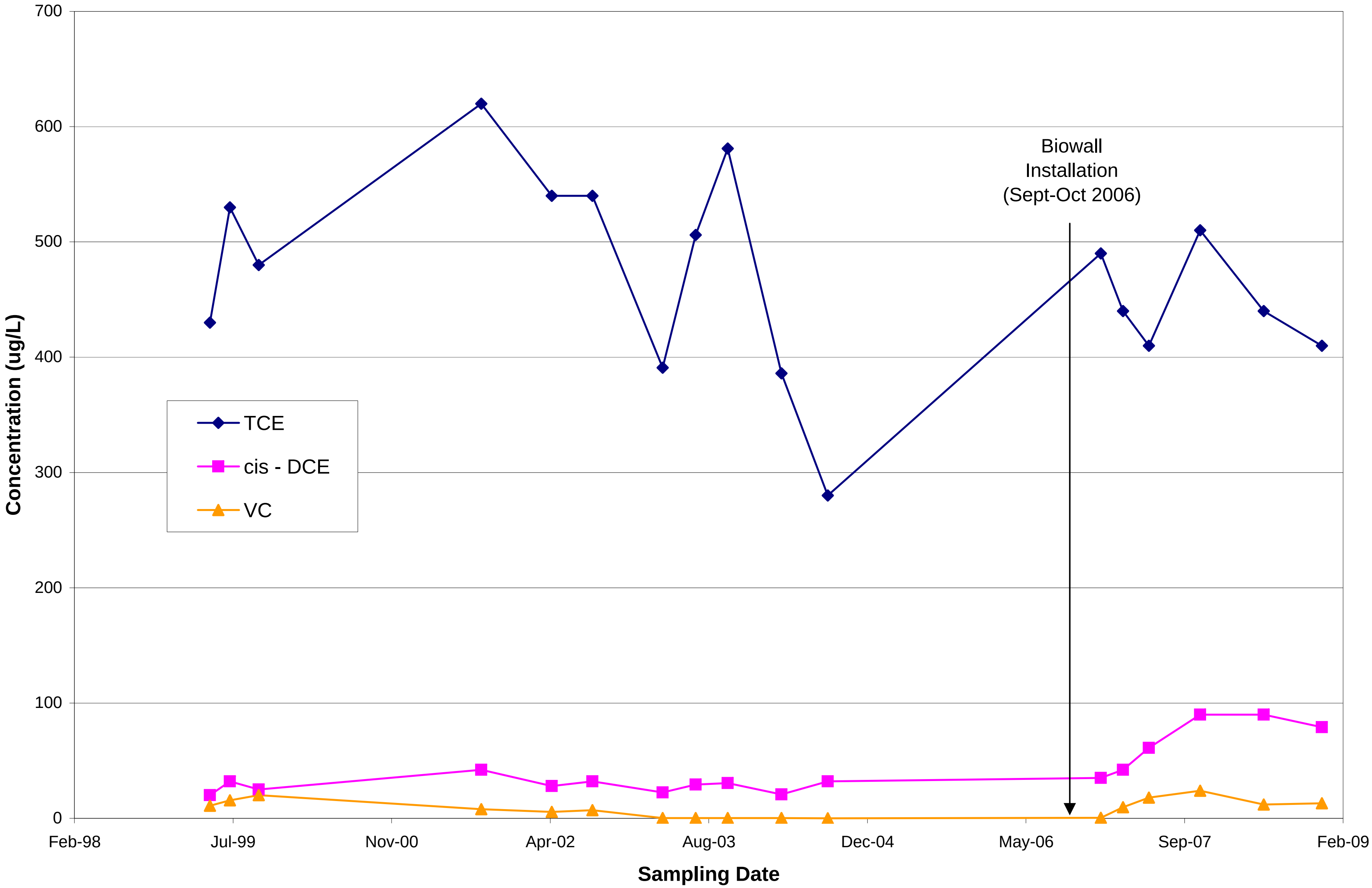
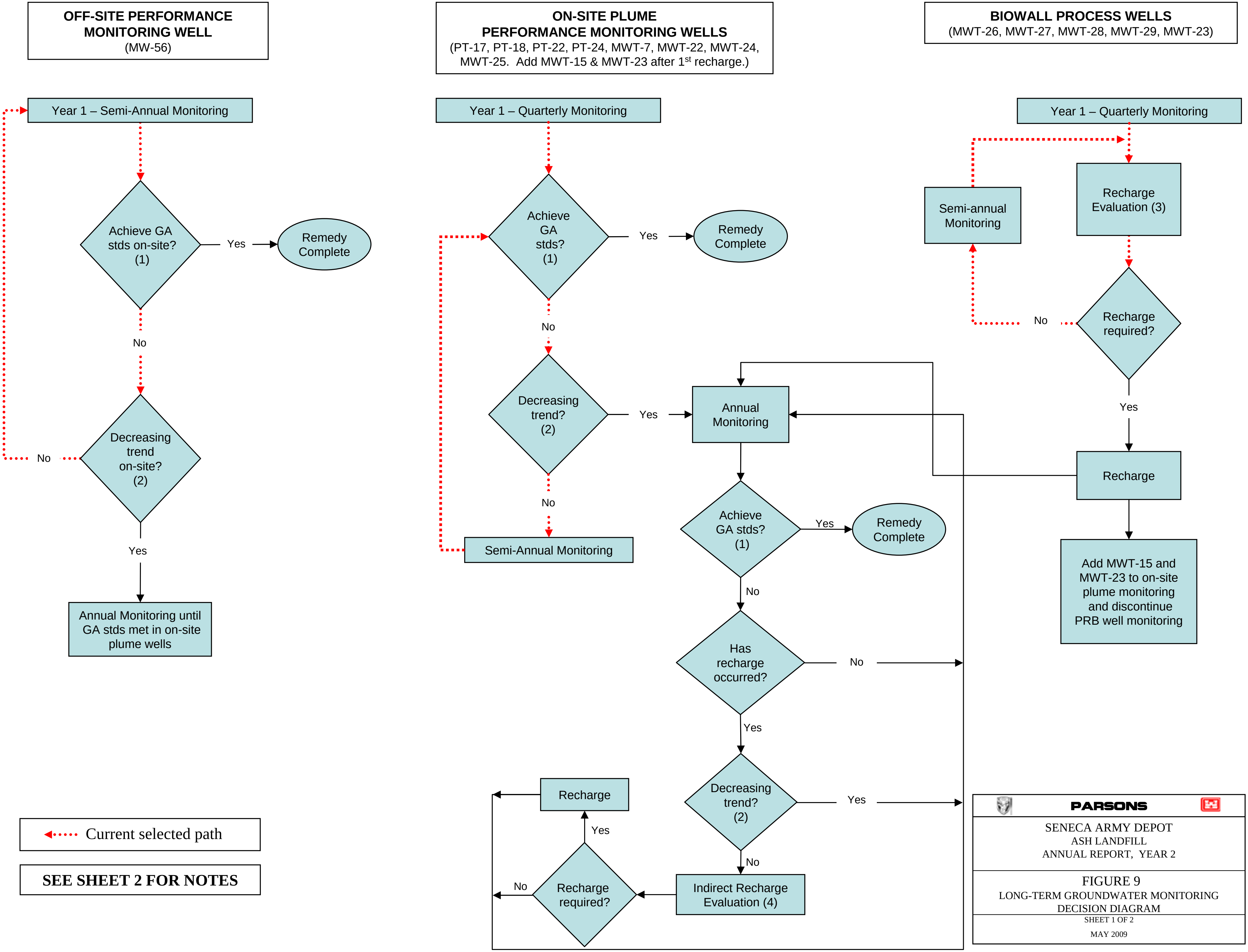


Figure 8C
Historic Concentrations of Chlorinated Organics at MWT-7
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity





SENECA ARMY DEPOT
ASH LANDFILL
ANNUAL REPORT, YEAR 2

FIGURE 9
LONG-TERM GROUNDWATER MONITORING DECISION DIAGRAM
SHEET 1 OF 2
MAY 2009

NOTES:

1. Achieving GA Stds: The condition of achieving GA standards applies to achieving groundwater standards for all COCs in all of the On-Site Plume Wells. If GA standards are achieved in the On-Site Plume Wells for two successive monitoring events, then the remedy is complete and no further monitoring is required at the site.

2. Decreasing Trend: After each year of sampling, the Army will review the results to determine if the chemical concentrations of the COCs are increasing, decreasing, or are unchanged. Graphical and statistical analyses will be used as the basis for this determination. For example, data points will be plotted and a best fit line (linear regression) will be graphed. The slope of the best fit line is representative of the trend in concentration; a negative slope indicates a decreasing trend in COC concentrations. A decreasing COC trend indicates that the potential for contaminants to migrate and negatively impact groundwater further downgradient is decreasing, and that the plume is being effectively managed by the remedy. Any evaluation of trends in contaminant concentrations will take into account that historic data at the Ash Landfill shows that there are seasonal fluctuations in contaminant concentrations. Semi-annual monitoring during wet and dry seasons is appropriate until it is established in which season maximum concentrations are observed. Annual monitoring would occur in the season of maximum concentrations.

3. Recharge Evaluation:

• Determining the need to recharge a biowall segment requires a review of chemical concentrations and geochemical parameters by an experienced professional. A specific, absolute set of conditions or parameter values are not appropriate to determine the need to recharge. Rather, a lines-of-evidence approach will be used that correlates a decrease in the efficiency of the system to degrade chloroethenes to geochemical evidence that indicates the cause is due to substrate depletion.

• The following parameters will be evaluated on an annual basis using at least two consecutive rounds of sampling data in order to determine if recharge of the biowalls is necessary:

a. COC concentrations in the wall. If COC concentrations have rebounded by greater than 50% for any single sampling event, this will indicate that recharge should be considered. Concentrations within the biowalls, not at downgradient locations, will be used to make this evaluation so that the effectiveness of the wall itself is being measured without the interference of effects such as desorption and mixing.

b. Geochemical parameters, specifically ORP, TOC, and DO, in the wall. Benchmark values will be used initially to evaluate anaerobic conditions in the groundwater. These benchmarks are:

- ORP < -100 Mv
- TOC > 20 mg/L
- DO < 1.0 mg/L

Parameters described in a and b above are intended to be used as guidelines and will be considered in the evaluation if, and when, a depletion of bioavailable organic substrate results in a rebound in geochemical redox conditions under which effective biodegradation does not occur.

4. **Indirect Recharge Evaluation**: Once the biowalls are recharged the first time, an indirect recharge evaluation will be conducted if an increasing trend in COC concentrations is observed in the plume performance monitoring wells. An increasing trend is a positive slope on the best-fit line, described in *Note 2* above. Two biowall monitoring wells, MWT-15 and MWT-23, will be added to the Plume Performance Monitoring program after the first recharge is completed. The evaluation will review the chemical and geochemical data and determine if the contaminant increase is a result of poor biowall performance or due to other issues, such as seasonal variations, recent precipitation events, desorption, etc. As stated in Note 2, a rebound in concentrations of COCs of 50% in MWT-15 and MWT-23 in two consecutive monitoring rounds is a major indication that recharge is needed. Once this COC rebound is observed, the geochemical parameter concentrations at MWT-15 and MWT-23 will be reviewed. In addition, conditions at the other plume performance wells will be reviewed and compared to the conditions observed at those wells at the time that the initial recharge was required. The Army will determine if similar conditions in the well provide further proof that carbon source recharge is needed again.

APPENDICES

APPENDIX A

COMPLETE GROUNDWATER DATA

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								PT-18A	PT-18A	PT-18A	PT-18A	PT-18A	PT-18A	MWT-25	MWT-25	MWT-25
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20059	ALBW20074	ALBW20088	ALBW20103	ALBW20117	ALBW20132	ALBW20064	ALBW20079	ALBW20093
Sample Date								1/3/2007	3/17/2007	6/5/2007	11/15/2007	6/24/2008	12/12/2008	1/3/2007	3/17/2007	6/6/2007
QC Code								SA	SA	SA	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								1	2	3	4	5	6	1	2	3
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Cleanup Goal[1]**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	1 U	1 U	1 U	1 U	1 U	0.26 UJ	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.21 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 UJ	1 U	1 UJ	0.31 U	1 U	1 U	1 UJ
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	1 U	1 U	1 U	1 U	1 U	0.23 U	1 U	1 U	1 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	1 U	1 U	1 U	1 U	1 U	0.75 U	1 U	1 U	1 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	0.64 J	0.73 J	1.4	2.1	1 U	1.3	1 U	1 U	1 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.41 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	1 U	1 U	1 U	1 U	1 UJ	1 UJ	1 U	1 U	1 U
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	1 U	1 U	1 U	1 U	1 U	0.17 U	1 U	1 U	1 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	1 U	1 U	1 U	0.2 U	1 U	1 U	1 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	1 U	1 U	1 U	1 U	1 U	0.21 U	1 U	1 U	1 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	1 U	1 U	1 U	1 U	1 U	0.14 U	1 U	1 U	1 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
Acetone	UG/L	2600	34%		0	30	88	5 U	2 J	7	5 U	5 U	1.3 U	5 U	5 U	4.5 J
Benzene	UG/L	0	0%	1	0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	1 U	1 U	1 U	1 U	1 U	0.38 U	1 U	1 U	1 U
Bromoform	UG/L	0	0%	80	0	0	88	1 U	1 U	1 U	1 U	1 U	0.26 U	1 U	1 U	1 U
Carbon disulfide	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.19 U	1 U	1 U	1 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.27 UJ	1 U	1 U	1 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.18 U	1 U	1 U	1 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	1 U	1 U	1 U	1 U	1 U	0.32 U	1 U	1 U	1 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	1 U	1 U	1 U	1 U	1 UJ	0.32 U	1 U	1 U	1 U
Chloroform	UG/L	27	5%	7	3	4	88	27	13 U	14	8.7	1 U	2.2	1 U	1 U	1 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	220	170	430	720	200	510	41	84	36
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	1 U	1 U	1 U	0.36 U	1 U	1 U	1 U
Cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.22 U	1 U	1 U	1 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.28 UJ	1 U	1 U	1 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	1 U	1 U	1 U	1 U	1 U	0.18 U	1 U	1 U	1 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.19 U	1 U	1 U	1 U
Methyl Acetate	UG/L	6	2%		0	2	88	1 U	1 UJ	1 U	1 UJ	1 UJ	0.17 U	1 U	1 UJ	1 U
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
Methyl bromide	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 UJ	0.28 U	1 U	1 U	1 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	5 U	5 U	5 U	5 UJ	5 UJ	1.2 U	5 U	5 U	5 U
Methyl chloride	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 UJ	0.34 U	1 U	1 U	1 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.22 U	1 U	1 U	1 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	5 U	5 U	5 U	5 U	5 UJ	1.3 U	5 U	5 U	5 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	5 U	5 U	5 U	5 U	5 UJ	0.91 U	5 U	5 U	5 U
Methylene chloride	UG/L	18	14%	5	7	12	88	1 UJ	1 U	1 U	1 U	1 U	0.44 UJ	1 U	1 U	1 U
Styrene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.18 U	1 U	1 U	1 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.36 U	1 U	1 U	1 U
Toluene	UG/L	590	23%	5	16	20	88	1 U	1 U	1 U	1 U	1 U	0.51 U	1 U	1 U	4.6
Total Xylenes	UG/L	0	0%	5	0	0	88	3 U	3 U	3 U	3 U	3 U	0.93 U	3 U	3 U	3 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	1.6	1.4	3.3	3.4	0.9 J	2.4	0.56 J	1.2	0.5 J
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	1 U	1 U	1 U	0.37 U	1 U	1 U	1 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	2000	1000	1100	2700	220	1400	50	55	28
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 UJ	1 U	1 UJ	0.15 UJ	1 U	1 U	1 UJ
Vinyl chloride	UG/L	180	66%	2	49	58	88	2.4	2.9	3.3	8.2	1.4	4.6	1.6	9.6	2.1
Other																
Manganese	UG/L	56900	100%		0	12	12									
Ethane	UG/L	98	83%		0	33	40									
Ethene	UG/L	200	83%		0	33	40									
Methane	UG/L	23000	93%		0	37	40									
Sulfate	MG/L	1060	68%		0	27	40									
Total Organic Carbon	MG/L	2050	100%		0	40	40									

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Frequency of Detection	Cleanup Goal[1]	Number of Exceedances	Number of Times Detected	Number of Samples Collected	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-25	MWT-25	MWT-25	MWT-26	MWT-26	MWT-26	MWT-26	MWT-26	MWT-26
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20108	ALBW20123	ALBW20138	ALBW20066	ALBW20081	ALBW20095	ALBW20111	ALBW20126	ALBW20141
Sample Date								11/15/2007	6/24/2008	12/15/2008	1/3/2007	3/17/2007	6/5/2007	11/15/2007	6/24/2008	12/15/2008
QC Code								SA	SA	SA	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								4	5	6	1	2	3	4	5	6
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	1 U	1 U	0.26 U	1 U	1 U	1 U	1 U	1 U	0.26 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	1 U	1 U	0.21 U	1 U	1 U	1 U	1 U	1 U	0.21 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.31 U	1 U	1 U	1 UJ	1 U	1 U	0.31 U
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	1 U	1 U	0.23 U	1 U	1 U	1 U	1 U	1 U	0.23 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	1 U	1 U	0.75 U	1 U	1 U	1 U	1 U	1 U	0.75 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	1 U	1 U	0.29 U	1 U	1 U	1 U	1 U	1 U	0.29 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.41 U	1 U	1 U	1 U	1 U	1 U	0.41 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	1 U	1 UJ	1 UJ	1 U	1 U	1 U	1 U	1 U	1 UJ
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	1 U	1 U	0.17 U	1 U	1 U	1 U	1 U	1 U	0.17 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	0.2 U	1 U	1 U	1 U	1 U	1 U	0.2 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	1 U	1 U	0.21 U	1 U	1 U	1 U	1 U	1 U	0.21 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	1 U	1 U	0.14 U	1 U	1 U	1 U	1 U	1 U	0.14 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	1 U	1 U	0.16 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	1 U	1 U	0.16 U
Acetone	UG/L	2600	34%		0	30	88	5 U	5 U	1.3 U	5 U	17	5 U	5 U	5 U	1.3 U
Benzene	UG/L	0	0%	1	0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	1 U	1 U	0.16 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	1 U	1 U	0.38 U	1 U	1 U	1 U	1 U	1 U	0.38 U
Bromoform	UG/L	0	0%	80	0	0	88	1 U	1 U	0.26 U	1 U	1 U	1 U	1 U	1 U	0.26 U
Carbon disulfide	UG/L	0	0%		0	0	88	1 U	1 U	0.19 U	1 U	1 U	1 U	1 U	1 U	0.19 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	1 U	1 U	0.27 U	1 U	1 U	1 U	1 U	1 U	0.27 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.18 U	1 U	1 U	1 U	1 U	1 U	0.18 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	1 U	1 U	0.32 U	1 U	1 U	1 U	1 U	1 U	0.32 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	1 U	1 UJ	0.32 U	1 U	1 U	1 U	1 U	1 UJ	0.32 U
Chloroform	UG/L	27	5%	7	3	4	88	1 U	1 U	0.34 U	1 U	1 U	1 U	1 U	1 U	0.34 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	17	17	0.63 J	19	17	11	2.8	3.3	1
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	0.36 U	1 U	1 U	1 U	1 U	1 U	0.36 U
Cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	0.22 U	1 U	1 U	1 U	1 U	1 U	0.22 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 U	0.28 U	1 U	1 U	1 U	1 U	1 U	0.28 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	1 U	1 U	0.18 U	1 U	1 U	1 U	1 U	1 U	0.18 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.19 U	1 U	1 U	1 U	1 U	1 U	0.19 U
Methyl Acetate	UG/L	6	2%		0	2	88	1 UJ	1 UJ	0.17 U	1 U	1 UJ	1 U	1 UJ	1 UJ	0.17 U
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	1 U	1 U	0.16 U
Methyl bromide	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.28 U	1 U	1 U	1 U	1 U	1 UJ	0.28 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	5 UJ	5 UJ	1.2 U	5 U	5 U	5 U	5 UJ	5 UJ	1.2 U
Methyl chloride	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.34 U	1 U	1 U	1 U	1 U	1 U	0.34 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	0.22 U	1 U	1 U	1 U	1 U	1 U	0.22 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	5 U	5 UJ	1.3 U	5 U	15	5 U	5 U	5 U	1.3 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	5 U	5 UJ	0.91 U	5 U	5 U	5 U	5 U	5 U	0.91 U
Methylene chloride	UG/L	18	14%	5	7	12	88	1 U	1 U	0.44 UJ	1 U	1 U	1 U	1 U	1 U	0.44 UJ
Styrene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.18 U	1 U	1 U	1 U	1 U	1 U	0.18 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.36 U	1 U	1 U	1 U	1 U	1 U	0.36 U
Toluene	UG/L	590	23%	5	16	20	88	1 U	1 U	0.51 U	1 U	1 U	1 U	1 U	1 U	0.51 U
Total Xylenes	UG/L	0	0%	5	0	0	88	3 U	3 U	0.93 U	3 U	3 U	3 U	3 U	3 U	0.93 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	1 U	1 U	0.13 U	0.6 J	1	0.7 J	1 U	1 U	0.13 U
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	0.37 U	1 U	1 U	1 U	1 U	1 U	0.37 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	26	19	3.2	10	11	3.2	2.8	1.7	1.9
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.15 U	1 U	1 U	1 UJ	1 U	1 UJ	0.15 U
Vinyl chloride	UG/L	180	66%	2	49	58	88	0.64 J	1 U	0.24 U	2	6.1	4.4	1 U	1 U	0.24 U
Other																
Manganese	UG/L	56900	100%		0	12	12				768	1620				
Ethane	UG/L	98	83%		0	33	40				2 U	0.4	1	0.16	0.82	0.046
Ethene	UG/L	200	83%		0	33	40				2 U	7.8	13	0.4	2.9	0.028
Methane	UG/L	23000	93%		0	37	40				2 U	210	390	44	210	10
Sulfate	MG/L	1060	68%		0	27	40				958	738	473	1060	600	541
Total Organic Carbon	MG/L	2050	100%		0	40	40				3.9 J	15.2	10.3	6.1	5.6	4.4

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Frequency of Detection	Cleanup Goal[1]	Number of Exceedances	Number of Times Detected	Number of Samples Collected	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-27	MWT-27	MWT-27	MWT-27	MWT-27	MWT-27	MWT-27	MWT-27	MWT-28
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20067	ALBW20082	ALBW20097	ALBW20096	ALBW20112	ALBW20127	ALBW20143	ALBW20142	ALBW20069
Sample Date								1/3/2007	3/16/2007	6/5/2007	6/5/2007	11/15/2007	6/24/2008	12/15/2008	12/15/2008	1/3/2007
QC Code								SA	SA	DU	SA	SA	SA	DU	SA	DU
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								1	2	3	3	4	5	6	6	1
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.6 UJ	2.6 UJ	20 UJ
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.1 UJ	2.1 UJ	20 UJ
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 UJ	20 UJ	10 U	4 U	3.1 UJ	3.1 UJ	20 UJ
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.3 UJ	2.3 UJ	20 UJ
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	20 UJ	20 U	20 U	20 U	10 U	4 U	7.5 U	7.5 U	20 UJ
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.9 U	2.9 U	20 UJ
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	4.1 UJ	4.1 UJ	20 UJ
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	10 UJ	10 UJ	20 UJ
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.7 UJ	1.7 UJ	20 UJ
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2 U	2 U	20 UJ
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.1 U	2.1 U	20 UJ
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.4 U	1.4 U	20 UJ
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.6 U	1.6 U	20 UJ
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.6 U	1.6 U	20 UJ
Acetone	UG/L	2600	34%		0	30	88	2000 J	1300	1300	1300	30 J	20 U	13 UJ	26 J	2600 J
Benzene	UG/L	0	0%	1	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.6 U	1.6 U	20 UJ
Bromodichloromethane	UG/L	0	0%	80	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.8 U	3.8 U	20 UJ
Bromoform	UG/L	0	0%	80	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.6 UJ	2.6 UJ	20 UJ
Carbon disulfide	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.9 U	1.9 U	20 UJ
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.7 UJ	2.7 UJ	20 UJ
Chlorobenzene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.8 U	1.8 U	20 UJ
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.2 U	3.2 U	20 UJ
Chloroethane	UG/L	1.1	5%	5	0	4	88	20 UJ	20 U	20 U	20 U	10 U	4 UJ	3.2 U	3.2 U	20 UJ
Chloroform	UG/L	27	5%	7	3	4	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.4 U	3.4 U	20 UJ
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	49 J	20 U	20 U	20 U	10 U	4 U	1.6 U	1.6 U	20 UJ
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.6 U	3.6 U	20 UJ
Cyclohexane	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.2 UJ	2.2 UJ	20 UJ
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.8 U	2.8 U	20 UJ
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.8 U	1.8 U	20 UJ
Isopropylbenzene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.9 U	1.9 U	20 UJ
Methyl Acetate	UG/L	6	2%		0	2	88	20 UJ	20 UJ	20 U	20 U	10 UJ	4 UJ	1.7 UJ	1.7 UJ	20 UJ
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.6 UJ	1.6 UJ	20 UJ
Methyl bromide	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 UJ	2.8 U	2.8 U	20 UJ
Methyl butyl ketone	UG/L	0	0%		0	0	88	100 UJ	100 U	100 U	100 U	50 UJ	20 UJ	12 U	12 U	100 UJ
Methyl chloride	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.4 U	3.4 U	20 UJ
Methyl cyclohexane	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.2 UJ	2.2 UJ	20 UJ
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	4100 J	2200	1700	1800	50 U	20 U	13 UJ	13 UJ	4900 J
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	100 UJ	100 U	100 U	100 U	50 U	20 U	9.1 UJ	9.1 UJ	100 UJ
Methylene chloride	UG/L	18	14%	5	7	12	88	18 J	20 U	13 J	11 J	10 U	4 U	4.4 UJ	4.4 UJ	14 J
Styrene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.8 U	1.8 U	20 UJ
Tetrachloroethene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.6 U	3.6 U	20 UJ
Toluene	UG/L	590	23%	5	16	20	88	20 UJ	20 U	20 U	20 U	7.3 J	5.9	7.2 J	6.9 J	350 J
Total Xylenes	UG/L	0	0%	5	0	0	88	60 UJ	60 U	60 U	60 U	30 U	12 U	9.3 U	9.3 U	60 UJ
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.3 U	1.3 U	20 UJ
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	20 UJ	20 U	20 U	20 U	10 U	4 U	3.7 U	3.7 U	20 UJ
Trichloroethene	UG/L	2700	69%	5	38	61	88	20 UJ	20 U	20 U	20 U	10 U	4 U	1.8 U	1.8 U	20 UJ
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 UJ	20 UJ	10 U	4 UJ	1.5 UJ	1.5 UJ	20 UJ
Vinyl chloride	UG/L	180	66%	2	49	58	88	20 UJ	20 U	20 U	20 U	10 U	4 U	2.4 U	2.4 U	20 UJ
Other																
Manganese	UG/L	56900	100%		0	12	12	56900	44500							30800
Ethane	UG/L	98	83%		0	33	40	10000 UJ	0.15	0.079	0.082	0.025 U	2.3	1.6	1.6	10000 UJ
Ethene	UG/L	200	83%		0	33	40	10000 UJ	2.7	0.32	0.34	0.014 J	0.049	0.12	0.13	10000 UJ
Methane	UG/L	23000	93%		0	37	40	10000 UJ	15000	13000	14000	13000	13000	15000	15000	13000 J
Sulfate	MG/L	1060	68%		0	27	40	10 U	10 U	2.7	2 U	31.7	2 U	23.8	24.2	2.3
Total Organic Carbon	MG/L	2050	100%		0	40	40	2050 J	1350	771	738	167	88.9	53.1	53.8	1730 J

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Frequency of Detection	Cleanup Goal[1]	Number of Exceedances	Number of Times Detected	Number of Samples Collected	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-28	MWT-28	MWT-28	MWT-28	MWT-28	MWT-28	MWT-29	MWT-29	MWT-29
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20068	ALBW20083	ALBW20098	ALBW20113	ALBW20128	ALBW20144	ALBW20070	ALBW20085	ALBW20084
Sample Date								1/3/2007	3/16/2007	6/5/2007	11/15/2007	6/25/2008	12/15/2008	1/3/2007	3/16/2007	3/16/2007
QC Code								SA	SA	SA	SA	SA	SA	SA	DU	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								1	2	3	4	5	6	1	2	2
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	20 UJ	20 U	20 U	5 U	4 U	2.6 U	2 U	4 U	5 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.1 U	2 U	4 U	5 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 UJ	5 U	4 U	3.1 U	2 U	4 U	5 U
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.3 U	2 U	4 U	5 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	20 UJ	20 U	20 U	5 U	4 U	7.5 U	2 U	4 U	5 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	20 UJ	20 U	20 U	5 U	4 U	2.9 U	2 U	4 U	5 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	4.1 U	2 U	4 U	5 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	20 UJ	20 U	20 U	5 U	4 U	10 UJ	2 U	4 U	5 U
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.7 U	2 U	4 U	5 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	20 UJ	20 U	20 U	5 U	4 U	2 U	2 U	4 U	5 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	20 UJ	20 U	20 U	5 U	4 U	2.1 U	2 U	4 U	5 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.4 U	2 U	4 U	5 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.6 U	2 U	4 U	5 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.6 U	2 U	4 U	5 U
Acetone	UG/L	2600	34%		0	30	88	2500 J	170	520	25 U	20 U	13 U	10 U	14 J	15 J
Benzene	UG/L	0	0%	1	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.6 U	2 U	4 U	5 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	20 UJ	20 U	20 U	5 U	4 U	3.8 U	2 U	4 U	5 U
Bromoform	UG/L	0	0%	80	0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.6 U	2 U	4 U	5 U
Carbon disulfide	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.9 U	2 U	4 U	5 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.7 U	2 U	4 U	5 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.8 U	2 U	4 U	5 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	20 UJ	20 U	20 U	5 U	4 U	3.2 U	2 U	4 U	5 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	20 UJ	20 U	20 U	5 U	4 UJ	3.2 U	2 U	4 U	5 U
Chloroform	UG/L	27	5%	7	3	4	88	20 UJ	20 U	20 U	5 U	4 U	3.4 U	2 U	4 U	5 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	20 UJ	20 U	20 U	5 U	4 U	1.6 U	280	220	220
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	20 UJ	20 U	20 U	5 U	4 U	3.6 U	2 U	4 U	5 U
Cyclohexane	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.2 U	2 U	4 U	5 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.8 U	2 U	4 U	5 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	20 UJ	20 U	20 U	5 U	4 U	1.8 U	2 U	4 U	5 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.9 U	2 U	4 U	5 U
Methyl Acetate	UG/L	6	2%		0	2	88	20 UJ	20 UJ	20 U	5 UJ	4 UJ	1.7 U	2 U	4 UJ	5 UJ
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.6 U	2 U	4 U	5 U
Methyl bromide	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 UJ	2.8 U	2 U	4 U	5 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	100 UJ	100 U	100 U	25 UJ	20 UJ	12 U	10 U	20 U	25 U
Methyl chloride	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	3.4 U	2 U	4 U	5 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	20 UJ	20 U	20 U	5 U	4 U	2.2 U	2 U	4 U	5 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	4900 J	180	510	25 U	20 U	13 U	10 U	20 U	25 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	100 UJ	100 U	100 U	25 U	20 U	9.1 U	10 U	20 U	25 U
Methylene chloride	UG/L	18	14%	5	7	12	88	13 J	20 U	9.3 J	5 U	4 U	4.4 UJ	2 U	4 U	2.5 J
Styrene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	1.8 U	2 U	4 U	5 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 U	5 U	4 U	3.6 U	2 U	4 U	5 U
Toluene	UG/L	590	23%	5	16	20	88	330 J	160	500	210	53	5.1 U	2.6	2.2 J	5 U
Total Xylenes	UG/L	0	0%	5	0	0	88	60 UJ	60 U	60 U	15 U	12 U	9.3 U	6 U	12 U	15 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	20 UJ	20 U	20 U	5 U	4 U	1.3 U	6.5	8	7.5
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	20 UJ	20 U	20 U	5 U	4 U	3.7 U	2 U	4 U	5 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	20 UJ	20 U	20 U	5 U	4 U	1.8 U	22	19	19
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	20 UJ	20 U	20 UJ	5 U	4 UJ	1.5 U	2 U	4 U	5 U
Vinyl chloride	UG/L	180	66%	2	49	58	88	20 UJ	20 U	20 U	5 U	4 U	2.4 U	140	170	160
Other																
Manganese	UG/L	56900	100%		0	12	12	31800	4450					7250	6500	6280
Ethane	UG/L	98	83%		0	33	40	10000 UJ	0.67	0.01 J	0.014 J	0.65	2	2000 U	25	20
Ethene	UG/L	200	83%		0	33	40	10000 UJ	0.48	0.057	0.025 U	0.044	0.12	2000 U	150	120
Methane	UG/L	23000	93%		0	37	40	12000 J	19000	11000	11000	12000	19000	2000 U	8100	6500
Sulfate	MG/L	1060	68%		0	27	40	2 U	2 U	2 U	2 U	2 U	48.3	113	173	179
Total Organic Carbon	MG/L	2050	100%		0	40	40	1820 J	171	309	92	49.2	27.9	25.1 J	36.7	35

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-29	MWT-29	MWT-29	MWT-29	MWT-29	MWT-22	MWT-22	MWT-22	MWT-22
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20099	ALBW20114	ALBW20130	ALBW20129	ALBW20145	ALBW20071	ALBW20075	ALBW20100	ALBW20115
Sample Date								6/5/2007	11/14/2007	6/25/2008	6/25/2008	12/15/2008	1/4/2007	3/17/2007	6/6/2007	11/14/2007
QC Code								SA	SA	DU	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								3	4	5	5	6	1	2	3	4
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Cleanup Goal[1]**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	2 U	1 U	1 U	1 U	0.26 UJ	2 U	4 U	1 U	1 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.21 UJ	2 U	4 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	2 UJ	1 U	1 U	1 U	0.31 UJ	2 U	4 U	1 UJ	1 U
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	2 U	1 U	1 U	1 U	0.23 UJ	2 U	4 U	1 U	1 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	2 U	1 U	1 U	1 U	0.75 U	2 U	4 U	1 U	1 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	2 U	1 U	1 U	1 U	0.29 U	2 U	4 U	1 U	1 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.41 UJ	2 U	4 U	1 U	1 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	2 U	1 U	1 U	1 U	1 UJ	2 U	4 U	1 U	1 U
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	2 U	1 U	1 U	1 U	0.17 UJ	2 U	4 U	1 U	1 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	2 U	1 U	1 U	1 U	0.2 U	2 U	4 U	1 U	1 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	2 U	1 U	1 U	1 U	0.21 U	2 U	4 U	1 U	1 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	2 U	1 U	1 U	1 U	0.14 U	2 U	4 U	1 U	1 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	2 U	1 U	1 U	1 U	0.16 U	2 U	4 U	1 U	1 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	2 U	1 U	1 U	1 U	0.16 U	2 U	4 U	1 U	1 U
Acetone	UG/L	2600	34%		0	30	88	5.7 J	5 U	5 U	5 U	1.3 UJ	10 U	18 J	38	5 U
Benzene	UG/L	0	0%	1	0	0	88	2 U	1 U	1 U	1 U	0.16 U	2 U	4 U	1 U	1 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	2 U	1 U	1 U	1 U	0.38 U	2 U	4 U	1 U	1 U
Bromoform	UG/L	0	0%	80	0	0	88	2 U	1 U	1 U	1 U	0.26 UJ	2 U	4 U	1 U	1 U
Carbon disulfide	UG/L	0	0%		0	0	88	2 U	1 U	1 U	1 U	0.19 U	2 U	4 U	1 U	1 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.27 UJ	2 U	4 U	1 U	1 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.18 U	2 U	4 U	1 U	1 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	2 U	1 U	1 U	1 U	0.32 U	2 U	4 U	1 U	1 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	2 U	1 U	1 UJ	1 UJ	0.32 U	2 UJ	4 U	1 U	1 U
Chloroform	UG/L	27	5%	7	3	4	88	2 U	1 U	1 U	1 U	0.34 U	2 U	4 U	1 U	1 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	**100**	**96**	**85**	**83**	**91**	**130**	**90**	**120**	**99**
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	2 U	1 U	1 U	1 U	0.36 U	2 U	4 U	1 U	1 U
Cyclohexane	UG/L	0	0%		0	0	88	2 U	1 U	1 U	1 U	0.22 UJ	2 U	4 U	1 U	1 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.28 U	2 U	4 U	1 U	1 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	2 U	1 U	1 U	1 U	0.18 U	2 U	4 U	1 U	1 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.19 U	2 U	4 U	1 U	1 U
Methyl Acetate	UG/L	6	2%		0	2	88	2 U	1 UJ	1 UJ	1 UJ	0.17 UJ	2 U	4 UJ	1 U	1 UJ
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	2 U	1 U	1 U	1 U	0.16 UJ	2 U	4 U	1 U	1 U
Methyl bromide	UG/L	0	0%	5	0	0	88	2 U	1 U	1 UJ	1 UJ	0.28 U	2 U	4 U	1 U	1 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	10 U	5 UJ	5 UJ	5 UJ	1.2 U	10 U	20 U	5 U	5 UJ
Methyl chloride	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.34 U	2 U	4 U	1 U	1 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	2 U	1 U	1 U	1 U	0.22 UJ	2 U	4 U	1 U	1 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	10 U	5 U	5 U	5 U	1.3 UJ	6 J	20 U	5 U	5 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	10 U	5 U	5 U	5 U	0.91 UJ	10 U	20 U	5 U	5 U
Methylene chloride	UG/L	18	14%	5	7	12	88	2 U	1 U	1 U	1 U	0.44 UJ	1.2 J	4 U	1 U	1 U
Styrene	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.18 U	2 U	4 U	1 U	1 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	2 U	1 U	1 U	1 U	0.36 U	2 U	4 U	1 U	1 U
Toluene	UG/L	590	23%	5	16	20	88	2 U	2.1	1 U	1 U	0.51 U	2 U	4 U	1 U	1 U
Total Xylenes	UG/L	0	0%	5	0	0	88	6 U	3 U	3 U	3 U	0.93 U	6 U	12 U	3 U	3 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	2.1	0.83 J	0.68 J	0.62 J	0.6 J	2.7	4 U	3.2	0.85 J
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	2 U	1 U	1 U	1 U	0.37 U	2 U	4 U	1 U	1 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	**7.6**	4.4	3.3	3.2	**6.6**	**5.2**	3.8 J	**6.5**	2.6
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	2 UJ	1 U	1 UJ	1 UJ	0.15 UJ	2 U	4 U	1 UJ	1 U
Vinyl chloride	UG/L	180	66%	2	49	58	88	**81**	**74**	**74**	**73**	**80**	**98**	**64**	**81**	**180**
Other																
Manganese	UG/L	56900	100%		0	12	12									
Ethane	UG/L	98	83%		0	33	40	13	19	14	15	14				
Ethene	UG/L	200	83%		0	33	40	160	200	140	140	19				
Methane	UG/L	23000	93%		0	37	40	2800	2600	3000	3200	2700				
Sulfate	MG/L	1060	68%		0	27	40	151	289	174	173	312				
Total Organic Carbon	MG/L	2050	100%		0	40	40	15.7	20.9	14	14.2	13.6				

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

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Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-22	MWT-22	PT-22	PT-22	PT-22	PT-22	PT-22	PT-22	MWT-23
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20121	ALBW20136	ALBW20060	ALBW20086	ALBW20089	ALBW20104	ALBW20118	ALBW20133	ALBW20065
Sample Date								6/25/2008	12/15/2008	1/3/2007	3/15/2007	6/5/2007	11/14/2007	6/26/2008	12/15/2008	1/3/2007
QC Code								SA	SA	SA	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								5	6	1	2	3	4	5	6	1
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Cleanup Goal[1]**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	5 U	1.3 UJ	1 U	1 U	1 U	1 U	1 U	0.26 U	4 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	5 U	1 UJ	1 U	1 U	1 U	1 U	1 U	0.21 U	4 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	5 UJ	1.6 UJ	1 U	1 U	1 U	1 U	1 UJ	0.31 U	4 U
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	5 U	1.2 UJ	1 U	1 U	1 U	1 U	1 U	0.23 U	4 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	5 U	3.8 U	1 U	1 U	1 U	1 U	1 U	0.75 U	4 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	5 U	1.4 U	1 U	1 U	1 U	1 U	1 U	0.29 U	4 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	5 U	2 UJ	1 U	1 U	1 UJ	1 U	1 U	0.41 U	4 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	5 UJ	5 UJ	1 U	1 U	1 U	1 U	1 UJ	1 UJ	4 U
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	5 U	0.85 UJ	1 U	1 U	1 U	1 U	1 U	0.17 U	4 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	5 U	1 U	1 U	1 U	1 U	1 U	1 U	0.2 U	4 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	5 U	1 U	3.3	2.4	5.6	5	3.9	2.8	2.3 J
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	5 U	0.7 U	1 U	1 U	1 U	1 U	1 U	0.14 U	4 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	5 U	0.8 U	1 U	1 U	1 U	1 U	1 U	0.16 U	4 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	5 U	0.8 U	1 U	1 U	1 U	1 U	1 U	0.16 U	4 U
Acetone	UG/L	2600	34%		0	30	88	25 U	6.5 UJ	5 U	5 U	3.8 J	5.3	5 U	1.3 U	180
Benzene	UG/L	0	0%	1	0	0	88	5 U	0.8 U	1 U	1 U	1 U	1 U	1 U	0.16 U	4 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	5 U	1.9 U	1 U	1 U	1 U	1 U	1 U	0.38 U	4 U
Bromoform	UG/L	0	0%	80	0	0	88	5 U	1.3 UJ	1 U	1 U	1 U	1 U	1 U	0.26 U	4 U
Carbon disulfide	UG/L	0	0%		0	0	88	5 U	0.95 U	1 U	1 U	1 U	1 U	1 U	0.19 U	4 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	5 U	1.4 UJ	1 U	1 U	1 U	1 U	1 U	0.27 U	4 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	5 U	0.9 U	1 U	1 U	1 U	1 U	1 U	0.18 U	4 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	5 U	1.6 U	1 U	1 U	1 U	1 U	1 U	0.32 U	4 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	5 UJ	1.6 U	1 UJ	1 U	1.1 J	0.82 J	1 UJ	0.32 U	4 U
Chloroform	UG/L	27	5%	7	3	4	88	5 U	1.7 U	1 U	1 U	1 U	1 U	1 U	0.34 U	4 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	68	160	57	41	61	30	26	52	60
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	5 U	1.8 U	1 U	1 U	1 U	1 U	1 U	0.36 U	4 U
Cyclohexane	UG/L	0	0%		0	0	88	5 U	1.1 UJ	1 U	1 U	1 U	1 U	1 U	0.22 U	4 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	5 U	1.4 U	1 U	1 U	1 UJ	1 U	1 U	0.28 U	4 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	5 U	0.9 U	1 U	1 U	1 U	1 U	1 U	0.18 U	4 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	5 U	0.95 U	1 U	1 U	1 U	1 U	1 U	0.19 U	4 U
Methyl Acetate	UG/L	6	2%		0	2	88	5 UJ	0.85 UJ	1 U	1 UJ	1 UJ	1 U	1 UJ	0.17 U	4 U
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	5 U	0.8 UJ	1 U	1 U	1 U	1 U	1 U	0.16 U	4 U
Methyl bromide	UG/L	0	0%	5	0	0	88	5 UJ	1.4 U	1 U	1 U	1 UJ	1 U	1 UJ	0.28 U	4 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	25 UJ	6 U	5 U	5 U	5 U	5 U	5 UJ	1.2 U	20 U
Methyl chloride	UG/L	0	0%	5	0	0	88	5 UJ	1.7 U	1 U	1 U	1 U	1 U	1 UJ	0.34 U	4 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	5 U	1.1 UJ	1 U	1 U	1 UJ	1 U	1 U	0.22 U	4 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	25 UJ	6.5 UJ	5 U	5 U	5 U	5 U	5 UJ	1.3 U	250
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	25 UJ	4.6 UJ	5 U	5 U	5 U	5 U	5 UJ	0.91 U	20 U
Methylene chloride	UG/L	18	14%	5	7	12	88	5 U	2.2 UJ	1 UJ	1 U	1 U	1 U	1 U	0.44 UJ	2.8 J
Styrene	UG/L	0	0%	5	0	0	88	5 U	0.9 U	1 U	1 U	1 U	1 U	1 U	0.18 U	4 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	5 U	1.8 U	1 U	1 U	1 U	1 U	1 U	0.36 U	4 U
Toluene	UG/L	590	23%	5	16	20	88	5 U	2.6 U	1 U	1 U	1 U	1 U	1 U	0.51 U	4 U
Total Xylenes	UG/L	0	0%	5	0	0	88	15 U	4.6 U	3 U	3 U	3 U	3 U	3 U	0.93 U	12 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	5 U	0.65 U	0.86 J	0.51 J	0.72 J	0.67 J	0.57 J	0.41 J	4 U
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	5 U	1.8 U	1 U	1 U	1 U	1 U	1 U	0.37 U	4 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	3 J	5.9	11	16	8.5	9.7	4.1	35	4 U
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	5 UJ	0.75 UJ	1 U	1 U	1 U	1 U	1 UJ	0.15 U	4 U
Vinyl chloride	UG/L	180	66%	2	49	58	88	42	140	22	13	32	11	13	1.3	23
Other																
Manganese	UG/L	56900	100%		0	12	12									19500
Ethane	UG/L	98	83%		0	33	40									10000 U
Ethene	UG/L	200	83%		0	33	40									10000 U
Methane	UG/L	23000	93%		0	37	40									12000
Sulfate	MG/L	1060	68%		0	27	40									2 U
Total Organic Carbon	MG/L	2050	100%		0	40	40									260 J

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-23	MWT-23	MWT-23	MWT-23	MWT-23	MWT-23	MWT-24	MWT-24	MWT-24
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20080	ALBW20094	ALBW20110	ALBW20109	ALBW20125	ALBW20140	ALBW20063	ALBW20078	ALBW20092
Sample Date								3/16/2007	6/6/2007	11/16/2007	11/16/2007	6/25/2008	12/12/2008	1/3/2007	3/15/2007	6/5/2007
QC Code								SA	SA	DU	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								2	3	4	4	5	6	1	2	3
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Cleanup Goal[1]**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	4 U	2 U	4 U	10 U	1 U	0.26 UJ	0.71 J	0.58 J	2 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.21 U	1 U	1 U	2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	4 U	2 UJ	4 U	10 U	1 U	0.31 U	1 U	1 U	2 UJ
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	4 U	2 U	4 U	10 U	1 U	0.23 U	1 U	1 U	2 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	4 U	2 U	4 U	10 U	1 U	0.75 U	0.81 J	0.83 J	1.1 J
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	4 U	2 U	4 U	10 U	1 U	0.29 U	1 U	1 U	2 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.41 U	1 U	1 U	2 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	4 U	2 U	4 U	10 U	1 U	1 UJ	1 U	1 U	2 U
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	4 U	2 U	4 U	10 U	1 U	0.17 U	1 U	1 U	2 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	4 U	2 U	4 U	10 U	1 U	0.2 U	1 U	1 U	2 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	4 U	1.6 J	4 U	10 U	0.6 J	0.6 J	1 U	1 U	2 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	4 U	2 U	4 U	10 U	1 U	0.14 U	1 U	1 U	2 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	4 U	2 U	4 U	10 U	1 U	0.16 U	1 U	1 U	2 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	4 U	2 U	4 U	10 U	1 U	0.16 U	1 U	1 U	2 U
Acetone	UG/L	2600	34%		0	30	88	190	190	62	64	4 J	1.3 U	42 U	54	73
Benzene	UG/L	0	0%	1	0	0	88	4 U	2 U	4 U	10 U	1 U	0.16 U	1 U	1 U	2 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	4 U	2 U	4 U	10 U	1 U	0.38 U	1 U	1 U	2 U
Bromoform	UG/L	0	0%	80	0	0	88	4 U	2 U	4 U	10 U	1 U	0.26 U	1 U	1 U	2 U
Carbon disulfide	UG/L	0	0%		0	0	88	4 U	2 U	4 U	10 U	1 U	0.19 U	1 U	1 U	2 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.27 UJ	1 U	1 U	2 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.18 U	1 U	1 U	2 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	4 U	2 U	4 U	10 U	1 U	0.32 U	1 U	1 U	2 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	4 U	2 U	4 U	10 U	1 UJ	0.32 U	1 U	1 U	2 U
Chloroform	UG/L	27	5%	7	3	4	88	4 U	2 U	4 U	10 U	1 U	0.34 U	1 U	1 U	2 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	11	3.1	2.1 J	10 U	1 U	2.4	210	68	19
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	4 U	2 U	4 U	10 U	1 U	0.36 U	1 U	1 U	2 U
Cyclohexane	UG/L	0	0%		0	0	88	4 U	2 U	4 U	10 U	1 U	0.22 U	1 U	1 U	2 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.28 UJ	1 U	1 U	2 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	4 U	1.3 J	4 U	10 U	0.85 J	0.71 J	1 U	1 U	2 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.19 U	1 U	1 U	2 U
Methyl Acetate	UG/L	6	2%		0	2	88	4 UJ	5.1	4 UJ	10 U	1 UJ	0.17 U	1 U	1 UJ	6
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	4 U	2 U	4 U	10 U	1 U	0.16 U	1 U	1 U	2 U
Methyl bromide	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 UJ	0.28 U	1 U	1 U	2 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	20 U	10 U	20 UJ	50 U	5 UJ	1.2 U	5 U	5 U	10 U
Methyl chloride	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.34 U	1 U	1 U	2 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	4 U	2 U	4 U	10 U	1 U	0.22 U	1 U	1 U	2 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	130	73	25	26 J	12	1.3 U	24	36	40
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	20 U	10 U	20 U	50 U	5 U	0.91 U	5 U	5 U	10 U
Methylene chloride	UG/L	18	14%	5	7	12	88	4 U	2 U	4 U	12	1 U	0.44 UJ	1 U	1 U	1 J
Styrene	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.18 U	1 U	1 U	2 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	4 U	2 U	4 U	10 U	1 U	0.36 U	1 U	1 U	2 U
Toluene	UG/L	590	23%	5	16	20	88	7.4	37	590	570	300	43	1 U	1 U	2 U
Total Xylenes	UG/L	0	0%	5	0	0	88	12 U	6 U	12 U	30 U	3 U	0.93 U	3 U	3 U	6 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	4 U	2 U	4 U	10 U	1 U	0.13 U	2.1	0.88 J	2 U
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	4 U	2 U	4 U	10 U	1 U	0.37 U	1 U	1 U	2 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	4 U	2 U	4 U	10 U	1 U	0.41 J	0.94 J	1 U	2 U
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	4 U	2 UJ	4 U	10 U	1 UJ	0.15 UJ	1 U	1 U	2 UJ
Vinyl chloride	UG/L	180	66%	2	49	58	88	4.8	2 U	2.3 J	10 U	1 U	2.8	19	45	22
Other																
Manganese	UG/L	56900	100%		0	12	12	19500								
Ethane	UG/L	98	83%		0	33	40	45	4.1	0.66	0.49	0.53	4.6			
Ethene	UG/L	200	83%		0	33	40	5.9	0.28	0.39	0.3	0.048	1.2			
Methane	UG/L	23000	93%		0	37	40	23000	18000	17000	15000	18000	19000			
Sulfate	MG/L	1060	68%		0	27	40	2 U	2 U	2.7	2.8	2 U	6.3			
Total Organic Carbon	MG/L	2050	100%		0	40	40	210	303	155	147	28.4	20.1			

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-24	MWT-24	MWT-24	PT-17	PT-17	PT-17	PT-17	PT-17	PT-17
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20107	ALBW20122	ALBW20137	ALBW20058	ALBW20073	ALBW20087	ALBW20102	ALBW20116	ALBW20131
Sample Date								11/13/2007	6/26/2008	12/12/2008	1/2/2007	3/15/2007	6/5/2007	11/13/2007	6/26/2008	12/11/2008
QC Code								SA	SA	SA	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								4	5	6	1	2	3	4	5	6
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Cleanup Goal[1]**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**	**Value (Q)**
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	1 U	5 U	0.76 J	1 U	2 U	1 U	1 U	1 U	0.26 UJ
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	1 U	5 U	0.21 U	1 U	2 U	1 U	1 U	1 U	0.21 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	1 U	5 UJ	0.31 U	1 U	2 U	1 UJ	1 U	1 UJ	0.31 U
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	1 U	5 U	0.23 U	1 U	2 U	1 U	1 U	1 U	0.23 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	1 U	5 U	0.75 U	1 U	2 U	1 U	1 U	1 U	0.75 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	1 U	5 U	0.29 U	1 U	2 U	1 U	1 U	1 U	0.29 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	1 U	5 U	0.41 U	1 U	2 U	1 U	1 U	1 U	0.41 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	1 U	5 UJ	1 UJ	1 U	2 U	1 U	1 U	1 UJ	1 UJ
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	1 U	5 U	0.17 U	1 U	2 U	1 U	1 U	1 U	0.17 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	5 U	0.2 U	1 U	2 U	1 U	1 U	1 U	0.2 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	1 U	5 U	0.21 U	1 U	2 U	1 U	1 U	1 U	0.21 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	1 U	5 U	0.14 U	1 U	2 U	1 U	1 U	1 U	0.14 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	5 U	0.16 U	1 U	2 U	1 U	1 U	1 U	0.16 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	5 U	0.16 U	1 U	2 U	1 U	1 U	1 U	0.16 U
Acetone	UG/L	2600	34%		0	30	88	5 U	25 U	1.3 U	9.3 U	22	5 U	5 U	5 U	1.3 U
Benzene	UG/L	0	0%	1	0	0	88	1 U	5 U	0.16 U	1 U	2 U	1 U	1 U	1 U	0.16 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	1 U	5 U	0.38 U	1 U	2 U	1 U	1 U	1 U	0.38 U
Bromoform	UG/L	0	0%	80	0	0	88	1 U	5 U	0.26 U	1 U	2 U	1 U	1 U	1 U	0.26 U
Carbon disulfide	UG/L	0	0%		0	0	88	1 U	5 U	0.19 U	1 U	2 U	1 U	1 U	1 U	0.19 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	1 U	5 U	0.27 UJ	1 U	2 U	1 U	1 U	1 U	0.27 UJ
Chlorobenzene	UG/L	0	0%	5	0	0	88	1 U	5 U	0.18 U	1 U	2 U	1 U	1 U	1 U	0.18 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	1 U	5 U	0.32 U	1 U	2 U	1 U	1 U	1 U	0.32 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	1 U	5 UJ	0.32 U	1 U	2 U	1 U	1 U	1 UJ	0.32 U
Chloroform	UG/L	27	5%	7	3	4	88	1 U	5 U	0.34 U	1 U	2 U	1 U	1 U	1 U	0.34 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	6.7	31	52	62	26	43	27	21	24
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	5 U	0.36 U	1 U	2 U	1 U	1 U	1 U	0.36 U
Cyclohexane	UG/L	0	0%		0	0	88	1 U	5 U	0.22 U	1 U	2 U	1 U	1 U	1 U	0.22 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	1 U	5 U	0.28 UJ	1 U	2 U	1 U	1 U	1 U	0.28 UJ
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	1 U	5 U	0.18 U	1 U	2 U	1 U	1 U	1 U	0.18 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	1 U	5 U	0.19 U	1 U	2 U	1 U	1 U	1 U	0.19 U
Methyl Acetate	UG/L	6	2%		0	2	88	1 UJ	5 UJ	0.17 U	1 U	2 UJ	1 U	1 UJ	1 UJ	0.17 U
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	1 U	5 U	0.16 U	1 U	2 U	1 U	1 U	1 U	0.16 U
Methyl bromide	UG/L	0	0%	5	0	0	88	1 U	5 UJ	0.28 U	1 U	2 U	1 U	1 U	1 UJ	0.28 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	5 UJ	25 UJ	1.2 U	5 U	10 U	5 U	5 UJ	5 UJ	1.2 U
Methyl chloride	UG/L	0	0%	5	0	0	88	1 U	5 UJ	0.34 U	1 U	2 U	1 U	1 U	1 UJ	0.34 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	1 U	5 U	0.22 U	1 U	2 U	1 U	1 U	1 U	0.22 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	5 U	25 UJ	1.3 U	5.4	11	5 U	5 U	5 UJ	1.3 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	5 U	25 UJ	0.91 U	5 U	10 U	5 U	5 U	5 UJ	0.91 U
Methylene chloride	UG/L	18	14%	5	7	12	88	1 U	5 U	0.44 UJ	1 U	1.2 J	1 U	1 U	1 U	0.44 UJ
Styrene	UG/L	0	0%	5	0	0	88	1 U	5 U	0.18 U	1 U	2 U	1 U	1 U	1 U	0.18 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	1 U	5 U	0.36 U	1 U	2 U	1 U	1 U	1 U	0.36 U
Toluene	UG/L	590	23%	5	16	20	88	1 U	5 U	0.51 U	1 U	2 U	1 U	1 U	1 U	0.51 U
Total Xylenes	UG/L	0	0%	5	0	0	88	3 U	15 U	0.93 U	3 U	6 U	3 U	3 U	3 U	0.93 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	1 U	5 U	0.13 U	1 U	2 U	0.77 J	0.54 J	1 U	0.46 J
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	5 U	0.37 U	1 U	2 U	1 U	1 U	1 U	0.37 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	1.6	5 U	6	6	11	3.4	15	8.5	9.2
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	1 U	5 UJ	0.15 UJ	1 U	2 U	1 UJ	1 U	1 UJ	0.15 UJ
Vinyl chloride	UG/L	180	66%	2	49	58	88	3.8	5 U	3.6	21	21	9.9	22	23	10
Other																
Manganese	UG/L	56900	100%		0	12	12									
Ethane	UG/L	98	83%		0	33	40								98	6.9
Ethene	UG/L	200	83%		0	33	40								66	6.6
Methane	UG/L	23000	93%		0	37	40								5700	380
Sulfate	MG/L	1060	68%		0	27	40								15.2	45.8
Total Organic Carbon	MG/L	2050	100%		0	40	40								6	2.6

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Frequency of Detection	Cleanup Goal[1]	Number of Exceedances	Number of Times Detected	Number of Samples Collected	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								MWT-7	MWT-7	MWT-7	MWT-7	MWT-7	MWT-7	PT-24	PT-24	PT-24
Matrix								GW	GW	GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20062	ALBW20077	ALBW20091	ALBW20106	ALBW20120	ALBW20135	ALBW20061	ALBW20076	ALBW20090
Sample Date								1/4/2007	3/15/2007	6/5/2007	11/13/2007	6/25/2008	12/15/2008	1/2/2007	3/15/2007	6/5/2007
QC Code								SA	SA	SA	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								1	2	3	4	5	6	1	2	3
VOCs																
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	1 U	1 U	1 U	1 U	1 U	0.26 U	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.21 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 UJ	1 U	1 UJ	0.31 U	1 U	1 U	1 UJ
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	1 U	1 U	1 U	1 U	1 U	0.23 U	1 U	1 U	1 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	1 U	1 U	1 U	1 U	1 U	0.75 U	0.68 J	1 U	0.75 J
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	1 U	1 U	1 U	1 U	1 U	0.29 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.41 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	1 U	1 U	1 U	1 U	1 UJ	1 UJ	1 U	1 U	1 U
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	1 U	1 U	1 U	1 U	1 U	0.17 U	1 U	1 U	1 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	1 U	1 U	1 U	0.2 U	1 U	1 U	1 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	1 U	1 U	1 U	1 U	1 U	0.21 U	1 U	1 U	1 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	1 U	1 U	1 U	1 U	1 U	0.14 U	1 U	1 U	1 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
Acetone	UG/L	2600	34%		0	30	88	5 U	5 U	5 U	5 U	5 U	1.3 U	5 U	5 U	5 U
Benzene	UG/L	0	0%	1	0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	1 U	1 U	1 U	1 U	1 U	0.38 U	1 U	1 U	1 U
Bromoform	UG/L	0	0%	80	0	0	88	1 U	1 U	1 U	1 U	1 U	0.26 U	1 U	1 U	1 U
Carbon disulfide	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.19 U	1 U	1 U	1 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.27 U	1 U	1 U	1 U
Chlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.18 U	1 U	1 U	1 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	1 U	1 U	1 U	1 U	1 U	0.32 U	1 U	1 U	1 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	1 U	1 U	1 U	0.65 J	1 UJ	0.93 J	1 U	1 U	1 U
Chloroform	UG/L	27	5%	7	3	4	88	1 U	1 U	1 U	1 U	1 U	0.34 U	1 U	1 U	1 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	35	42	61	90	90	79	54	38	60
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	1 U	1 U	1 U	0.36 U	1 U	1 U	1 U
Cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.22 U	1 U	1 U	1 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.28 U	1 U	1 U	1 U
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	1 U	1 U	1 U	1 U	1 U	0.18 U	1 U	1 U	1 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.19 U	1 U	1 U	1 U
Methyl Acetate	UG/L	6	2%		0	2	88	1 U	1 UJ	1 U	1 UJ	1 UJ	0.17 U	1 U	1 UJ	1 U
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.16 U	1 U	1 U	1 U
Methyl bromide	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 UJ	0.28 U	1 U	1 U	1 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	5 U	5 U	5 U	5 UJ	5 UJ	1.2 U	5 U	5 U	5 U
Methyl chloride	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 UJ	0.34 U	1 U	1 U	1 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	1 U	1 U	1 U	0.22 U	1 U	1 U	1 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	5 U	5 U	5 U	5 U	5 UJ	1.3 U	5 U	5 U	5 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	5 U	5 U	5 U	5 U	5 UJ	0.91 U	5 U	5 U	5 U
Methylene chloride	UG/L	18	14%	5	7	12	88	1 U	1 U	1 U	1 U	1 U	0.44 UJ	1 U	1 U	1 U
Styrene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.18 U	1 U	1 U	1 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	1 U	1 U	1 U	1 U	1 U	0.36 U	1 U	1 U	1 U
Toluene	UG/L	590	23%	5	16	20	88	1 U	1 U	1 U	1 U	1 U	0.51 U	1 U	1 U	1 U
Total Xylenes	UG/L	0	0%	5	0	0	88	3 U	3 U	3 U	3 U	3 U	0.93 U	3 U	3 U	3 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	1 U	1 U	1 U	1 U	1 U	0.13 U	0.86 J	0.81 J	1.6
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	1 U	1 U	1 U	0.37 U	1 U	1 U	1 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	490	440	410	510	440	410	4	2.8	3.1
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 U	1 UJ	1 U	1 UJ	0.15 U	1 U	1 U	1 UJ
Vinyl chloride	UG/L	180	66%	2	49	58	88	0.51 J	9.7	18	24	12	13	0.6 J	1 U	2.6
Other																
Manganese	UG/L	56900	100%		0	12	12									
Ethane	UG/L	98	83%		0	33	40					6.7	11			
Ethene	UG/L	200	83%		0	33	40					2	0.27			
Methane	UG/L	23000	93%		0	37	40					400	670			
Sulfate	MG/L	1060	68%		0	27	40					29.1	29.1			
Total Organic Carbon	MG/L	2050	100%		0	40	40					2.3	3			

Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

Appendix A
Table A-1
Complete Groundwater Data for Ash Landfill Long Term Monitoring
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Frequency of Detection	Cleanup Goal[1]	Number of Exceedances	Number of Times Detected	Number of Samples Collected	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Facility								ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL	ASH LANDFILL
Location ID								PT-24	PT-24	PT-24	MW-56	MW-56	MW-56	MW-56
Matrix								GW	GW	GW	GW	GW	GW	GW
Sample ID								ALBW20105	ALBW20119	ALBW20134	ALBW20072	ALBW20101	ALBW20124	ALBW20139
Sample Date								11/13/2007	6/26/2008	12/12/2008	1/4/2007	6/6/2007	6/26/2008	12/11/2008
QC Code								SA	SA	SA	SA	SA	SA	SA
Study ID								LTM	LTM	LTM	LTM	LTM	LTM	LTM
Sampling Round								4	5	6	1	3	5	6
VOCs														
1,1,1-Trichloroethane	UG/L	0.76	3%	5	0	3	88	1 U	1 U	0.26 U	1 U	1 U	1 U	0.26 UJ
1,1,2,2-Tetrachloroethane	UG/L	0	0%	5	0	0	88	1 U	1 U	0.21 U	1 U	1 U	1 U	0.21 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.31 U	1 U	1 UJ	1 UJ	0.31 U
1,1,2-Trichloroethane	UG/L	0	0%	1	0	0	88	1 U	1 U	0.23 U	1 U	1 U	1 U	0.23 U
1,1-Dichloroethane	UG/L	1.1	8%	5	0	7	88	0.56 J	0.69 J	0.75 U	1 U	1 U	1 U	0.75 U
1,1-Dichloroethene	UG/L	2.1	6%	5	0	5	88	1 U	1 U	0.29 U	1 U	1 U	1 U	0.29 U
1,2,4-Trichlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.41 U	1 U	1 U	1 U	0.41 U
1,2-Dibromo-3-chloropropane	UG/L	0	0%	0.04	0	0	88	1 U	1 UJ	1 UJ	1 U	1 U	1 UJ	1 UJ
1,2-Dibromoethane	UG/L	0	0%	0.0006	0	0	88	1 U	1 U	0.17 U	1 U	1 U	1 U	0.17 U
1,2-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	0.2 U	1 U	1 U	1 U	0.2 U
1,2-Dichloroethane	UG/L	5.6	11%	0.6	8	10	88	1 U	1 U	0.21 U	1 U	1 U	1 U	0.21 U
1,2-Dichloropropane	UG/L	0	0%	1	0	0	88	1 U	1 U	0.14 U	1 U	1 U	1 U	0.14 U
1,3-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	0.16 U
1,4-Dichlorobenzene	UG/L	0	0%	3	0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	0.16 U
Acetone	UG/L	2600	34%		0	30	88	5 U	5 U	1.3 U	5 U	5 U	5 U	1.3 U
Benzene	UG/L	0	0%	1	0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	0.16 U
Bromodichloromethane	UG/L	0	0%	80	0	0	88	1 U	1 U	0.38 U	1 U	1 U	1 U	0.38 U
Bromoform	UG/L	0	0%	80	0	0	88	1 U	1 U	0.26 U	1 U	1 U	1 U	0.26 U
Carbon disulfide	UG/L	0	0%		0	0	88	1 U	1 U	0.19 U	1 U	1 U	1 U	0.19 U
Carbon tetrachloride	UG/L	0	0%	5	0	0	88	1 U	1 U	0.27 U	1 U	1 U	1 U	0.27 UJ
Chlorobenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.18 U	1 U	1 U	1 U	0.18 U
Chlorodibromomethane	UG/L	0	0%	80	0	0	88	1 U	1 U	0.32 U	1 U	1 U	1 U	0.32 U
Chloroethane	UG/L	1.1	5%	5	0	4	88	1 U	1 UJ	0.32 U	1 U	1 U	1 UJ	0.32 U
Chloroform	UG/L	27	5%	7	3	4	88	1 U	1 U	0.34 U	1 U	1 U	1 U	0.34 U
Cis-1,2-Dichloroethene	UG/L	720	82%	5	61	72	88	39	48	34	1.2	1.7	1.3	0.4 J
Cis-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	0.36 U	1 U	1 U	1 U	0.36 U
Cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	0.22 U	1 U	1 U	1 U	0.22 U
Dichlorodifluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 U	0.28 U	1 U	1 U	1 U	0.28 UJ
Ethyl benzene	UG/L	1.3	3%	5	0	3	88	1 U	1 U	0.18 U	1 U	1 U	1 U	0.18 U
Isopropylbenzene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.19 U	1 U	1 U	1 U	0.19 U
Methyl Acetate	UG/L	6	2%		0	2	88	1 UJ	1 UJ	0.17 U	1 U	1 U	1 UJ	0.17 U
Methyl Tertbutyl Ether	UG/L	0	0%		0	0	88	1 U	1 U	0.16 U	1 U	1 U	1 U	0.16 U
Methyl bromide	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.28 U	1 U	1 U	1 UJ	0.28 U
Methyl butyl ketone	UG/L	0	0%		0	0	88	5 UJ	5 UJ	1.2 U	5 U	5 U	5 UJ	1.2 U
Methyl chloride	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.34 U	1 U	1 U	1 UJ	0.34 U
Methyl cyclohexane	UG/L	0	0%		0	0	88	1 U	1 U	0.22 U	1 U	1 U	1 U	0.22 U
Methyl ethyl ketone	UG/L	4900	24%		0	21	88	5 U	5 UJ	1.3 U	5 U	5 U	5 UJ	1.3 U
Methyl isobutyl ketone	UG/L	0	0%		0	0	88	5 U	5 UJ	0.91 U	5 U	5 U	5 UJ	0.91 U
Methylene chloride	UG/L	18	14%	5	7	12	88	1 U	1 U	0.44 UJ	1 U	1 U	1 U	0.44 UJ
Styrene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.18 U	1 U	1 U	1 U	0.18 U
Tetrachloroethene	UG/L	0	0%	5	0	0	88	1 U	1 U	0.36 U	1 U	1 U	1 U	0.36 U
Toluene	UG/L	590	23%	5	16	20	88	1 U	1 U	0.51 U	1 U	1 U	1 U	0.51 U
Total Xylenes	UG/L	0	0%	5	0	0	88	3 U	3 U	0.93 U	3 U	3 U	3 U	0.93 U
Trans-1,2-Dichloroethene	UG/L	8	44%	5	3	39	88	1 U	1.1	0.36 J	1 U	1 U	1 U	0.13 U
Trans-1,3-Dichloropropene	UG/L	0	0%	0.4	0	0	88	1 U	1 U	0.37 U	1 U	1 U	1 U	0.37 U
Trichloroethene	UG/L	2700	69%	5	38	61	88	3.8	2.4	2.2	1 U	1 U	1 U	0.33 J
Trichlorofluoromethane	UG/L	0	0%	5	0	0	88	1 U	1 UJ	0.15 U	1 U	1 UJ	1 UJ	0.15 UJ
Vinyl chloride	UG/L	180	66%	2	49	58	88	1 U	1.9	0.26 J	1 U	1 U	1 U	0.24 U
Other														
Manganese	UG/L	56900	100%		0	12	12							
Ethane	UG/L	98	83%		0	33	40							
Ethene	UG/L	200	83%		0	33	40							
Methane	UG/L	23000	93%		0	37	40							
Sulfate	MG/L	1060	68%		0	27	40							
Total Organic Carbon	MG/L	2050	100%		0	40	40							

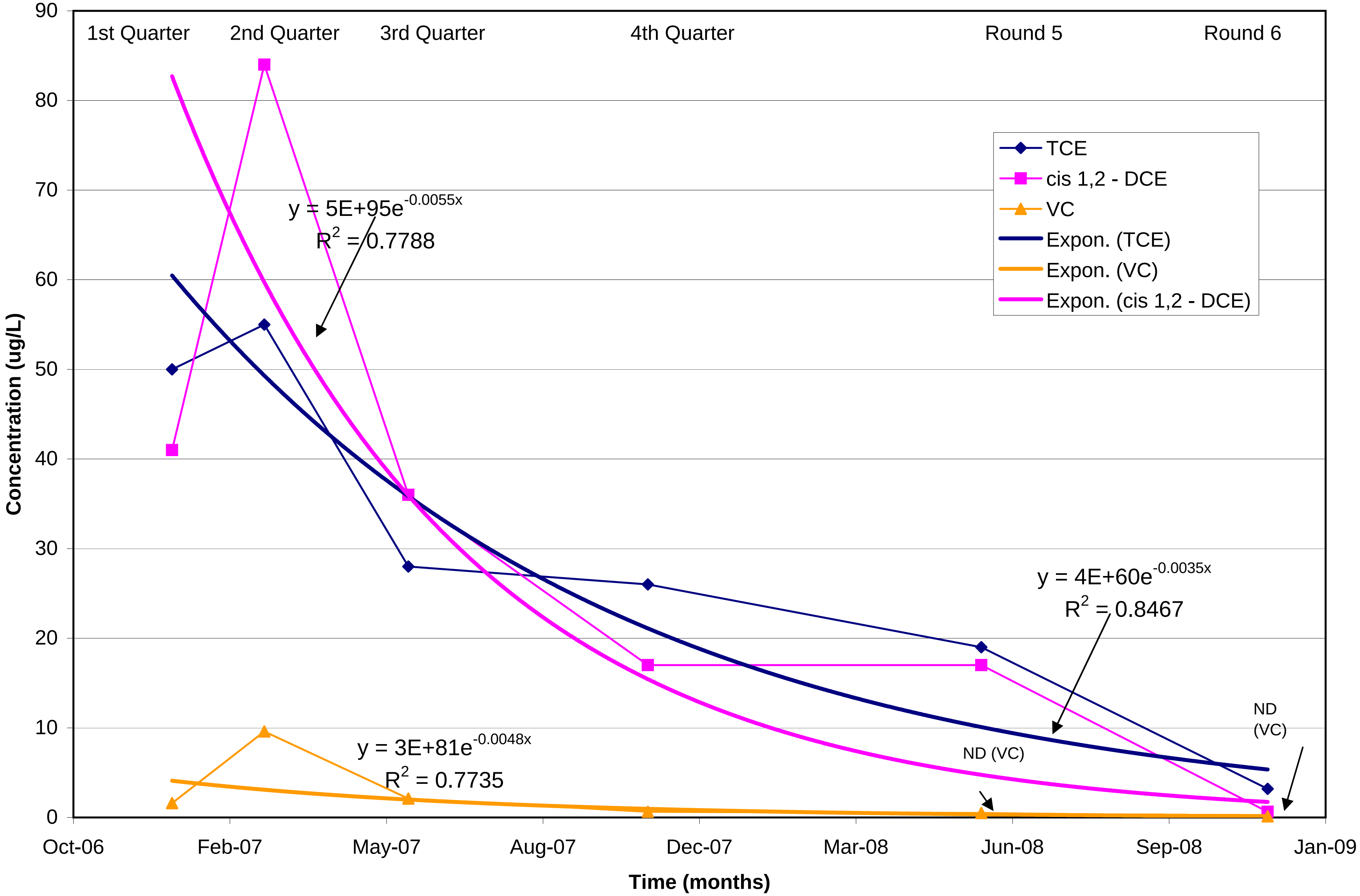
Notes:
1. The cleanup goal values are NYSDEC Class GA Groundwater Standards (TOGS 1.1.1, June 1998).
2. Shading indicates a concentration above the GA Groundwater standard.

U = compound was not detected
J = the reported value is and estimated concentration
UJ= the compound was not detected; the associated reporting limit is approximate.

APPENDIX B

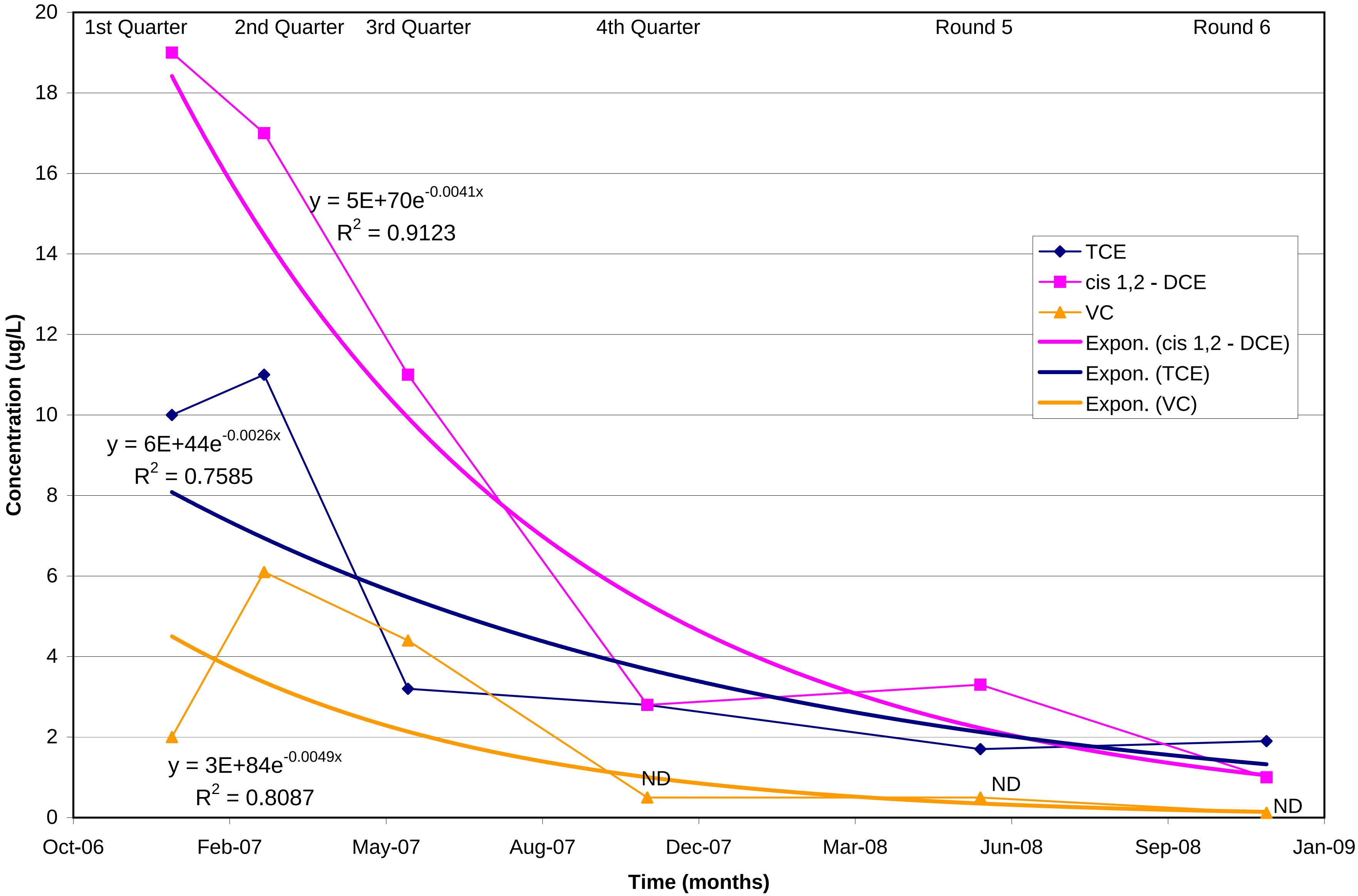
REGRESSION PLOTS

Figure B-1
Regression Plot of Well Concentrations At MWT-25
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



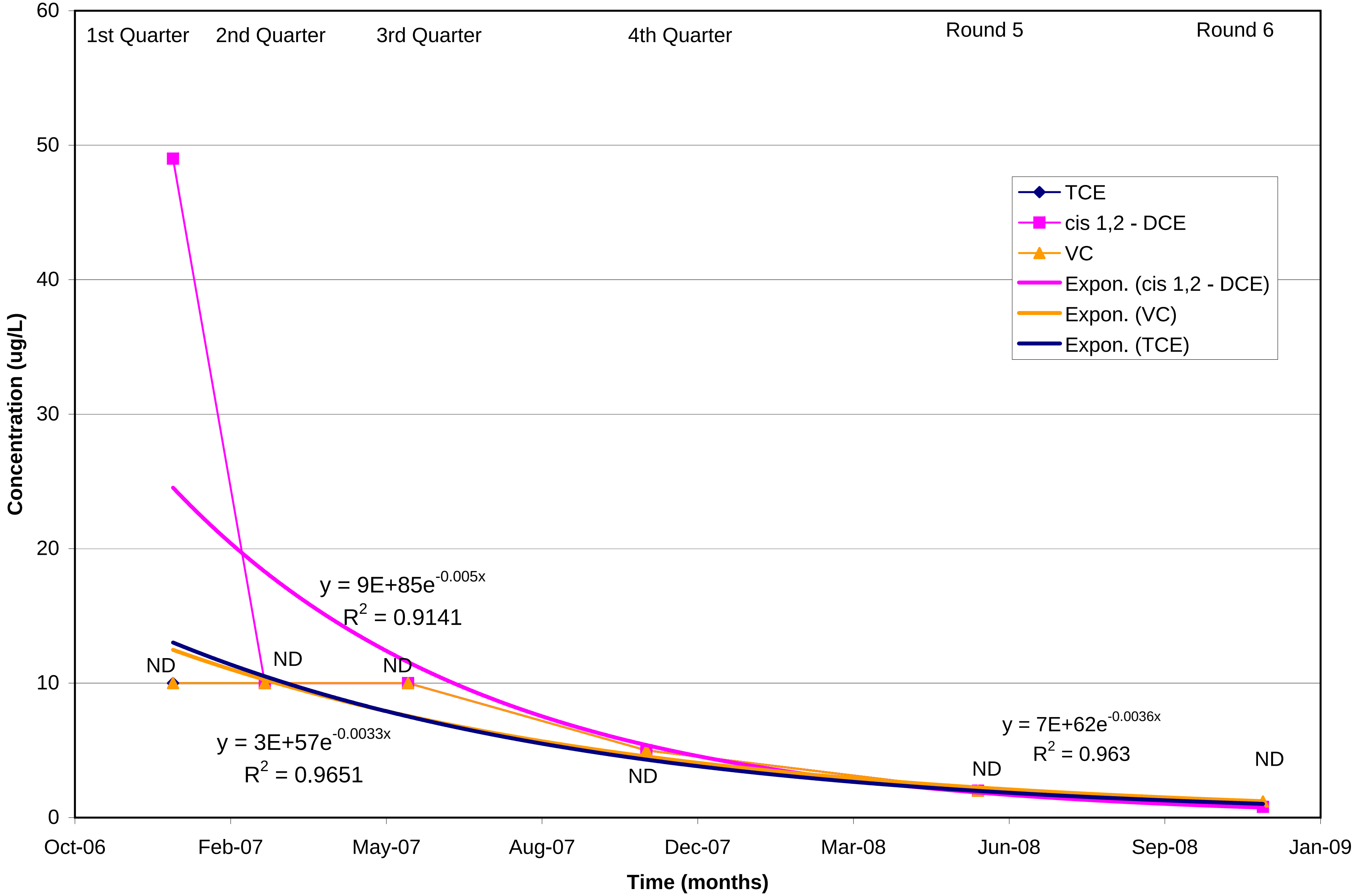
ND = not detected.

Figure B-2
Regression Plot of Well Concentrations At MWT-26
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



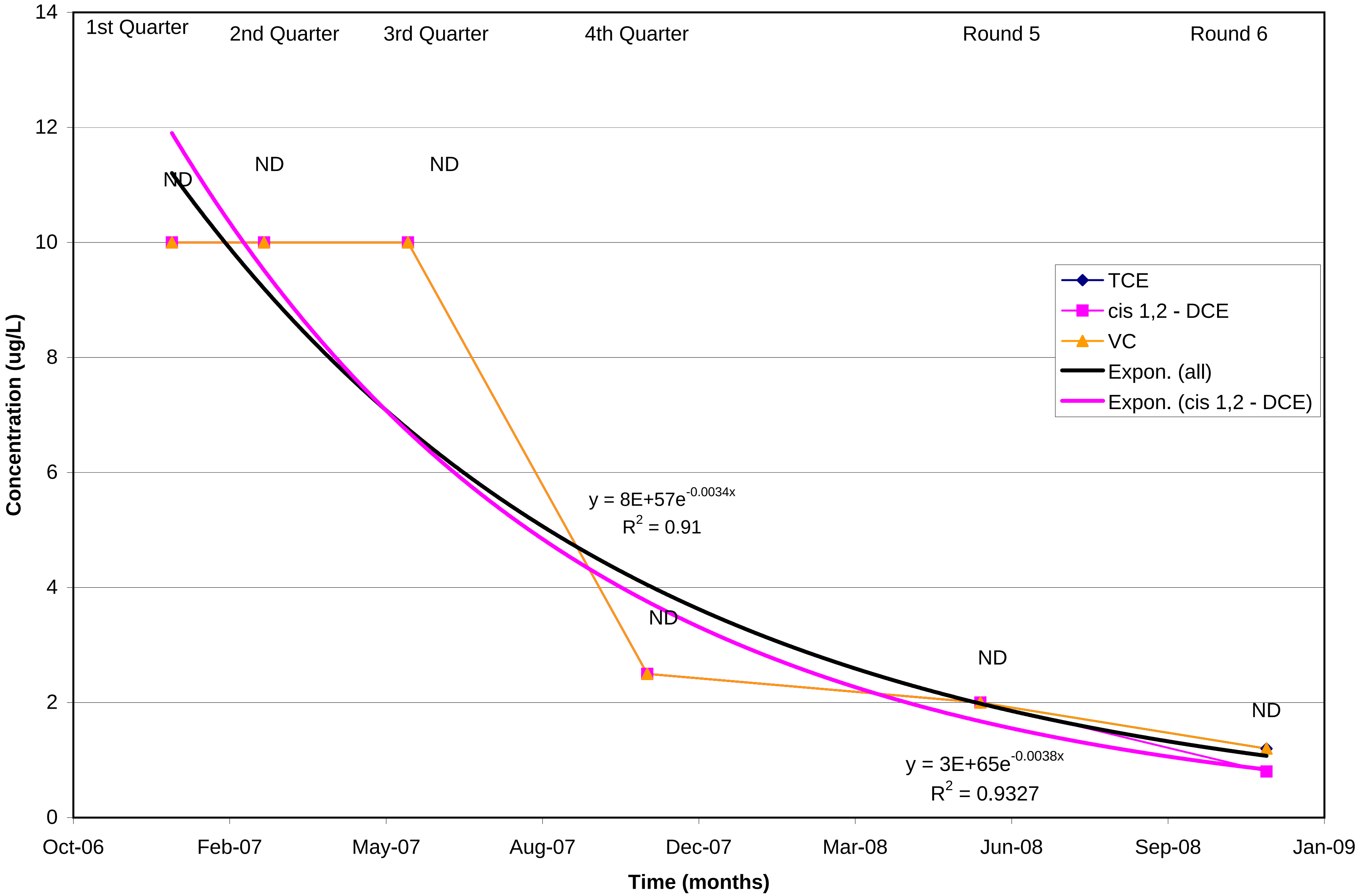
ND = not detected.

Figure B-3
Regression Plot of Well Concentrations At MWT-27
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



ND = not detected.

Figure B-4
Regression Plot of Well Concentrations At MWT-28
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



ND = not detected.

Figure B-5
Regression Plot of Well Concentrations At MWT-29
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

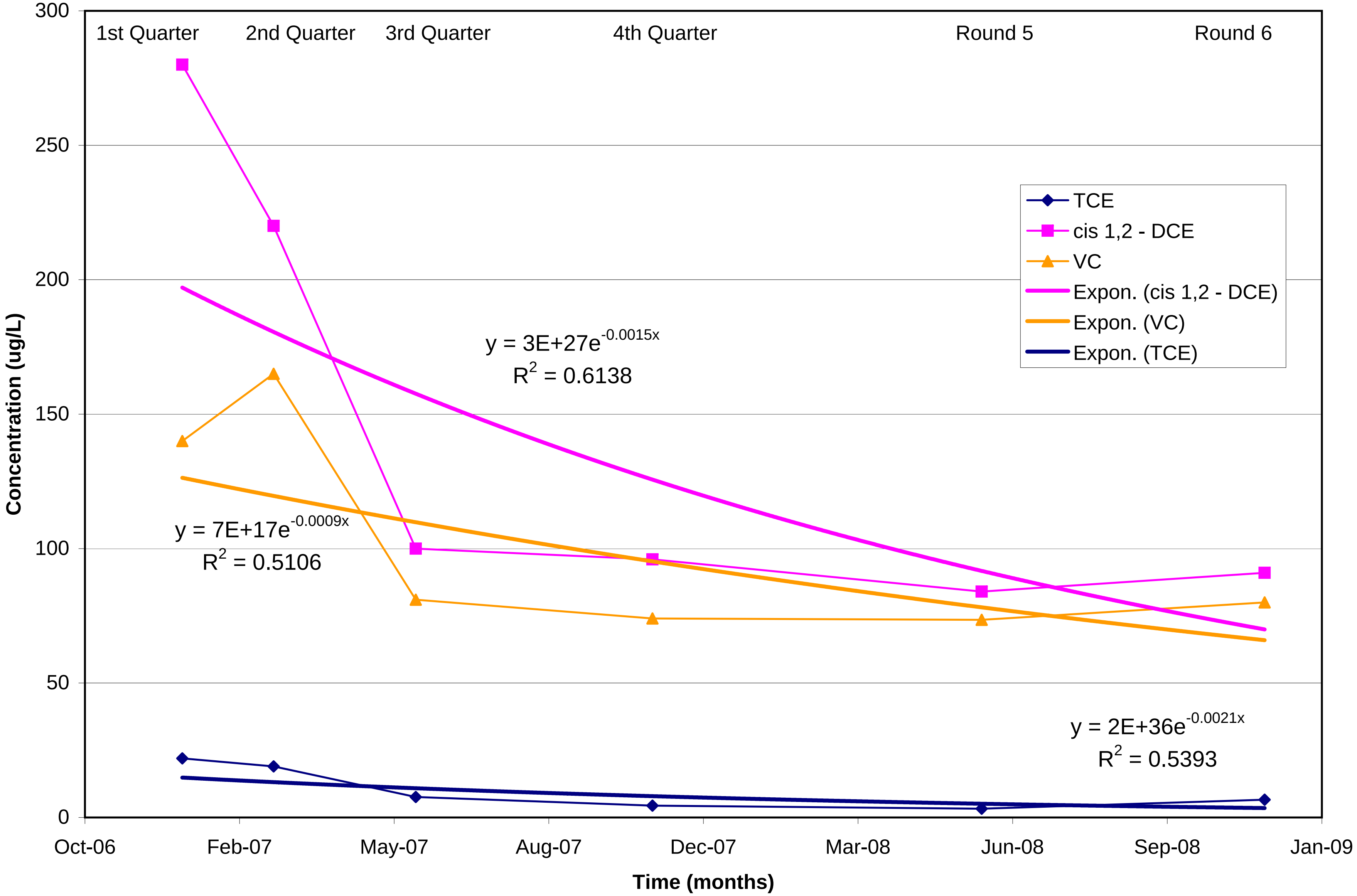


Figure B-6
Regression Plot of Well Concentrations At MWT-22
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

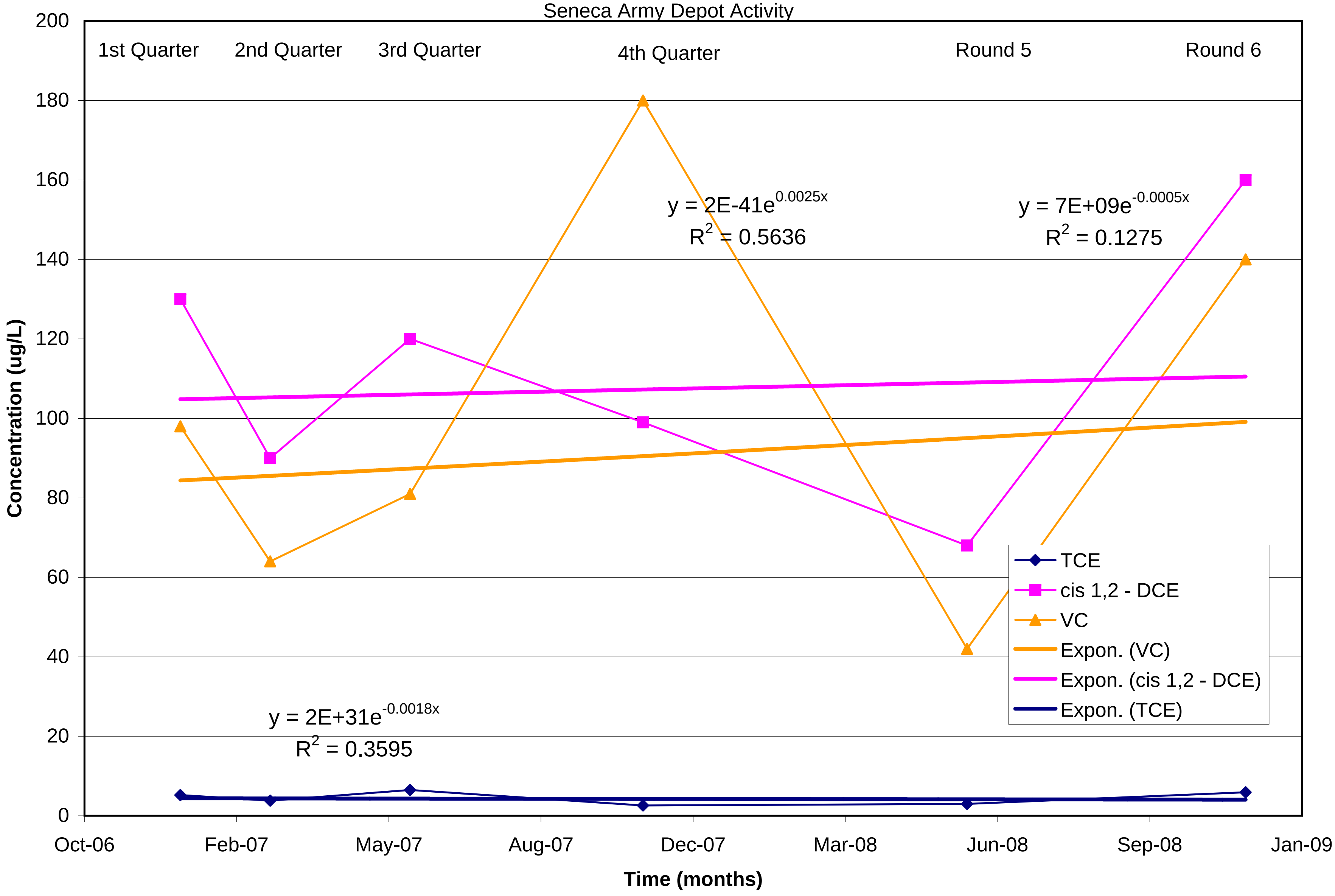


Figure B-7
Regression Plot of Well Concentrations At PT-22
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity

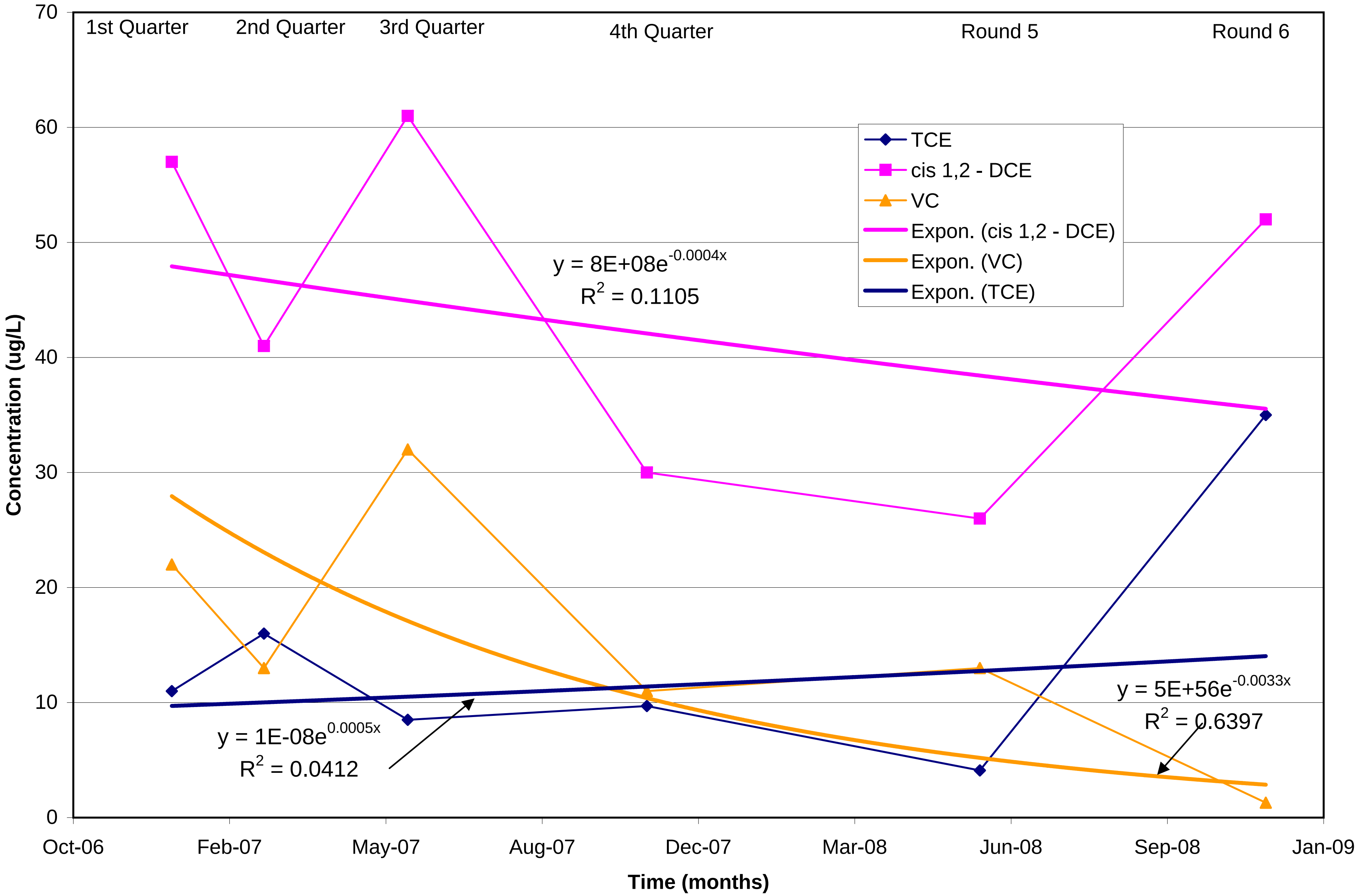
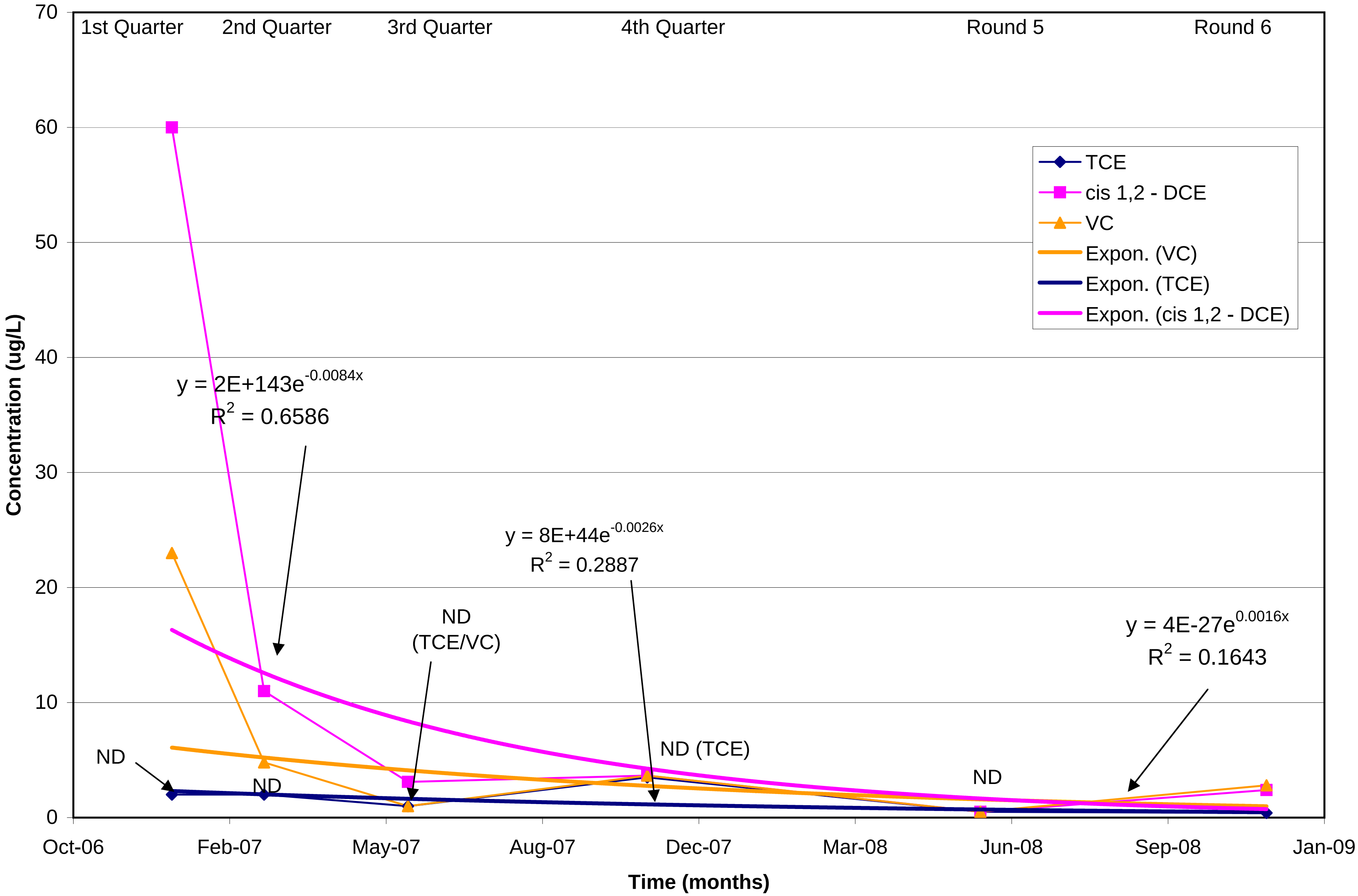
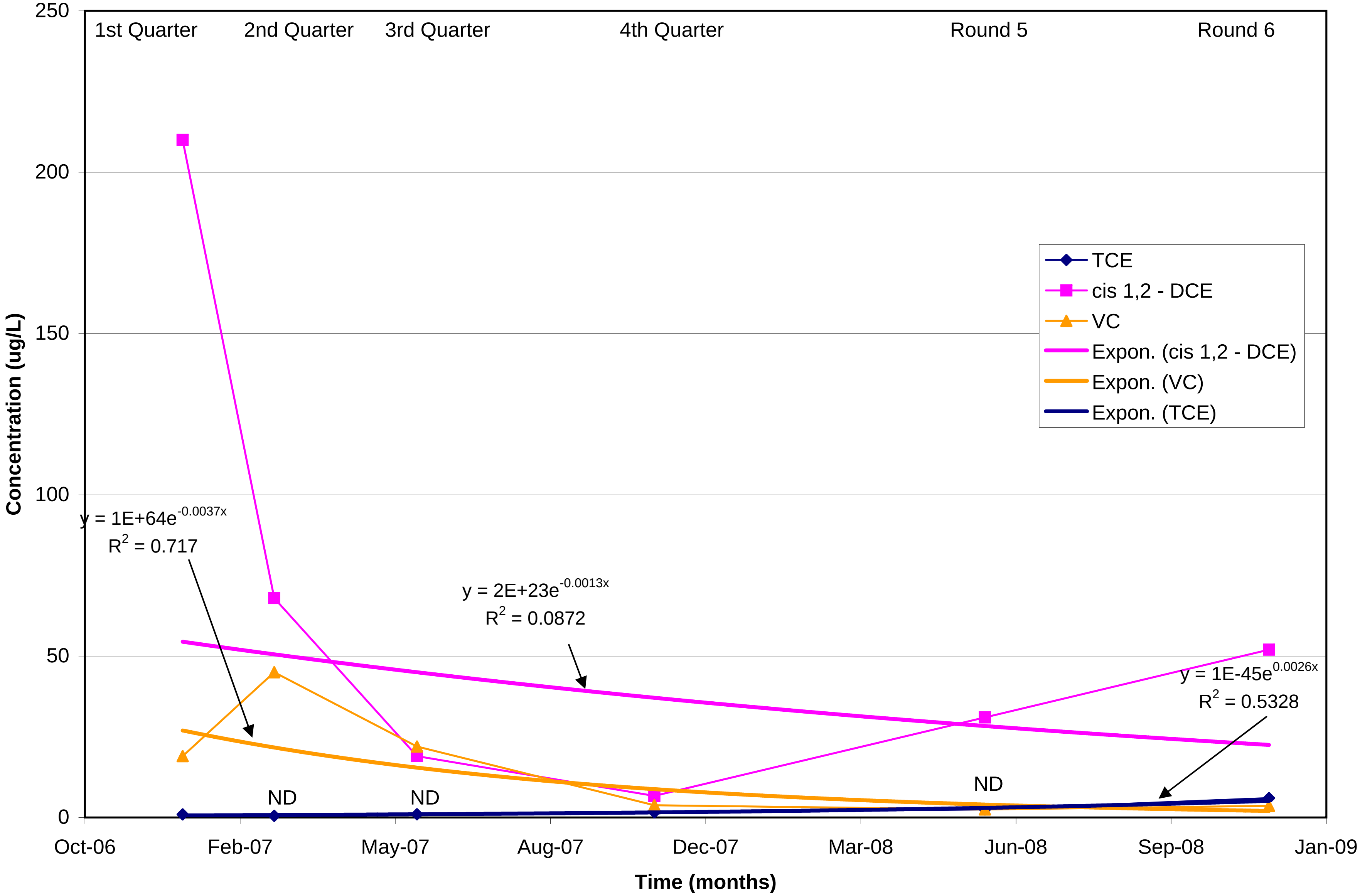


Figure B-8
Regression Plot of Well Concentrations At MWT-23
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



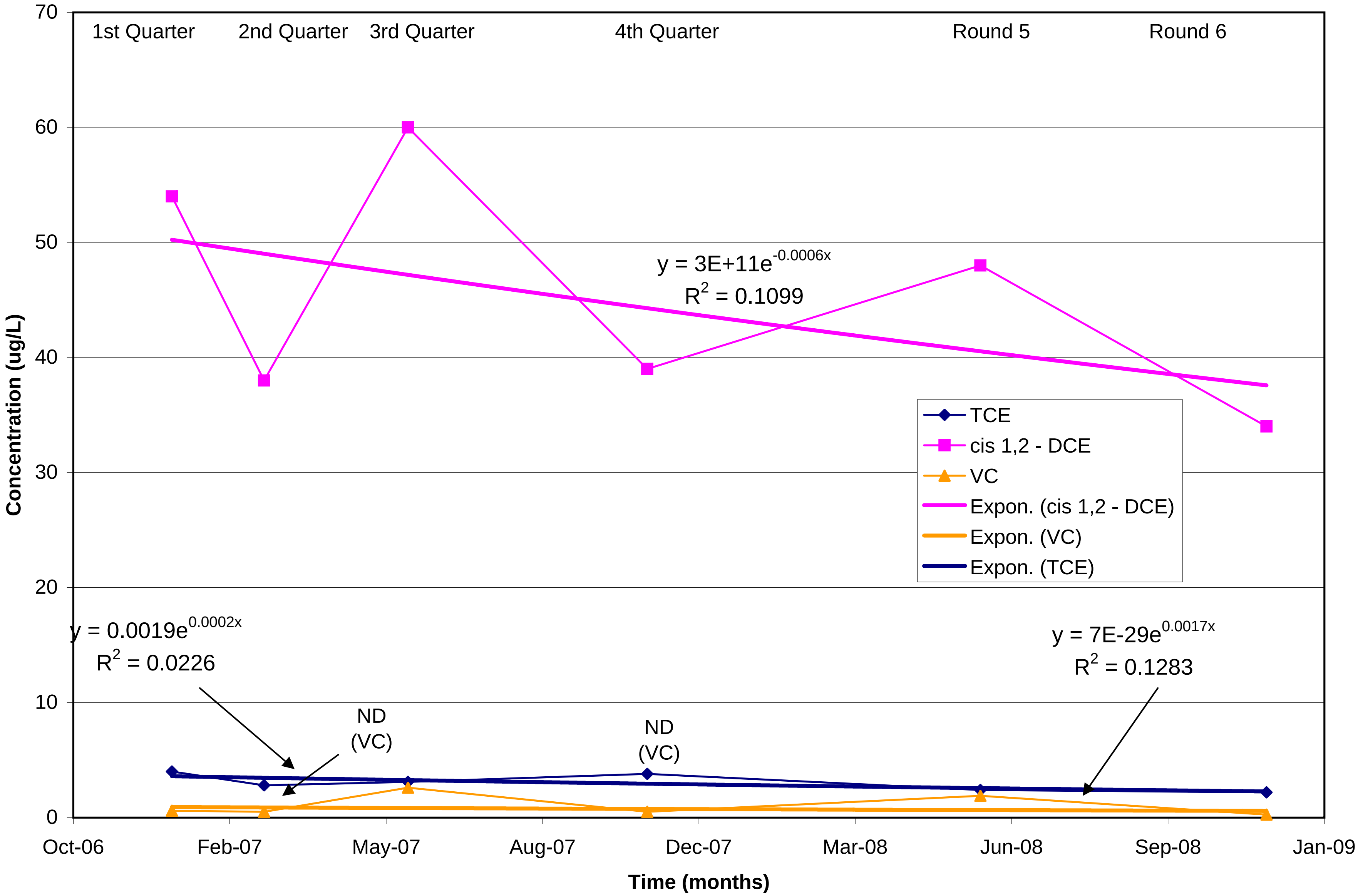
ND = not detected.

Figure B-9
Regression Plot of Well Concentrations At MWT-24
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



ND = not detected.

Figure B-10
Regression Plot of Well Concentrations At PT-24
Ash Landfill Annual Report, Year 2
Seneca Army Depot Activity



ND = not detected.

APPENDIX C

RESPONSE TO COMMENTS

Army's Response to Comments from the United States Environmental Protection Agency

Subject: Draft Annual Report and Year 2 Review
Ash Landfill Operable Unit
Seneca Army Depot
Romulus, New York

Comments Dated: July 16, 2009

Date of Comment Response: August 26, 2009

<u>Army's Response to Comments</u>

GENERAL COMMENT

Comment 1: Current EPA Guidance entitled, Technical Protocol For Enhanced Anaerobic Bioremediation Using Permeable Mulch Biowalls and Bioreactors, Final, dated May 2008 (Biowall Guidance, 2008) states in Section 8.2, Sustaining Biowall Performance, in the second paragraph on Page 8-2, that "[o]ne objective of an [Operation and Maintenance] O&M plan is to determine when replenishment is required prior to contaminant breakthrough. Therefore, the monitoring protocol for O&M should focus on critical geochemical thresholds and not simply on monitoring for breakthrough of the contaminants of concern. In addition, the frequency of monitoring should be adequate to provide sufficient time to implement a substrate replenishment event prior to unacceptable contaminant breakthrough. Thus, the frequency of monitoring will be a function of how accurate geochemical indicators are in determining when replenishment will be required. An iterative approach may be necessary, and O&M monitoring protocols should be evaluated periodically as additional data are collected and experience is gained with the treatment system." The criteria used for assessment of the need for replenishment for the Ash Landfill are presented in the table in Section 3.4, Biowall Recharge Evaluation, at the bottom of Page 16 of the Report. The table values presented as assessment points for recharge of the biowalls include a total organic carbon (TOC) value of greater than 20 mg/L. The values presented are approaching the 20 mg/L criterion at MWT-28 and MWT-23. Further, oxygen reduction potential (ORP) is another assessment point for recharge of the biowall, with a trigger value of less than -100 mV. The ORP values presented indicate that conditions have not maintained the specified criterion of -100 mV at well MWT-28 for the last two quarters, and are close to this value at MWT-23. The third and final assessment point presented is dissolved oxygen (DO) with a specified criterion of less than 1.0 mg/L. The Biowall Guidance, 2008 indicates in Section 8.3, Protocols for Determining When to Replenish Substrate, on Page 8-3, in the second to last paragraph of the section, that "DO and pH were retained primarily as stabilization parameters for well purging," and are not considered a "scoring matrix" for biowall recharge. The Report goes on to conclude in the last paragraph of Section 3.4 on Page 17 that the, "… biowalls do not need to be recharged and the biowall system continues to meet the long-term monitoring objectives established n the RDR (Parsons, 2006b)," and further states in the last bullet of Section 4.2, Recommendations, on Page 21 that "[t]he frequency of monitoring and the need to recharge the biowalls will be reviewed in the annual report submitted after the completion of the third year of LTM." This approach potentially allows the on-site conditions to dangerously approach breakthrough. It would be more prudent to reassess the conditions and the potential need for biowall recharge during the summer bi-annual sampling event. Please revise the Report to allow for a re-assessment of the need for biowall recharge after the Summer 2009 sampling event.

Response 1: Section 8.2 notes that multiple lines of evidence are required to fully evaluate the need for recharge of a biowall. The analysis in the annual report includes an assessment of both geochemical parameters and chemicals of concern. The AFCEE biowall protocol, (which was written by a Parsons geologist, Bruce Henry, who is the technical reviewer of this project) provides threshold values that are examples and the exact values are unique to each site, determined by site-specific monitoring observations.

The data collected does not indicate that recharging is a concern at this time for the following reasons:

1. Values for geochemical thresholds in Section 8 of the protocol were not intended to be used verbatim, but rather as examples.
2. Section 8 further indicates that each site will be unique and that threshold levels will have to be determined based on monitoring observations for each individual site. For example, a biowall at Offutt AFB remains highly effective after 6 years with TOC levels below 5-10 mg/L.
3. The scoring matrix for NWIRP McGregor is only an example (and it is developed for perchlorate and not for TCE).

The last bullet in Section 4.2 will be revised to state that "the need to recharge will be evaluated after the completion of the seventh sampling event in June 2009."

Comment 2: There were a number of comments from our April 22, 2008 letter on the *Draft Annual Report and One-Year Review for the Ash Landfill Operable Unit* that did not appear to have been addressed or incorporated into this report: Technical Review Comment Nos. 3, 5, and 7.

Response 2: Responses to comments were submitted via email on October 29, 2008. The responses are summarized here:

Comment 3 requested information on data collected after the removal of the debris piles. In the original response, the Army indicated that, in accordance with the RDR, the piles were not sampled; therefore, data are not available to present. Consequently, there are no changes to the text.

A response to Comment 5 was provided and plots were attached to the response; text changes were not required.

In response to Comment 7, the text was updated, and the revised text can be found on Page 20 of the Year 2 Annual Report under the first bullet.

SPECIFIC COMMENTS

Comment 1: Section 1.0, Introduction, Page 1: The third bullet on this page lists the Guidance for Evaluation of Federal Agency Demonstrations as Section 12(h)(s). The version of the document titled Guidance for Evaluation of Federal Agency Demonstrations that was located indicated the reference should be CERCLA Section 120(h)(3). Please resolve this discrepancy.

Response 1: The discrepancy was resolved.

Comment 2: Section 3.1, Sample Collection, Page 8: The first sentence in the last paragraph on Page 8 states that "[t]he five biowall process monitoring wells include three wells that are also plume performance wells (MWT-23, MWT-28 and MWT-29)." The next sentence states that "These five wells are either within or immediately upgradient or downgradient of the biowalls…" However, it appears that none of these three wells are immediately upgradient of any of the biowalls. MWT-23 and MWT-28 are within the biowalls while MWT-29 is downgradient of the biowall. Please revise the Report to clarify the location of these three plume performance wells. It should be noted, that due to the scale used to present the information on Figure 4, the symbol used to denote the well location is larger than the biowall width, so a determination of wells immediately upgradient or downgradient versus within the biowall may be difficult to confirm.

Response 2: The sentence referenced is referring to the five biowall process monitoring wells; MWT-26, MWT-27, MWT-28, MWT-29, and MWT-23. MWT-26 is immediately upgradient of the Biowalls B1 and B2.

The statement has been clarified by replacing the beginning of the second sentence with "These five biowall process wells (MWT-26, MWT-27, MWT-28, MWT-29, and MWT-23. . ."

Comment 3: Section 3.4, Biowall Recharge Evaluation, Page 17: The first sentence at the top of Page 17 states that "…the change in concentrations at MWT-27 (Biowall B1), MWT-28 (Biowall B2), and MWT-23 summarized in the following table," but the relative location of the wells with respect to each other is not discussed. Given that MWT-23 is within Biowall C2, while MWT-27 is within Biowall B1 and MWT-28 is within Biowall B2 as noted, the text should be revised to include the relative location of MWT-23. Please revise the text to include the relative location of MWT-23.

Response 3: The text was revised as follows, "…the change in concentrations at MWT-27 (Biowall B1), MWT-28 (Biowall B2), and MWT-23 (Biowall C2), summarized in the following table."

Comment 4: Section 4.2, Recommendations, Page 20: In the first sentence of the first bullet under Section 4.2, the five biowall process wells are listed as MWT-26, MWT-27, MWT-28 (twice), MWT-29 and MWT-23. Please revise the Report to list only five actual biowall process wells.

Response 4: The text was revised as follows, "Biowall process monitoring wells (MWT-26, MWT-27, MWT-28, MWT-29, and MWT-23) will be monitored on a semi-annual basis."

Comment 5: Section 4.2, Recommendations, Page 20: The second sentence in the first bullet reads: "As stated in the RDR (Parsons, 2006)…" According to Section 5.0, References, the RDR is referenced as Parsons, 2006b. Please revise the sentence.

Response 5: The text was revised as follows, "As stated in the RDR (Parsons, 2006b)..."

Comment 6: Table 3: Table 3 has five well numbers highlighted in blue text. The Note for Table 3 indicates that "Wells in blue represent five performance monitoring wells", while in fact these five wells represent the Biowall Process Monitoring Wells. Please revise this Note similar to the Note included in Table 2 indicating that the "bolded wells are the five wells included in the biowall process monitoring group."

Response 6: The note for Table 3 was revised as follows, "The bolded wells are the five wells included in the biowall process monitoring group."